PROGRAM

CKC 2020

Canada-Korea Conference on Science & Technology

“ST & I Collaborations for an Agile Future”

2-5 September 2020

In-person at Sejong, Seoul in Korea
Kananaskis, Toronto, Ottawa, Halifax in Canada

CKC 2020

CANADA-KOREA CONFERENCE ON SCIENCE & TECHNOLOGY

beyond leading technology KIAT
Korea Institute for Advancement of Technology

Beyond leading technology

Innovation

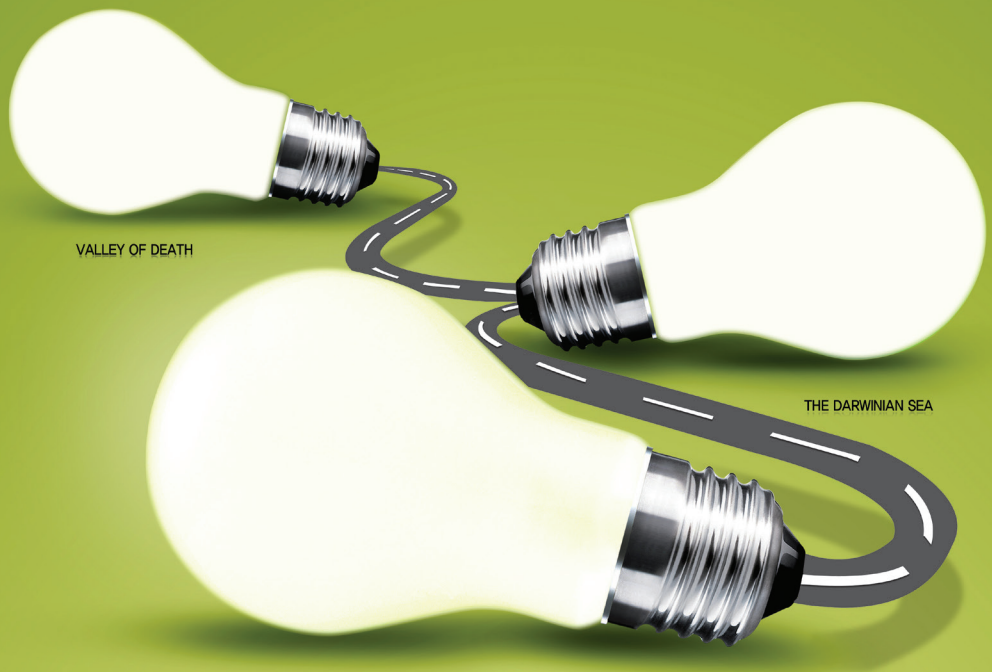
We will change the world for the better through technical innovation and industrial growth

Vision

To be a global, world-class industrial technology promotion agency that leads the convergence and development of the industrial technology ecosystem.

Mission

To establish Korea as a world leading technological power through industrial technology policy development and by strengthening Korea's technical innovation ecosystem.



KIAT is a Bridge over the Valley of Death and the Darwinian Sea

MISSION | 미션

대한민국을 세계에 알리는 지질자원 연구

국내는 물론 세계를 선도하는 지질자원 연구를 통해 대한민국의 지속 가능한 내일을 책임지고 있습니다.

VISION | 비전

지속가능한 안전·풍요사회 실현의 지질자원기술 솔루션 리더

대한민국 유일의 지질자원 연구기관으로 한반도와 지구의 밝은 미래를 열어갑니다.

K	I	G	A	M
Knowledge to Solution	Innovation to Future	Globalization to Leader	Alteration to Smartness	Mobility to Convergence

지구의 46억 년,
세월을 이해하고 자원의 한계를 극복하는 일

한국지질자원연구원은 국토지질, 광물자원, 석유해저, 지질환경, 지오플랫폼 등의 연구 분야를 집중적으로 연구하고 있습니다.
더 나아가 국가산업 발전의 핵심 원동력으로 국가의 미래 과학기술을 책임지는 세계 일류 연구기관으로 도약하고 있습니다.

GEOSCIENCE PLATFORM DIVISION
지오플랫폼연구본부

지질자원 정보 대국민 서비스 제공

GEOLOGY DIVISION
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GEOLOGIC ENVIRONMENT DIVISION
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기후변화 및 지질환경 대응 기술개발

KIGAM POHANG BRANCH
포항지질자원실증연구센터

지질자원 탐사개발 실용화 기술개발

CLIMATE CHANGE | 기후변화대응

세계 최고 수준의 원천기술을 보유한 한국지질자원연구원은 「탄소광물 플래그십 사업」을 착수하여 우리나라 CO_2 배출 저감 목표량 달성에 중추적인 역할을 수행하고 있습니다.

www.kwse.or.kr

대한여성과학기술인회 2020

KWSE

The Association of Korean Woman Scientists and Engineers

KWSE, founded in 1993, is the first association of woman scientists and engineers in Korea with a goal to contribute to national development of science & technology and to protect the rights of women in STEM.

Major Activities

- Participating in national policy development for science and technology
- Providing opportunities to exchange academic outcomes and research information for enhanced interdisciplinary capacity and leadership
- Supporting science education to foster science-friendly culture
- Expanding opportunities to build global networks for international cooperation by women scientists and engineers

대한여성과학기술인회
THE ASSOCIATION OF KOREAN WOMAN SCIENTISTS AND ENGINEERS

AKCSE 캐나다한인과학기술자협회
The Association of Korean-Canadian Scientists and Engineers

The Association of Korean-Canadian Scientists and Engineers (AKCSE) was established in 1986 as a non-profit professional organization and has grown to over 3,000 registered members with 11 Local Chapters, 16 School Chapters, 5 Young Professional Chapters, and 3 Professional Societies across Canada. The association is young with roughly half of its members in their 20s and growing today faster than ever. We have been active in promoting young Koreans to develop their professional career by holding annual competition in math and science from grade 4 to 11, sending young engineers and scientists to Young Generation Forum in Korea, awarding scholarship to undergraduate and graduate students, and supporting regional groups of young professionals. Our organization objectives are to:

- Promote the application of science and technology for the general welfare of society,
- Help Korean-Canadian scientists and engineers develop their full career potential in both Canada and Korea,
- Serve the Korean community by delivering scientific and technological information.

KOFST Korean Federation of Science & Technology Societies
한국과학기술단체총연합회

The increasing importance of science and technology calls upon the Korean Federation of Science and Technology Societies (KOFST), an organization of scientific and technological societies in various disciplines, to assume increased responsibilities for the advancement of our society. KOFST will double its efforts to foster and support scientific and technological societies, who are the key actors in knowledge creation and diffusion, and also to expand the participation of scientists and engineers in social developments. KOFST seeks “Represent the science and theology community sharing the future if science”. To fulfill our mission, KOFST has set the broad goals:

- Foster and support the science and technology societies
- Encourage scientists to engage with society
- Enhance the rights and interests of scientists
- Increase public understanding of scientific discoveries and theories
- Support the national growth by undertaking study, planning, research and advice on science and technology policy

과학기술정보통신부
Ministry of Science and ICT

Good morning Distinguished VIPs and CKC 2020 Participants,

COVID-19 pandemic has impacted the global community. I hope you are all doing well and staying safe.

On behalf of the Organizing Committee members, I am delighted to welcome all the delegates and their guests - either in-person or online - to the 2020 Canada-Korea Conference on Science and Technology (CKC 2020). This is an annual event co-organized by the Association of Korean-Canadian Scientists and Engineers (AKCSE), and the Korean Federation of Science and Technology Societies (KOFST).

The CKC is a conference that aims to bring experts and leaders from Canada and Korea to discuss up-to-date challenges in ST & I, and how we can address these challenges together. Since its first conference in 2011, every CKC has served as a major platform for not only networking among professionals from diverse fields of science and technology, but also nurturing cutting-edge ideas and exploring collaborative opportunities for R&D between the two countries.

Korea and Canada have maintained strong partnership in various fields for a long time. Following the strategic partnership established in 2014, the 2015 FTA served as a momentum for urgent need of cooperation in science and technology. This resulted in ST & I Cooperation Agreement in the spring of 2017. The first Korea-Canada Joint Committee Meeting was held in December of the same year in Seoul, Korea, which was followed by the second Joint Committee meeting during the CKC 2019 in Banff, Canada.

This year's conference theme, "ST & I Collaborations for an Agile Future" highlights a goal shared by both signatories, and demonstrates new steps taken toward bilateral R&D collaboration between the two countries. In addition to highlighting Canada-Korea collaborations for agile technologies to address global challenges, the conference will also showcase and promote discussions for A.I., response to emerging infectious disease such as COVID-19, future of lithium-ion batteries, development of sustainable materials, and clean technologies for Earth, energy and environment. Taking this opportunity, I sincerely hope that the two countries will be able to maintain excellent partnership in science and technology, and furthermore, it serves as an opportunity to actualize the future ST & I cooperation in detail.

In 2011, the AKCSE hosted our first CKC in Vancouver, British Columbia with around 120 participants. Last year, we hosted the 9th CKC in Banff, Alberta with nearly 500 participants. Without a doubt, the success of this conference ultimately depends on the participation of scientists and engineers, young generation and professional, passionate organizers, and the sponsoring research institutions and industry partners. As conference chair of the CKC 2020, I would like to thank all participating organizations for their generous support for the conference, all members of the organizing committee, and the conference IT committee for their tireless dedication and efforts.

Certain challenges and problems are expected as we host the combination of in-person and online conference for the first time. The Organizing Committee will learn from this and expand the future online programs so that more scientists and engineers can participate in the conference, as well as the lessons learned will improve and enhance the future conference in terms of quality and quantity.

Once again, I welcome VIPs and all participants, and I wish you all a pleasant and fruitful time.
Thank you very much.

Sincerely yours,

Jeong Woo Kim
Conference Chair and 22nd President of the AKCSE

Distinguished participants, ladies and gentlemen, it is my great pleasure to welcome all scientists and engineers from home and abroad to the 2020 Canada-Korea Conference on Science and Technology (CKC-2020), which is held in a hybrid format encompassing both in-person and virtual. I am grateful to President Jeong Woo Kim and the dedicated members of the Association of Korean-Canadian Scientists and Engineers (AKCSE) for successfully orchestrating this gathering.

This year's Conference was postponed due to the spread of COVID-19 pandemic that has wreaked havoc around the world since last December. The venue had to be replaced from a physical location of Halifax to a mix of online and partially offline event in select regions. I owe the great hand of applause to AKCSE as well as to Korean and Canadian scientists and engineers who were instrumental in pulling off a well planned event of this magnitude amidst these trying period. As all participants joining from Canada are urged to remain vigilant against the coronavirus, I trust that the safety will be given the highest priority during the Conference.

In the wake of the World Health Organizations's declaration of COVID-19 outbreak as a global pandemic in March, the world is unquestionably divided into the pre- and post-pandemic eras. COVID-19 impacted our lives in a myriad of ways by accelerating the offline-to-online conversion and fast-tracking platform technologies grounded on digital ecosystem. By riding the waves of these technologies, Korean Federation of Science and Technology Societies (KOFST) is also converting a number of official meetings into virtual events while maintaining a close collaboration with respective overseas Korean Scientists and Engineers Associations (KSEAs) including AKCSE in leveraging non-contact technology that facilitates encounters without a face-to-face contact.

For instance, on April 28th, KOFST along with 18 KSEAs held an online meeting, followed by the KOFST-KSEAs joint international forum entitled 'The Key Takeaways in the National Containment Measures and the Development of Treatments and Vaccines' held virtually on June 3rd in collaboration with the Korean Academy of Science and Technology and the National Academy of Medicine of Korea. The joint forum was attended by eminent scholars representing diverse academic fields in America, Europe and Asia along with Korean scientists and engineers prominent around the world. The forum witnessed more than 200 participants from Korea although taken place late at night, which bespeaks a high degree of public interest that transcends time and space in eradicating the global pandemic.

The theme of this year's CKC is 'ST&I Collaborations for an Agile Future'. As the world is set for a major reorganization due to technological advances in AI, cloud, big data, robotics and VR, it is indispensable that we elevate Korea-Canada ST&I cooperation to the next level in order to adapt to today's rapidly changing environment. The technology drivers of the fourth industrial revolution shall move in the direction of pursuing the survival and prosperity of human beings, particularly in the post COVID-19 era that gives renewed impetus to the role of science and technology. As a matter of fact, core technologies in major industries such as non-contact services are progressing faster than anticipated. In light of this, the role entrusted to Korean and Canadian scientists and engineers convened today are more significant than ever in addressing challenges facing the international community by accelerating technology advancement and creating an environment where humanity will live in a harmonious co-existence with science and technology.

As this year marks the 10th anniversary of CKC since its inception, I sincerely hope that CKC will be uniquely positioned to lay a basis for joint research and make headway in science and technology advancements in two countries. With these few words, I hope today's conference will stimulate lively discussions on how we should harness science and technology to remove barriers among countries and facilitate innovative partnership at the same time. Rest assured, we, at KOFST, will always remain committed to your noble work and are determined to be a reliable supporter for Korean scientists and engineers residing in Canada to play an integral part in non-governmental diplomacy. I wish you all gathered in this year's CKC the best of luck for your future endeavors. Thank you.

Woo Il Lee
President of Korean Federation of Science and Technology Societies

Dear respected scientists and engineers,

I am Kiyoung Choi, Minister of Science and ICT of Republic of Korea.
First of all, I send my sincere congratulations on the 10th anniversary of the Canada-Korea Conference on Science and Technology (CKC).
I would like to convey my profound gratitude to President Wooil LEE of the Korean Federation of Science and Technology Societies and President Jeongwoo KIM of the Korean-Canadian Scientists and Engineers Association as well as everyone involved in organizing this event despite the hardship and difficulties arisen from the COVID-19 pandemic. I would also like to extend my gratitude to the scientists and engineers from both countries for gladly stepping up to share knowledge.

As COVID-19 began early this year and still persists, some experts predict that we may have to co-exist with COVID-19 in the future. Our daily lives are becoming 'contact-less' with the digitalization of entire economies and societies, and accordingly, the world is fast approaching an era of new normal.
Every nation in the world is focusing on investing in its ability to fight the economic crisis triggered by COVID-19 and climate change caused by global warming. The government of Republic of Korea also announced the 'Korean New Deal' policy last July.

President Jae-In Moon emphasized that the Korean New Deal is to 'design the next 100 years.' It is a project of great national transformation and an aspiration for Korea to take the lead in creating a whole new world for all.
First, Korea plans to expand the full-scale digital transformation based on ICT infrastructure, one of Korea's biggest strengths, and to accelerate the transition to low-carbon and eco-friendly green economy by investing 160 trillion won by 2025. Korea also plans to further solidify its foundation as a people-centered inclusive nation through enhanced social safety net, while alleviating inequality resulting from the economic restructuring.
Throughout history, Korea has demonstrated its wisdom and potential by turning crisis into opportunity. Again, Korea will do its utmost to become a leading nation well-prepared for the post-COVID-19 era.
I have been told the focus of this year's CKC event will be the prospects of the future society with increasing uncertainty and the ways of responding to such uncertainties through scientific and technological innovation. I believe it is a very timely and suitable topic. The role of scientists and engineers in proposing the directions to the future with rational intellect and scientific approach is more important than ever. I anticipate various solutions to be proposed during this event, and those solutions will help enrich the lives of people from both nations and lead the humanity to a sustainable future.

Since the Agreement for Science, Technology and Innovation Cooperation was signed in 2016, Korea and Canada have been seeking ways to cooperate in the future-leading fields of AI, aerospace, clean technology and so forth. I urge both Canadian and Korean scientists and engineers to act as a strong bridge in developing partnership and cooperation for scientific and technological innovation. The Ministry of Science and ICT will stand with you and provide strong support in promoting the development and cooperation between the two nations.

Once again, I would like to congratulate the hosting of CKC 2020 and wish all the best for you and your loved ones. Thank you.

Kiyoung Choi
Minister of Science and ICT

September 2020

Dear distinguished guests from Korea and Canada,

On behalf of the National Research Council of Science and Technology (NST) of Korea, I would like to extend my warmest greetings to all of you attending the 2020 Canada-Korea Conference on Science & Technology (CKC 2020).

This year, the world is experiencing unprecedented challenges from COVID-19. While many international activities have been canceled or postponed due to this pandemic, Canada-Korea Conference has surprised us again by making its traditional event into a virtual one.

Facing the difficult times in COVID-19, the ability to adjust to a "new normal" has become a key element to surviving the crisis. In this regard, the Association of Korean-Canadian Scientists and Engineers (AKCSE) shows us the best example of what an agile organization is. NST with 25 Korean government-funded research institutes (GRIs) is also making every endeavor to flexibly respond to the problem from the early stage of the epidemic.

In fight against COVID-19, science and technology is the key element to overcome coronavirus. Under the timely theme of 'ST&I Collaboration for an agile future', I sincerely hope that the conference will help prepare us all for necessary information, insights, and wisdom to be agile through these new and challenging times.

Stay put, stay safe, stay healthy.

Sincerely,

Dr. Kwangyun Wohn
Chairperson
National Research Council of Science and Technology (NST)

Dear CKC 2020 Guests and Participants:

August 11, 2020

It is my sincere pleasure to welcome you all to the 2020 Canada-Korea Conference on Science and Technology. First of all, I would like to say thank you to Jeong Woo Kim, the president of the Association of Korean-Canadian Scientists and Engineers (AKCSE), who has made efforts to hold this conference online this year in spite of all the difficulties due to COVID-19. I look forward to having a chance to see the participants in person in the near future.

As you know, by every measure, 2020 has been an unprecedented year for all of us. The need for closer and more extensive scientific and technological collaboration is needed now more than ever, as we try to contain the ongoing pandemic and race to develop effective therapeutics and vaccines to help fight against COVID-19. You may have heard the saying: "If you want to go fast, go alone. If you want to go far, go together." We have witnessed first-hand how vulnerable we are in the absence of a coordinated international response to the pandemic. That is why Korea has been working closely with likeminded partners, including Canada, to exchange information on best practices, and to step up efforts to maintain international air and trade links, in order to stabilize global supply chains and achieve a global economic recovery.

As the global economy undergoes seismic technological changes, Canada and Korea, as part of the 'Digital 9' or 'D9' for short, continue to share world-class digital practices, identify improvements to digital services, and collaborate to solve common problems. We all know, common problems require common solutions – this is where the CKC comes in. The CKC makes much needed collaboration between our two countries possible. Let us not forget that Korea excels at introducing new technologies to the marketplace, and Canada remains a world leader in basic research. Clearly we have a symbiotic relationship – so the question remains: how do we capitalize on this?

One avenue would be to increase people-to-people exchanges between Canadian and Korean universities – particularly in the field of Artificial Intelligence. The ability to solve complex global problems will increasingly rely on advancements in AI; and both countries are well positioned to lead in this rapidly expanding field. Collaboration should not end there, but it should continue on all fronts – and certainly the CKC is the perfect venue to further these discussions. So let us continue to reach out, engage, and search for joint solutions. The international community needs solutions now more than ever.

With that said, I would like to convey my appreciation to all the organizers who have worked so hard to make this year's conference a success. I wish you all a most enlightening and engaging conference.

H.E. CHANG Keung Ryong,
Ambassador of the Republic of Korea to Canada

PRIME MINISTER · PREMIER MINISTRE

September 3-6, 2020

Dear Friends:

I am pleased to extend my warmest greetings to everyone participating in the 2020 Canada-Korea Conference on Science and Technology.

This annual conference offers a wonderful opportunity for scientists and engineers to collaborate, share information, and discuss the latest developments in science and technology. I am certain that delegates will benefit from the activities planned for this conference and will appreciate the opportunity to network with their peers.

I would like to thank the organizers for putting together an informative program for everyone in attendance. I would also like to commend participants for their dedication to advancing innovation in the fields of science and technology.

Please accept my best wishes for a productive conference.

Sincerely,

The Rt. Hon. Justin P. J. Trudeau, P.C., M.P.
Prime Minister of Canada

SENATE
The Honourable Yonah Martin

CANADA

SÉNAT
L'honorable Yonah Martin

August 2020

GREETINGS ON BEHALF OF THE HONOURABLE YONAH MARTIN

I am honoured to extend my sincere greetings to all those participating at the 2020 Canada-Korea Conference on Science and Technology Conference. We can all find hope and inspiration in taking part in this virtual ceremony in the midst of these challenging and unprecedented times.

For over 34 years, the Association of Korean-Canadian Scientists and Engineers (AKCSE), has been providing support and opportunities for Korean-Canadian scientists and engineers and contributing to the enhancement of the field of science and technology for both Canada and Korea. They have become a wealth of knowledge and leadership in the field of science and technology, and to their community.

To all of the participants at this year's conference, I commend you for your passion and dedication to enriching the field of science and technology and providing diverse and enlightening discussions and knowledge to this conference as well as your field of expertise for Canada, Korea and around the world.

On behalf of the Senate of Canada, best wishes for a productive conference and continued success to you all!

Sincerely,

The Honourable Yonah Martin
Deputy Leader of the Opposition in the Senate

Dear President Jeong Woo Kim and AKCSE members,

On behalf of The Korean Scientists and Engineers Association in the UK (KSEAUK), I wish to express my sincere congratulations to President Jeong Woo Kim and the members of The Association of Korean-Canadian Scientists and Engineers (AKCSE) on the opening of CKC 2020.

Despite the unpredicted COVID-19 pandemic, I am very pleased to see that AKCSE has been able to host CKC2020 successfully with their well organised and proactive response to the COVID-19 situation. It is my belief that CKC2020 will be as successful as ever with the right combination of online and offline sessions under the leadership of the President Jeong Woo Kim and the accumulated knowhow of hosting the past CKC events.

Once again, my sincere congratulations on the successful hosting of the CKC2020, and I hope every delegate attending this event share a meaningful and tangible experience.

Yours Sincerely,

Dr. Sungwoo Lim
President of The Korean Scientists and Engineers Association in the UK (KSEAUK)

Dear President Jeong Woo Kim and all the members of AKCSE.

On behalf of Association des Scientifiques Coréens en France (ASCoF), let me offer my sincere congratulations on the opening of the 2020 Canada-Korea Conference on Science and Technology. I wish to extend my deep appreciation to President Jeong Woo Kim and the Association of Korean-Canadian Scientists and Engineers (AKCSE) for their invaluable commitment to this successful conference.

Since ASCoF and AKCSE signed an MOU to promote scientific cooperation in May 2017, regularly, we attend both conferences (France and Canada) to exchange ideas and discuss future collaboration research. While the COVID-19 has created worldwide a serious situation, I sincerely hope that this online and hybrid conference will produce valuable ideas and give us more opportunities to have joint research projects between France and Canada.

Once again, congratulations on running a great CKC 2020 conference event, and I wish everyone good health and much happiness.

Sincerely yours,

Junbeum Kim

President of the ASCoF

프랑스 한인 과학기술 협회

ASCOF

Association des Scientifiques Coréens en France (1976)

IN ALPHABETICAL ORDER OF FIRST NAME

Dr. Bok Chul Kim
President / Korea Institute of Geoscience and Mineral Resources (KIGAM)

Dr. Bok Chul Kim is currently the President of the Korea Institute of Geoscience and Mineral Resources (KIGAM). He has the B.Sc. in Geology and the M.Sc. in Sedimentary Petrology and Ph.D. in Sedimentology from Yonsei University, Korea. He also was a visiting professor at the University of Calgary, Canada (Sep. 2013~Aug. 2014). He built his academic career in KIGAM since 1988, and held various important positions at KIGAM and elsewhere. Dr. Kim was appointed as the Executive Director of the Geological Research Division at KIGAM and he was sent to serve as the Director General at the National Research Council of Science and Technology (NST) from 2015 to 2018. He holds leaders positions for Korea Society of Economic and Environmental Geology and Korean Society of Petroleum and Sedimentary Geology as the President since 2017 as well. His life-time achievements were recognized with the prestige awards: The Order of Merit for Science and Technology of Korea, 'Jinbo' and Commendation of Merit from the Legislative Judiciary Committee of the National Assembly in 2016 after followed by the Minister's Awards in 2008 and 2012.

Dr. Gyu Ha Choe
President / Korea Electrotechnology Research Institute(KERI)

Dr. Gyu-Ha Choe was born in Pusan, Korea. He received his B.S., M.S. and Ph.D. degrees from Seoul National University, Seoul, Korea, in 1978, 1980 and 1986, respectively. From 1980 to 2018, he had been with the Department of Electrical Engineering, Konkuk University, Seoul, Korea, where he was a Professor and the Director of the Energy Electronics Research Center. From 1987 to 1988, he was a Post-Doctoral Fellow in the Department of Electrical Engineering, Oregon State University, Corvallis, OR, USA; and from 1998 to 1999, he was a Visiting Scholar in the Department of Electrical Engineering, Virginia Tech, Blacksburg, VA, USA. From 1997 to 1998, he was the Dean of Academic Research Affairs, Konkuk University; and from 2002 to 2004, he was the Dean of Academic Affairs, Konkuk University. From 2007 to 2008, he was the President of the Korean Institute of Power Electronics(KIPE), Seoul, Korea. From 2012 to 2013, he was the Vice President of Konkuk University. Since April 2018, he has been with Korea Electrotechnology Research Institute(KERI), Changwon, Korea, where he is currently the President of KERI. His current research interests include active power filters, PWM control, ac voltage regulators, inverter welding machines, the PCS design of photovoltaic generation and fuel cell generation, and the technologies for DC distribution, EV chargers and electrical safety.

Dr. Hai Joo Moon
Secretary General / Korean Federation of Science and Technology Societies

Dr. Hai Joo Moon is currently the Secretary General of Korean Federation of Science and Technology Societies. He graduated from the Chonnam National University and the University of Manchester in 1985 and 1996 with B.S. and M.S. degrees all in mechanical engineering, respectively and received his Ph.D. in management of technology from the Konkuk University in 2018. He joined the Ministry of Science and Technology in 1987 and from 2008 to 2010, he was the Director of Science and Technology Policy Division and the Director General of Big Science Policy Bureau from the Ministry of Education, Science and Technology. He served as the Director General for Exhibition & Research Bureau of the National Science Museum for one year from 2012 to 2013 and as the Director General of Space, Nuclear and Big Science Policy Bureau from the Ministry of Science, ICT and Future Planning from 2013 to 2016. He was the Director of the RCA Regional Office(the Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology For Asia and the Pacific) from 2016 to 2019.

IN ALPHABETICAL ORDER OF FIRST NAME

Dr. Heesun Chung

President / The Korean Federation of Women's Science and Technology Associations (KOFWST)

Dr. Heesun Chung is a distinguished professor at the department of Forensic Science in SungKyunKwan University. She obtained her PhD in Pharmacy from Sookmyung Women's University, Korea in 1987, and was awarded Foreign Commonwealth Office Scholarship from the UK government to do further postdoctoral study in King's College, London. Dr. Chung was the Director General of the National Forensic Service, Korea from 2008 to 2012. She was the 22nd president of the International Association of Forensic Sciences (IAFS) from 2011 to 2014, served as the 13th president of the International Association of Forensic Toxicologists (TIAFT) from 2014 to 2017, and has been an executive Board member since 2002 to present. She is also on the Editorial board for Forensic Toxicologists and Forensic Science International, a fellow of American Academy of Forensic Science, and the president of Korean Association of Forensic Science and the deputy president of the Pharmaceutical Society of Korea. From 2019, she has been a member of the International Panel of Forensic Experts of United Nations Office on Drugs and Crime (UNODC) and the National Bioethics Committee.

Dr. Hyo-Suk Lim

President / The Association of Korean Woman Scientists and Engineers (KWSE)

Dr. Lim received her BS and MS degrees from Seoul National University, Korea, in 1985 and 1987, respectively. She received a PhD degree in meteorology from Texas A&M University, USA, in 1993 and worked as a Post Doc at NASA/GSFC from February 1994 to February 1996. In March 1996, she joined the Korea Aerospace Research Institute (KARI), where she is currently an Executive Director of Satellite Operation & Application Center starting from February of 2018. Dr. Lim mainly had focused on satellite data application in earth science, calibration/validation of satellite data, and international collaboration of remote sensing before she became Executive Director of Satellite Operation & Application Center. Until now, she has served as reviewer of several journals and organizing committee of international conferences. She is the board member of International Charter on Space and Major Disasters. The Charter is composed of space agencies and space system operators from around the world who work together to provide satellite data to disaster management. She also serves as a member of Presidential Advisory Council on Science and Technology.

Jae Bum Seok

President / Institute for Information & communications Technology Planning & Evaluation(IITP)

Jaebum Seok is the president of IITP, Institute for Information & communications Technology Planning & Evaluation (2018-Present). IITP is responsible for planning, evaluation, and management of national ICT R&D funding. IITP also establish national R&D policies and IT human resources for ICT industries Before joining IITP, Jaebum Seok had a remarkable career in government and public service. He first entered government service in 1992 for the Ministry of Communications. Throughout his career in the ministries, he was responsible for planning and executing various policies in the field of the ICT industry, telecommunication, network, cybersecurity, and broadcasting. In 2014, President Office appointed Jaebum Seok as secretary for information, broadcasting, and communication. Later in 2017, he served as Deputy Minister of Ministry of Science and ICT. He holds a Bachelor's Degree from Seoul University and a Master's Degree in Public Administration from Syracuse University.

IN ALPHABETICAL ORDER OF FIRST NAME

Dr. Jong-Nam Kim
President / Korea Institute of Energy Research (KIER)

Dr. Jong-Nam Kim has been contributed to climate change mitigation by conducting R&D activities as a researcher of the Korea Institute of Energy Research (KIER) since 1985. Currently, he is the President of KIER, and is facilitating the use of all technologies that KIER develops to eventually achieve carbon neutrality entitled "2050 Plan" a key to a sustainable future. Becoming a member of the National Hydrogen Economy Committee from July 2020, he is doing his utmost best to create national growth engine with KIER's technologies.

Dr. Junbeum Kim
CREIDD Research Centre on Environmental Studies & Sustainability, Department of Humanities, Environment & Information Technology (HETIC) at University of Technology of Troyes (UTT), France

Dr. Junbeum Kim's research focuses on environmental science and sustainable engineering and industrial ecology areas (sustainable resource management, material flow analysis, life cycle assessment, waste system etc.). He holds a Ph.D. from Civil, Environmental and Sustainable Engineering at Arizona State University (U.S.) on December in 2008, a Master's degree in Civil and Environmental Engineering from Carnegie Mellon University (U.S.) and Environmental Engineering from Inha University in South Korea. After 2 years Post-Doc. experiences in University of California, Santa Barbara and University of Minnesota, he joined to University of Technology of Troyes in 2012. Currently he is the president of Association des Scientifiques Coréens en France (ASCoF).

Dr. Kwangyun Wohn
Chairperson / National Research Council of Science and Technology (NST)

Before Dr. Kwangyun Wohn accepted the Chairship of NST, he has been at KAIST as professor for 27 years. He started his professional career at Agency of Defense Development in Korea. Having completed the master's and Ph.D. studies at University of Wisconsin and University of Maryland, respectively, he had been with Harvard University as Lecturer, and with University of Pennsylvania as Assistant Professor. Having returned back to his home country, Korea, he had been with Computer Science Department for fifteen years, and founded a new graduate school, Graduate School of Culture Technology (GSCT), and served as Dean. Having retired from KIAST, he still holds the Professor Emeritus of KAIST.
NST is the governing organization that oversees the 25 major national research institutes, including KIST, ETRI, and KAERI.

IN ALPHABETICAL ORDER OF FIRST NAME

Dr. Sang Jin Park
President / Korea Institute of Machinery and Materials (KIMM)

Dr. Sang Jin Park is the President of the Korea Institute of Machinery and Materials (KIMM). He earned his bachelor's, master's, and doctoral degrees in Mechanical Engineering from Seoul National University. He has worked as a senior/principal researcher at KIMM since 1996. His main field of interest is desalination plant design and operation. Before he became the President, as the Director of Division of Research Planning and Coordination, he has been responsible for the entire cycle management from planning to commercialization of R&D. He also served as a Program Director for Plant Engineering under the Ministry of Knowledge Economy from 2011 to 2013. He received a Prime Minister's Citation in 2016, as well as a Chairperson's Merit Award from the National Assembly in 2014. Currently, he is the Vice President of the Plant Division, Korean Society of Mechanical Engineers, which is the oldest academic society in Korea with its foundation in 1945.

Dr. Seok-jin Yoon
Vice President / Korea Institute of Science and Technology (KIST)

Dr. Yoon is currently president of the Korea Institute of Science and Technology (KIST). He graduated with a BA from Yonsei University in 1983, and with a Ph.D. in electrical and electronic engineering in 1992. Since joining KIST in 1988, he has devoted himself to researching sensors, actuators, and piezoelectricity within the electronic ceramics field. His previous positions include serving as president of the Korean Institute of Electrical and Electronic Material Engineers (KIEEME) and president of the Korean Sensors Society (KSS).

Dr. Seung Heon Han
President / Korea Institute of Civil Engineering and Building Technology (KICT)

Dr. Han is currently serving as the President of the Korea Institute of Civil Engineering and Building Technology (KICT). As President, he oversees the direction and focus of KICT, a government-sponsored research institute responsible for establishing government policies. KICT also serves as the R&D arm of the government to enable convenient, safe, and high quality land development for the nation. Dr. Han also currently serves as a professor at the School of Civil and Environmental Engineering at Yonsei University since 2001. His research theme is centered and focused on systematic project management principles, tools, and techniques including emerging technology and its applications to our current construction technologies. He has published several technical papers internationally and more than a hundred in Korea. Dr. Han has successfully utilized his knowledge and skills for a multitude of endeavors in the construction industry, the government, research institutes, academia, and the society. He is serving as a board of director at International Centre for Water Security and Sustainable Management (UNESCO i-WSSM). His main areas of interest include innovations in construction technology.

IN ALPHABETICAL ORDER OF FIRST NAME

Dr. Sungwoo Lim
President / Korean Scientists and Engineers Association in the UK (KSEAUK)

Dr. Sungwoo Lim is a President of the Korean Scientists and Engineers Association in the UK (KSEAUK). He is an Honorary Fellow at The Open University in the United Kingdom, a senior member of American Institute of Aeronautics and Astronautics (AIAA), a member of Space Architecture Technical Committee (SATC) in AIAA, a UK node member of Solar System Exploration Research Virtual Institution (SSERVI) at NASA AMES, a member of Korean-Technology Advisory Group (K-TAG) in Europe, and a mentor of Korea-EU Research Centre (KERC). Dr Lim is also a peer reviewer of NASA and ESA (European Space Agency)'s bid proposals and several international journals in the areas of Space Exploration, Additive Manufacturing, and Construction. Based on his architectural engineering and design background, he developed a world-first large-scale 3D Concrete Printing System (3DCP) in 2009 and applied his work to the space exploration area. Now, he is actively working with ESA to develop a microwave heating-based 3D Printing technology as part of an extra-terrestrial construction process, mainly focuses on the Moon.

Dr. Yang Ho Chung
President / Korea Evaluation Institute of Industrial Technology (KEIT)

Dr. Yang-Ho Chung received a B.S. degree in Economics from Seoul National University in 1985, and a Ph. D degree in Economics from Southern Illinois University in 1996.
Dr. Chung passed the Public Administration Examination in 1984, and worked as a deputy director/ secretary of the Ministry of Commerce and Industry from 1985 to 2000. Several years later, Dr. Chung worked as the Leader of General of Affairs Team for the Ministry of Commerce Industry and Energy from 2007 to 2008. Afterwards, Dr. Chung worked for the Ministry of Knowledge Economy from 2011 to 2012 as a Director General of the Industrial Technology Policy, and from 2012 to 2013 as a Director General of Energy Resource Development. Dr. Chung worked for Ministry of Trade, Industry and Energy (MOTIE) from 2014 to 2016 as a Deputy Minister of Energy Resources. Along with these many positions, Dr. Chung also worked as a Commissioner of Public Procurement Service during the years 2016 and 2017. Now, Dr. Chung is working as the President of Korea Evaluation Institute of Industrial Technology (KEIT).

Dr. Yeong Cheol Seok
President / Korea Institute for Advancement of Technology (KIAT)

Dr. Yeong Cheol Seok received a B.S. degree in History from Seoul National University in 1981 and a Ph. D degree in Economics from Ohio State University in 1989.
Dr. Seok worked for the Korea Economic Research Institute (KERI) from 1983 to 1984 as a research economist. He worked at the University of Cincinnati as an assistant professor from 1990 to 1994. Then he moved to ITEP and worked as a senior research fellow/director from 1994 and 2001. Dr. Seok worked for KOTEF as a director from 2001 to 2009 and worked for KIAT as a vice president/executive director from 2009 to 2014. Along with these many positions, he worked as an executive director at the Office of Strategic R&D Planning (OSP) Ministry of Trade, Industry from 2014 to 2016, and as a professor at Inha University from 2017 to 2019. Now, Dr. Seok is working as the President of the Korea Institute for Advancement of Technology(KIAT).

TIME	Day 1: Wednesday. September 2nd, 2020 (CANADA MOUNTAIN TIME)					
CANADA MST (GMT - 6)	Sejong 1 (GMT + 9)	Sejong 2 (GMT + 9)	Kananaskis (GMT - 6)	Toronto (GMT - 4)	Halifax (GMT - 3)	Online Only
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13:30 - 14:00						
14:00 - 14:30			AKCSE LOCAL CHAPTER PRESIDENT MEETING (AKCSE CHAPTER PRESIDENTS ONLY)			
14:30 - 15:00						
15:00 - 15:30			AKCSE BOARD MEETING (AKCSE BOARD MEMBERS ONLY)			
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17:00 - 17:30	OPENING (Pre-Recorded) AND AWARD CEREMONY					
17:30 - 18:00						
18:00 - 18:30		NST: AI Roundtable Live !		NST: AI Roundtable		YGP President Meeting
18:30 - 19:00						
19:00 - 19:30						
19:30 - 20:00	Plenary Session I: SDG 1. Response to Emerging Infectious Diseases					
20:00 - 20:30						
20:30 - 21:00		SDG 1. Live !		SDG 1. Response to Emerging Infectious Diseases		
21:00 - 21:30						
21:30 - 22:00	NST Ambassdor (Invitees Only)					
22:00 - 22:30		KIST (Reserved)				KISTI-AKCSE R&D CANADA (Invitees Only)
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23:00 - 23:30			KIMM (Invitees Only)			
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BEGINNING/END OF CKC | Live Broadcasting | Online Only | Plenary Session | KOFST Special Program

YG/YP Program | SDG Joint Session | KGRI Sassion | Special Sassion | AKCSE MEMBER ONLY

TIME	Day 2: Thursday. September 3rd, 2020 (CANADA MOUNTAIN TIME)					
CANADA MST	Sejong 1	Sejong 2	Kananaskis	Waterloo	Halifax	Online Only
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09:00 - 09:30	D+1 (September 4th)		YGF/YPF Alumni Networking Opening (Invitees Only)			
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10:00 - 10:30			YGP OPENING			
10:30 - 11:00			YGP Townhall Meeting			
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12:30 - 13:00			YGF/YPF Alumni Networking Program (Invitees Only)			
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14:00 - 14:30			AKCSE ANNUAL GENERAL MEETING (AKCSE REGULAR MEMBERS ONLY)			
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16:00 - 16:30			YGP Entrepreneurship Program			
16:30 - 17:00						
17:00 - 17:30						
17:30 - 18:00						
18:00 - 18:30	Plenary Session II: SDG 2. The Future of Lithium-Ion Battery					
18:30 - 19:00						
19:00 - 19:30	KWSE	KIER: Lithium-Ion Battery (invitees Only)			KIER (Invitees Only)	
19:30 - 20:00						
20:00 - 20:30	KWSE Live!	KEIT Global Technology Strategy Forum		KERI-AKCSE SME Consulting		
20:30 - 21:00						
21:00 - 21:30		KEIT Roundtable (Invitees Only)			D+1	
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22:00 - 22:30	KICT (Reserved)	KIGAM (Invitees Only)	AI for Energy & Environment (Invitees Only)			
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BEGINNING/END OF CKC | Live Broadcasting | Online Only | Plenary Session | KOFST Special Program

YG/YP Program | SDG Joint Session | KGRI Sassion | Special Sassion | AKCSE MEMBER ONLY

TIME	Day 3: Friday. September 4th, 2020 (CANADA MOUNTAIN TIME)				
CANADA MST (GMT - 6)	Seoul (GMT + 9)	Kananaskis (GMT - 6)	Ottawa (GMT - 4)	Halifax (GMT - 3)	Online Only
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09:00 - 09:30	D+1 (Sept. 5th)	KOFST Special Program I			
09:30 - 10:00					
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10:30 - 11:00			KOFST Special Program II		
11:00 - 11:30					KIAT K-Tag General Meeting (Invitees Only)
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12:00 - 12:30					KIAT K-Tag Forum (Invitees Only)
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16:00 - 16:30		YGP Research Competition (Pre-Recorded)			
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18:00 - 18:30	KOFWST Live !	KOFWST			
18:30 - 19:00					
19:00 - 19:30		CLOSING AND AKCSE AWARD CEREMONY			
19:30 - 20:00					
20:00 - 20:30		AKCSE FAREWELL DINNER (AKCSE OFFLINE PARTICIPANT MEMBERS ONLY)			
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BEGINNING/END OF CKC | Live Broadcasting | Online Only | Plenary Session | KOFST Special Program

YG/YP Program | SDG Joint Session | KGRI Sassion | Special Sassion | AKCSE MEMBER ONLY

	Day 0: Wednesday. September 2nd, 2020 (KOREAN TIME)					
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04:00 - 04:30	BEGINNING OF CKC 2020					
04:30 - 05:00						
05:00 - 05:30			AKCSE LOCAL CHAPTER PRESIDENT MEETING (AKCSE CHAPTER PRESIDENTS ONLY)			YGP President Meeting
05:30 - 06:00						
06:00 - 06:30			AKCSE BOARD MEETING (AKCSE BOARD MEMBERS ONLY)			
06:30 - 07:00						
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BEGINNING/END OF CKC | Live Broadcasting | Online Only | Plenary Session | KOFST Special Program

YG/YP Program | SDG Joint Session | KGRI Sassion | Special Sassion | AKCSE MEMBER ONLY

	Day 1: Thursday. September 3rd, 2020 (KOREAN TIME)					
KOREA	Sejong 1	Sejong 2	Kananaskis	Toronto	Halifax	Online Only
(GMT + 9)	(GMT + 9)	(GMT + 9)	(GMT - 6)	(GMT - 4)	(GMT - 3)	
08:00 - 08:30	OPENING (Pre-Recorded) AND AWARD CEREMONY					
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09:00 - 09:30		NST: AI Roundtable Live !		NST: AI Roundtable		YGP President Meeting
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10:30 - 11:00	Plenary Session I: SDG 1. Response to Emerging Infectious Diseases					
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11:30 - 12:00		SDG 1. Live !		SDG 1. Response to Emerging Infectious Diseases		
12:00 - 12:30						
12:30 - 13:00	NST Ambassdor (Invitees Only)					
13:00 - 13:30		KIST (Reserved)				KISTI-AKCSE R&D CANADA
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24:00 - 00:30	D+1 (September 4th)		YGF/YPF Alumni Networking Opening (Invitees Only)			
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01:00 - 01:30			YGP OPENING			
01:30 - 02:00			YGP Townhall Meeting			
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03:30 - 04:00			YGF/YPF Alumni Networking Program (Invitees Only)			
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07:00 - 07:30			YGP Entrepreneurship Program			
07:30 - 08:00						

BEGINNING/END OF CKC | Live Broadcasting | Online Only | Plenary Session | KOFST Special Program

YG/YP Program | SDG Joint Session | KGRI Sassion | Special Sassion | AKCSE MEMBER ONLY

	Day 2: Friday. September 4th, 2020 (KOREAN TIME)					
KOREA	Sejong 1	Sejong 2	Kananaskis	Waterloo	Halifax	Online Only
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08:00 - 08:30			YGP Entrepreneurship Program			
08:30 - 09:00						
09:00 - 09:30	Plenary Session II: SDG 2. The Future of Lithium-Ion Battery					
09:30 - 10:00						
10:00 - 10:30	KWSE	KIER: Lithium-Ion Battery (invitees Only)			KIER (Invitees Only)	
10:30 - 11:00						
11:00 - 11:30	KWSE Live!	KEIT Global Technology Strategy Forum		KERI-AKCSE SME Consulting		
11:30 - 12:00						
12:00 - 12:30		KEIT Roundtable (Invitees Only)			D+1	
12:30 - 13:00						
13:00 - 13:30	KICT (Reserved)	KIGAM (Invitees Only)	AI for Energy & Environment (Invitees Only)			
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24:00 - 00:30	D+1 (September 5th)		KOFST Special Program I			
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01:30 - 02:00				KOFST Special Program II		
02:00 - 02:30						KIAT K-Tag General Meeting
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07:00 - 07:30			YGP Research Competition (Pre-Recorded)			
07:30 - 08:00						

BEGINNING/END OF CKC | Live Broadcasting | Online Only | Plenary Session | KOFST Special Program

YG/YP Program | SDG Joint Session | KGRI Sassion | Special Sassion | AKCSE MEMBER ONLY

	Day 3: Saturday. September 5th, 2020 (KOREAN TIME)				
KOREA (GMT + 9)	Seoul (GMT + 9)	Kananaskis (GMT - 6)	Ottawa (GMT - 4)	Halifax (GMT - 3)	Online Only
08:00 - 08:30		YGP Research Competition (Pre-Recorded)			
08:30 - 09:00					
09:00 - 09:30	KOFWST Live !	KOFWST			
09:30 - 10:00					
10:00 - 10:30		CLOSING AND AKCSE AWARD CEREMONY			
10:30 - 11:00					
11:00 - 11:30		AKCSE FAREWELL DINNER (AKCSE OFFLINE PARTICIPANT MEMBERS ONLY)			
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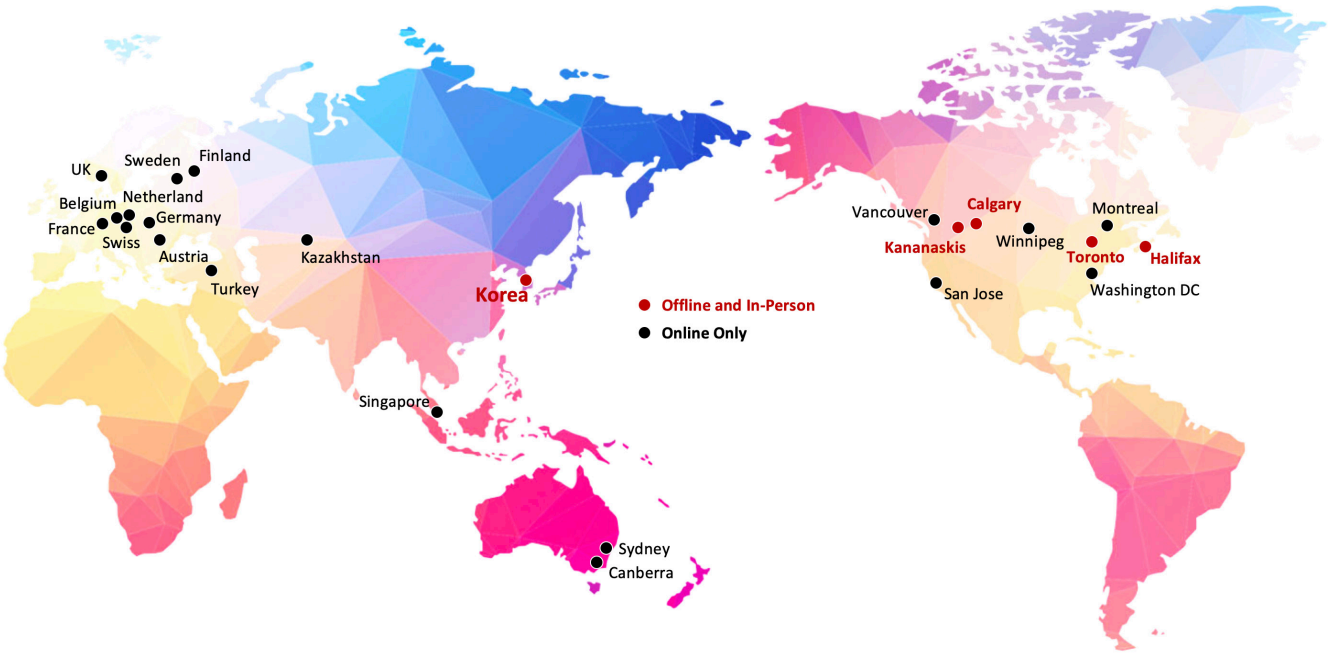
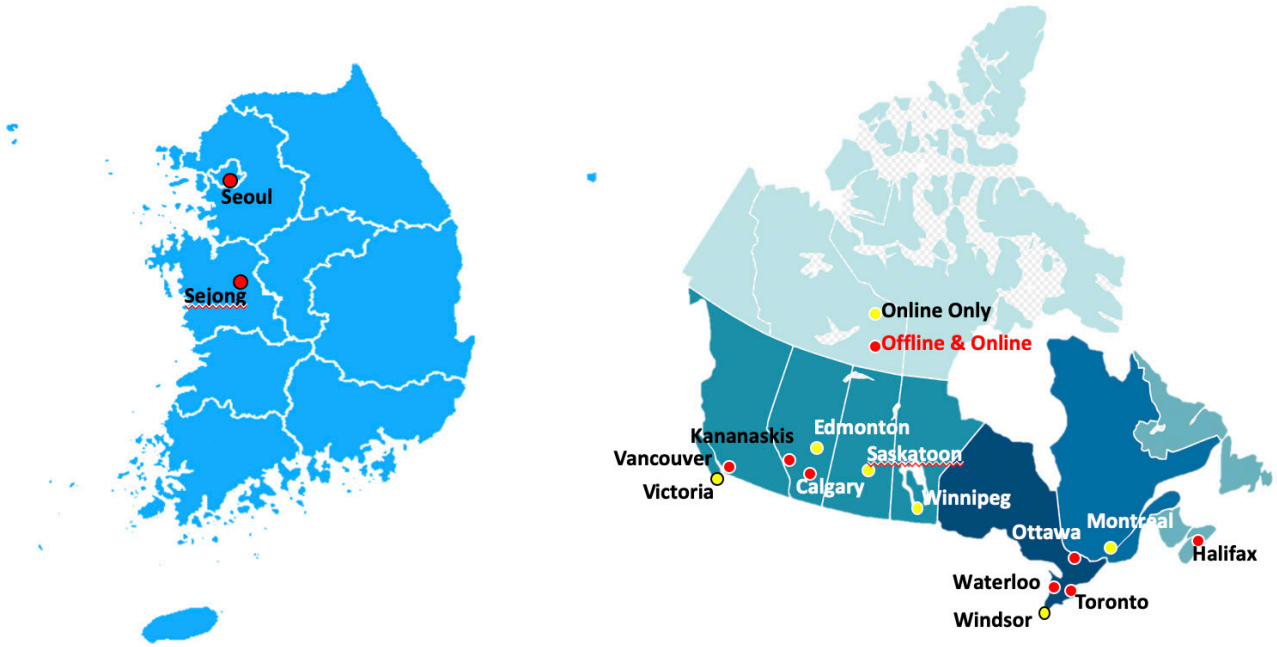
BEGINNING/END OF CKC	Live Broadcasting	Online Only	Plenary Session	KOFST Special Program
YG/YP Program	SDG Joint Session	KGRI Sassion	Special Sassion	AKCSE MEMBER ONLY

Online Everywhere



In-person Venues



Plenary Session I.
19:30-20:30 (Canada MDT), September 2 (Wednesday), Online, In-person in Sejong, Korea and Kananaskis, Canada

Speaker: Dr. Chil-Yong Kang

Professor, Schulich School of Medicine and Dentistry at the Western University

Dr. Kang received his Ph.D. in molecular virology from McMaster University in 1971 and Doctor of Science degrees from McMaster University and Carleton University. He took his three-year postdoctoral training under Professor Howard Temin (1975 Nobel Laureate) at the University of Wisconsin-Madison (1971-1974). He served as a Professor of Microbiology at the University of Texas, Southwestern Medical School in Dallas, Texas (1974-1982), Professor and Chairman of the Department of Microbiology and Immunology at University of Ottawa, Faculty of Medicine (1982-1992), Dean of Science (1992-1999), and Professor of Virology in the Department of Microbiology and Immunology at the University of Western Ontario (1992-Present).
Dr. Kang's research in molecular virology includes the development of viral-specific antiviral therapeutic agents and efficacious vaccines against various human viral diseases including hepatitis C, Ebola hemorrhagic fever, MERS, Zika virus microcephaly, and HIV/AIDS. Dr. Kang has already developed a second-generation vaccine against the hepatitis B virus and an experimental vaccine against HIV-1. His SAV001 HIV vaccine based on genetically modified killed whole-HIV-1 has completed its Phase I human clinical trial successfully and is currently being prepared for Phase II trial. Kang Lab has also created a replication-competent recombinant vesicular stomatitis viral vectors as a vaccine platform to develop a SARS-CoV-2 vaccine. Dr. Kang has published 304 scientific papers and holds fifteen international biotechnology patents covering over 70 countries. Dr. Kang has received the Ho-Am Prize in Medicine (1999), Queen Elizabeth II Diamond Jubilee Medal of the Governor General of Canada (2012). Dr. Kang was elected a Life-time Fellow of the Royal Society of Canada, Academy of Science (1993) and an elected a Life-time Member of Korean Academy of Science and Technology (1997). Dr. Kang has served as a member of the Science Technology Innovation Council of Canada and serves as a reviewer for the Journal of Virology, Journal of Infectious Diseases, Virus Research, Virology, Journal of General Virology, Journal of Biological Chemistry, and the Canadian Medical Association Journal. E-mail: cykang@uwo.ca

Emerging Viral Diseases and Control of COVID-19 Pandemic

Chil-Yong Kang

Department of Microbiology and Immunology, Schulich School of Medicine and Dentistry, Western University, London, ON Canada

Numerous emerging viruses have caused deadly diseases in humans in the past half century. These include Ebolavirus hemorrhagic fever, AIDS caused by HIV, Nipah virus encephalitis, Hantavirus pulmonary syndrome, SARS, MERS, and Zika virus microcephaly. In December 2019, yet another coronavirus disease, COVID-19, caused by SARS-CoV-2, emerged in China and the WHO has declared it a pandemic. The SARS-CoV-2 has spread rapidly across the globe infecting 23 million people with 800,000 deaths as of 21 August, 2020. The world's most urgent mission is to control these emerging viral diseases, especially COVID-19, with effective vaccine(s). There are approximately 150 COVID-19 vaccines being developed using seven different vaccine strategies and many of them are already in human clinical trials. The target antigen for all of these vaccines is the spike (S) protein of SRAS-CoV-2, since the S protein binds to the cellular receptor, angiotensin converting enzyme 2 (ACE2), to initiate infection. An ideal COVID-19 vaccine should induce completely protective immune responses, must be safe, and efficient for manufacturing in order to provide billions of doses of vaccine. We have employed two antigenically distinct, replication competent, and genetically modified vesicular stomatitis virus platform technology to develop a prime-boost vaccine against SARS-CoV-2. I will present newly emerging viral diseases including COVID-19 and discuss pros and cons of SARS-CoV-2 vaccine development strategies including our own.

Plenary Session II.
18:00 - 19:00 (Canada MDT), September 3 (Thursday),
Online, In-person in Sejong, Korea and Kananaskis, Canada

Speaker: Jeff Dahn

Jeff Dahn obtained his B.Sc. from Dalhousie University (1978) and his Ph.D. from the University of British Columbia in 1982. Dahn then worked at NRC (Canada) (82-85) and at Moli Energy (85-90) before taking up a faculty position at Simon Fraser University in 1990. He returned to Dalhousie in 1996. At Moli, he did pioneering work on lithium-ion batteries.

Dahn was appointed as the NSERC/3M Canada Industrial Research Chair in Materials for Advanced Batteries at Dalhousie University in 1996, a position that he held until 2016. In 2016, Dahn began a research partnership with Tesla as the NSERC/Tesla Canada Industrial Research Chair. With over 700 journal publications and 70 distinct inventions, his H-index is 123.

Dahn's research has been recognized by numerous awards including a Governor General's Innovation Award (2016) and the Gerhard Herzberg Gold Medal in Science and Engineering (2017), Canada's top science prize. He is the only person to have been awarded both. He has also been awarded both Electrochemical Society Battery Division Awards.

The Future of Lithium-Ion Battery

Dr. Jeff Dahn

Lithium-ion batteries are amazing. They power our phones, computers, tools, vehicles and now store energy from renewables for later use. In my opinion, lithium-ion batteries can last many decades and our goal should be to make them last a century. I will discuss how good Li-ion batteries are today and how they can be improved.

PLEASE NOTE: THIS LECTURE CANNOT BE RECORDED BY THE AUDIENCE.

Response to Emerging Infectious Disease: UN's Sustainable Development Goals (SDG) I

Time: 11:30 - 12:30, 3 September (Thursday) Korea Time
20:30 - 21:30, 2 September (Wednesday) Canada Mountain Time

Place: Online
In-person in Sejong, Korea and Kananaskis, Canada

Sponsor: KOFST and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Organizer: Dr. Hyo-Jick Choi (University of Alberta) and Dr. Jong Sung Kim (Dalhousie University)

Moderator: Dr. Hyo-Jick Choi (University of Alberta)

Speakers: Dr. Seon-Won Kim (Congratulatory Remarks)
Dr. Seungtaek Kim (Keynote Speech)
Dr. Haryoung Poo (Keynote Speech)

Panel: From Canada - CY Kang, JS Kim, HJ Choi; from Korea - ST Kim, HR Poo

Description: Globally, emerging infectious disease (EID) represents a major public health problem. Recent examples include the Coronavirus disease (COVID-19) that is a global pandemic of unprecedented magnitude and with long-term consequences. While patterns are emerging with respect to the characteristics of individuals with symptomatic infections requiring hospitalization, much remains unknown. Creating a highly effective method for protection against the novel coronavirus, SARS-CoV-2, is considered a major challenge in public health at the national and global level. Successful vaccination can greatly reduce morbidity and mortality during a pandemic/epidemic. However, due to constant mutation, new vaccines specifically matching the latest strains must be developed and produced continuously to maintain efficacy. Vaccines would not be available until, at the earliest, 12 months after the initial outbreak of a pandemic. As a result, development of universal and effective vaccines, antiviral drugs, therapeutics, and diagnostics is acknowledged as the best strategy to contain pandemic respiratory diseases such as COVID-19. One of the most important lessons learned from the COVID-19 pandemic is that coordinated efforts across different sectors of society and international collaboration are essential to the global strategy for pandemic preparedness. Keeping abovementioned challenges in perspective, CKC 2020 will host a special session to feature EID. Experts in both countries will speak about the current status of the research in the fields of vaccine, therapeutics, diagnostics and personal protective equipment (PPE), and present an agenda for future directions during the session.

Program:

Time (ET)	Place	Topic	Speaker	Affiliation
20:30-20:35	Online & In-person	Opening Welcome Message by AKCSE President	JS Kim JW Kim	
20:35-20:50		Congratulatory Remarks	SW Kim	
20:50-21:10		Keynote Speech	ST Kim	
21:10-21:30		Keynote Speech	HR Poo	
21:30-21:30		Closing	HJ Choi	

List of Key Participants:

Canada

Name	Affiliation/Position	Role	In-person/Online
강칠용 (Dr. CY Kang)	Western Univ/Professor	Plenary Speaker	online
김종성 (Dr. JS Kim)	Dalhousie Univ/Professor	Opening	Online
최효직 (Dr. HJ Choi)	Univ. of Alberta/Professor	Moderator	In-person

Korea

Name	Affiliation/Position	Role	In-person (Sejong)
김선원 (Dr. SW Kim)	NRF 차세대바이오단장	Congratulatory Remarks	In-person
김승택 (Dr. ST Kim)	파스퇴르 연구소/팀장	Keynote	In-person
부하령 (Dr. HR Poo)	한국생명공학연구원/KWSE	Keynote	In-person
권문혁 (Dr. MH Kwon)	University of Calgary/Researcher	General Participant	In-person
김나리 (Dr. NR Kim)	AKCSE/Member	General Participant	In-person
신재명 (Ms. JM Shin)	U. Calgary/Graduate Student	General Participant	In-person

SDG 1. EID Session

Organizer, Moderator: Dr. Hyo-Jick Choi

Assistant Professor at the University of Alberta

Dr. Hyo-Jick Choi is an assistant professor in the Department of Chemical & Materials Engineering at the University of Alberta, and runs a sustainable engineering and drug delivery design (SE∃D) lab. Dr. Choi has made influential scientific contributions in Global health and Biotechnology by developing, 1) universal and reusable personal protective measures with no risk of cross contamination, 2) cold chain-free, long-term stable solid oral vaccines, and 3) antimicrobial technologies againt food-borne, air-borne, water-borne, hospital-borne diseases. His capability in integrative fusion technologies and their commercialization enabled him to establish two start-up companies based on his research findings. Dr. Choi is an Editorial Board Member of Scientific Reports and Pharmaceutics. He was chosen as the Researcher of the Month for June 2017 by the Canadians for Health Research for his efforts in the development of virus deactivation system against pandemic/epidemic diseases and solid oral vaccines.

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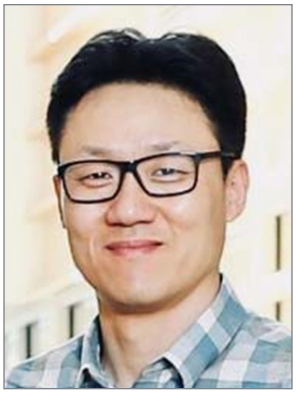
SDG 1. EID Session



Organizer: Dr. Jong Sung Kim

Associate Professor, Faculty of Medicine at Dalhousie University/ Director of Health and Environments Research Centre (HERC)

Dr. Jong Sung Kim is a tenured Associate Professor and Director of Health and Environments Research Centre (HERC) in the Faculty of Medicine at Dalhousie University in Canada.

Nanotoxicology and human health risk assessment have been his primary academic and research interests since the completion of his MSc degree in Environmental Toxicology at the University of Nebraska Center for Health and Environmental Toxicology. Following this, he commenced his PhD in Human Toxicology, where he was enrolled in the Interdisciplinary Graduate Program at the University of Iowa (US National Institutes of Health Fellowship).

In recognition of his contributions to nanotoxicology research, he has served on the Technical Committee for the International Organization for Standardization (ISO) Working Group on Nanotechnology, and he received numerous international awards such as Best Paper Award of Delta Omega Honorary Society in Public Health from the American Public Health Association and the MB Research Award from the Society of Toxicology.

The primary objective of his research program is to better understand how emerging hazards and exposures lead to adverse health outcomes at various levels of biological organization (from cellular and molecular levels to populations) and how human body modify these responses to maintain homeostasis (host-defense).

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SDG 1. EID Session

Congratulatory Remarks: Dr. Seon-Won Kim

Professor, Division of Applied Life Science at Gyeongsang National University/ Director of Next Generation Biotechnology, National Research Foundation of Korea

Dr. Seon-Won Kim is a synthetic biologist and professor in Division of Applied Life Science, Gyeongsang National University in Jinju, Korea. After his B.S. (1990) from Yonsei University, he received M.S. (1992) and Ph.D. (1996) from Korea Advanced Institute of Science and Technology, Korea (KAIST). Then, he carried out his postdoctoral research associate in Korea Research Institute of Bioscience and Biotechnology (KRIBB) and University of California at Berkley under the supervision of Dr. Jay Keasling.

He is interested in synthetic biology research specifically 1) development of genetic tool system for metabolic engineering 2) Plastid engineering in plant cell 3) development of microorganism for isoprenoid production 4) Development of bioconversion process for production of medical carbohydrates and 5) High throughput screening system for novel antibiotics, anti-malaria, and hypercholesterolemia drugs.

Currently, he is working in National Research Foundation of Korea as a director of Next Generation Biotechnology. He is planning and managing numerous projects for bio-health field including infectious diseases.

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SDG 1. EID Session

Speaker: Dr. Seungtaek Kim

Head, Zoonotic Virus Laboratory at Institut Pasteur Korea

Dr. Seungtaek Kim received his Ph.D. in biochemistry from Iowa State University in 2004. For postdoctoral research, he moved to Howard Hughes Medical Institute at University of Wisconsin-Madison and studied hepatitis B virus with Dr. Paul Ahlquist. In 2007, his research focus was changed to hepatitis C virus when he moved to Dr. Stan Lemon's Lab at UTMB/University of North Carolina. His hepatitis virus research continued even after he came back to Korea in 2012 to join the Yonsei Liver Center at Severance Hospital. In 2017, he became a Head of Zoonotic Virus Laboratory at Institut Pasteur Korea and started to investigate emerging viruses (e.g., MERS-CoV, SARS-CoV-2, SFTS, Zika and dengue viruses). Currently, his research focuses on the development of therapeutic interventions (i.e., small molecule inhibitors and therapeutic antibodies) against these emerging viruses. In addition to his research, he is also serving as a member of the Pan-Government Working Group for COVID-19 Drug & Vaccine Development and the WHO Working Groups on COVID-19 Animal Models and Serology.

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Identification of antiviral drug candidates against SARS-CoV-2 from FDA-approved drugs

Seungtaek Kim

Zoonotic Virus Laboratory at Institut Pasteur Korea, Seongnam-si, Gyeonggi-do, South Korea

COVID-19 is an emerging infectious disease and was declared as a pandemic by WHO. Currently, there is no effective vaccine or therapeutic available for this disease. Drug repositioning represents the only feasible option to address this global challenge and a panel of 48 FDA-approved drugs that have been pre-selected by an assay of SARS-CoV was screened to identify potential antiviral drug candidates against SARS-CoV-2 infection. We found a total of 24 drugs which exhibited antiviral efficacy (0.1 μM < IC50 < 10 μM) against SARS-CoV-2. Among them, two FDA-approved drugs - niclosamide and ciclesonide – were notable in some respects. Using Calu-3 human lung cell line, we also compared antiviral efficacy of the drug candidates and found nafamostat is the most potent antiviral therapeutic option. Some drug candidates that we found will be tested in an appropriate animal model for their antiviral activities. In the near future, these already FDA-approved drugs could be further developed following clinical trials in order to provide additional therapeutic options for patients with COVID-19.

SDG 1. EID Session

Speaker: Dr. Haryoung Poo

Principal Investigator, Infectious Disease Research Center, Korea Research Institute of Bioscience and Biotechnology (KRIBB)

Dr. Haryoung Poo received her B.S. in biology, Sogang University in Korea, M.S in microbial genetics, the University of Missouri at St. Louis and Ph.D. in cellular immunology, Wayne State University in USA. Dr. Poo has started her career in KRIBB since 1998 and has focused currently on investigating cell immunity, vaccine adjuvant & immune therapeutic technology, and establishment of virus diagnostics. She published more than eighty papers in respectable journals and registered about forty patents nationally and internationally. Three technologies of vaccine and vaccine adjuvant she developed was transferred to company for industrializations. She has served as a professor at the University of Science & Technology from 2006 to present and a member of The Korean Academy of Science and Technology since 2016. As the former President of the Association of Korean Woman Scientists and Engineers (KWSE) for 2016-2017, she has greatly contributed in supporting not only Korea woman in science and engineering for the development their leadership by initiating jumping-up program but also international woman scientists and engineers by working as a board member and fund development chair of INWES(2017-2020).
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Development of Vaccines for Aging Populations

Haryoung Poo

Infectious Disease Research Center, Korea Research Institute of Bioscience and Biotechnology, Daejeon, South Korea

Influenza is a highly contagious respiratory disease caused by the influenza A viruses and results in public health threat, especially to immunocompromised elderly people. Although vaccination is an effective strategy for preventing influenza, the aging-related reduced efficacy of the influenza vaccine remains the urgent global problem to overcome. Here, we investigate that the use of a new adjuvant, the complex of poly-γ-glutamic acid and alum (PGA/Alum), is able to recover the aging-related reduced efficacy of the influenza vaccine in elderly mouse (21 months) model. Despite of vaccination with pandemic (pH1N1) influenza vaccine (1 μg/mouse), all of the aged mice died following pH1N1 viral challenge compared to vaccinated young mice showing 100% survival. The aging-related reduced efficacy of the influenza vaccine was recovered by PGA/Alum, and the recovery effect was observed when using 2 and 4-fold lower vaccine dose (0.5 and 0.25 μg/mouse). Notably, PGA/Alum-adjuvanted vaccine (1 μg/mouse) induced 100% survival of elderly mice, which is identical with that of vaccinated young mice. The vaccine-PGA/Alum-immunized elderly mice rapidly facilitated virus clearance following pH1N1 viral challenge, accompanied with increases of hemagglutination-inhibition titers, serum-neutralization titers, cytotoxic T lymphocyte activity, and generation of multifunctional CD4+ T lymphocytes. Taken together, these results suggest that the aging-related abolished efficacy of the influenza vaccine could be recovered by the use of vaccine adjuvants including PGA/Alum, thereby resulting in effective prevention against influenza virus infection in the elderly.

The Future of Lithium-Ion Battery: UN's Sustainable Development Goals (SDG) II

Time: 09:00 - 10:00, 3 September (Friday) Korea Time
18:00 - 19:00, 2 September (Thursday) Canada MDT Time

Place: Online
In-person in Sejong, Korea and Kananaskis, Canada

Sponsor: KIER and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Organizer: Dr. Simon Park (University of Calgary) and Dr. Jong Sung Kim (Dalhousie University)

Moderator: Dr. Simon Park, University of Calgary (sipark@ucalgary.ca)

Description: Lithium-ion batteries are amazing. They power our phones, computers, tools, vehicles and now store energy from renewables for later use. In my opinion, lithium-ion batteries can last many decades and our goal should be to make them last a century. I will discuss how good Li-ion batteries are today and how they can be improved.

AI Roundtable

Time: 09:00 - 10:30, 3 September (Thursday) Korea Time
18:00 - 19:30, 2 September (Wednesday) Canada MDT Time

Place: Online
In-person in Sejong, Korea and Kananaskis, Canada

Sponsor: Korea National Research Council of Science and Technology (NST)

Organizer: NST and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Moderator: Dr. Hyock Ju Kwon (University of Waterloo)

Presenters: Dr. Soo Jeon (University of Waterloo)
Dr. Ok-Gi Baek (ETRI)
Dr. Jong Uk Kim (KERI)

Panels: Dr. Seok-Bun Ko (University of Saskatchewan)
Dr. Il-Min Kim (Queen's University)
Dr. Young-Jin Cha (University of Manitoba)
Dr. Gunho Sohn (York University)

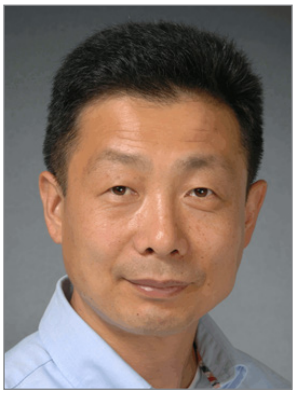
Contact: Ms. Boyoung Choe, NST (bychoe@nst.re.kr)
Dr. Hyock Ju Kwon, University of Waterloo (hjkwon@uwaterloo.ca)
Dr. Il Yong Kim, Queen's University (kimiy@queensu.ca)

Description: This session will provide an overview of recent advancement of AI technology and related research activities in Canada and Korea. This session includes presentations and a panel discussion in Artificial Intelligence, and future collaboration opportunities between Korea and Canada. World-class AI research activities and AI labs founded by multi-national companies in Canada will be presented, and the GPAI (Global Partnership on AI) initiative will be introduced.

Program:

(Korea) Time	Place	Topic	Speaker	Affiliation
09:00-09:10	Kananaskis Sejong Online	Opening remark	Dr. Kwangyun Wohn	NST
9:10-9:20		AI research in Canada	Dr. Soo Jeon	U Waterloo
9:20-9:30		AI research in ETRI	Dr. Ok-Gi Baek	ETRI
9:30-9:40		KERI-Waterloo AI Centre	Dr. Jong Uk Kim	KERI
9:40-10:10		Panel Presentations (4 speakers)	Dr. Seok-Bum Ko Dr. Il-Min Kim Dr. Young-Jin Cha Dr. Gunho Shon	U Saskatchewan Queen's U U Manitoba York U
10:10-10:30		Panel Discussions (4 panels and Moderator)	Dr. Hyock Ju Kwon Dr. Seok-Bum Ko Dr. Il-Min Kim Dr. Young-Jin Cha Dr. Gunho Shon	U Waterloo U Saskatchewan Queen's U U Manitoba York U
10:30		Closing remark	Dr. Kwangyun Wohn	NST

AI Roundtable



Moderator: Dr. Hyock Ju (HJ) Kwon

Associate Professor, Mechanical and Mechatronics Engineering, University of Waterloo

Dr. Kwon is an Associate Professor in the Department of Mechanical and Mechatronics Engineering at the University of Waterloo. He received his B.Sc. (1985) in Mechanical and Design Engineering from Seoul National University, M.Sc. (1988) in Production Engineering from KAIST in South Korea. and Ph.D. (2007) in Mechanical Engineering from the University of Alberta, Edmonton, Canada. Prior to joining University of Waterloo, he held a NSERC Postdoctoral Fellowship at Caltech in Pasadena, USA. Dr. Kwon also over 10 years industry experience at Samsung Electronics, Korea and Texas Instruments, USA before he came to Canada. He is a Professional Engineer in Alberta and Ontario in Canada, and also in Korea.

Dr. Kwon has expertise in AI for manufacturing, AI-based nondestructive testing (NDT), Smart Factory and Automation. His group at Waterloo is also developing hardware-based AI technology, an universal NDT platform and autonomous logistics robot.

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AI Roundtable

Speaker: Dr. Soo Jeon

Associate Professor, Mechanical and Mechatronics Engineering, University of Waterloo

Dr. Soo Jeon received his BS and MS degrees from Mechanical & Aerospace Engineering at Seoul National University, Korea in 1998 and 2001 respectively, and his PhD from Mechanical Engineering at University of California, Berkeley in 2007. After graduation, he worked as a mechanical engineer in Applied Materials Inc. until he moved to Department of Mechanical & Mechatronics Engineering at University of Waterloo in 2009 where he is currently an associate professor. His research interests include dynamic systems and control, mechatronic system design, friction-induced stability and machine learning for physical systems. Applications of his research cover robotics, industry automation, medical ultrasound, and transportation systems. He received Rudolf Kalman Best Paper Award from ASME Dynamic Systems and Control Division in 2010, and Discovery Accelerator Supplement Award from NSERC (Natural Sciences and Engineering Research Council) of Canada in 2015. He is a member of ASME, IEEE, CSME (Canadian Society for Mechanical Engineering) and PEO (Professional Engineers Ontario). He has been an associate editor for ASME Journal of Dynamic Systems, Measurement and Control, IEEE Transactions on Automation Science and Engineering, and IEEE/ASME Transactions on Mechatronics (Guest Associate Editor).

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AI in Canada

Soo Jeon

Department of Mechanical and Mechatronics Engineering, University of Waterloo, Waterloo, ON Canada

Canada has been playing a dominant role in the recent surge of AI and machine learning. This has to do with a number of factors including the steady stream of funding from Canadian government (especially in 1970s and 80s during which many countries retreated from it) and strong relationship between academia and private sectors (innovation ecosystem). This talk will briefly overview the Canada's global stature in AI and how Canada has been attracting global companies and great minds to lead its way to breakthrough research in AI and machine learning as well as its applications to various industrial sectors.

AI Roundtable

Speaker: Dr. O. K. Baek

Research Fellow & Head of Cognitive and Adaptive AI Research and Development, ETRI

O.K. Baek is leading the strategic institutional initiative for development of a next generation AI ("CybreBrain") enabling deductive reasoning, real time inferencing, progressive and incremental learning, and self-adaptation to unanticipated changes and exceptions, and uncertainty management. Prior to joining ETRI, he had led complex programs for emerging industries as the Global Solutions Executive & Distinguished Architect at IBM Corporation, focusing on Artificial Intelligence and Cognitive Computing. He has over 40 years of extensive experience and in-depth expertise in research & development of advanced systems and complex industry solutions. He has developed and taught various courses in modeling, architecture, end-to-end solution design, and R&D methodologies.

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AI Roundtable

Speaker: Dr. Jong Uk Kim

Executive Director, Strategy & Policy Division, KERI & Adjunct Professor, University of Waterloo

Dr. Jong Uk Kim is an Executive Director at Korean Electrotechnology Research Institute and an Adjunct Professor at University of Waterloo. He is in charge of Strategy & Policy Division of KERI, which establishes short- and medium-term goals and strategies for the operation/development of research (R&D), testing, and certification projects, and strives to enhance the status of the institute through various internal and external cooperation. He received his B.S. and M.A. degrees in Physics from Hankuk University of Foreign Studies, Seoul, Korea and M.S. and Ph.D. degrees in Physics from Michigan State University. Dr. Kim has expertise in optical imaging and laser diagnostics, especially in the field of applied physics for engineering applications. Dr. Kim is one of the Korean Government Overseas Scholarship Grantees selected in Physics on the merit of scholastic aptitude by The Ministry of Education (Republic of Korea) in 1990. Dr. Kim joined the American Project Management Institute (PMI) as a regular member to secure international objectivity and expertise as a Project Manager (PM) and is working as an internationally recognized project management expert (PMP).

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AI Roundtable

Speaker: Dr. Seokbum Ko

Professor/ Department of Electrical and Computer Engineering, University of Saskatchewan

Seok-Bum Ko received his Ph.D. in Electrical and Computer Engineering at the University of Rhode Island, USA in 2002. He is a Professor in the Dept. of Electrical and Computer Engineering at the University of Saskatchewan, Canada. He worked as a technical staff member for Korea Telecom Research and Development Group, Korea from 1993 to 1998. His research interests include computer arithmetic and architecture, and biomedical engineering. Dr. Ko is a senior member of IEEE Circuits and Systems Society and an Associate Editor of IEEE Access and IEEE Transactions on Circuits and Systems I.

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Deep Learning Processor Architecture and Its Applications

Seokbum Ko

Department of Electrical and Computer Engineering, University of Saskatchewan, Canada

Deep Learning has achieved great success in recent years. In many fields of applications, such as computer vision, biomedical analysis, and natural language processing, deep learning can achieve a performance that is even better than human-level.

However, behind this superior performance is the expensive hardware cost required to implement deep learning operations. Deep learning operations are both computation intensive and memory intensive. Many research works in the literature focused on improving the efficiency of deep learning operations. In this talk, special focus is put on improving deep learning computation and several efficient arithmetic unit architectures are proposed and optimized for deep learning computation. Some examples are also introduced.

AI Roundtable

Speaker: Dr. Il-Min Kim

Professor / Director of Wireless AI Laboratory

Il-Min Kim received the B.S. degree in electronics engineering from Yonsei University, Seoul, Korea, in 1996, and the M.S. and Ph.D. degrees in electrical engineering from the Korea Advanced Institute of Science and Technology (KAIST), Taejon, Korea, in 1998 and 2001, respectively. From July 1997 to Aug. 2001, he worked as a Member of Technical Staff at the Electronics and Telecommunications Research Institute (ETRI). From October 2001 to August 2002 he was with the Dept. of Electrical Engineering and Computer Sciences (EECS) at Massachusetts Institute of Technology (MIT), Cambridge, USA, and from September 2002 to June 2003 he was with the Dept. of Electrical Engineering (EE) at Harvard University, Cambridge, USA, as a Postdoctoral Research Fellow. In 2003, he joined the Dept. of Electrical and Computer Engineering (ECE) at Queen's University, Kingston, Canada, as Assistant Professor. In 2009, he was promoted to the rank of Associate Professor and in 2014 he was promoted to the rank of Full Professor. He is currently Director of Wireless Artificial Intelligence Laboratory (WAI lab). His research interests are mainly in Wireless Artificial Intelligence including On-Device AI, machine learning, deep learning, deep reinforcement learning, AI for IoT/IoE/IIoT/Mobile Crowd Sensing (MCS), Signal processing for IoT/IoE/IIoT/AIoT, Federated learning, edge device computing, distributed learning/computing, Convergence of wireless communications/sensing/AI, AI-driven 6th generation (6G) wireless systems, AI-driven vehicle to everything (V2X) communications, Geoscience AI (Geo-AI), AI-driven surveillance and radar systems. Email: ilmin.kim@queensu.ca

Evolution of AI: Cooperative AI

Il-Min Kim

Department of Electrical and Computer Engineering (ECE), Queen’s University, ON, Canada

In this talk, we first discuss how AI has evolved: Starting from classical machine learning, it evolved to (cloud-based) AI, then to on-device AI, and finally to AIoT, which is a combination of AI and Internet of Things (IoT). We then claim that AI will evolve to Cooperative AI, in which multiple intelligent devices (or multiple AI agents) cooperate with one another in order to achieve the Wisdom of Crowds or Collective Intelligence. In pursuit of Cooperative AI, we have recently made a meaningful advancement by developing a few innovative AI techniques. As the first example, our results for federated learning, of which concept was originally proposed by Google Inc., are discussed in the context of cooperative training of neural networks. Then, as an effective approach for cooperative inference of neural networks, the technique of neurosurgeon and our results are presented. As the final example of our research, we propose the notion of Collective Neural Networks, which might be considered as the ultimate architecture for Cooperative AI. This talk is concluded by discussing how Cooperative AI can be practically used in various industrial applications.

AI Roundtable

Speaker: Dr. Young-Jin Cha

Assistant Professor at the University of Manitoba

Dr. Young-Jin Cha received his Ph.D. (2008) from Texas A&M University's Department of Civil and Environmental Engineering, M.S. (2004) from Yonsei University, and B. E. (2002), from Kumoh National Institute of Technology. He started as a post-doctoral fellow (2009) in the City College of New York by collaborating with Professor Anil Agrawal who is Editor in Chief of the Journal of Bridge Engineering, ASCE, then he became post-doctoral associate at the Massachusetts Institute of Technology (MIT) (2012) by collaborating with Professor Oral Buyukozturk and MIT Computer Science and Artificial Intelligence Laboratory (CSAIL). He then joined the Department of Civil Engineering at the University of Manitoba in 2014. His areas of investigation include 1) advanced deep learning methods with big data, computer vision analysis, robotics and autonomous navigation of unmanned aerial vehicles (UAVs) for structural health monitoring (SHM), holistic three-dimensional (3-D) damage maps with autonomous UAVs, digitization of manufacturing systems and infrastructures, intelligent transportation monitoring system, plant & industrial product quality inspection, and disease detection problems within medical images.

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Deep learning-based defect/damage detection with autonomous UAVs

Young-Jin Cha

Department of Civil Engineering, Price Faculty of Engineering, University of Manitoba, Winnipeg, MB Canada

Abstract: This online seminar provides deep learning-based structural health monitoring from crack classification, multiple types of damage classification, volumetric quantification of concrete spalling, crack segmentation, autonomous UAV methods, and their integrations. This presentation introduces a risk-based approach for structural health monitoring (SHM) applications. The used methods are convolutional neural network (CNN) based crack classification under various complex scenes and lighting conditions. Faster R-CNN also was used to detect multiple types of damage in civil infrastructures and localized the detected damage using various bounding boxes. Depth camera was integrated to a Faster R-CNN for concrete spalling damage detection to volumetric quantification. Autonomous flight method of UAV is introduced to integrate it with deep learning-based damage detection. Subsurface damage detection is introduced using deep learning and thermography. Damage segmentation method is introduced to detect cracks in pixel level. These advanced deep learning-based methods overcome the limitation of traditional computer vision-based methods. It also opened the new door for fully automated SHM.

AI Roundtable

Speaker: Dr. Gunho Sohn

Associate Professor/ Earth & Space Science & Engineering, York University

Dr. Gunho Sohn received the B.Sc. and M.Sc. degrees in astronomy and space science from Yonsei University, Seoul, South Korea, in 1993 and the Ph.D. degree in geomatics engineering from University College London, London, U.K., in 2004.,From 1993 to 1999, he was a Research Scientist in Samsung Aerospace Industry, Ltd., (currently Korean Aerospace Industries, Ltd.,) with Satellite R&D Division. Since 2013, he has been an Associate Professor with the Earth and Space Science and Engineering Department, York University, Toronto. He is the Author of three book chapters and more than 100 articles. He has been supervising 26 graduate students and nine postresearch fellows. His research interest includes the development of photogrammetric computer vision and machine learning techniques for 3-D reconstruction of augmented urban space models in large-scale using multi-modal mobile mapping data.,Dr. Sohn was a recipient of York University's Research Leader Award in 2016, the Best Doctoral Thesis Award of the British Remote Sensing and Photogrammetry in 2005, and the British Chevening Technology Enterprise Scholarship Fellowship in 2003.

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Application of AI to Energy and Mechatronics: IITP International Joint Research Program Session

Time: 13:00 - 14:30, 4 September (Friday) Korea Time
22:00 - 23:30, 3 September (Thursday) Canada MDT Time

Place: Online
In-person at Sejong, Korea and Kananaskis, AB, Canada

Sponsor: Korea Institute for Information and Communication Technology Planning & Evaluation (IITP) 2019 and 2020 International Joint Research Programs

Organizer: Program 1. Prof. Kwon, Sun-Il (Dong-A University, Korea),
Program 2. Prof. See Hun Lee (Jeonbuk National University, Korea), and
Program 3. Prof. Youngsoo Lee, Jihyun Lee (Jeonbuk National Univ., Korea, and University of Calgary)

Contact: Dr. Hyeong Jun Seo, University of Calgary (jun860517@gmail.com)

Description: This session is to present three AI projects at the University of Calgary in the International Joint Research Program supported by the IITP. In this session, descriptions and progress will be presented by PIs and Co-PIs.

Program:

(Korea) Time	Place	Topic	Speaker	Language
13:00-13:05	Kananaskis Sejong Online	Welcome Message Introduction	JW Kim YS Lee	Korean
13:05-13:45		Key Note Speech • Application of AI to E&E • AI for Pipeline Leak detection • Prediction the effectiveness of trapping mechanisms on CO2 sequestration in saline aquifers using an neural network (Hanyang University) • The application of VR technology in offshore gas field (KOGAS)	XC Wang S Park Jihoon Wang Sangyub Jang	English/ Korean
13:45-13:55		Prj. 1: Development of AI Techniques for Multivariate Geophysical Analysis Dong-A University	SunIl Kwon	Korean
13:55-14:05		Prj. 2: Development of a real-time AI/IoT solution for the stable operation and maintenance of underground pipeline network Jeonbuk National University	Seehoon Lee	Korean
14:05-14:20		Prj. 3: Digital twin for mechatronics-based smart manufacturing Ulsan National Institute of Science and Technology - Development of the Virtual Digital Twin Model for the Industrial Robot and Manufacturing Processes Sungkyunkwan University	Dr. Hyung Wook Park Dr. Sang Won Lee	Korean
14:20-14:30		Discussion	YS Lee	Korean

List of Participants:

Canada

Name	Affiliation/Position	Role, etc	In-person/Online
Dr. Kim, Jeong Woo	U. Calgary/Professor	Projects PI, AKCSE President	In-person
Dr. Wang, Xin	U. Calgary/Professor	Presenter, Projects Co-PI	Online
Dr. Park, Simon	U. Calgary/Professor	Presenter, Projects Co-PI	In-person
Dr. Lee, Jihyun	U. Calgary/Professor	Project PI	In-person
Dr. Lee, Youngsoo	U. Calgary, JBNU/Professor	Panel Facilitator	In-person
Dr. Seo, Hyeong Jun	U. Calgary/Researcher	Moderator	In-person
Dr. Bryan Moon	MKS Ltd./President	Panel	Online
Mr. Kevin Lim	MKS Ltd./Manager		Online
Ms. Minseo Kim	Sejong University/M.Sc. Student		Online

Korea

Name	Affiliation/Position	Role, etc	In-person/Online
Dr. Kwon, Sunil	Dong-A U./Professor	Presenter, Project PI	Online
Dr. Lee, See Hun	Jeonbuk Nat. U./Professor	Presenter, Project PI	Online
Dr. Cho, Sangho	Jeonbuk Nat. U./Professor	Project Co-PI	Online
Dr. Kim, Yeongdu	Jeonbuk Nat. U./Professor	Project Co-PI	Online
Dr. Park, Hyuck-Jin	Sejong U./Professor	Project Co-PI	Online
Dr. Kim, Sang-Wan	Sejong U./Professor	Project Co-PI	Online
Dr. Bae, Tae-Suk	Sejong U./Professor	Project Co-PI	Online
Dr. Kim, Jinhoo	Dong-A U./Professor	Project Co-PI	Online
Dr. Lee, Seungguk	Dong-A U./Professor	Project Co-PI	Online
Dr. Son, Hanam	Pukyoung Nat. U./Professor	Project Co-PI	Online
Dr. Yang, Minjun	Pukyoung Nat. U./Professor	Project Co-PI	Online
Dr. Hyung Wook Park	UNIST/Professor	Project PI	Online
Dr. Sang Won Lee	SKKU/Professor	Project Co-PI	Online
Dr. Sung, WonMo	Hanyang U./Professor		Online
Dr. Chris Lee	Kogas Corp. Korea		Online
Dr. Jang SangYub	Kogas Corp. Korea		Online
Mr. Jang, Hochang	Kangwon Nat. U./Professor		Online
Dr. Han, Dongkwon	Dong-A U. /Researcher		Online
Mr. Lee, Sanghee	Dong-A U. /Ph.D. Student		Online
Ms. Sung, Yujeong	Dong-A U./ M.Sc. Student		Online

Name	Affiliation/Position	Role, etc	In-person/Online
Ms. Yang, Yunjeong	Dong-A U./M.Sc. Student		Online
Mr. Jeong, Dohyun	Dong-A U./M.Sc. Student		Online
Ms. Kim, Yangah	Dong-A U./M.Sc. Student		Online
Ms. Kim, Jisu	Dong-A U./M.Sc. Student		Online
Ms. Lee, Junghyun	Sejong U./ Ph.D. Student		Online
Mr. Lee, Dongjun	Sejong U./M.Sc. Student		Online
Ms. Lim,Soohyeon	Sejong U./M.Sc. Student		Online
Ms. Kim, Minseo	Sejong U./M.Sc. Student		Online
Ms. Kang Seoyoung	Jeonbuk Nat. U./M.Sc. Student		Online
Mr. Kim juhyun	Jeonbuk Nat. U./Ph.D. Student		Online
Mr. Min Gyeongjo	Jeonbuk Nat. U./Ph.D. Student		Online
Ms. Go Eunsol	Jeonbuk Nat. U./M.Sc. Student		Online
Mr. Lee Roosse	Jeonbuk Nat. U./ Ph.D. Student		Online
Ms. Chae Minju	Jeonbuk Nat. U./M.Sc. Student		Online
Ms. Han Sunlee	Jeonbuk Nat. U./ Ph.D. Student		Online
Ms. Han Jinju	Jeonbuk Nat. U./ Ph.D.		Online
Mr. Seo Youngjin	Jeonbuk Nat. U./ Ph.D. Student		Online
Mr. Kim Donghyun	Jeonbuk Nat. U./ Ph.D. Student		Online
Mr. Kim, Changmin	Pukyoung Nat. U./M.Sc.Student		Online
Mr. Yoo Hyunsang	Chonnam Nat. U./ Ph.D.Student		Online
Mr. Kim Juwan	Chonnam Nat. U./ M.Sc.Student		Online
Mr. Song Chayoung	Chonnam Nat. U./ M.Sc.Student		Online
Mr. Song youngsoo	Hanyang U./Ph.D.Student		Online
Mr. Jeong Jaeyeol	Hanyang U./Ph.D.Student		Online
Dr. MH Kwon	Univ. of Calgary/Researcher		In-person
Dr. NR Kim	AKCSE/Member		In-person
Ms. JM Shin	U. Calgary/Graduate Student		In-person

Application of AI to Energy and Mechatronics: IITP International Joint Research Program Session

Chair: Dr. Hyeong Jun Seo

Post Doctor/University of Calgary

Dr. SEO is Post Doctor in the Department of Geomatics Engineering at the University of Calgary. He received BSc. (2012), MSc. (2014) and Ph.D. (2019) degrees in Energy and Mineral Resource Engineering from Dong-A University, Busan, South Korea.

He has conducted research related to A Study on the Gas Contents Estimation for Coalbed Methane(CBM) Field. His research focuses on Development of Optimization Model for Gas Pipeline Network Considering Geographical Information System. He is participating research project “Development and Application of Artificial Intelligence Techniques for Geospatial Information Analysis”

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Application of AI to Energy and Mechatronics: IITP International Joint Research Program Session

Keynote Speaker: Dr. Xin Wang

Professor/ Director of Intelligent Geospatial Data Mining Laboratory

Dr. Xin Wang is a full professor in the Department of Geomatics at Schulich School of Engineering (SSE). She has proposed and developed various geospatial information systems and data mining methods to various problems in engineering, especially in transportation applications. Dr. Xin Wang received her Ph.D. in Computer Science and has worked on spatial-temporal data mining, trajectory mining, and route recommendation for over 10 years. She is the leader of the Intelligent Geospatial Data Mining Lab at University of Calgary, where a team of one PDF, 5 Ph.D students and 4 MSc students works to advance the field of research. She is an expert in the field of data analytics and has experienced much success in her career. She has published over 90 referred journal articles and peer-reviewed conferences. Most recent publications are published in the premier AI conferences and journals, such as AAAI, IJCAI, PAKDD, IEEE Transactions on Intelligent Transportation Systems, IEEE Transactions in Neural Network and Learning Systems, International Journal of Geographical Information Science, and International Journal of Health Geographics. Dr. Xin Wang is also the executive member and Treasurer of Canadian AI Association (CAIAC).

E-mail: xcwang@ucalgary.ca

An AI-based steam injection distribution optimization method for SAGD oil field

Xin Wang

Department of Geomatics Engineering, Schulich School of Engineering, University of Calgary, Calgary, AB, Canada

Steam injection distribution optimization refers to the process of distributing steam injection in steam assisted gravity drainage (SAGD) oil field to maximize the total oil production. A novel optimization method that integrates long short-term memory (LSTM) neural network and dynamic programming is presented in this paper to solve the steam injection distribution optimization problem for the first time. In the proposed method, LSTM is used to construct the prediction model to predict oil production of the wells. With the prediction result, dynamic programming optimizes steam injection distribution in the oil field to maximize total oil production. Convergence stability and computational complexity of the dynamic programming method have been analyzed and presented in this research. Experiments on two pads of a real-world SAGD project demonstrate that LSTM model gives better prediction result than other four existing models and production improvement of the proposed method is highly related to parameter setting of the optimization process.

Application of AI to Energy and Mechatronics: IITP International Joint Research Program Session

Keynote Speaker: Dr. Simon S. Park

Professor, University of Calgary

Dr. Park is a professor at the Schulich School of Engineering, Dept. of Mechanical and Manufacturing Engineering, University of Calgary, Canada. He was an AITF iCORE Chair in sensing and monitoring. He is a professional engineer in Alberta and is an as- sociate member of CIRP (Int. Academy of Production Engineers) from Canada. Dr. Park received bachelor and master's degrees from the University of Toronto, Canada. He then continued his PhD at the University of British Columbia, Canada. He has worked in several companies including IBM manufacturing where he was a procure- ment engineer for printed circuit boards and Mass Prototyping Inc. dealing with rapid prototyping systems. His research interests include pipeline engineering, nanocompo- sites, directional drilling, petroleum processing printed electronics, sensors, IoTs, and advanced manufacturing. He has also founded three start-up companies in sensing and partial upgrading of bitumen. He has received several awards including Young Innova- tor's Award, Schulich School of Engineering Teaching Award, Schulich School Re- search Excellence Award, CFI New Faculty Grant, Alberta Innovates New Faculty award, NSERC scholarships. He is also serving as associate editors of several journals. Currently, he is directly supervising over 28 students and scholars at Multifunctional Engineering, Dynamics and Automation Lab (MEDAL, www.ucalgary.ca/medal).

E- mail: simon.park@ucalgary.ca

Application of AI to Energy and Mechatronics: IITP International Joint Research Program Session

Speaker: Dr. Jihoon Wang

Assistant Professor / Hanyang University

Jihoon Wang is an assistant professor in the Department of Earth Resources and Environmental Engineering at Hanyang University. His research interests are reservoir engineering and geomechanics including geomechanical property alterations by rock deformation failure, well completion designs in unconventional reservoirs, well/formation stability during hydrocarbon production and carbon sequestration, etc. After he received the PhD degree in the Petroleum Engineering Department at Texas A&M University, he was working in the Department of Petroleum and Natural Gas engineering at New Mexico Tech before joining Hanyang University.

Application of AI to Energy and Mechatronics: IITP International Joint Research Program Session

Speaker: Dr. Sangyup Jang

Korea Gas Corporation(KOGAS)

Dr. Jang graduated of PhD degree of mechanical engineering. But now he is working for the E&P business of KOGAS.

Dr. Jang managed and completed oil production project for Zubair and Badra field in Iraq. And, now he is carrying out a national project to apply AI, ICT, VR technologies to the E&P industry. He believes that this technological development will have a great impact on all industries and is gradually working on the main results of this project.

Application of AI to Energy and Mechatronics: IITP International Joint Research Program Session

Speaker: Dr. Hyung Wook Park

Professor at Ulsan National Institute of Science and Technology

Hyung Wook Park is the professor at the Ulsan National Institute of Science and Technology from 2009. He received his BSc and MSc in School of Mechanical and Aerospace Engineering from Seoul National University, Korea in 2000 and 2002, respectively. Then, he worked as a researcher in Namyang R&D center in Hyundai Motor Company, Korea. he worked as a researcher in Packaging R&D center in Intel, Chandler, USA in 2007. He earned his Ph.D. in Mechanical Engineering from Georgia Institute of Technology, USA in 2008. He worked as a senior researcher in Intelligent Manufacturing and System Research Team in Korea Institute of Machinery and Materials (KIMM). He has published more than 100 papers in reputed conference and journals in the field of manufacturing and composites. His lab's long-term research goal is to establish and develop "Multi-Physics based Micro/Meso-scale Manufacturing (MP- M2) Processes and Systems"

NST ST&I Ambassador Conference

Time: 12:30 - 13:30, 3 September (Thursday) Korea Time
21:30 - 22:30, 2 September (Wednesday) Canada MDT Time

Place: In-person at Kananaskis, AB, Canada

Sponsor: National Research Council of Science and Technology, Korea (NST)

Organizer: NST and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Moderator: Dr. Il Yong Kim (Queen's University, Canada)

Contact: Dr. Il Yong Kim (kimiy@queensu.ca)

Description: This session is intended to associate Korea Government Research Institutes (KGRIs) and corresponding AKCSE ambassadors. It also aims to encourage and support the ambassadors to closely work with KGRIs to relate AKCSE members with KGRIs for collaborative research.

Program:

(Korea) Time	Place	Topic	Speaker	Affiliation
12:30-12:50	Kananaskis (Canada)	Activity Briefing	Ambassadors	
12:50-13:00		2020-2021 Ambassador announcement	Dr. Il Yong Kim	Queen's Univ.
13:00-13:30		Group Discussion - How to enhance the collaboration between KGRIs and AKCSE?	All	

KEIT Global Technology Strategy Forum

Time: 11:00 - 12:00, 4 September (Friday) Korea Time
22:00 - 23:00, 3 September (Thursday) Canada Eastern Time

Place: Online
In-person at Sejong, Korea and Kananaskis, AB, Canada

Sponsor: Korea Evaluation Institute of Industrial Technology (KEIT)

Organizer: KEIT and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Contact: Dr. Seonghwan Kim, University of Calgary (sskim@ucalgary.ca)

Description: This forum is to promote participation of Korean-Canadian scientists and engineers in the planning of Korea Government R&D projects for improving productivity and global cooperation.

Program:

(Korea) Time	Place	Topic	Speaker	Affiliation
11:00-11:05	Online, Kananaskis, Sejong	Opening remarks	Dr. Yang-Ho Jung	KEIT
11:05-11:10		Greeting	Dr. Jeong Woo Kim	Univ. Calgary
11:10-11:30		Industrial Technology R&D Policy and Strategy	Dr. Jungwoo Lee	KEIT
11:30-11:50		International Collaboration Success Case Presentation	Dr. Jong Sung Kim	Dalhousie Univ.
11:50-12:00		Concluding remarks	All	

KEIT-AKCSE Roundtable

Invitees Only

Time: 12:00 - 13:00, 4 September (Friday) Korea Time
23:00 - 24:00, 3 September (Thursday) Canada Eastern Time

Place: Online
In-person at Sejong, Korea and Kananaskis, AB, Canada

Sponsor: Korea Evaluation Institute of Industrial Technology (KEIT)

Organizer: KEIT and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Contact: Dr. Seonghwan Kim, University of Calgary (sskim@ucalgary.ca)

Description: Informal discussion meeting between representatives from KEIT and AKCSE to promote international collaborative research work.

Program:

(Korea) Time	Place	Topic	Speaker	Affiliation
12:00-12:05	Online, Kananaskis, Sejong	Opening remarks	Dr. Jongseok Han	KEIT
12:05-12:10		Introduction of attendees	Mr. Byoung-Jai Kim	KEIT
12:10-12:20		Current status of industrial R&D international collaboration	Mr. Byoung-Jai Kim	KEIT
12:20-12:50		Informal discussion and suggestion on the direction of future R&D international collaboration	All	
12:50-13:00		Concluding remarks	All	

KEIT Global Technology Strategy Forum

Chair: Dr. Seonghwan (Sam) Kim

Associate Professor/Canada Research Chair in Nano Sensing Systems at the University of Calgary

Dr. Kim is an Associate Professor and Canada Research Chair in Nano Sensing Systems, in the Department of Mechanical and Manufacturing Engineering at the University of Calgary. He received his B.Sc. (1998) and M.Sc. (2000) degrees in Aerospace Engineering from Seoul National University, Seoul, South Korea and Ph.D. (2008) in Mechanical, Aerospace and Biomedical Engineering from the University of Tennessee, Knoxville, USA. He was a Postdoctoral Research Associate at Oak Ridge National Laboratory, USA and an Acting Research Associate at the University of Alberta, Canada prior to his current position. Dr. Kim has founded the Nano/Micro-Sensors and Sensing Systems Laboratory (NMSSS, www.ucalgary.ca/sskim) at the University of Calgary in 2013 to develop 1) ultrasensitive chemical/biological sensors and sensing systems based on micro/nanotechnology; 2) novel micro/nano-metrologies to characterize nanomaterials and polymeric nanocomposites for energy, environmental, biological applications. E-mail: sskim@ucalgary.ca

KEIT Global Technology Strategy Forum

Speaker: Dr. Yang Ho Chung

President, Korea Evaluation Institute of Industrial Technology (KEIT)

Dr. Yang-Ho Jung received the B.S. and M.S. degree both in Economics from Seoul National University in 1985 and 1987, and Ph. D degree in Economics from Southern Illinois University in 1996 respectively.

Dr. Jung passed Public Administration Examination in 1984, worked as a deputy director/secretary of the Ministry of Commerce and Industry from 1985 to 2000. After working for Ministry of Commerce Industry and Energy from 2007 to 2008 as a Leader of General Affair Team, he worked for Ministry of Knowledge Economy from 2011 to 2012 as a Director General of Industrial Technology Policy and from 2012 to 2013 as a Director General of Energy Resource Development. After Dr. Jung worked for Ministry of Trade, Industry and Energy (MOTIE) from 2014 to 2016 as a Deputy Minister of Energy Resources, he worked as a Commissioner of Public Procurement Service from 2016 to 2017. Currently Dr. Jung is working as a President of Korea Evaluation Institute of Industrial Technology (KEIT).

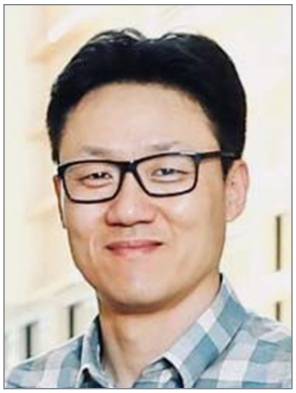
KEIT Global Technology Strategy Forum

Speaker: Dr. Jung Woo Lee

Leader of Policy Planning Team, Korea Evaluation Institute of Industrial Technology (KEIT)

Dr. Jung Woo Lee received the B.S., M.S. degrees both in Electrical Engineering from KookMin University and Ph.D. degree in E-Business from KonKuk University in Seoul, Korea in 1991, 1993 and 1997 respectively. Dr. Lee joined Korea Evaluation Institute of Industrial Technology (KEIT) in 2001 and worked as an officer of R&D Evaluation Management including Parts and Material R&D evaluation. After Dr. Lee has been worked as an officer of Information System Management, Fraudulent Use of Research Funds and Audit since 2009, he is currently working as a Leader of Policy Planning Team.

KEIT Global Technology Strategy Forum



Speaker: Dr. Jong Sung Kim

Associate Professor, Faculty of Medicine at Dalhousie University/ Director of Health and Environments Research Centre (HERC)

Dr. Jong Sung Kim is a tenured Associate Professor and Director of Health and Environments Research Centre (HERC) in the Faculty of Medicine at Dalhousie University in Canada.

Nanotoxicology and human health risk assessment have been his primary academic and research interests since the completion of his MSc degree in Environmental Toxicology at the University of Nebraska Center for Health and Environmental Toxicology. Following this, he commenced his PhD in Human Toxicology, where he was enrolled in the Interdisciplinary Graduate Program at the University of Iowa (US National Institutes of Health Fellowship).

In recognition of his contributions to nanotoxicology research, he has served on the Technical Committee for the International Organization for Standardization (ISO) Working Group on Nanotechnology, and he received numerous international awards such as Best Paper Award of Delta Omega Honorary Society in Public Health from the American Public Health Association and the MB Research Award from the Society of Toxicology.

The primary objective of his research program is to better understand how emerging hazards and exposures lead to adverse health outcomes at various levels of biological organization (from cellular and molecular levels to populations) and how human body modify these responses to maintain homeostasis (host-defense).

E-mail: jskim@dal.ca

KEIT-AKCSE Roundtable

Chair: Dr. Seonghwan (Sam) Kim

Associate Professor/Canada Research Chair in Nano Sensing Systems at the University of Calgary

Dr. Kim is an Associate Professor and Canada Research Chair in Nano Sensing Systems, in the Department of Mechanical and Manufacturing Engineering at the University of Calgary. He received his B.Sc. (1998) and M.Sc. (2000) degrees in Aerospace Engineering from Seoul National University, Seoul, South Korea and Ph.D. (2008) in Mechanical, Aerospace and Biomedical Engineering from the University of Tennessee, Knoxville, USA. He was a Postdoctoral Research Associate at Oak Ridge National Laboratory, USA and an Acting Research Associate at the University of Alberta, Canada prior to his current position. Dr. Kim has founded the Nano/Micro-Sensors and Sensing Systems Laboratory (NMSSS, www.ucalgary.ca/sskim) at the University of Calgary in 2013 to develop 1) ultrasensitive chemical/biological sensors and sensing systems based on micro/nanotechnology; 2) novel micro/nano-metrologies to characterize nanomaterials and polymeric nanocomposites for energy, environmental, biological applications. E-mail: sskim@ucalgary.ca

KEIT-AKCSE Roundtable

Speaker: Dr. Jong Suk Han

Director, Korea Evaluation Institute of Industrial Technology (KEIT)

Dr. Jong Suk Han received the B.S., M.S. and Ph.D. degrees in Electrical Engineering from KonKuk University in Seoul, Korea in 1991, 1993 and 1997 respectively.

After Dr. Han worked as a Sr. researcher for Dacom Research Institute in 1997, he worked for Institute of Information Technology Assessment (IITA) from 2002 to 2004 as a Sr. researcher of Mobile Communication and from 2004 to 2009 as Leader of Technical Planning Team. Since 2009, Dr. Han has been working for Korea Evaluation Institute of Industrial Technology (KEIT) as a Leader of Strategic Planning Team, Head of Business Planning Group and he is currently working as a Director of Industrial Technology Strategy Division.

KEIT-AKCSE Roundtable

Speaker: Mr. Byoung-Jai Kim

Representative of KEIT US Office, Korea Evaluation Institute of Industrial Technology (KEIT)

Mr. Kim is a representative of Korea Evaluation of Institute of Industrial Technology (KEIT) at US Office. He earned Master degree from Seoul National University in Electrical and Computer Science Engineering. He joined KEIT in 2005 and currently is serving as representative of KEIT USA since January 2018.

ChangWon City SME Industries Project Technical Consulting Group Strategy Meeting: KERI-AKCSE International Joint Research Program Session

Invitees Only

Time: 11:00 - 12:30, 4 September (Friday) Korea Time
20:00 - 21:30, 3 September (Thursday) Canada MDT Time

Place: Online
In-person in Sejong, Korea and Kananaskis, Toronto, Ottawa, Halifax, Canada

Sponsor: A research project "Consulting for Technological Challenges and Innovation in the Small to Medium-sized Manufacturing Industries in ChangWon City Area, Korea", supported by Korea Electrotechnology Research Institute (KERI)

Organizer: KERI and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Contact: Dr. Jihyun Lee, University of Calgary (jihyun.lee@ucalgary.ca)

Moderator: Dr. Il Yong Kim (Queen's University)

Description: One of objectives of the sponsored project includes identifying current difficulties of manufacturers in the ChangWon City area through cooperation with the KERI and proposing solutions through AKCSE's Technical Consulting Group. The project covers all important technological areas in the 4th Industrial Revolution, including artificial intelligence, advanced materials and nanotechnology, intelligent robots, 3D printing, big data, IoT, advanced machinery, unmanned transportation, future vehicles and aviation, smart factories, clean and renewable energy including secondary batteries, advanced medical technologies and devices. In this strategic meeting, project leaders present details and current status of the project. AKCSE's technical consulting group members, along with participants from KERI and ChangWon City, discuss strategies for overcoming unexpected difficulties caused by COVID-19 pandemic

Program:

(MDT) Time	Place	Topic	Speaker	Affiliation
20:00-20:10	Online In-person	Opening by AKCSE President Welcome Remarks by KERI	Dr. Jeong Woo Kim Jong Uk Kim	Univ. Calgary KERI
20:10-20:15		Introduction of Program	Dr. Il Yong Kim	Queen's Univ.
20:15-20:35		Project Overview and Update on Survey of AI in Canada - AKCSE	Dr. Jihyun Lee	Univ. Calgary
20:35-20:45		Project Update – KERI	Jong Uk Kim	KERI
20:45-21:30		Consulting Group Discussion and Closing	Dr. Il Yong Kim	Queen's Univ.

List of Participants:

Canada

Name	Affiliation/Position	Role, etc	In-person/Online
Dr. Kim, Jeong Woo	U. Calgary/Professor	Projects PI, AKCSE President	In-person
Dr. Kim, Il Yong	Queen's U. /Professor	Projects co-PI AKCSE Vice-President	In-person
Dr. Chung, Joon	Ryerson U. /Professor	Expert member	Online
Dr. Yun, Sean	NRC Canada/Group Leader	Expert member	Online
Dr. Regina Lee	York U. /Professor	Expert member	Online
Dr. Chang, Gap Soo	U. Saskatchewan/Professor	Expert member	Online
Dr. Jeon, Sang Yong	McGill U. /Professor	Expert member	Online
Dr. Park, Simon	U. Calgary/Professor	Expert member	In-person
Dr. Lee, Chi-Guhn	U. Toronto/Professor	Expert member	Online
Dr. Kwon, Hyock Ju	U. Waterloo/Associate Professor	Expert member	Online
Dr. Lee, Jihyun	U. Calgary/Assistant Professor	Projects member, AKCSE member	In-person
Dr. Seo, Jaho	Ontario Inst. Tech./Assistant Professor	Expert member	Online
Dr. Jeon, Soo	U. Waterloo/Associate Professor	Expert member	Online
Dr. Kim, Seonghwan	U. Calgary/Associate Professor	Expert member	In-person
Dr. Lee, Patrick	U. Toronto/Professor	Expert member	Online
Dr. Chang, Won Jae	U. Saskatchewan/Associate Professor	Expert member	Online
Dr. Chung, Hyun-Joong	U. Alberta/Associate Professor	Expert member	Online
Dr. Kim, Keun Su	NRC Canada/Senior Research Officer	Expert member	Online
Dr. Shin, Homin	NRC Canada/Research Officer	Expert member	Online
Dr. Kim, JongSung	Dalhousie U. /Associate Professor	Expert member	Online
Dr. Choi, Hyo-Jick	U. Alberta/Assistant Professor	Expert member	Online
Dr. Kwon, Moonhyuk	U. Calgary/Visiting Professor	Expert member	In-person
Dr. Ro, Dae-Kyun	U. Calgary/Professor	Expert member	Online
Dr. Lee, Hyung-Sool	U. Waterloo/Associate Professor	Expert member	Online
Dr. Kim, ChunIl	U. Alberta/Associate Professor	Expert member	Online
Dr. Ko, Seok-bum	U. Saskatchewan/Professor	Expert member	Online
Dr. Kim, Ilmin	Queen's U. /Professor	Expert member	Online
Dr. Kim, Na Young	U. Waterloo/Associate Professor	Expert member	Online
Dr. Yoon, Youngki	U. Waterloo/Associate Professor	Expert member	Online
Dr. Kwon, Oh-Sung	U. Toronto/Associate Professor	Expert member	Online
Dr. Kim, Yong Hoon	U. Windsor/Assistant Professor	Expert member	Online

Dr. Kwon, Tae Jung	U. Alberta/Assistant Professor	Expert member	Online
Dr. Lee, Jongho	U. British Columbia/Assistant Professor	Expert member	Online
Dr. Cho, Sun hee	U. Alberta/Adjunct Professor	Expert member	Online
Dr. Kim, Keekyoung	U. Calgary/Assistant Professor	Expert member	Online
Dr. Yeum, Chul Min	U. Waterloo/Assistant Professor	Expert member	Online
Dr. Lim, Hyun Ja	U. Saskatchewan/Associate Professor	Expert member	Online
Dr. Suh, Miyoung	U Manitoba/Professor	Expert member	Online
Dr. Kim, Bumsoo	Defence R&D Canada/Defence Scientist	Expert member	Online
Dr. Lee, Youngsoo	Chonbuk National U. /Associate Professor	Expert member	Online
Dr. Seo, Hyeong Jun	U. Calgary/Visiting Professor	Expert member	Online
Dr. Moon, Bryan	MKS INVESTMENTS LTD/President	Expert member	Online
Dr. Park, Chaneel	U. Calgary/Post-doc	Expert member	
Dr. Won, Jongho	U. Calgary/Research Associate	Expert member	Online
Dr. Oh, Kee Seung	Queen's U./Post-doc	Expert member	Online
Dr. Kim, Dongwook	U. Calgary/Post-doc	Expert member	Online
Dr. Lee, Jonghwa	TBC/PDF	Expert member	Online
Dr. Yoo, byonghoon	Dalhousie U./Senior Res. Associate	Expert member	Online
Dr. Oh, Won Taek	U. New Brunswick/Assistant Professor	Expert member	Online
Dr. Michael Ha	Nova Scotia Health Authority/Doctor	Expert member	Online
Dr. Park, Kyoungchul	National Research Council-IMB/ Researcher	Expert member	Online
Dr. Hwang, Dae Kun	Ryerson U./Associate Professor	Expert member	Online

Korea

Name	Affiliation/Position	Role, etc	In-person/Online
Jong Uk Kim	KERI/General Manager of Strategic Policy	Project Director	Online
TaiHyun Kim	KERI/Manager of Future Strategic	Project Director	Online

ChangWon City SME Industries Project Technical Consulting Group Strategy Meeting: KERI-AKCSE International Joint Research Program Session

Chair: Dr. Jihyun Lee

Assistant Professor at the University of Calgary

Dr. Jihyun Lee received her BSc in Mechanical Engineering from Yonsei University, Seoul, South Korea, and her MSc and Ph.D. in Mechanical Engineering from the University of Michigan-Ann Arbor, USA. Prior to joining the University of Calgary, she worked for 2.5 years as a senior researcher in the department of Ultra-precision Machines and Systems at Korea Institute of Machinery & Materials (KIMM), South Korea. She has worked as an assistant professor at the University of Calgary since February 2019. Projects she mainly fulfilled at the KIMM were 'Vibration Reduction of Machines using Multiple TMD system'(.1 million granted by Doosan Machine Tools), 'Virtual Machining Mechatronics Platform', 'Industrial Robot Manipulator Machining on Mobile Platform' and 'Laser Tracker Network Development'. Current research topic she focuses on at the UCalglary is robotic metal hybrid additive and subtractive manufacturing. Dr. Lee conducts her research at the intelligent automation research laboratory (iAR Lab).

E-mail jihyun.lee@ucalgary.ca

ChangWon City SME Industries Project Technical Consulting Group Strategy Meeting: KERI-AKCSE International Joint Research Program Session

Speaker: Dr. Il Yong Kim

Professor at Queen's University

Dr. Il Yong Kim is a Professor in the Department of Mechanical and Materials Engineering at Queen's University, Kingston, Canada. His research interest is design optimization with applications in automotive and aerospace systems. KIM received his M.S. and Ph.D. degrees in mechanical engineering from the Korea Advanced Institute of Science and Technology (KAIST). He worked as an instructor and postdoctoral researcher in the Department of Aeronautics and Astronautics at M.I.T., where he taught undergraduate design course. KIM received a number of awards, including the Early Researcher Award in Canada, the recognition of the Experienced Humboldt Fellow in Germany, the Research Excellence Award at Queen's, and many paper awards at major scientific conferences. KIM is actively collaborating with global, multi-national companies in the automotive and aerospace industries, including General Motors, Magna, Bombardier Aerospace, Pratt & Whitney, Safran Landing Systems, and General Dynamics.

KIAT's Korea Technology Advisory Group (K-TAG) Seminar and General Meeting

Time: 02:00 - 04:00, 5 September (Saturday) Korea Time
11:00 - 13:00, 4 September (Friday) Canada MDT Time

Place: Online only

Sponsor: Korea Institute for Advancement of Technology (KIAT)

Organizer: KIAT and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Contact: Dr. Jong Sung Kim, Dalhousie University (jskim@Dal.Ca)

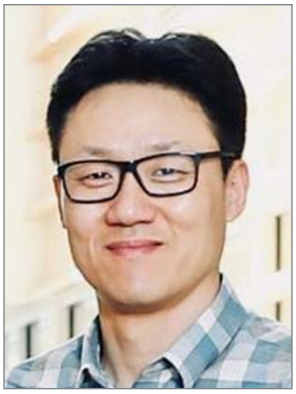
Description: The Korea Institute for Advancement of Technology (KIAT) is a comprehensive technology support organization committed to promoting industrial technology growth in Korea. Korea-Technology Advisory Group (K-TAG) Canada launched by KIAT and AKCSE in July 2016, consists of Korean Science and engineering experts in Canada. Main activities of K-TAG are 1) to assist Korean Small and Medium-sized Enterprises (SMEs) in finding Canadian Innovative partners, 2) to provide advice as well as information related to Korea-Canada R&D cooperation and 3) to develop and participate in Korea-Canada joint R&D projects. In CKC 2019, the members of K-TAG Canada in various technical areas will get together to 1) seek research collaborations, 2) present/propose innovative research projects and 3) discuss R&D projects planning with delegates of KIAT in this forum.

Program:

(Korea) Time	Place	Topic	Speaker	Affiliation
11:00-12:00	Online & Kananaskis	Welcome Message by AKCSE President KIAT K-TAG General Meeting	Dr. Pomjin Lee	Chief Representative, KIAT
12:00-13:00		KIAT K-TAG R&D Forum: Seminar 1	Dr. Gap Soo Chang	Univ. of Saskatchewan
		KIAT K-TAG R&D Forum: Seminar 2	Dr. Il Yong Kim	Queen's University
		R&D Program Discussion	K-TAG members	AKCSE

PLEASE NOTE: THIS LECTURE CANNOT BE RECORDED BY THE AUDIENCE.

KIAT's Korea Technology Advisory Group (K-TAG) Seminar and General Meeting



Chair and Panel: Dr. Jong Sung Kim

Associate Professor, Faculty of Medicine at Dalhousie University/ Director of Health and Environments Research Centre (HERC)

Dr. Jong Sung Kim is a tenured Associate Professor and Director of Health and Environments Research Centre (HERC) in the Faculty of Medicine at Dalhousie University in Canada.

Nanotoxicology and human health risk assessment have been his primary academic and research interests since the completion of his MSc degree in Environmental Toxicology at the University of Nebraska Center for Health and Environmental Toxicology. Following this, he commenced his PhD in Human Toxicology, where he was enrolled in the Interdisciplinary Graduate Program at the University of Iowa (US National Institutes of Health Fellowship).

In recognition of his contributions to nanotoxicology research, he has served on the Technical Committee for the International Organization for Standardization (ISO) Working Group on Nanotechnology, and he received numerous international awards such as Best Paper Award of Delta Omega Honorary Society in Public Health from the American Public Health Association and the MB Research Award from the Society of Toxicology.

The primary objective of his research program is to better understand how emerging hazards and exposures lead to adverse health outcomes at various levels of biological organization (from cellular and molecular levels to populations) and how human body modify these responses to maintain homeostasis (host-defense).

E-mail: jskim@dal.ca

KIAT's Korea Technology Advisory Group (K-TAG) Seminar and General Meeting

Speaker: Dr. Pomjin Lee

Chief Representative, Korea Institute for Advancement of Technology US Office

Dr. Pomjin Lee is the chief representative of KIAT US office. The KIAT, as a non-profit government funding agency, is entrusted with the implementation of the state R&D budget for industrial technology. It supports the overarching R&D of industry through planning, project support, building R&D infrastructure, nurturing human resources, and performance management. Dr. Lee's work focuses on international technology collaboration activities supporting Korean companies work with overseas partners.

Dr. Lee has been working for KIAT HQ since July 2002. His positions have been Team Leader of International Cooperation Planning Team, Team Leader of Creative Innovation Team, and Head of Job Creation Management Division. His career with KIAT HQ has been focused on planning of international technology cooperation strategy and manage global partnership program. Working at International Cooperation Planning Team (May 2011 – Oct 2013), his duties were as follows: (i) planned International Technology Cooperation Strategy and long-term Industrial Innovation Plan, (ii) responsible for Global R&D cooperation, and (iii) responsible for Global Partnership Program.

Working at Creative Innovation Team and Job Creation Management Division (Oct 2013 – Feb 2018), his duties were as follows: (i) focused on domestic job creation projects, (ii) responsible for Management Evaluation of Public Institution, (iii) planned long-term Management Strategy of KIAT HQ, and (iv) responsible for Customer Satisfaction based on Government(open) Innovation.

Dr. Lee has a Master of Business Administration from University of Kyunghee in South Korea and a Doctor of Engineering degree from University of Sungkyunkwan in South Korea. His major at University of Sungkyunkwan is Management of Technology and Ph. D. thesis is "Verification of Indicators for Measuring Management of Technology Competitiveness

KIAT's Korea Technology Advisory Group (K-TAG) Seminar and General Meeting

Speaker: Dr. Il Yong Kim

Professor at Queen's University

Dr. Il Yong Kim is a Professor in the Department of Mechanical and Materials Engineering at Queen's University, Kingston, Canada. His research interest is design optimization with applications in automotive and aerospace systems. KIM received his B.S in mechanical engineering from Korea University, and M.S. and Ph.D. degrees in mechanical engineering from the Korea Advanced Institute of Science and Technology (KAIST). He worked as an instructor and postdoctoral researcher in the Department of Aeronautics and Astronautics at M.I.T., where he taught undergraduate design course. KIM received a number of awards, including the Early Researcher Award in Canada, the recognition of the Experienced Humboldt Fellow in Germany, the Research Excellence Award at Queen's, and many paper awards at major scientific conferences. KIM is actively collaborating with global, multi-national companies in the automotive and aerospace industries, including General Motors, Magna, Bombardier Aerospace, Pratt & Whitney, Safran Landing Systems, and General Dynamics.

KIAT's Korea Technology Advisory Group (K-TAG) Seminar and General Meeting

Speaker: Dr. Gap Soo Chang

Professor in Department of Physics and Engineering Physics, University of Saskatchewan

Dr. Chang is currently a Professor in the Department of Physics and Engineering Physics at the University of Saskatchewan. He received his B. Sc. (1992), M.Sc. (1994), and Ph.D. (1998) degrees in Experimental Condensed Matter Physics from Yonsei University, Seoul, Korea in 1994 and 1998, respectively. He held a postdoctoral researcher position at Atomic-scale Surface Science Center, Korea and one at the University of Tennessee at Knoxville/Lawrence Berkeley National Laboratory before joining the faculty at the University of Saskatchewan. He has actively researched in the areas of carbon-based semiconductor electronics, high efficiency energy technology, ferromagnetic semiconductors/nanostructures, and synchrotron-radiation X-ray spectroscopy.

E-mail: gapsoo.chang@usask.ca

KIER Lithium-Ion Battery

Invitees Only

Time: 10:00 - 11:00, 4 September (Saturday) Korea Time
19:00 - 20:00, 3 September (Thursday) MDT Time

Place: Online
In-person at Sejong, Korea, Kananaskis, AB, Canada and Halifax, NS, Canada

Sponsor: Korea Institute of Energy Research (KIER)

Organizer: KIER and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Contact: Dr. Jong Sung Kim, Dalhousie University (jskim@dal.ca);
Dr. Simon Park, University of Calgary (sipark@ucalgary.ca)

Description: Lithium-ion batteries are used in many applications such as cell phones, computers, tools, vehicles and now store energy from renewables for later use. We will 1) explore/discuss the opportunity for research collaboration between Korea and Canada and 2) present innovative research projects in battery field and 3) discuss R&D program planning with delegates of KIAT in this forum.

Program:

(Korea) Time	Place	Topic	Speaker	Affiliation
10:00-10:05	Online & In-person	Opening	Dr. Simon Park	University of Calgary
10:05-10:25		Battery research from KIER	Dr. Boyun Jang	KIER
10:25-10:55		Panel Discussion	Dr. Jeff Dahn	Dalhousie University
			Dr. Simon Park	University of Calgary
			Dr. Jong Sung Kim	Dalhousie University
			Researchers	KIER
10:55-11:00		Closing	Dr. Simon Park	University of Calgary

KIER Lithium-Ion Battery

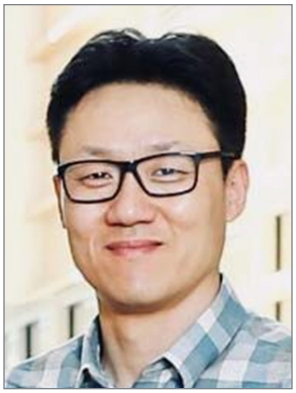
Chair: Dr. Simon S. Park

Professor, University of Calgary

Dr. Park is a professor at the Schulich School of Engineering, Dept. of Mechanical and Manufacturing Engineering, University of Calgary, Canada. He was an AITF iCORE Chair in sensing and monitoring. He is a professional engineer in Alberta and is an as- sociate member of CIRP (Int. Academy of Production Engineers) from Canada. Dr. Park received bachelor and master's degrees from the University of Toronto, Canada. He then continued his PhD at the University of British Columbia, Canada. He has worked in several companies including IBM manufacturing where he was a procure- ment engineer for printed circuit boards and Mass Prototyping Inc. dealing with rapid prototyping systems. His research interests include pipeline engineering, nanocompo- sites, directional drilling, petroleum processing printed electronics, sensors, IoTs, and advanced manufacturing. He has also founded three start-up companies in sensing and partial upgrading of bitumen. He has received several awards including Young Innova- tor's Award, Schulich School of Engineering Teaching Award, Schulich School Re- search Excellence Award, CFI New Faculty Grant, Alberta Innovates New Faculty award, NSERC scholarships. He is also serving as associate editors of several journals. Currently, he is directly supervising over 28 students and scholars at Multifunctional Engineering, Dynamics and Automation Lab (MEDAL, www.ucalgary.ca/medal).

E- mail: simon.park@ucalgary.ca

KIER Lithium-Ion Battery



Chair and Panel: Dr. Jong Sung Kim

Associate Professor, Faculty of Medicine at Dalhousie University/ Director of Health and Environments Research Centre (HERC)

Dr. Jong Sung Kim is a tenured Associate Professor and Director of Health and Environments Research Centre (HERC) in the Faculty of Medicine at Dalhousie University in Canada.

Nanotoxicology and human health risk assessment have been his primary academic and research interests since the completion of his MSc degree in Environmental Toxicology at the University of Nebraska Center for Health and Environmental Toxicology. Following this, he commenced his PhD in Human Toxicology, where he was enrolled in the Interdisciplinary Graduate Program at the University of Iowa (US National Institutes of Health Fellowship).

In recognition of his contributions to nanotoxicology research, he has served on the Technical Committee for the International Organization for Standardization (ISO) Working Group on Nanotechnology, and he received numerous international awards such as Best Paper Award of Delta Omega Honorary Society in Public Health from the American Public Health Association and the MB Research Award from the Society of Toxicology.

The primary objective of his research program is to better understand how emerging hazards and exposures lead to adverse health outcomes at various levels of biological organization (from cellular and molecular levels to populations) and how human body modify these responses to maintain homeostasis (host-defense).

E-mail: jskim@dal.ca

KIGAM Project Presentation

Invitees Only

Time: 13:00 - 16:00, 4 September (Friday) Korea Time
22:00 - 01:00, 3&4 September (Thur.&Fri.) Canada MDT Time

Place: Online
In-person at Sejong, Korea, Kananaskis, AB, Canada

Sponsor: Korea Institute of Geoscience and Mineral Resources (KIGAM)

Organizer: KIGAM and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Contact: Dr. Il-min Kim, Queen's University (ilmin.kim@queensu.ca)

Description: Dr. Il-min Kim will present the final result of KIGAM project.

KIMM - AKCSE International Joint Research Proposal Presentation

Invitees Only

Time: 14:00 - 15:30, 3 September (Thursday) Korea Time
23:00 - 12:30, 2 September (Wednesday) Canada MDT Time

Place: Online
In-person at Daejeon, Korea and Kananaskis, AB, Canada

Sponsor: Korea Institute of Machinery & Materials (KIMM)

Organizer: KIMM and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Contact: Dr. Jihyun Lee, University of Calgary (jihyun.lee@ucalgary.ca)

Description: This session is to discuss the proposal of joint research between KIMM (Korea Institute of Machinery & Materials) and AKSCE members.

Program:

(Korea) Time	Place	Topic	Speaker	Affiliation
14:00-14:05	Online Daejeon Kananaskis	Opening	Jihyun Seo	KIMM
14:05-14:20		Project 1: Topological Optimization Method Considering Residual Stress in Additive Manufacturing Process	Dr. Il-young Kim	Queen's Univ.
14:20-14:35		Project 2: Development and Application of Low-cost Smart Sensors for Manufacturing Machines	Dr. Jihyun Lee	Univ. Calgary
14:35-14:50		Project 3: Integrated logistics robot based on self-driving electric vehicle	Dr. Hyock Ju Kwon	Univ. Waterloo
14:50-15:05		Project 4: A Study on the Exploration of AI-based Sensor Convergence Technology for Self-driving and Unmanned Operations of Special Purpose Vehicles	Dr. Jaho Seo	Univ. Ontario Institute of Tech.
15:05-15:10		Feedback of Project 1	Dr. Se Gon Heo	KIMM
15:10-15:15		Feedback of Project 2	Dr. Hyung Chul Shim	KIMM
15:15-15:20		Feedback of Project 3	Dr. Jung Joong Kim	KIMM
15:20-15:25		Feedback of Project 4	Dr. Dong Wook Lee	KIMM
15:25-15:30		Closing		

List of Participants:

Korea

Affiliation	Name	Position	In-person/Online
Korea Institute of Machinery & Materials	Dr. Joon Ho Jung	General Manager of Research Strategy Coordination Division	Online
	Dr. Changwoo Lee	General Manager of Advanced Manufacturing Systems Research Division	Online
	Dr. Hyun Yi Lim	General Manager of Nano-Convergence Manufacturing Systems Research Division	Online
	Dr. Bong Ki Kim	General Manager of Mechanical Systems Safety Research Division	Online
	Dr. Tae Ho Ha	Department Manager of 3D printing	Online
	Dr. Jae-hyeon Kim	Department Manager of Applied Nano-Mechanics	Online
	Dr. Chang-Hyun Kim	Department Manager of AI Machinery	Online
	Dr. Han Min Lee	Department Manager of Smart Industrial Machine Technologies	Online
	Dr. Se Gon Heo	Principal Researcher	Online
	Dr. Hyung Chul Shim	Senior Researcher	Online
	Dr. Jung Joong Kim	Senior Researcher	Online
	Dr. Dong Wook Lee	Senior Researcher	Online

KIMM - AKCSE International Joint Research

Chair: Dr. Jihyun Lee

Assistant Professor at the University of Calgary

Dr. Jihyun Lee received her BSc in Mechanical Engineering from Yonsei University, Seoul, South Korea, and her MSc and Ph.D. in Mechanical Engineering from the University of Michigan-Ann Arbor, USA. Prior to joining the University of Calgary, she worked for 2.5 years as a senior researcher in the department of Ultra-precision Machines and Systems at Korea Institute of Machinery & Materials (KIMM), South Korea. She has worked as an assistant professor at the University of Calgary since February 2019. Projects she mainly fulfilled at the KIMM were 'Vibration Reduction of Machines using Multiple TMD system'(.1 million granted by Doosan Machine Tools), 'Virtual Machining Mechatronics Platform', 'Industrial Robot Manipulator Machining on Mobile Platform' and 'Laser Tracker Network Development'. Current research topic she focuses on at the UCalglary is robotic metal hybrid additive and subtractive manufacturing. Dr. Lee conducts her research at the intelligent automation research laboratory (iAR Lab).

E-mail jihyun.lee@ucalgary.ca

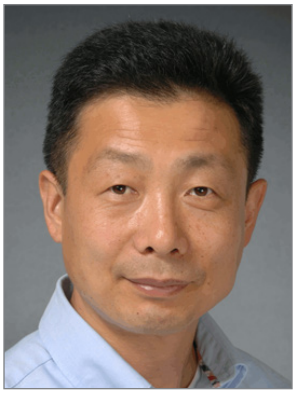
KIMM - AKCSE International Joint Research

Speaker: Dr. Il Yong Kim

Professor at Queen's University

Dr. Il Yong Kim is a Professor in the Department of Mechanical and Materials Engineering at Queen's University, Kingston, Canada. His research interest is design optimization with applications in automotive and aerospace systems. KIM received his M.S. and Ph.D. degrees in mechanical engineering from the Korea Advanced Institute of Science and Technology (KAIST). He worked as an instructor and postdoctoral researcher in the Department of Aeronautics and Astronautics at M.I.T., where he taught undergraduate design course. KIM received a number of awards, including the Early Researcher Award in Canada, the recognition of the Experienced Humboldt Fellow in Germany, the Research Excellence Award at Queen's, and many paper awards at major scientific conferences. KIM is actively collaborating with global, multi-national companies in the automotive and aerospace industries, including General Motors, Magna, Bombardier Aerospace, Pratt & Whitney, Safran Landing Systems, and General Dynamics.

KIMM - AKCSE International Joint Research



Speaker: Dr. Hyock Ju Kwon

Associate Professor, University of Waterloo

Dr. Kwon is currently an Associate Professor in the Department of Mechanical and Mechatronics Engineering at the University of Waterloo. He received his B.Sc. (1985) in Mechanical and Design Engineering from Seoul National University, M.Sc. (1988) in Production Engineering from KAIST in South Korea. and Ph.D. (2007) in Mechanical Engineering from the University of Alberta, Edmonton, Canada. Prior to joining University of Waterloo, he was a NSERC Postdoctoral Fellow at Caltech in Pasadena, USA. Dr. Kwon also has over 10 years industry experience in Korea before he came to Canada.

Dr. Kwon has expertise in ultrasound nondestructive testing (NDT) and nondestructive imaging. His group is also developing on-board artificial intelligence (AI) technology for NDT and non-invasive biomedical therapeutic and diagnostic methods such as high intensity focused ultrasound and elastography.

E-mail hjkwon@uwaterloo.ca

KIMM - AKCSE International Joint Research

Speaker: Dr. Jaho Seo

Assistant Professor, Ontario Tech University

Dr. Jaho Seo received his B.S degree in agricultural machinery and process engineering from Seoul National University, Seoul, Korea in 1999, M.Ing (MSc) degree in mechanical engineering from the University of Quebec (Ecole de Technologie Superieure), Montreal, Canada in 2006, and Ph.D. in mechanical engineering from the University of Waterloo, Waterloo, Canada in 2011. He was with the Department of Mechanical and Mechatronics Engineering of the University of Waterloo as a postdoctoral fellow in 2011, the Department of System Reliability of the Korea Institute of Machinery & Materials (KIMM) as a senior researcher for 2012-2016, and the Department of Biosystems Machinery Engineering of Chungnam National University, Korea as an assistant professor for 2016-2017. Since 2017, he has been an assistant professor at the Department of Automotive and Mechatronics Engineering, Ontario Tech University where he has been involved in research on the development of autonomous control systems for construction equipment and mobile machines.

E-mail: Jaho.Seo@ontariotechu.ca

KISTI-AKCSE R&D Canada

Time: 13:00 - 14:00, 3 September (Thursday) Korea Time
22:00 - 23:00, 2 September (Wednesday) MDT Time

Place: Online Only

Sponsor: Korea Institute of Science and Technology Information (KISTI)

Organizer: KISTI and AKCSE (Association of Korean-Canadian Scientists and Engineers)

Contact: Dr. Moonhyuk Kwon, University of Calgary (kwonm@ucalgary.ca)

Description: After launching R&D Canada to public in CKC2019, the R&D Canada has been used as a formal platform to connect AKCSE members to Korean scientific society. AKCSE and KISTI are developing new tools and environment to provide high quality and more quantitative R&D information to public. In this meeting, the AKCSE-KISTI associates will discuss the future direction and strategy for improved R&D Canada.

Program:

(Toronto) Time	Place	Topic	Speaker	Affiliation
24:00-01:00	Online Only	Discuss the future direction and strategy for improved R&D Canada	KISTI and AKCSE associates	

List of Participants:

Canada

Name	Affiliation/Position	Role, etc	In-person/Online
Dr. Kim, Jeong Woo	U. Calgary/Professor	Projects PI, AKCSE President	In-person
Dr. Kim, Il Yong	Queen's U. / Professor	Moderator, AKCSE VP-R&D	Online
Dr. Lee, JiHyun		Organizer	In-person

KOFWST Gender Seminar: 'Enabling Next Generation Women Leaders through Career Progression'

Time: 08:00 - 10:00, 5 September (Saturday) Korea Time
17:00 - 19:00, 4 September (Friday) Canada MDT Time

Place: Live
In-person at Seoul, Korea and Kananaskis, AB, Canada and Ottawa, ON, Canada

Sponsor: Korea Foundation of Women's Science & Technology Associations (KOFWST)

Organizer: KOFWST and AKCSE-WiSE (AKCSE-Women in Science and Engineering)

Contact: Dr. Sunhee Cho, University of Alberta (sunnysun@ucalberta.ca)

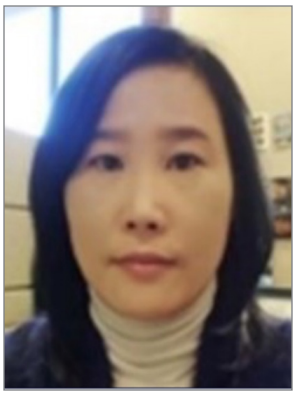
Description: This program will support developing outstanding female leaders and promote gender diversity, both in STEM areas and Korea and Canada at large. Along with the ability to network with women leaders in Korea and Canada as key elements to expanding next-generation women (NGW) leadership, this program will also help maximize NGW potential and make positive changes in their lives and their communities.

Program:

(Korea) Time	Place	Topic	Speaker	Affiliation
08:00-09:00	Online (Pre-recording*)	Sexism in the STEM industry - the dichotomy between traditional women's roles and 'strong, independent women'	Ms. Nia Kang	University of Ottawa
		Women in STEM - The influence of a strong independent supervisor with an ethnically diverse lab	Ms. Dianne Lee	Queen's University
		Female Frontier Scientist Presentation: Challenges and Opportunities in STEM	Dr. Heesun Chung	KOFWST
09:00-10:00	Seoul, Korea and Ottawa, Kananaskis, Canada (LIVE)	Panel/Open Discussion: 'Enabling Next Generation Women Leaders through Career Progression'	Speakers & Participants (Presiders: Dr.Sunhee Cho & Dr. Mi-hye Kim)	

*note: presentations will be pre-recorded and available in the CKC2020 website prior to the session date, http://akcse.ca/ckc2020/. Groups or individuals may watch the pre-recorded presentations one hour prior to the session time or anytime at their convenience.

KOFWST Gender Seminar: 'Enabling Next Generation Women Leaders through Career Progression'



Chair: Dr. Sunhee Cho

Adjunct Professor, University of Alberta

Dr. Cho is an adjunct professor of the Department of Civil and Environmental Engineering at the University of Alberta. She specialized in air contaminants, source emissions, fate and risk assessment and air quality modeling in Canada's oil sands energy sector. Dr. Cho is responsible for establishing and sustaining state-of-the-art research in air related issues. She is chairing a multi-stakeholder cumulative environmemtal working group since 2010. She is also serving as a president of the Air & Waste Management Association at Canadian Prairie & Northern Section. Dr. Cho earned a Ph.D. in atmospheric science from York University and held a postdoctoral fellowship at the Air Quality Research Section at Environment Canada.

Email: sunnysun@uablerta.ca

KOFWST Gender Seminar: 'Enabling Next Generation Women Leaders through Career Progression'

Co-Chair, Speaker: Dr. Heesun Chung

President / The Korean Federation of Women's Science and Technology Associations

Dr. Heesun Chung is a distinguished professor at the department of Forensic Science in SungKyunKwan University. She obtained her PhD in Pharmacy from Sookmyung Women's University, Korea in 1987. Dr. Chung was the Director General of the National Forensic Service, Korea from 2008 to 2012, the 22nd president of the International Association of Forensic Sciences (IAFS) from 2011 to 2014, served as the 13th president of the International Association of Forensic Toxicologists (TIAFT) from 2014 to 2017, and has been an executive Board member since 2002 to present. She is also on the Editorial board for Forensic Toxicologists and Forensic Science International, a fellow of American Academy of Forensic Science, and the president of Korean Association of Forensic Science and the deputy president of the Pharmaceutical Society of Korea.

Challenges and Opportunities in STEM

Heesun Chung

President / The Korean Federation of Women's Science and Technology Associations

Throughout history and over the last several decades, women have commenced to play central roles in addressing major aspects of the world's most urgent problems such as global poverty, health, and social safety. Women have been in a continuous effort to promote health, social and educational programs. However, women are facing countless obstacles to ensure gender equality. One of these problems is gender inequality which systematically hampers the ability of women to progress and develop their full potential. Science is not an exception in the field of gender-equality, there being a great disparity between men and women present in the Korean scientific community in my generation. Women continue to face serious obstacles when pursuing a scientific career while juggling family life and research is particularly difficult. Life as a woman scientist including my working experience as the first Director General of the National Forensic Service, Korea and advice to young scientists will be delivered in the form of interviews which I hope will motivate many young female scientists in Canada to invest in their careers, and ultimately help their career progression.

KOFWST Gender Seminar: 'Enabling Next Generation Women Leaders through Career Progression'

Speaker: Nia Kang

Master's Student/University of Ottawa Faculty of Education

Nia received her Honours Bachelor of Health Sciences from the University of Ottawa. She is now pursuing her master's degree in Health Professions Education at the University of Ottawa Faculty of Education under the supervision of Dr. Angus McMurtry, while working as a freelance translator and a writing advisor at the University of Ottawa Student Academic Success Services. Her research interests include the complexity and non-linearity of telemedicine approaches for culture-sensitive challenges in the Asian immigrant population.

Nia has been affiliated with AKCSE since 2017, serving as the Young Generation National Chair for the past two years, and a member of the CKC YGP organizing committee for three years. She was the recipient of the Best AKCSE Student Award in 2019.

E-mail: nia.kang@gmail.com

Sexism in the STEM Industry – the Dichotomy between Traditional Women's Roles and "Strong, Independent Women"

Nia Kang[1]*

[1]Faculty of Education, University of Ottawa, Ottawa, Ontario K1N 6N5

Conversations regarding gender inequity and subsequent gender inequality have been ongoing over the past decades. Though a few of the most obvious problems appear to have been alleviated thanks to persistent activism, more subdued forms of sexism still remain. This is especially true within STEM, a traditionally male-dominant field. One of the barriers that women have to face in the present day is the dichotomy between a woman's ability to take on more traditional roles of homemaking, versus the same woman demonstrating excellence and ambition in her career. To illustrate how microaggressions and disparities arising from such a dichotomy can influence the younger generation of women in STEM, I plan to share my experiences and observations as a student in the field. Moreover, I will be sharing an article recently published (and since retracted) from the Journal of Vascular Surgery that sparked a social media outcry due to its underlying biases reflective of the double standards still prevalent in medicine. *E-mail: nia.kang@gmail.com

KOFWST Gender Seminar: 'Enabling Next Generation Women Leaders through Career Progression'

Speaker: Dianne Lee

Ph.D Student, Queen's University

Dianne received her B.Sc with honours in chemistry at Dalhousie University in 2017 and recently finished her M.Sc in chemistry at Queen's University. Currently, she is a Ph.D student at Queen's University under Dr. Cathleen Crudden. Her research focuses on investigating the use of carbon-based molecules as ligands for self-assembled monolayers on surface for pathogen detection with electroanalytical and surface characterization techniques. Dianne has been heavily involved with AKCSE YG/YP chapters since 2016, recently as vice president of the young professional national (YPN). Dianne has been serving as the organizer CKC YGP conference for the past 4 years and is a recent KCSF scholarship recipient.

E-mail: dianne.lee@queensu.ca

Women in STEM – The influence of having a strong independent supervisor with an ethnically diverse lab.

Dianne Seohyun Lee[1]

[1]Department of Chemistry, Queen's University, Kingston, Ontario K7L 2S8

Diversity and inclusion present a positive atmosphere in the workspace. From personal experience, a positive working environment promotes better work ethics to achieve efficiency. I have been extremely fortunate to be surrounded by gender and ethnically diverse group throughout my academic years and have never faced a discrepancy. I have seen the good and the bad side of the academic field when it comes to workforce diversity. This presentation will show 1) statistics on the gender diversity of Canadian universities and departments 2) what is like to have a great role model as a supervisor 3) public criticism and act upon the recent controversial article regarding diversity hiring. Email: dianne.lee@queensu.ca

KWSE Korea-Canada WiSE Consilience Technical Workshop

Time: 10:00 - 12:00, 4 September (Friday) Korea Time
19:00 - 21:00, 3 September (Thursday) Canada MDT Time

Place: Online & LIVE
In-person at Sejong, Korea

Sponsor: The Association of Korean Woman Scientists & Engineers (KWSE)

Organizer: KWSE and AKCSE-WiSE (AKCSE-Women in Science and Engineering)

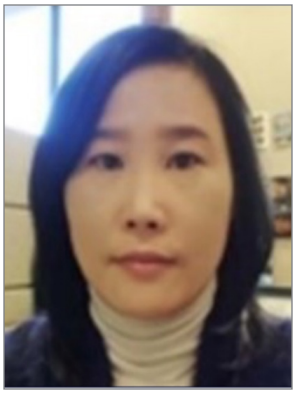
Contact: Dr. Sunhee Cho, University of Alberta (sunnysun@ucalberta.ca)

Description: This session is one of the CKC2020 WiSE program series to promote Korea-Canada WiSE researchers by engaging with work outside of their disciplined areas and extending science, technology and society interdisciplinarity across countries. This program will bring together research beyond the disciplinary matrix to discuss how we interact, as it will always be a continual iterative human endeavo ur.

Program:

(Korea) Time	Place	Topic	Speaker	Affiliation
10:00-11:00	Online	3D hair strands reconstruction from an image based on deep learning	Dr. WonSook Lee	University of Ottawa
		Application of CLEM and 3DEM in the study of inter-organelles' communication	Dr. Ji Young Mun	Korea Brain Research Institute
		Break		
		Quantum technologies R&D	Dr. Na Yong Kim	University of Waterloo
		Atmospheric observations trace mysterious emissions of banned ozone-destroying, greenhouse gases	Dr. Sunyoung Park	Kyungpook University
11:00-11:15	Break			
11:15-12:00	Sejong, Korea (LIVE)	Panel Discussion & Q/A	Speakers (Presider: Dr. Hyo-Suk Lim and Dr. Sunhee Cho)	

KWSE Korea-Canada WiSE Consilience Technical Workshop



Chair: Dr. Sunhee Cho

Adjunct Professor, University of Alberta

Dr. Cho is an adjunct professor of the Department of Civil and Environmental Engineering at the University of Alberta. She specialized in air contaminants, source emissions, fate and risk assessment and air quality modeling in Canada's oil sands energy sector. Dr. Cho is responsible for establishing and sustaining state-of-the-art research in air related issues. She is chairing a multi-stakeholder cumulative environmemtal working group since 2010. She is also serving as a president of the Air & Waste Management Association at Canadian Prairie & Northern Section. Dr. Cho earned a Ph.D. in atmospheric science from York University and held a postdoctoral fellowship at the Air Quality Research Section at Environment Canada.

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KWSE Korea-Canada WiSE Consilience Technical Workshop

Co-Chair: Dr. Hyo-Suk Lim

President / The Association of Korean Woman Scientists and Engineers (KWSE)

Dr. Lim received her BS and MS degrees from Seoul National University, Korea, in 1985 and 1987, respectively. She received a PhD degree in meteorology from Texas A&M University, USA, in 1993 and worked as a Post Doc at NASA/GSFC from February 1994 to February 1996. In March 1996, she joined the Korea Aerospace Research Institute (KARI), where she is currently an Executive Director of Satellite Operation & Application Center starting from February of 2018. Dr. Lim mainly had focused on satellite data application in earth science, calibration/validation of satellite data, and international collaboration of remote sensing before she became Executive Director of Satellite Operation & Application Center. Until now, she has served as reviewer of several journals and organizing committee of international conferences. She is the board member of International Charter on Space and Major Disasters. The Charter is composed of space agencies and space system operators from around the world who work together to provide satellite data to disaster management. She also serves as a member of Presidential Advisory Council on Science and Technology.

KWSE Korea-Canada WiSE Consilience Technical Workshop

Speaker: Dr. WonSook Lee

Professor/University of Ottawa

Prof. Lee received her Ph.D. from University of Geneva in 2000. She is a Professor in the School of Electrical Engineering and Computer Science, Faculty of Engineering at the University of Ottawa. With background in Mathematics and Computer Science, her main research areas cover Computer Graphics, Computer Vision, Virtual/Augmented Reality, Machine Learning and Medical Imaging. She is the author or co-author about 130 peer-reviewed conference/journal publications. Through the years in the University of Ottawa, she has awarded several research grants such as NSERC DISCOVERY, NSERC RTI, CFI, ORF, ORNEC, CIHR/NSERC CHRP, NSERC Engage, SME4SME, NCE GRAND and Global Frontier R&D program by the National Research Foundation of Korea. Most of grants, she is the Principal Investigator.
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3D Hair Strands Reconstruction from an Image based on Deep Learning

Chao Sun, WonSook Lee*

[1]School of Electrical Engineering and Computer Science, University of Ottawa, Canada

Visual details of digital humans in games, VR/AR applications, and films are becoming significantly more demanding. Hair, as a vital component of the human's appearance, plays an important role in producing digital characters. However, the generation of realistic hairstyles usually needs professional digital artists and complex hardware, and the procedure is often time-consuming. Thus, automatic capture of real-world hairstyles can greatly benefit the production pipeline. Recently, great efforts have been devoted to the area of 3D hair modelling. State of the art 3D hair modeling systems require either multi-view images as input or a single-view with complementary synthetic 3D hair models. For the multi-view based 3D hair reconstruction, complex capture system, and controlled environment are usually needed. On the contrary, single-view based methods use simple capture equipment.
Our work based on single-view input picture can be divided into two parts. The first part is the 2D hair analysis. There are several hairstyles that can not be easily reconstructed, such as braid hairstyle and kinky hairstyle, etc. Our methods include the 2D hair strand extraction, the hairstyle pattern recognition and analysis, and the braid structure analysis. The second part is a system that can reconstruct 3D hair strands based on unconstrained single-view images using deep learning methods. The detailed information extraction in 2D is combined with 3D volume information for procedural hair modeling for animation.

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KWSE Korea-Canada WiSE Consilience Technical Workshop

Speaker: Dr. Ji Young Mun

Director/ Brain Research Policy Center, Korea Brain Research Institute

Dr. Ji Young Mun received her BS in 2000 from Chungnam National University, Korea. She received her Master and PhD degree from the School of Life Sciences and Biotechnology at Korea University, in 2000 and 2009, respectively. After graduation she worked as a Post Doc. at the University of Massachusetts Medical School from December 2009 to August 2014. In September 2014, she joined the Dept. of Biomedical Laboratory Science at Eulji University. Then she moved (in 2018) to Korea Brain Research Institute, where she is currently a Principal researcher in neural circuit research group, and Director of Brain Research Policy Center from 2020. Dr. Mun's research is mainly focused on ultrastructural imaging to study neural circuits in the brain.

Application of CLEM and 3DEM in study of inter-organelles' communication

Ji Young Mun*

Brain Research Policy Center, Korea Brain Research Institute, Daegu, Korea

Membrane-bound cellular organelles are distinct compartments for specialized functions. However recent studies revealed surprisingly extensive communication and network between these organelles. The visualization of the network has been tried by super resolution fluorescence microscopy, However, we have used manly electron microscopy including Cryo-EM, Correlative light and electron microscopy, and 3DEM for more higher resolution. Our current research aims at investigating ultrastructural changes of interorganelles' connection in neuron and astrocyte, when they got damage from environmental stress. Neuromyelitis optica (NMO) is an autoimmune disease that attacks the central nervous system. Autoimmune antibody in NMO patient sera (NMO-IgG) targets Aquaporin 4 (AQP4) in astrocytes. Since the discovery of anti-AQP4 autoantibody, studies have been focused on understanding the cellular pathogenic mechanisms of astrocytes. However, pathophysiological outcomes of antibody binding in astrocytes still remain elusive. By treating astrocytes with either serum, purified IgG or IgG depleted serum, we showed that IgG fraction of patient serum is necessary and sufficient to mediate the changes in cellular organelles. Ultrastructural observations of astrocytes that are exposed to either patient serum or NMO-IgG showed accumulation of mutilamellar structure possibly related to ER by comparison with astrocytes exposed to control serum/IgG. Furthermore, by increasing flux of macroautophagy in astrocytes, we were able to alleviate NMO-IgG related changes both in light and electron microscopic levels. Our study establishes a reference for NMO-IgG specific cellular changes in human astrocytes and potential therapeutic targets to hamper the NMO pathology.

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KWSE Korea-Canada WiSE Consilience Technical Workshop

Speaker: Dr. Na Young Kim

Associate Professor/ University of Waterloo

Dr. Na Young Kim is Associate Professor in Electrical and Computer Engineering and Institute for Quantum Computing at the University of Waterloo. Dr. Kim studies quantum electronics, quantum optics, cavity quantum electrodynamics, condensed matter physics, and quantum information science and technology. Her primary contributions in quantum electronics and quantum optics were published in top-tier science and engineering journals, including the direct observation of strongly correlated Tomonaga-Luttinger liquid properties from the first shot noise measurement with ballistic single-walled carbon nanotubes in Physical Review Letters, and the first observation of degenerate high-orbital condensates in artificial lattices in Nature and Nature Physics. She is a recipient of AKPA Outstanding Young Research Award in 2012, and she has delivered more than 70 invited talks at international venues.

Quantum Technologies Research & Development

Na Young Kim

[1]Department of Electrical and Computer Engineering and Institute for Quantum Computing Biotechnology, University of Waterloo

General-purpose quantum computers (QCs) are one of the most advanced smart machines; they will not only expand human knowledge boundaries, but will also tackle intractable problems, such as complex resource distribution, optimization problems, and sophisticated computational modelling that are not possible using the currently available classical computers. The global race to harness enabling technologies for building future powerful quantum processors has begun and is supported by many governments and the largest global technology industries. In this talk, I will give a brief introduction of quantum technologies and their R&D activities in the world.

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KWSE Korea-Canada WiSE Consilience Technical Workshop

Speaker: Professor Sunyoung Park

Professor/ Department of Oceanography, Kyungpook National University

Professor Sunyoung Park came to Kyungpook National University in 2013 after two years on the research faculty in Seoul National University. Before SNU, she worked for nearly six years at Harvard University. Her long-standing research interests are the biogeochemical cycles of the major greenhouse gases (GHGs) – CO2, CH4 and N2O, focusing on sources, sinks, and distributions of these gases, and the chemistry related to their formation and destruction. Her expertise in isotopic compositions of GHGs gained from her PhD at UC Berkeley combines uniquely with the experiences in a laser-based spectroscopy at Harvard University, allowing for a challenging task to make a continuous, in situ laser-based spectroscopy system for the isotope ratio measurements of airborne and dissolved GHGs. Her recent research topics also emphasize man-made halogenated compounds (CFCs, HCFCs, HFCs, and PFCs) – stratospheric ozone-depleting substances and/or GHGs by suggesting a significant increase in the emissions of most halocarbons in East Asia. She is a PI of the Gosan station run under an international network, Advanced Global Atmospheric Gases Experiment (AGAGE [http://agage.eas.gatech.edu/]), which is the most powerful global observing system measuring halocarbons and bromocarbons in the Earth's atmosphere. She also serves as an advisory committee of the Vienna Convention Trust Fund for Research and Systematic Observation under the United Nations Environment Programme, and a committee of SCOR (Scientific Committee on Ocean Research, [http://www.scor-int.org/]), an interdisciplinary body formed by the International Council for Science (ICSU).

Atmospheric observations trace mysterious emissions of banned ozone-destroying, greenhouse gases

Sunyoung Park*

Department of Oceanography, School of Earth System Sciences, Kyungpook National University, Daegu, Korea

Many man-made halogenated compounds such as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfurhexafluoride(SF6) are thousands of times more potent than CO2 in terms of their Global Warming Potentials (GWPs). CFCs and HCFCs are also targeted for emission regulations by the Montreal Protocol on ozone depletion substances (ODSs). While emissions of these industrial gases from the large economies of East Asia must be one of the most significant environmental concerns these days, identifying and quantifying their emission sources remain poorly studied due mainly to rapid evolution in industrial structure, resulting complicated emission patterns, and uncertainties in the reported emissions. Thus, there has been a consensus that atmospheric monitoring of these gases can validate the reported emissions, improve the emission estimations and eventually help establish effective regulation strategies. In this presentation, I introduce continuous, in-situ, high-precision atmospheric observations of a wide range of halogenated compounds obtained at a regional monitoring site in East Asia (Gosan station, Jeju Island, Korea; 33oN, 126oE) since 2008 as part of the Advanced Global Atmospheric Gases Experiment (AGAGE). Gosan is ideally located with seasonally varying, distinctive wind patterns, which basically allow for monitoring both of polluted air masses from continental, regional sources and of clean Pacific and Siberian air masses reflecting global background levels. A recent study based on the Gosan observations for the regional emissions of banned ozone depleting CFC-11 (Rigby, Park et al., Nature, 2019) is also discussed to demonstrate how crucial long-term, precise regional atmospheric measurements are in order to timely detect unexpected emission increases of ODSs and to ensure that the Montreal Protocol and its amendments continue to be implemented effectively.

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Young Generation (YG) / Young Professional (YP) Program

Time: 3 - 5 September (Thursday, Friday, and Saturday) Korea Time
2 - 4 September (Wednesday, Thursday, and Friday) Canada MDT Time

Place: Online Only

Organizer: AKCSE (Association of Korean-Canadian Scientists and Engineers)

Contact: Dr. Patrick Lee, University of Toronto (patricklee@mie.utoronto.ca), Dr. Simon Park, University of Calgary (sipark@ucalgary.ca), Dr. Jong Sung Kim, Dalhousie University (jskim@ dal.ca), Kanghee Ryu (YPN, kanghee@ualberta.ca), Nia Kang (YGN, nkang103@uottawa.ca)

Description: The YGP (Young Generation/Professionals) Program is an annual international conference held during the Canada-Korea Conference (CKC) for undergraduate and graduate students as well as young professionals in the field of Science and Technology. It aims to bring together YGP members from all over Canada, providing a platform on which they are able to network, build important skills and share knowledge and experiences.

Program:

(MDT) Time		Place	Topic
Sep.2 (Wed.)	18:00-19:00	Online	YGP Orientation Session
	19:00-20:00		YGN/YPN President's Meeting
Sep.3 (Thur.)	10:00-10:30		YGP Opening Session - Congratulatory remarks by KOFST
	10:30-12:00		YGP Townhall Meeting & Survey
	16:00-17:00		YGP Entrepreneurship Session - Guest entrepreneur presentation a. Jiho Cho, Co-Founder & VP Advanced Research at Airy3D Inc. b. Uytae Lee, Urban planning
	17:00-18:00		YGP Entrepreneurship Session - Group pitching presentation
Sep.4 (Fri.)	16:00-18:00		YGP Research Competition

YGP Research Competition Abstract List

No.	Name	Affiliation	Title
1	Yoon A Park	University of Toronto and Vector Institute for Artificial Intelligence	Question Answering on COVID-19 using Language Models
2	Chaneel Park	University of Calgary	Vibration Assisted Nano-Mechanical Machining using an AFM Probe
3	Kiha Kim	Frampton Biomedical Sciences Lab	Optimization of Polymer Fiber Fabrication Techniques as a Template for Extracellular Matrix Cell Culture
4	Laura Kim	University of Toronto	Evaluating visual evoked cortical magnetic responses in youth with demyelination
5	Chan Woo Jeong	University of Calgary	Self Healing Inks for 3D Printed Electronics
6	Minseok Kim	Dalhousie University	Investigation of Immunotoxicity of Copper-based Nanoparticles Using an In Vitro Inhalation Model
7	Bomin Kim	University of Calgary	Investigation of Sonochemical Treatment of Ultrasound-assisted Cavitation of Heavy Hydrocarbon
8	Seung A Song	University of Calgary	Effect of carbon nano-particles on cure reaction of phenolic resin
9	Catherine Ko	University of Calgary	Fabrication of Lignin-Based Carbon Fibers
10	Min-Hyung Lee	University of Calgary	Rapid detection of Salt in Soil through Sensor Fusion and CNN
11	Jaemyung Shin	University of Calgary	Comparison of the Performances between Machine Learning and Convolutional Neural Networks to Detect Powdery Mildew Disease on Strawberry Leaves
12	Jaehyun Yang	University of Calgary	Intelligent Liquid Pipeline Leak Detection Based on Artificial Intelligence and Multi-Window Wavelet Analysis
13	Elizabeth Choi	McMaster University	Shining Light on Tardigrade Photoperiod Preferences

Respected young scientists, honorable guests, ladies and gentlemen,
I would like to begin by expressing my heartfelt gratitude to our young scientific talents residing in Canada, who have gathered here today to join the YG/YP Program on the margins of the 2020 Canada-Korea Conference on Science and Technology (CKC-2020).

Last July, the World Health Organization (WHO) took note of the Republic of Korea, Germany, China and Canada as countries that set exemplary models for keeping the COVID-19 under control in respect to a series of testing, isolation, treatment and contact tracing. Notably, Canada stood out in effectively containing the spread of pandemic from the outset by imposing such strong preventive measures as closing the land borders with the United States experiencing the greatest surge of coronavirus cases, notwithstanding the fact that the economies of the two countries are highly integrated. I extend my deepest respect to all noble endeavors by everyone involved, including the Association of Korean-Canadian Scientists and Engineers (AKCSE), for making this year's event possible amidst this challenging time. As all participants are urged to stay vigilant against the infectious disease, I trust that the safety will be given the highest priority throughout the Conference.

A host of young scientist programs initiated by Korean Federation of Science and Technology Societies (KOFST) are now fully up and running, which are designed to support a cadre of young Korean heritage scientists in their capacity-building and interaction among fellow scientific talents. While the COVID-19 outbreak has affected some projects to be either downsized or limited, the KOFST in collaboration with the overseas Korean Scientists and Engineers Associations (KSEAs) is making a headway in keeping exchange and networking programs on track for next-generation scientists and engineers. In particular, the Alumni Networking Forum which took place this year paved the way for young science professionals living abroad to facilitate collaboration and exchange activities with fellow leaders. The KOFST firmly believes that such channels of interaction will usher in a well-established network of overseas scientists and engineers of tomorrow.

The COVID-19 has unquestionably heralded an era-defining transformation in every respect, not to mention the fast-track of scientific advances driven by non-contact technologies. For instance, the live virtual concert performed by the world famous K-pop giant BTS last June drew over an estimated 750 thousand simultaneous viewers around the world, which equates to the combined audience of 15 shows if taken place at an offline stadium with 50 thousand. By the same token, digital innovation is also gaining ground in the public sector. Non-contact, virtual means of evaluation framework is applied to the public domain of ICT R&D projects, which alleviates the discomfort of traveling long-distance for evaluation purposes and keeps researchers safe from the pandemic.

If we are to win a new race for talent in the AI-powered Fourth Industrial Revolution in the wake of COVID-19 outbreak, it is hard to overstate the importance of creative talents in a wide range of areas that will serve as a bedrock for the next wave of digital economy. With this in mind, I urge young leaders convened here today to pioneer a new pathway for a brighter future by embracing diversity and inclusion at all levels and forging a meaningful synergy from them.

Respected young scientists and engineers,
You are endowed with boundless potentials, irreplaceable by any other assets. As such, the KOFST will stand shoulder to shoulder in your journey towards untapped potential.

I truly hope that this year's CKC will mark another new chapter in your endeavors towards having a wide variety of experiences with a diverse group of young minds. To this end, I pledge my unstinting support for your noble objectives.

Hai Joo, Moon
Secretary-General of Korean Federation of
Science and Technology Societies

2020 AKCSE YGP Committee

Kanghee Ryu

Ph.D. Student/the School of Public Health at the University of Alberta

Kanghee Ryu is currently a Ph.D. student at the School of Public Health. He has been researching the phenotypic and genotypic traits of foodborne and waterborne pathogens via bioinformatics tools. He is also interested in antimicrobial resistance, prevention and control of bacterial infection.

Since 2018, he has affirmatively contributed to promoting the young professional (YP) members of AKCSE by serving as the president of YP of AKCSE the Central Alberta Chapter from April 2018 to June 2019, and currently as the National Chair of AKCSE-Young General/Professional National (YGP).

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2020 AKCSE YGP Committee

Nia Kang

Master's Student/University of Ottawa Faculty of Education

Nia received her Honours Bachelor of Health Sciences from the University of Ottawa. She is now pursuing her master's degree in Health Professions Education at the University of Ottawa Faculty of Education under the supervision of Dr. Angus McMurtry, while working as a freelance translator and a writing advisor at the University of Ottawa Student Academic Success Services. Her research interests include the complexity and non-linearity of telemedicine approaches for culture-sensitive challenges in the Asian immigrant population.

Nia has been affiliated with AKCSE since 2017, serving as the Young Generation National Chair for the past two years, and a member of the CKC YGP organizing committee for three years. She was the recipient of the Best AKCSE Student Award in 2019.

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2020 AKCSE YGP Committee

Dianne Lee

Ph.D. Student/Queen's University

Dianne received her B.Sc with honours in chemistry at Dalhousie University in 2017 and recently finished her M.Sc in chemistry at Queen's University. Currently, she is a Ph.D. student at Queen's University under Dr. Cathleen Crudden. Her research focuses on investigating the use of carbon-based molecules as ligands for self-assembled monolayers on surface for pathogen detection with electroanalytical and surface characterization techniques. Dianne has been heavily involved with AKCSE YG/YP chapters since 2016, recently as vice president of the young professional national (YPN). Dianne has been serving as the organizer CKC YGP conference for the past 4 years and is a recent KCSF scholarship recipient. E-mail: dianne.lee@queensu.ca

2020 AKCSE YGP Committee

Brian Song

Master's Student/Dalhousie University

Brian is currently a graduate student starting his MASc program of Industrial Engineering in Dalhousie University, scheduled to graduate in September, 2022. He served as the Young Generation National (YGN) Vice-Chair for the Association of Korean-Canadian Scientists and Engineers (AKCSE) since July, 2018 and has been an active member of AKCSE since 2015, serving as the Dalhousie University YG Chapter President from 2018-2019

Entrepreneurship Session (September 3 Thursday)

Guest Entrepreuner: Jiho Cho

Jiho Cho is a computer vision and machine learning scientist with more than 10 years experience designing and implementing software algorithms, with a focus on depth sensing and processing. He is a Co-Founder & VP Advanced Research at Airy3D Inc. in Montreal, Canada. Airy 3D Inc. is building a depth camera that is underpinned by a transmissive diffraction mask (TDM) made with standard semiconductor technology. At Airy3D, he founded the computer vision and machine learning (CVML) group and has been leading the group to develop novel algorithms to estimate depth information. He holds a PhD in Information and Mechatronics (GIST, Korea) with stints at ETHZ Zurich, the University of Tokyo and Vienna University of Technology. He published more than 20 high-impact scientific papers and 3 international and national patents

Entrepreneurship Session (September 3 Thursday)

Guest Entrepreuner: Uytae Lee

Uytae Lee produces videos that inform and engage the public on the complex issues surrounding our cities. His videos on his YouTube channel ‘About Here’ have been viewed hundreds of thousands of times, helping raise awareness on topics such as housing, skytrains, streetfood, and much more. In addition to his YouTube channel, Uytae produces a column with CBC Vancouver under the same name where he challenges audiences to ‘rethink’ their city."

YGP Research Competition (September 4 Friday)

Question Answering on COVID-19 using Language Models

Yoon A Park
Vector Institute for Artificial Intelligence, University of Toronto, Toronto, ON, Canada

Since the beginning of COVID-19 pandemic in 2020, a vast amount of articles and research papers related to COVID-19 are published. In response to the rapid growth of the number of medical journals, we have developed a Question Answering or QA system using topic modelling and a state-of-the-art language model. We have used freely available COVID-19 dataset from Kaggle's COVID-19 Open Research Dataset(CORD-19). Since the CORD-19 is a large collection of journal articles, we have first filtered out articles irrelevant to a question query using Topic Modelling. Then, the filtered articles are fed into a pre-trained ALBERT, a state-of-the-art transformer-based language model. ALBERT is pretrained on various QA datasets including BioASQ, a biomedical QA dataset. The pretrained language model computes the cosine similarity score between the question query and the abstract from each filtered article. Then, the articles are sorted in descending order based on the similarity score. The output of the language model is a span of text from each article, that may represent the answer of the question query. Our assumption is that an article with a high similarity score has a high relevancy with the question query. The main challenge of our QA system is lack of labelled dataset, which makes difficult to evaluate the performance of the QA system. Developing reliable and explainable QA tools requires cooperation of medical experts and AI researchers.

YGP Research Competition (September 4 Friday)

Vibration Assisted Nano-Mechanical Machining using an AFM Probe

Chaneel I. Park[1]*, Simon S. Park[1]
[1]University of Calgary, Alberta, Canada

Atomic Force Microscope (AFM) probe based nano-mechanical scribing technique has great potential in fabrication of nanometric features due to its ability to measure and control applied forces in sub-micron Newtons. However, the conventional scribing technique is limited in terms of material removal rate due to the relatively low stiffness of the AFM probe cantilever. In this study, we applied the vibration assisted nano-mechanical machining (VANM) technique using atomic force microscopes (AFM) probe to reduce the applied force at each cutting instance by mimicking the milling motion. In order to understand the effects of the feed per cycle, vibration frequency and the feed speed, experiments were performed at varying vibration frequency and the feed speed while keeping the feed per cycle same. The resulting depths of grooves, the 3-axis forces, and the 3-axis coordinates of the tool were also recorded during experiments and comparatively analyzed for each condition. The results showed that the increasing vibration frequency and the decreasing feed speed both increased the depth of groove by decreasing the feed per cycle. However, the changes in the depth of groove was greater when the frequency was varied. Application of the VANM creates not only the planar rotational motion, instead, it results in complicated 3D path due to the vertical force feedback control in AFM system. Modelling the effects of the vibration frequency and the feed speed, it is possible to control the resulting features in more flexible ways.
*Corresponding author; e-mail cpark@ucalgary.ca

YGP Research Competition (September 4 Friday)

Optimization of Polymer Fiber Fabrication Techniques as a Template for Extracellular Matrix Cell Culture

Kiha Kim[1]

[1]Department of Sciences, Dalhousie University

Traditionally, cells were cultured in a 2-dimensional media dish. While the media could be enriched with protein and nutrients to guide the growth of cells, there have not been many alternatives to assemble cells in an organized pattern. Recently, a novel biomaterial collagen assembly technique has been developed in the lab to template collagen-infused polymer fibers to be adherent onto a special PDMS matrix. When polymer fibers are washed off with a special buffer, a special collagen template is left behind to adhere and guide the growth of cells in an organized pattern. This technique of fiber fabrication was optimized to ensure that the polymer fibers could be made in a sterile environment for future use in cell culture. A method was developed to apply the PDMS matrix on top of a well plate and cured in different intervals to see when the matrix was at a right consistency to have adherent properties to attach the polymer fibers but remained a solid. Dextran, hydroxypropyl cellulose, and a special proprietary polymer designed in lab were all adhered successfully onto the matrix and could be dissolved appropriately to leave a trail of a protein template for future use. Overall, improvements of polymer application had been made to prepare the application of cells using this novel polymer fiber template technique. As a future step, these collagen polymer fibers would be infused with different proteins and be observed for the proliferation of cells on this new matrix environment.
*Corresponding author; e-mail cpark@ucalgary.ca

YGP Research Competition (September 4 Friday)

Evaluating visual evoked cortical magnetic responses in youth with demyelination

Laura Kim[1], Elizabeth Pang[1, 2], Bryan McGuire, Cecilia Jobst[1], Giulia Longoni[1,2], Donald Mabbott[1], E. Ann Yeh[1,2]

[1] Program in Neuroscience and Mental Health, Hospital for Sick Children, Toronto, Ontario, Canada,

[2] Division of Neurology, Department of Pediatrics, The Hospital for Sick Children Research Institute, University of Toronto, Toronto, ON, Canada

The full-field evoked responses may not adequately capture focal injury in different quadrants of the retina, hence missing important information about distinctive disease processes associated with different forms of acquired demyelinating syndromes (ADS). The utility of hemifield evoked responses in the evaluation of youth with ADS/MS is unknown. This cross-sectional study included youth with ADS (n=22, MS=11, and Myelin Oligodendrocyte Glycoprotein antibody-related disorders (MOG)=11) and 21 age/sex-matched HC. Evaluations were performed at a minimum of 6 months after a known episode of optic neuritis (ON). When assessed separately by hemifield (nasal and temporal), latency did not distinguish HC from ADS or HC from MS. Decreases in amplitude (0.99±1.00nAm) measures overall corresponded to increased probability of MS. This relationship was stronger when measured in the temporal hemifield (X2=0.98). Effect size was small, but statistically significant (p=0.023).In the chronic state, using visual evoked fields (VEF), the amplitude is more likely than latency to distinguish youth with MS from HC. This effect is accentuated in the temporal hemifield. This reinforces the knowledge that focal axonal injury may occur early on in youth with MS. While significant, the effect size of this relationship was small, suggesting that VEF temporal hemifield amplitude alone may not be adequate to distinguish MS from HC. Future studies should concentrate on the contribution of other morphological features of the VEF waveform to distinguishing MS from other populations.

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YGP Research Competition (September 4 Friday)

Self Healing Inks for 3D Printed Electronics

R. Jeong[1], S. S. Park[1], M. Hassani[1]

1Department of Mechanical and Manufacturing Engineering, University of Calgary, Calgary, Canada

Complex wiring and circuitry are a trait of small electronics incorporated into automobiles and airplanes. Traditional circuit board production has limitations integrating electric circuits onto 3D surfaces. Conventional wiring relies on miles of materials which impact production speed. By producing a printable conductive ink, we aim to reduce weight and complexity by directly drawing circuitry onto electronics bodies/housings. This is achieved with the use of a novel ink composition containing highly conductive copper nanoparticles with low temperature self-healing alloys to repair microcracks propagated at sintered grain boundaries. This novel ink is capable of facilitating fast manufacturing cycles in which: 1) the ink accommodates existing lithography methods i.e. screen printing onto a thermoformable substrate; 2) sintering of the loose nanoparticles by a dual stage flash light within 6ms of irradiation; 3) healing after thermoforming to desired shape under low heat flash light irradiation to repair microcracks and regain conductivity. Simulations and characterization of experimental results show low temperature bridging action of damaged circuitry after total loss of conductivity from thermoforming.

YGP Research Competition (September 4 Friday)

Investigation of Immunotoxicity of Copper-based Nanoparticles Using an In Vitro Inhalation Model

Minseok Kim[1], Jong Sung Kim[1,2]

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With a wide range of applications for nanotechnology, there is an increasing risk of nanoparticles (NPs) exposure for workers and the public. While many studies have evaluated the cytotoxicity of copper (Cu) NPs, this research investigated immunotoxicity of Cu NPs using in vitro Streptococcus pneumoniae (S. pneumoniae) infection model. Cu NPs were generated and delivered to human alveolar epithelial type II cells using an in vitro NP inhalation exposure system. Exposure to Cu NPs led to a dose-dependent decrease in cell viability and an increase in ROS production. Cu NPs exposed cells showed a significant increase in total number of S. pneumoniae adhesion. The expression of surface receptors mediating S. pneumoniae infection and cytokines promoting receptor expression were significantly increased in response to Cu NPs exposure. This study provides mechanistic insight into how Cu NPs enhance susceptibility to bacterial infection in human lung cells.

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YGP Research Competition (September 4 Friday)

Investigation of Sonochemical Treatment of Ultrasound-assisted Cavitation of Heavy Hydrocarbon

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Partial upgrading aims to reduce the diluent usage and minimize downstream processing of heavy oil, leading to an overall cost reduction. Traditional methods of upgrading unconventional hydrocarbon sources involve catalytic and thermal upgrading. These methods require high temperature and pressure which correlate to high energy intensive processes. This study aims to investigate the viability of cavitation-assisted upgrading of heavy hydrocarbon with a proprietary additive at low temperature and ambient pressure. This study uses 20 kHz ultrasound through an ultrasonic horn to induce cavitation. Cavitation is a phenomenon comprising of formation, growth and collapse of bubbles in a liquid medium. Collapse of bubbles lead to extreme conditions, creating regional hotspots capable of breaking chemical bonds and generation of free radicals. This study uses n-hexadecane (C16) as a model molecule as it is abundant in heavy oil. The effect of sonication showed a significant change in the conversion of n-hexadecane. The samples treated with the additives at 230℃ under cavitation, the conversion of n-hexadecane was 5.30%. The selectivity to low molecular weight molecules was 75%. The additives with decalin at 230℃ under cavitation resulted in 9.25% conversion of n-hexadecane and 88% selectivity to low molecular weight molecules. Seven different experiments were performed to reveal that the effect of cavitation in conversion of n-hexadecane was 3%. This study focuses on less energy intensive process for heavy hydrocarbon by utilizing cavitation and the additives and how ultrasound-assisted cracking with the stimulator could be a viable alternative to treat heavy hydrocarbon at the low temperature.

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YGP Research Competition (September 4 Friday)

Effect of carbon nano-particles on cure reaction of phenolic resin

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Phenolic foams have excellent flame resistance, high thermal stability over a broad temperature range and low generation of toxic gases during combustion. However, phenolic foams have inferior mechanical strength and high thermal conductivity compared with other polymer foams, and it is difficult to control the cell morphology by forming different sizes of pores during the foaming and curing process because phenolic resins contain various solvents. In this work, the nanoparticles such as multi-wall carbon nanotubes (MWCNTs) and graphene-reinforced phenolic foams were fabricated to control the cell morphology. To improve the thermal and mechanical properties of the phenolic foam, the proper foaming point of each particle-reinforced phenolic foam was investigated by cure monitoring using a dielectric sensor. From the experimental results, the effects of viscosity and the dispersion of particles on the cell morphology was introduced, and the optimal weight fraction of each particle was found based on the cell morphology and the thermal and mechanical properties of the phenolic foams.

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YGP Research Competition (September 4 Friday)

Fabrication of Lignin-Based Carbon Fibers

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Carbon fibers are lightweight and characterized with desirable properties of high strength, good elasticity, corrosion resistance, as well as electrical and thermal conductivity. Although polyacrylonitrile (PAN) is traditionally used for carbon fiber manufacturing, its high cost, extensive processing time, and derivation from non-renewable petroleum pose as limitations. This research explores electrospun biodegradable softwood lignin fibers for carbon nanofibers through photo-electromagnetic irradiation stabilization and carbonization. A synergetic carbon fiber manufacturing process is investigated which explores the outcome of combining processes of lignin treatment, electrospinning, UV treatment, microwave, intense pulsed light (IPL), and laser irradiation. As opposed to conventional techniques, photo-electromagnetic irradiation yields carbon fibers with less energy and time requirement. IPL treatment produces porous, hollow nanofibers, which can be applicable in biomedical fields. In addition, IPL treated surfaces yields unique properties of superhydrophobicity, high electrical conductivity, and increased surface area.

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YGP Research Competition (September 4 Friday)

Rapid detection of Salt in Soil through Sensor Fusion and CNN

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Detection of soil salinity and sodicity are highly reliant on costly and labour-intensive laboratory analysis due to the complexity of field soil. This study investigated a method for rapid field determination of salt content in soil through the combination of ultraviolet-visible (UV-Vis) spectroscopy and electrochemical impedance spectroscopy (EIS) alongside the integration of artificial intelligence. Most of the previous salt detection research have been confined to detect singular salt. Since there are many kinds of salt ions dissolved in field soil, only singular salt detection is less practical. To improve the detection method, both UV-Vis spectrometer and EIS were utilized in this study. A number of single, dual and triple aqueous mixture samples with NaCl, Na2SO4, NaHCO3, CaCl2, KBr, and KCl was fabricated in a controlled laboratory. These samples were measured with a UV-Vis spectrometer and EIS. In turn, both spectral data was inputted to an artificial neural network to predict salts contents. The artificial network resulted in root mean squared error (RMSE) of 95.5 mmol / kg solution and coefficient of determination (R2) of 0.8380 for a validation dataset in predicting the concentration of each salt ions. The result suggests the feasibility of this method as a faster field salt detection method than conventional laboratory dependent methods. In addition, as more accumulation of the training dataset, the continual improvement of the prediction accuracy is expected.

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YGP Research Competition (September 4 Friday)

Comparison of the Performances between Machine Learning and Convolutional Neural Networks to Detect Powdery Mildew Disease on Strawberry Leaves

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Powdery Mildew (Sphaerotheca macularis f. sp. Fragariae), is one of the most significant fungal diseases for strawberries. Powdery mildew (PM) is observed mostly as a foliage disease, but it can affect flowers and fruits as well, which would result in a significant yield loss in strawberry production. Conventional methods of detecting PM requires field-scouting on a weekly or bi-weekly basis at the time of strawberry cultivation; however, these methods are labor-intensive, time-consuming, and costly. Furthermore, the low frequency of field scouting is not suitable for detecting the early onset of PM. This paper proposes a fast, accurate, and cost-effective techniques to detect the PM with image processing, supervised machine learning (ML), and convolutional neural network (CNN). Image processing was processed before training the algorithms by using supervised ML and the recommended combination was suggested. The results of CNN were also discussed to compare the performance with ML to classify healthy and infected leaves.

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YGP Research Competition (September 4 Friday)

Intelligent Liquid Pipeline Leak Detection Based on Artificial Intelligence and Multi-Window Wavelet Analysis

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Current leak detection systems in the pipeline industry are susceptible to sudden leak and false alarm during operation, which will lead to false decision when leak events occur and cause harmful effects on environment. Leak signals can be rarely extracted out of background and operational noise that has broad range of frequencies with strong amplitude and easily cover sensitive leak signatures, making it insensible to a leak detection system. To cope with this challenge, this study aims to develop an accurate and robust leak detection system with multiple sensors by combining Artificial Intelligence (A.I.) technique along with wavelet transform analysis as an advanced signal processing. We employ sensor data residuals as input datasets that are deviation between measured data against a model-based data. A Real Time Transient Model (RTTM) that calculate pressure and flow numerically in each pipe section will be introduced in preparing input dataset. The wavelet transform method that is specialized in extracting discontinuities of the signals by being analyzed in both frequency and time domain will be developed, representing more information in signals with multiple time-window characteristics. Furthermore, a Convolutional Neural Networks (CNN) as one of the A.I. techniques which are specialized in pattern recognition will be utilized in a way that multiple CNN models are fused together and characterize leak features to classify better leak status. To elucidate the proposed method, a lab-scale pipeline leak experiments with a pipe facility in the pipeline engineering center (PEC), University of Calgary are performed to verify the proposed system.

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YGP Research Competition (September 4 Friday)

Shining Light on Tardigrade Photoperiod Preferences1

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In a previous pilot study, a group exposed to a completely and continuously dark environment was found to reproduce the most and at the fastest rate, followed by a group exposed to the earth's natural light-dark cycle and then a group exposed to a completely and continuously lit environment. This study further investigates tardigrade photoperiod preferences by analyzing the mean lifespan of Grevenius annulatus specimens placed in three different light environments: (1) control group (NL; earth's natural light-dark cycle), (2) continuous light group (CL), and (3) continuous dark group (CD).Seventy-five adult tardigrades of similar age were observed under a light microscope for survivorship and egg production for seventy-one days until only two adults remain alive in CD group. A total of three groups, one control group (NL) and two treatment groups (CL and CD), consists of three replicates with eight individuals in each. Logrank test was used to compare survivorship data and egg production was analyzed using ANOVA followed by Tukey-Kramer test. No difference was detected in the survivorship of tardigrades among treatment groups. The average number of eggs produced per each individual's lifetime was significantly lower in CL group compared to NL and CD groups, which was a result of decrease in number of eggs produced per molt by individuals in CL group, compared to NL group. This study further investigates the effect of photoperiod on tardigrade G. annulatus, as well as their ability to adapt to changes in environment lighting.

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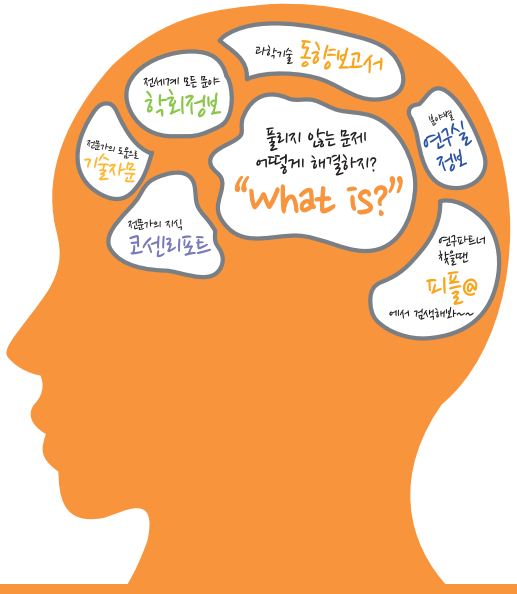

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