KICS GN
The Korean Institute of Communications and Information Sciences – Global Newsletter
KICS Global Newsletter
ISSN 2671-891X
VOL.5 NO.2, 2023

President's letter for 2023

Dear members of the Korean Institute of Communications and Information Sciences (KICS), With 2023 off to a good start under the slogan "the Korean Institute of Communications and Information Sciences as an academic society representing Korea," we are ending this year with noticeable achievements, thanks to enormous interest and participation from all of our members, while establishing ourselves as an academic society representing Korea. Above all, I would like to take this opportunity to thank everyone and share the KICS's some of the most important activities this year.

(1) We held academic events with the highest level and largest scale in our history.

The scale of the conferences we hosted in February for winter (Yongpyong), in June for summer (Jeju), and in November for fall (Gyeongju) was the largest in our history. In particular, after COVID-19 restrictions were lifted, we held all of the events face-to-face this year, which attracted the largest number of participants ever. We are confident that we have made remarkable progress in not only quantity but quality, as most of our session venues were fully packed with participants through a variety of special programs, which take the lead in the field of future communications and interdisciplinary information and communications technology (ICT), including seminars with internationally renowned scholars as guest speakers, seminars with leading researchers in the academic fields that have garnered the most attention recently, and special seminars with companies across industries.

Moreover, ICTC 2023, our most well-known international conference held in October in Jeju, was hosted successfully as an all-face-to-face event, even without online participation, with many foreign researchers, generating the largest revenue ever and greatly improving awareness about the KICS across the world.

(2) This year marked the first year of our digital social contributions.

At the beginning of 2023, I told you that we would explore ways to share our progress with and contribute to society as an academic society representing Korea. Back then, I said that the KICS has grown rapidly, and we now have noblesse oblige to share our progress with society and especially vulnerable groups in terms of information.

Starting with offering free tailored courses related to communications to share knowledge, we opened 3 courses, which recorded more than 2,000 views, and provided expert matching solutions for technical difficulties experienced by small and medium-sized businesses. Most of all, with support from Codeit, an online coding education organization, we were able to provide free coding education to low-income and information-disadvantaged groups. With Yana, an organization that supports young people who are preparing to leave orphanages and get on their feet, we were able to select and support young people preparing for financial independence, who want to receive software education. Furthermore, at a time when generative artificial intelligence (AI) on a massive scale is becoming the country's underlying technology, developing AI through high-quality data would be a good course of action to compete with countries with deep pockets, such as the United States and China. The KICS has very good data, including research papers and conference proceedings. We are working to contribute to the country by providing these data to Samsung Electronics in an effort to support the development of generative AI with a global competitive edge. We have begun to see some good results thanks to the interest and support from many of our members over the past year, and I hope that the KICS will be able to contribute more and more to our society.

(3) We have made our strengths stronger and made up for our weaknesses.

The KICS has 30,000 members and is growing with participation from most industries, academic institutions, and research institutes related to ICT. Nevertheless, companies in the defense industry and mid-sized IT companies, which were not yet actively participating in the KICS, became new sponsors and continued vigorous activities this year, and the KICS's overall sponsored fund also increased. Furthermore, we newly created a research paper competition sponsored by HFR to promote domestic academic activities. We also created a new KICS invitational event to solidify ties with companies across industries, which was successfully completed with the participation of more than 40 companies. We invited key officials from the government to our academic events, enabling communication and collaboration between industry, academia, research, and government. As the KICS is a large academic society, there has been some lack of effort in terms of promoting activities for new people and organizing the Board of Trustees based on active members. This year, we introduced some changes in selecting candidates for the Board of Trustees by evaluating their participation in conferences. Subsequently, the Board of Trustees is made up of members who are actually active in conferences, and a lot of younger members have been added to bring more energy.

In terms of the Board of Executive Directors, 20% of the Executive Directors are newly recruited as new people who have actively participated in the KICS. Furthermore, the Board has also been reorganized to allow new researchers to the roles of the Executives and Directors, adding more vitality to the KICS. Meanwhile, to share the leading research results of our members, we have continued to make quantitative and qualitative progress in not only our domestic journals but also our SCI-level international journals JCN and ICT Express. Most notably, we are working hard to move our international journals up to the top ranks (Q2 for JCN and Q1 for ICT Express) with open access and continuous improvements in the citation index. To make further progress for our domestic journals, we have made efforts to make our way into the Scopus list this year and have achieved a certain level of results. We have filed an application and are currently waiting for the outcome. Our domestic chapters also had many activities this year. In addition to expanding our domestic chapters' own activities and submitting more articles to conferences, all of our domestic chapters jointly held a workshop in Gwangju with the Executive Officers from the headquarters, and ICMIC 2023, an international conference organized by one of our chapters which started last year, was successfully hosted in Jeju with more paper submissions and greater participation. For our international chapters, our Japanese chapter, which we have been seeking for a long time, was finally established and successfully hosted 2 workshops with substantive information exchanges between the two countries. As described above, this year marked a year in which the KICS grew its reach, further strengthened its capabilities, and began to make social contributions befittingly as an academic society representing Korea. I would like to take this opportunity to thank you once again as all of these activities were made possible by the active participation and support of our members. Based on these achievements, I am confident that the KICS will continue to develop and lead the communications and ICT field in Korea and around the world in the next year, which marks the 50th anniversary of the KICS's inception. Thank you.

Een-Kee Hong
President of the KICS
and Professor of Electronics and Radio Engineering at Kyung Hee University, South Korea

BRIEF BIOGRAPHY:

(Currently) Chairman of the Radio Policy Advisory Committee, Ministry of Science and ICT
(Former) Principal Researcher at SK Telecom and NTT DoCoMo, and Visiting Professor at Oregon State University
(Former) Chairman of the 5G Frequency Advisory Committee, Ministry of Science and ICT, and Member of the Frequency Review Committee, Office for Government Policy Coordination
(Former) Frequency Chairman of the 5G Forum, and Frequency Chairman of the Satellite Communications Forum
(Former) Chairman of the 5G-Based Smart Factory Forum
(Former) Mobile Communications Research Institute, Korean Institute of Communications and Information Sciences, and Chairman of Seoul Chapter, IEEE VTS

IN THIS ISSUE

REPORT ON ACADEMIC ACTIVITIES

KICS Fall Conference 2023

by Sang-Hyo Kim,
Sungkyunkwan University, South Korea

Following the previous year's success, the KICS Fall Conference returned to the historic city of Gyeongju. The event took place at the Hotel Lahan Select from November 22 to 24, 2023. This year's conference was remarkable with record-breaking 568 papers presented and 923 attendees, making it the largest KICS Fall Conference to date. It marked the continuous growth of KICS over the past three years, attracting many participants from academia, industry, research institutes, and public agencies, and thus becoming a vibrant platform for technological and personal exchange.

The conference featured meticulously organized invited talks, tutorials, and special sessions where the latest trends and advanced technologies in ICT convergence and communication were shared, generating significant interest among the attendees.

The conference opened with a reception featuring a welcome speech by President Een-kee Hong. Following this, Dr. Sang-hoon Song, the Information and Communication Policy Director at the Ministry of Science and ICT, delivered a special lecture titled “Digital Bill of Rights” focusing on the new order and norms required in the AI/digital era.

The keynote speaker, Prof. Giuseppe Caire from TU Berlin, introduced ISAC technology, an emerging topic in the field of communications, through his talk "Integrated Sensing and Communication Toolbox: Information Theory, Communication Theory, and Machine Learning." His insightful and in-depth lectures were extremely popular among the attendees. Additionally, there were two industrial keynote speeches. Dr. Juho Lee, a Fellow at Samsung Research, presented an interesting talk on “Evolution of Mobile Communication Technology towards 6G,” and Min-Soo Na, Manager at SK Telecom, discussed “Technical trends and vision for future 6G network evolution.”

The program included various other enriching activities, such as, instructive tutorials on cutting-edge research. Prof. Bang Chul Jung of Chungnam National University introduced holographic MIMO technology from the perspective of electromagnetic information theory. Additionally, there were engaging lectures by Prof. Jaeho Lee on the compression of large language models, and Prof. Jinho Choi on semantic communications.

The AI Top Conference session showcased four research papers presented at top AI conferences, such as NeurIPS, ICML, and AISTATS, focusing on communication-related topics. Young-Chai Ko, the head of the ICT convergence department of NRF, Korea, introduced new programs and grants for NRF for 2024. The undergraduate paper contest was also exciting, with 119 submissions competing intensely. Creative research and graduation projects were introduced, with one paper winning the grand prize, five receiving excellence prizes, and 14 honorable mentions.

The KICS Fall Conference was a resounding success filled with vitality and substance. This was made possible by the full support of the executive board and the dedicated contributions of the organizing committee members. The organizers extend their gratitude to KICS members and attendees who enriched the event.

Finally, I would like to announce an important upcoming event: the KICS Winter Conference 2024, which will be held from January 31 to February 2, 2024, at the Yongpyong Resort in Pyeongchang. Everyone is encouraged to participate and submit papers for this upcoming conference. For more detailed information about these conferences, including schedules, submission guidelines, and registration, please visit the official website at https://conf.kics.or.kr. Stay tuned for further updates, and mark your calendars.

ICUFN 2023 (The 14th International Conference on Ubiquitous and Future Networks)

by Kyung-Joon Park, DGIST, South Korea

The 14th International Conference on Ubiquitous and Future Networks (ICUFN 2023) was held in an online/offline hybrid manner at ECE-Ecole d' Ingénieurs in Paris, France, from July 4th to July 7th, 2023. ICUFN 2023 was organized by the Korean Institute of Communications and Information Sciences (KICS) and technically co-sponsored by the IEEE Communications Society (ComSoC) and IEICE Communications Society. With a 14-year history, the ICUFN has served as a premier international forum, providing an excellent opportunity to exchange state-of-the-art research advances in ubiquitous and future communications and networking technologies, and expanding the research community.

This year, we received submissions from 32 countries worldwide. The papers were subjected to a rigorous review process, and each paper received three or more independent reviews. Based on these reviews, we selected 68 papers for oral presentations and 97 for poster presentations at the main conference. Additionally, 41 workshop papers were selected for presentations. The accepted technical papers were organized into 17 oral sessions, 4 poster sessions, and 6 workshops. The authors of the 68 oral presentations represented 19 countries from around the world.

The ICUFN 2023 program was designed to encompass a wide range of wireless and wired communication network technologies. It covered topics such as cognitive radios, wireless sensor networks, Internet of Things (IoT), broadband wireless communications, future network issues, mobile multimedia networking, and emerging technologies such as AI and ML. In addition, we prepared two keynote speeches by world-renowned researchers. The first keynote speech, titled "Deep Gaussian Process-Based Radio Map Construction and Localization," was delivered by Prof. Shiwen Mao at Auburn University, USA. The second keynote speech, titled "Large Language Models for Telecom: The Next Big Thing?" was presented by Prof. Mérouane Debbah at the Khalifa University of Science and Technology in Abu Dhabi, UAE. Furthermore, we organized two tutorials by world-class experts. The first tutorial, "Machine Learning in Digital Twin Edge Networks," was conducted by Prof. Yan Zhang from the University of Oslo, Norway. The second tutorial, "Towards Extreme Band Communications to Super-Connect the Connected and Connect the Unconnected," was presented by Prof. Mohamed-Slim Alouini from King Abdullah University of Science and Technology (KAUST), Saudi Arabia.

Overall, ICUFN 2023 was a great success, providing unique opportunities to participate in technical and workshop sessions, engage with authors, and promote collaboration between researchers worldwide.

2023 4th Korea Artificial Intelligence Conference

by Insoo Sohn, Dongguk University, South Korea

Figure 1. Tutorial Presentation

The 2023 4th Korea Artificial Intelligence Conference (KAIC) was held on 20th of October 2023 in Shilla Stay Jeju Hotel on Jeju Island. The Conference is an annual event hosted by the Korean Institute of Communications and Information Sciences (KICS) and organized by the KICS Artificial Intelligence Society. The goal of this annual event is to provide a leading international forum for researchers in machine learning and related fields to share their new ideas, progress, and achievements with this year's theme of "The Era of Hyper-scale AI and Innovative Applications."

The KAIC 2023 program consisted of four Tutorials, four Top Conferences, two Keynotes, five Special Sessions, and 42 Paper Sessions. A total of 211 papers were presented and 360 people attended, demonstrating the tremendous increase in the conference attendance from the previous year's total of 170 papers and 250 attendees. KAIC has become the flagship conference in AI in Korea through years of hard work from the steering, organizing, and technical program committees. Leading chairs this year were as follows: Steering Committee Chair: Prof. Yeong Min Jang (Kookmin Univ., Korea), Organizing Committee Chair: Prof. Dong Seog Han (Kyungpook National Univ., Korea), Technical Program Committee Chairs: Prof. Sang-Chul Kim (Kookmin Univ., Korea),

Prof. Insoo Sohn (Dongguk Univ., Korea), and Prof. Youn-Hee Han, Korea Tech. Education Univ., Korea).

Keynote speaker information: Keynote 1: Director. Jungwoo Ha (Naver AI Lab, Korea) on "Naver's Strategy for Hyper-scale AI: HyperCLOVA X" and Keynote 2: President Junho Baik (FuriosaAI, Korea) on "ChatGPT optimized High Performance AI Chip Development: FuriosaAI." In Keynote session 1, the latest technology related to the Hyper-scale generative AI foundation model related to language, image, audio, and others were presented with a focus on ChatGPT. Furthermore, the keynote speaker discussed how ChatGPT is creating a new trend in information search and creation applications with comparison to Google Search. Other important topic covered in the Top Conference Sessions was "MPViT: Multi-Path Vision Transformer for Dense Prediction," which was presented in CVPR 2022, and the first tutorial session topic was related to the "Learning to Optimize Wireless Networks" using AI technology. Owing to the great success of KAIC in 2023 in terms of attendance, quality and size of paper presentation, and growing interest from the AI community, the KAIC 2024 Organizing Committee decided to move the conference venue to a place where greater expansion of the conference is possible. Thus, the KAIC 2024 Organizing Committee is proud to announce that KAIC 2024 will be held in Sono Calm Jeju, which is located on the southern coast of Jeju Island with a beautiful garden and a path along the beach.

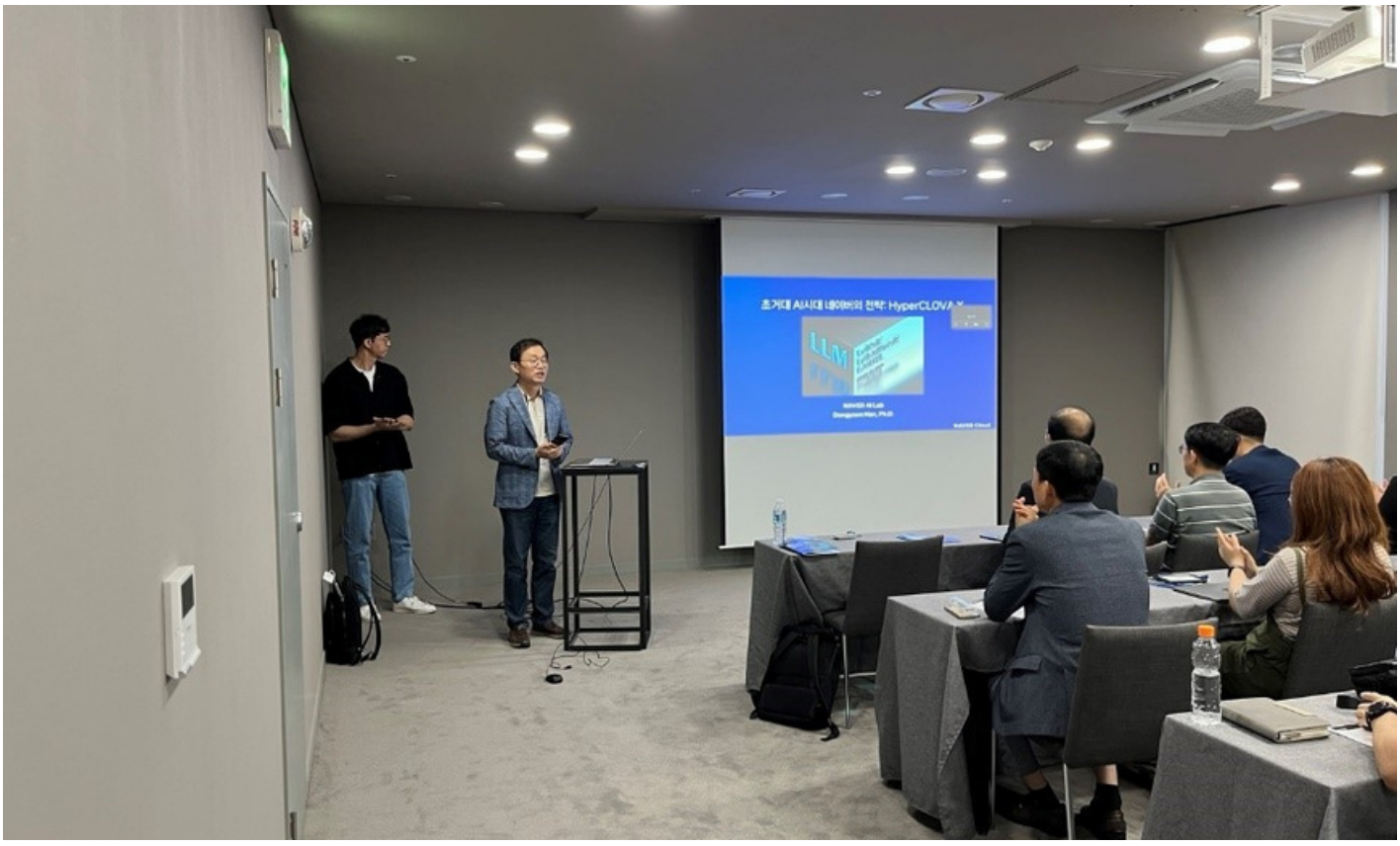
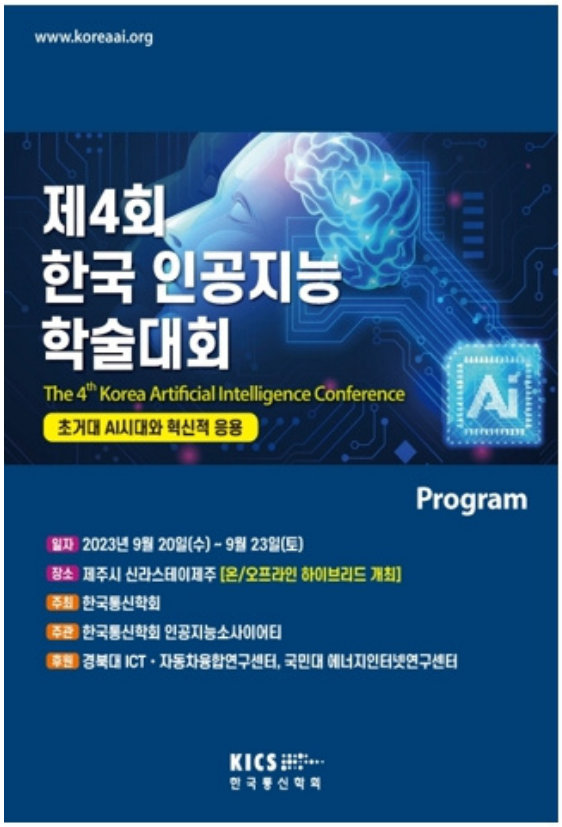


Figure 2. Keynote Speech



2023년 9월 20일 (수)

시간	주제 / 강사 / 내용				
	ROOM 1	ROOM 2	ROOM 3	ONLINE 1	ONLINE 2
11:50-12:20	등록				
12:20-13:20 (60')	특별세션1 경북대 ITRC 멀티모달 AI 좌장: 정호영 (경북대)	논문발표 A-1 딥러닝 I 좌장: 이규민 (건양대)	논문발표 A-2 지능형모빌리티 I 좌장: 윤주상 (동의대)	논문발표 B-1 자연어처리 I 좌장: 채승호 (한국공학대)	논문발표 B-2 의료인공지능 I 좌장: 장혜령 (동국대)
13:20-13:30 (10')	Session Break				
13:30-14:30 (60')	특별세션 2 ETRI 인공지능 기반의 차안/안전 유지 관리 기술 좌장: 김종욱 (ETRI)	논문발표 A-3 인공지능응용 I 좌장: 이성우 (목원대)	논문발표 A-4 영상분석제어 I 좌장: 김광주 (ETRI)	논문발표 B-3 스마트산업 I 좌장: 채승호 (한국공학대)	논문발표 B-4 스마트환경 I (학부생 세션) 좌장: 이규민 (건양대)
14:30-14:40 (10')	Session Break				
14:40-15:40 (60')	특별세션 3 ETRI 인공지능 기반의 지능형 시스템 좌장: 이훈 (DGIST)	논문발표 A-5 스마트산업 II 좌장: 홍용근 (대전대)	논문발표 A-6 인공지능응용 II (학부생세션) 좌장: 임현교 (한국기술교대)	논문발표 B-5 딥러닝 II 좌장: 문상희 (나사렛대)	논문발표 B-6 국방 보안응용 I 좌장: 박현희 (명지대)
15:40-15:50 (10')	Session Break				
15:50-16:50 (60')	튜토리얼 I Learning to Optimize Wireless Networks (UNIST 이훈 교수) 좌장: 손인수 (동국대)				
16:50-17:20 (30')	Top Conference 초청세션 III MPViT: Multi-Path Vision Transformer for Dense Prediction (CVPR 2022) (ETRI 이영한 연구원) 좌장: 손인수 (동국대)				
17:20-17:30 (10')	Session Break				
17:30-18:30 (60')	논문발표 A-7 의료인공지능 II 좌장: 신석주 (조선대)	논문발표 A-8 스마트산업 III (학부생세션) 좌장: 이규민 (건양대)	논문발표 A-9 지능형모빌리티 II 좌장: 백광선 (ETRI)	논문발표 B-7 인공지능응용 III 좌장: 이재훈 (서울과기대)	논문발표 B-8 국방 보안응용 II (학부생세션) 좌장: 김호수 (경상대)

Figure 3. Conference Program

ICTC 2023 (14th International Conference on ICT Convergence)

by Kwang Soon Kim, Yonsei University, South Korea

The 14th International Conference on Information and Communication Technology Convergence (ICTC 2023) was held successfully in Jeju Island, Korea, on October 11–13, 2023.

ICTC is one of the major international conferences in information and communication technology (ICT) convergence. It is organized by the Korean Institute of Communications and Information Sciences (KICS) with technical co-sponsorship from IEEE Communication Society and IEICE Communications Society. This year, ICTC was patronized by leading ICT companies, organizations, and government agencies, including the Ministry of Science and ICT, Electronics and Telecommunications Research Institute (ETRI), Korea Tourism Organization, Samsung Electronics, SK Telecom, MOASOFT, KT, LG Uplus, LG Electronics, and GL associates.

ICTC 2023 featured a vibrant program with the theme of "Exploring the Frontiers of ICT Innovation." The attendees had an excellent opportunity to interact with illustrious industry leaders, researchers, government officials, and academia professionals in the fields of machine learning, wireless access, networks, IoT, localization, mobility, blockchain, ICT convergence, 6G, satellite communications, big data, cloud and edge computing, military informatics, communication and sensing, underwater communication, quantum internet, quantum deep learning, and emerging technologies.

Keynote speeches were delivered by highly prominent experts from Ericsson, Kakao, Nokia Bell Labs, ETRI, SK Telecom, and Oregon State University. Talks were presented by industrial experts from LS Electric, Huawei, China Mobile, AIFactory, Asleep, and KDDI. Moreover, distinguished experts from Rochester Institute of Technology, Incheon National University, Seoul National University, Remcom, the University of Southern California, the University of California, Riverside, Korea Advanced Institute of Science & Technology (KAIST), Simon Fraser University, Sungkyunkwan University, Nokia Bell Labs, Quandary Peak Research, Kyonggi University, and Korea Institute for Advanced Study delivered talks in various sessions.

The technical program includes oral presentations on 115 regular and 164 workshop papers, organized into 19 technical and 29 workshop sessions, respectively, to be conducted in six parallel tracks. Additionally, 203 regular and 42 workshop poster papers are organized into 7 technical and 1 workshop poster sessions, respectively. The program covers various topics on recent advances in ICT convergence, including machine learning, wireless access, networks, IoT, localization, mobility, blockchain, ICT convergence, 6G MIMO/MAC/Core network, 3D networks, satellite communications, big data, cloud and edge computing, military informatics, communication and sensing, underwater communication, quantum Internet, quantum deep learning, and emerging technologies.

Over the past three years, the COVID-19 pandemic has gradually subsided, allowing ICTC 2023 to return to in-person attendance and presentations. Almost all the participants attended ICTC 2023 in person, contributing to a vibrant and enjoyable event.

We hope to organize ICTC on a larger scale in 2024, covering a broader range of advanced topics, and evolve into an important platform for discussing ICT convergence.

REPORT ON INDUSTRY-ACADEMY-INSTITUTE COOPERATION

6G Research Trend with Related Topics in Korea and Japan

by Sungtek Kahng, Executive Director
and a professor at Incheon National University, South Korea

KICS has been growing by knocking on the doors of information and communication research communities from different regions and countries to collaborate and exchange technical knowledge.

As a result, international conferences and forums have grown in size to welcome an increasing number of foreign researchers and let them experience the status of Korea's mobile communication technologies and Korean culture. In addition to the United States, Vietnam, Indonesia, Malaysia, and China, KICS has recently established its Japan chapter. People inside and outside KICS should take note of this because Korea, which had to seek advice from or benchmark against the world leader in software and hardware fields decades ago, is now leading the way in semi-conductor chip manufacturing and mobile networking and has established a chapter in Tokyo across the border. A workshop was prepared and held in Sapporo, Hokkaido, to celebrate the foundation of the Japan chapter headed by Prof. Emeritus Dr. Moo Wan Kim of the Tokyo University of Information Sciences.

Figure 1. The speakers and the session chairs of the congratulatory workshop in August 2023

The workshop dealt with 6G Research Trends with Related Topics in Korea and Japan and included 10 speeches and a panel discussion. The speakers included Prof. Een-Kee Hong (KICS President 2023, Kyung Hee University), Dr. Moo Wan Kim (Chair of KICS Japan Chapter), Prof. Jae-Hyun Kim (KICS Vice President 2023, Ajou University), Prof. Jong Geol Park (Tokyo University of Information Sciences), Dr. Moon-Sik Lee (ETRI), Prof. Sungtek Kahng (KICS Executive Director, Incheon National University and Radio & Satellite ITRC Director), Prof. Min Seok Kim (Niigata University), Prof. Yeong Hwan Kim (Tokyo University of Technology), Prof. Shintaro Uno (Aichi University of Technology), and Prof. Hyun Kwang Nam (Tokyo University of Science). These speakers shared common directions for policymaking and visions for 6G linkable with satellites and presented various approaches to define, develop, and implement core technologies. Prof. Younghan Kim (President Emeritus of KICS and Soongsil University) and Prof. Seong Ho Jeong (Exec. Vice President of KICS and Hankuk University of Foreign Studies) presided over the sessions they were in charge of, which delighted the speakers and audience. The technical explanations for the queries and comments were as hot as the weather in Sapporo, which was unusual. During my stay there, the local news shows focused on the surprisingly high temperatures experienced for three nights in a row. However, inside the building for the workshop, the temperature was cool. Despite the sweltering days, the capital of Hokkaido was packed with people. Let me not forget to mention the venue, as KICS has kicked-off the preparation for a conference as the extended version of the workshop held there.

Figure 2. The photographs of the gate and hall areas of the building for the workshop

We rented a space in the Hokkaido University conference building, as seen in Figure 2. Right next to it is a canteen that serves delicious curry dishes. Yes, you can drink beer there, which is understandable considering it is the home of Sapporo beer, or you can go outside the campus to find other restaurants. Hopefully, you can visit Sapporo to enjoy the local cuisine before the nuclear-polluted water discharged from Fukushima TEPCO affects marine natural resources, which should be prevented or rationally regulated by neighboring countries.

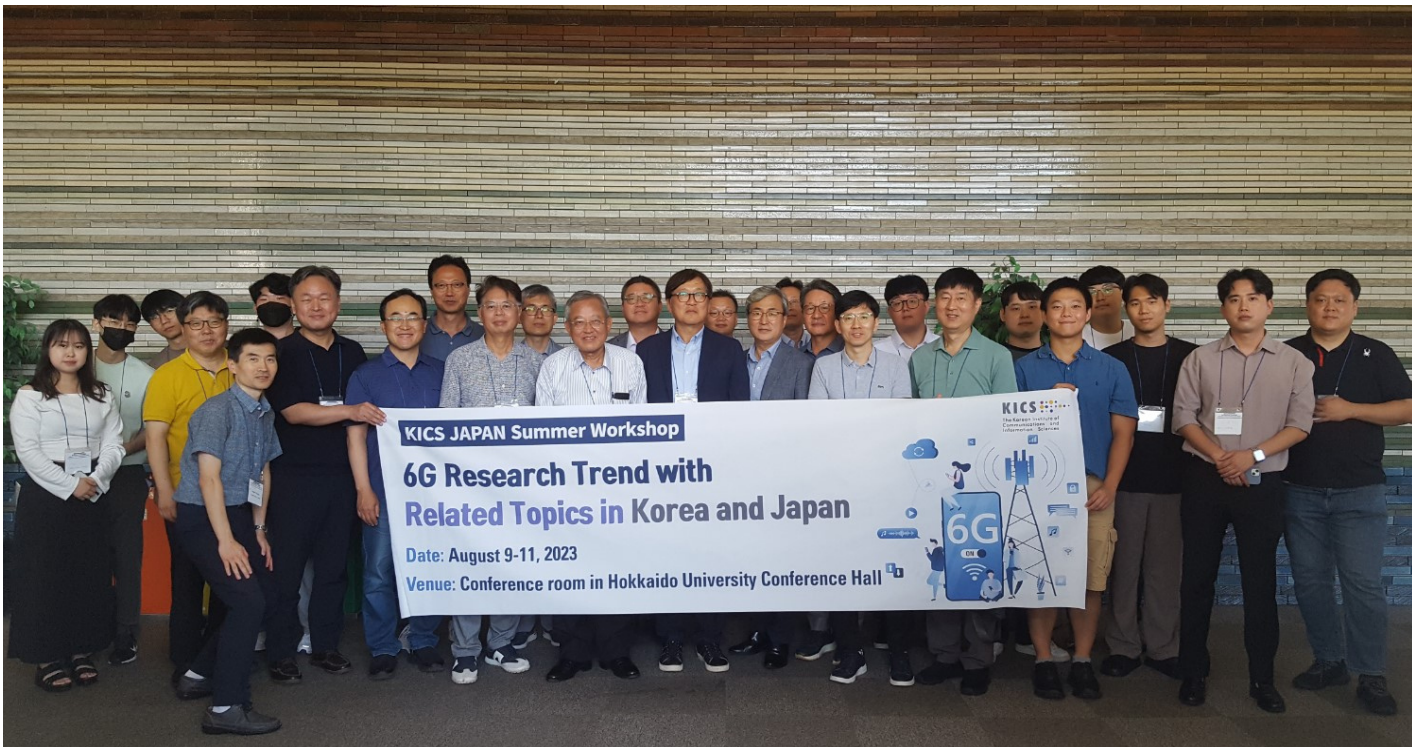


Figure 3. The picture of the participants in the workshop

Attendees of the convention gathered at the Kodak moment, as seen in Figure 3. Though this was the first workshop between KICS and the KICS Japan chapter, academia as well as corporate workers joined us. Time flew by as we had a good time, which leaves something to be desired in terms of the period and scale. Therefore, the steering committee and advisory board decided to make it an international conference with distinct features compared to other conventions. I sincerely hope you will pay attention to the call for papers announcement and seize the opportunity to share your research work with others and establish a friendship with them.

KICS and Codeit Have Formalized Their Collaboration Through the Signing of a MOU for the Information-Vulnerable Support Project

by Wan Choi, Seoul National University, South Korea

On Monday, September 25th, 2023, the Korean Institute of Communications and Information Sciences (KICS), Korea's largest leading information and communication technology (ICT) institute comprising leading ICT experts, entered a memorandum of understanding (MoU) with Codeit Co., Ltd. (Co-CEOs: Kang Young-hoon and Lee Yun-soo). This collaboration marked the commencement of an information-vulnerable support project as part of a digital environmental, social, and governance (ESG) initiative. The primary objective of this project is to bridge the knowledge–information gap and contribute to society, particularly to information-vulnerable classes, by providing complementary online coding education.

Codeit (https://www.codeit.kr), a key participant in this initiative, is the leading online coding education company in Korea with the largest number of service subscribers. It offers a diverse range of education, from basic training to professional employment training, through online coding and boot camps (Codeit Sprint), boasting a cumulative student count of 400,000. Collaborating closely, KICS and Codeit aim to deliver free coding education to low-income and information-disadvantaged groups, thereby supporting informatization education and fostering the establishment of an information infrastructure for the information-vulnerable. In this regard, KICS grants free online education rights to the information-disadvantaged through donations from member companies, whereas Codeit provides the corresponding online education services free of charge.

The first beneficiaries of this complementary online education project included the corporate entity YANA (https://yana.or.kr), which has partnered with KICS. The project targets young individuals transitioning from orphanages and offers them various free online coding education courses provided by Codeit to prepare them for independent living. Further details on this project can be found on the KICS website (https://www.kics.or.kr).

KICS is actively involved in social contribution projects, fulfilling its role and responsibilities as experts and making significant contributions to the development of a sustainable society. Notably, the institute distinguishes itself as the first domestic academic organization to undertake such initiatives. In addition to the information-vulnerable support project, which focuses on providing free coding education to low-income and information-disadvantaged groups, the Digital ESG projects undertaken by KICS since 2023 encompass the following: Matching Projects Between Small and Medium-Sized Enterprises (SMEs) Technological Challenges and Experts: This project aims to enhance domestic SMEs' research and development competitiveness by leveraging the expertise of KICS's top professionals in the information and communication field.

Unlike large enterprises that have access to advanced technology and resources, SMEs often face challenges in addressing problems that arise during the research, development, and production processes. This is often due to difficulties in acquiring specialized professionals. The expert-matching project bridges this gap by identifying and connecting experts capable of resolving specific technological challenges faced by SMEs in product development. When an SME seeks assistance with a technology-related problem through the KICS website, we locate an expert capable of solving the problem, establish a connection between them and the company, and resolve the problem.

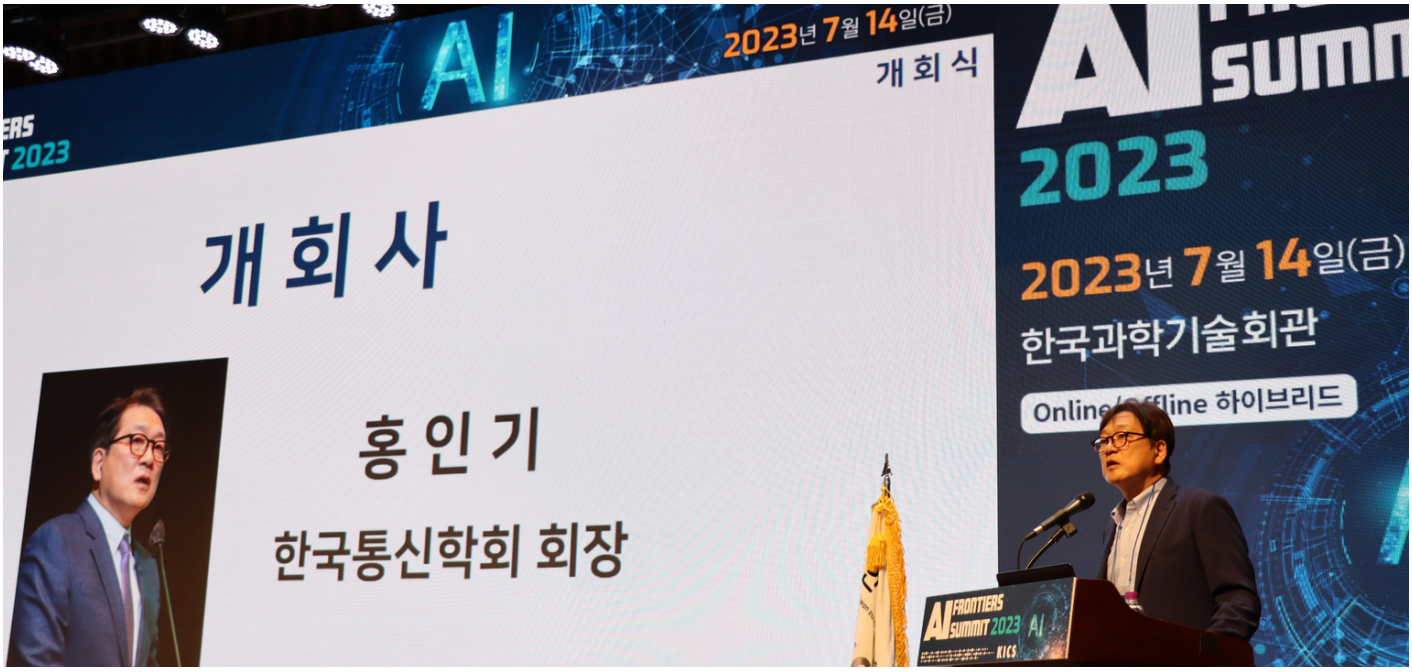
Knowledge Sharing Business: The KICS Knowledge Sharing Project aims to disseminate knowledge and information through communication with the public. By making ICT easily accessible and usable, we can expand the knowledge base in this domain and actively raise awareness regarding the importance of ICT. This was achieved by offering free customized courses on the KICS website and YouTube channels. These courses cater to individuals ranging from beginners to experts, enabling them to acquire and apply knowledge in the ICT field.

KICS 한국통신학회

yana

AI Frontiers Summit 2023

by Joongheon Kim, Korea University, South Korea



The 3rd AI Frontiers Summit was held on July 14th 2023, at the Korean Federation of Science and Technology Society (KOFST) Building, Seoul, Korea. The Summit hosted many participants, including over 300 researchers. It encompassed many technical presentations, through keynote speeches, special sessions, top conference sessions, and customized AI-focused individual technical sessions, by top-tier AI researchers worldwide. Based on the consecutive successes over the last three years, the AI Frontiers Summit is currently recognized as a pre-eminent platform for exchanging innovative ideas and advancements in AI technologies, thereby fostering the growth of the AI research community and society. Given its inclusive nature, this summit welcomes stakeholders from various fields, including industry professionals, academicians, research institutes, and the Korean government.

The third summit commenced with a welcome speech by KICS President Een-Kee Hong, with keynote speeches by Prof. Antonio Ortega (University of Southern California, USA), on graph-based deep learning, and Prof. Bhaskar Krishnamachari (University of Southern California, USA), on IoT-based deep learning applications. Both keynote speakers are well-known professionals in the fields of theory and application of deep learning methodologies.

After the interesting keynote speeches, four special session presentations were conducted by Prof. Gunhee Kim (Seoul National University, Korea), Prof. Chung Hyuk Park (George Washington University, USA), Prof. Jaegul Choo (Korea Advanced Institute of Science and Technology, Korea), and Prof. Kangwook Lee (University of Wisconsin, USA). These sessions included impressive and valuable presentations, in terms of diversity of topics and quality of content.

The special session presentations covered large language model (LLM), AI-based healthcare systems and applications, advanced image and computer vision techniques, and pretrained language models. Furthermore, the high-quality presentations stimulated deep-dive discussions by the participants.

Another highlight was the top conference session presentation. Following the successful special sessions, three top conference papers were presented by Prof. Sung Whan Yoon (UNIST, Korea), Prof. Jungseul Ok (POSTECH, Korea), and Prof. Albert No (Hongik University, Korea). These papers had been accepted by AAAI 2023, NeurIPS 2022, and AISTATS 2022, respectively. The presentations covered important research topics, such as domain-invariant representations, deep reinforcement learning, and diffusion models. Based on the novelty of the top conference papers, many valuable discussions could be held during the summit.

Furthermore, the AI Frontiers Summit 2023 provided a rich and diverse program with the following three customized category sessions, i.e., AI Core, AI + X, and AI + Industry, where each session included three top-tier researchers. For the AI Core session, AI core technologies, in terms of image processing, natural language processing, and healthcare were presented by Prof. Seungwon Jung (Korea University, Korea), Prof. Bugeun Kim (Chung-Ang University, Korea), and Prof. JeongGil Ko (Yonsei University, Korea). For the AI + X session, AI-based networking research results were presented by Prof. Jeonghun Park (Yonsei University, Korea), Prof. Hyunggon Park (Ewha Womans University, Korea), and Prof. Sungbin Lim (Korea University, Korea). Lastly, for the AI + Industry session, various industry experts in AI technologies were invited, such as Dr. Jin-Xia Huang (Electronics and Telecommunications Research Institute (ETRI), Korea), Dr. Sungha Choi (Qualcomm, Korea), and Dr. Daewoo Kim (Asleep, Korea), where the various industry technologies were introduced, i.e., dialog-based AI-based foreign language tutoring, test-time domain adaptation, and sound-based sleep staging.

Finally, I would like to express deep appreciation to the organizers, including KICS President Een-Kee Hong (Chair) and KICS Vice President Sungrae Cho (Organizing Chair), for their valuable contribution to the success of the 3rd AI Frontiers Summit.

KOREA'S LEADING INNOVATIONS AND TECHNOLOGIES

Lecture Series on ICT Convergence: Bio-healthcare, Robotics, Energy and Batteries, Satellites, and Smart Cities

by Kyung-Joon Park, DGIST, South Korea

Recently, there has been a burgeoning landscape of interdisciplinary research marked by the dynamic integration of various ICT advancements. The convergence occurring within the domains of bio-healthcare, robotics, energy and batteries, satellites, and smart cities is particularly noteworthy, where sophisticated amalgamation of diverse ICT technologies and established methodologies is actively taking place. Therefore, the Korean Institute of Communications and Information Sciences (KICS) organized a lecture series on ICT convergence with a specific focus on biohealthcare, robotics, energy and batteries, satellites, and smart cities.

From July 10 (Monday) to July 12 (Wednesday), 2023, KICS conducted a lecture series on ICT convergence, covering bio-healthcare, robotics, energy and batteries, satellites, and smart cities. On the first day, speakers actively involved in pioneering research in ICT-based bio-healthcare convergence studies were invited to represent the forefront of research endeavors in this field. On the second and third days, lectures focusing on the most acclaimed application areas in recent times, including robotics, batteries, energy, satellites, and smart cities were presented. Notably, we invited leading domestic researchers actively engaged in convergence research and prominent international researchers actively conducting convergence studies as speakers. Furthermore, there was special focus on inviting speakers who could elucidate each field from the perspective of ICT applications.

Overall, the program was designed to emphasize presentations that examine each field from an ICT perspective, providing a meaningful opportunity to approach these domains within the context of ICT convergence.

This event served as a significant platform for exploring these fields through the lens of ICT convergence. In particular, ICT researchers were able to establish a foundation for ICT convergence research by acquiring fundamental knowledge of recently highlighted areas through this lecture series.

Short Courses on Wireless and Mobile Communications 2023

by Oh-Soon Shin, Soongsil University, South Korea

In the early 1990s, domestic researchers and industry experts foresaw the rapid growth of the mobile communication industry, which led to the establishment of the KICS Mobile Communications Research Group in 1993, later rebranded as the Mobile Communications Society. Since its inception, the society has actively engaged in research exchange and educational activities in the field of wireless and mobile communications. As part of its educational initiatives, the society has organized short courses on "Wireless and Mobile Communications" annually, which cover diverse topics such as the latest technologies, applications, services, standardization, and policies related to wireless and mobile communication systems.

Held online from August 16 to 18, 2023, this year's event witnessed the successful participation of a total of 110 researchers and students, concluding with success. The short courses examined fundamental and essential topics, ranging from the foundational technologies of wireless and mobile communication systems to the applications of artificial intelligence in sixth-generation (6G) communications.

On the first day, Prof. Wonjae Shin from Ajou University delivered lectures on the fundamentals of wireless and mobile communication theory, which covered the characteristics of wireless channels, cellular systems, and the concept of multiple access. Prof. Sang-Woon Jeon from Hanyang University introduced the overall theory and physical layer technologies of digital communication systems. On day two, Prof. Namyoon Lee from Korea University addressed the latest technologies in multiple antennas, which is a key technology for enhancing spectral and energy efficiencies in wireless communication systems. Prof. Songnam Hong from Hanyang University introduced optimization theory, which is crucial for the development of wireless communication technologies. On the final day, Prof. Woong-Hee Lee from Korea University and Prof. Howon Lee from Hankyong National University explored the applications of machine learning technologies in the physical and medium access control layers. Lastly, Prof. Byonghyo Shim from Seoul National University introduced various cutting-edge physical layer technologies capable of enabling 6G communications.

The short courses this year not only covered the fundamental communication theories but also delved into the applications of machine learning in communications and the latest research topics related to 6G. The short courses are expected to maintain a central role in 6G mobile communication research and education in the future.

The short courses on the fundamentals and core technologies of communication networks conducted by the Communication Network Society

by Seokjoo Shin, Chosun University, South Korea

The Communication Network Society of the KICS has been organizing essential short courses in communication and network-related topics. While there are numerous courses covering foundational knowledge of artificial intelligence and deep learning, and their applications in networks, there has been a scarcity of courses that delve deeply into fundamental concepts important to network majors and emerging issues in the field. Therefore, the Society has been preparing annual courses specifically for communication network researchers, and this year, two events were conducted.

First, a two-day workshop covering various communication network topics was held from August 21st to 22nd. On the first day, the sessions addressed topics such as quantum artificial neural network theory and mobility applications, communication network applications of offline reinforcement learning, foundational and applied research on semantic communication, and 6G mobile communication. These sessions presented fresh and innovative directions in extending the applications of network and communication technologies. On the second day, lectures were conducted on topics like RAN-agnostic communication, network security protocols, and foundational aspects of federated learning, with a focus on applied research on wireless networks. These sessions provided in-depth understanding of the complex theories and application cases of communication technology.

This event, conducted both online and offline, attracted the participation of over 100 researchers and students. Numerous questions were posed, creating an enthusiastic atmosphere among the participants.

On December 6th, a workshop was conducted featuring lectures in English to facilitate the participation of foreign researchers and students. It focused on the recently prominent field of quantum neural network technology.

Quantum neural networks leverage the high computational power of quantum computers to address machine learning and optimization problems. However, the practical application of quantum computing and quantum neural networks is still in its early stages, with ongoing research. This course aimed to provide an understanding of how quantum neural networks can be utilized to solve complex problems through future research and development.

In the morning session, we reviewed widely used artificial neural networks, with a particular emphasis on convolutional neural networks. Additionally, participants learned essential concepts required to design artificial neural networks based on quantum computing.

In the afternoon session, we covered the design of quantum gates for implementing quantum computing theory, along with the associated mathematical foundations.

Participants also explored the configuration of various quantum circuits and their optimization through examples. In addition, we examined the structure and characteristics of quantum neural networks and explored why they can achieve better performance than traditional neural networks.

The final session delved into quantum reinforcement learning, which involves implementing reinforcement learning based on quantum neural networks, with a focus on mobility applications.

This course was conducted by Professor Joongheon Kim of Korea University. Many foreign researchers attended this online event, and a significant number of domestic researchers also participated, confirming the enthusiasm for recent quantum artificial intelligence technologies.

Tutorials and Workshops on Communications Signals Research

by Hong-Yeop Song, Yonsei University, South Korea

First of all, I would like to introduce the Special Research Group on Communications Signals Research within KICS. It was established approximately four years ago to disseminate and promote the future generation of communications signal research within KICS initiated by the Research Center for Convergence Technology. We have approximately 50 general members and some volunteers, including myself, SJ Oh and NY Lee from Korea University, KS Kim and JH Park from Yonsei University, SH KIM from SKK University, JH Kim from Sejong University, SW Kim, and SN Hong from Hanyang University. The main events of our group are (1) the announcement of the Call for Proposal (CFP) to the members of KICS in early November, (2) deciding on some proposals in February, (3) workshops in March, August, and November, and (4) a tutorial program in summer.

This year, the tutorial program was planned for four days with the following topics and speakers, as shown in the picture. The final day was included in the Second Workshop of the Research Group on Communications Signals Research. The total number of registrations was approximately 80, including those from external companies and students our Operating Committee members.

프로그램

일시	강 좌 명	연 사
1일차 – 8월 28일(월)		
09:00~12:00	무선통신이론	김광순 교수 (연세대학교)
13:30~16:30	안테나 기초 / 빔포밍 / MIMO	박정훈 교수 (연세대학교)
2일차 – 8월 29일(화)		
09:00~12:00	FEC 기술 및 이론	김상효 교수 (성균관대학교)
13:30~16:30	Software Defined Radio / 방향탐지	이남윤 교수 (고려대학교)
3일차 – 8월 30일(수)		
09:00~12:00	AI 신호분석기술	김정현 교수 (세종대학교)
13:30~16:30	(매트랩/C언어 등을 기반으로) 무선 변복조 모뎀기술	오성준 교수 (고려대학교)
4일차 – 8월 31일(목) *통신신호연구회 제2차 워크숍과 병행 진행됩니다.		
10:40~12:40	Future of Satellite Edge Computing: Dynamic Network Routing, Contents Caching, and Code Offloading	곽정호 교수 (DGIST)
14:00~16:00	LEO Satellite Constellation Networks in 6G Era: Recent Trends, Opportunities, and Challenges	신원재 교수 (아주대학교)

The final workshop of the year was planned as a special session of the KICS 2023 Fall conference at Lahan Select, Gyeongju, Korea. This year, all of the five PIs of the following research projects have briefly presented their results:

(1) Detection and separation of combined signals in the same frequency band
(2) Design of digital communication systems using LABVIEW
(3) Frequency synchronization of MF-TDMA systems for satellite communications
(4) Modulation techniques for long range and low-power digital communications
(5) Combined positioning and communications systems with improved capacity

In addition, we had two invited talks:

▶ Issue and Trend of Global/Regional Navigation Satellite Systems Technology (Past, Present and Future) by Prof. JH WON from Inha University and

▶ Fronthaul and Frame Structure Optimization for LET-based Open NTN by Prof. HJ RYU of Korea University.

More than 30 committee members of the group and others from the general audience who attended the KICS Fall conference attended the workshop, and we all had a great time asking and answering questions on various topics of communication signals research.

We thank all the speakers, including the two invited professors, all working members of the group, and the KICS Fall Conference Committee for this successful workshop.

Hong-Yeop Song
Chair of Operating Committee, Special Group of Communications Signals Research
Vice President of KICS, Communications Signals Research

Eighth Intensive Course on Quantum Communication and Computation

by Joonwoo Bae, KAIST, South Korea

Currently, quantum information technology is no longer a topic of interest in the scientific community. The era of quantum information and communication technology (QICT) that directly exploits the laws of quantum mechanics for practical information processing tasks, such as efficient computation, secure communication, and quantum network communication, is becoming a reality.

Mathematical problems that are considered intractable by conventional computation can be addressed and even rendered tractable using a quantum approach. For example, the problem of prime-number factorization, for which a quantum algorithm was proposed in 1994, can be solved by a quantum computer at an exponential speed, compared to its classical counterpart.

The industry continues to announce record-breaking improvements annually, with an increasing number of qubits available for quantum computing and long-distance quantum communication.

Therefore, when quantum technologies are available and convenient, technological innovations can be seen in all computing-related disciplines. Simultaneously, we may also encounter some unexpected issues in real life, such as security threats, owing to efficient computation. Quantum information technology affects all areas of science, technology, and society in one way or another.

In light of these considerations, two information technology research centers (ITRCs), namely ultra-secure quantum internet (USQI)-ITRC of Korea University and quantum computing for artificial intelligence (QCAI)-ITRC of Korea Advanced Institute of Science and Technology, had organized the 8th intensive summer course on the basics of quantum information and quantum computation. The course was scheduled for a week from August 28 to September 1, 2023. This intensive course targeted the audience who were particularly concerned about the currently available quantum technologies, known as noisy-intermediate-scale-quantum (NISQ). The content ranged from the very fundamental to the most practical aspects, catering to those aiming to demonstrate quantum advantages and capabilities beyond the limitations of conventional computation. The course delved into addressing pertinent questions about noisy quantum systems and envisaging applications of quantum technologies. The era of NISQ technologies could be rephrased as an opportunity to prepare for the days of ideal quantum information processing.

For this purpose, the intensive course invited expert speakers from the academic and industry sides. Prof. Jun Heo (Korea University) delivered lectures on the basics of quantum information, while Dr. Jeonghwan Shin (KT) talked about the basics and practical applications of quantum communication. Prof. Joonwoo Bae provided a detailed security analysis and related discussions. The course also included a non-quantum topic by Prof. Yongwoo Lee (Inha University)—post-quantum cryptography. This topic explores a higher level of computational security by considering mathematical problems with higher computational complexity.

These lectures introduced code-based cryptography, lattice-based cryptography, and the Regev system. Lectures on the applications of NISQ algorithms were offered by Prof. Joongheon Kim (Korea University), who introduced the basics of quantum algorithms to NISQ algorithms, including quantum approximate optimization algorithms.

The audience was diverse, ranging from undergraduate students eager to glimpse the future of information technologies, to graduate students and researchers keen on tracking the recent progress in quantum communication and computing. Industry and government sectors, the frontiers bridging academic interests to real-world quantum applications, were also represented among the attendees.

Questions, comments, and answers were observed during the five-day lectures. Interactions among instructors and audience fostered the generation of novel ideas, the exploration of new directions, and a deeper understanding of QICT. The 8th intensive course was the most successful, boasting the largest audience and most active interactions compared to the past. These tell why the Korean Institute of Communications and Information Sciences (KICS) should continue intensive courses in quantum technologies.

Finally, important key results were obtained for 2023. Regev devised a polynomial speedup over the Shor algorithm, and an improvement was made after approximately 30 years. Device-independent quantum key distribution protocols were realized, achieving the highest level of security without relying on computational assumptions or implementation details, but solely on the quantum nature of the working principles. Beyond two-party communication, network information theory may also show quantum advantages in scenarios such as multiple access and interference channels.

From the perspective of national quantum activities, the week of the intensive course (August 28 to September 1) was rich in various quantum meetings in Korea, such as the Asian Quantum Information Science, which is the world's largest conference on advances in quantum information, and Photonics Meeting of the Optics Society of Korea in Jeju. QICT, which is becoming closer to industrial applications, will attract more people from various fields.

Workshop on Network Technologies for 6G – Integrated AI and Communications

by Hyunggon Park, Ewha Womans University, South Korea

The sixth-generation mobile communication network, commonly known as 6G, is expected to be commercialized in 2030, and active research is underway to achieve peak transmission speeds of 100 Gbit/s to 1 Tbit/s and transmission delays one-tenth the level of fifth-generation (5G) communication. In June 2023, the ITU-R completed its work on the IMT-2030 Framework Recommendation (hereinafter referred to as the 6G Vision), which defines six target usage scenarios and 15 performance indicators (KPIs). Moreover, the 3GPP (3rd Generation Partnership Project) is expected to begin discussions to achieve the performance indicators in 2024 and 2025 and complete initial specifications in 2027 and 2028. In addition to the advancement of the typical performance targets of mobile communication systems, such as maximum transmission rate and latency, the main difference between the 5G and 6G is in the target scenarios in which new functions, such as artificial intelligence (AI) and sensing, are used in close conjunction with communication, and their explicit performance indicators. Among them, the discussion on the joint consideration of AI and communication (hereinafter referred to as Integrated AI and Communication), which is expected to revolutionize the network structure, is still in its early stages; thus, research, development, and standardization are expected to begin in earnest with the completion of the 6G Vision Recommendations.

In this workshop, we discussed the development direction of network technologies required for Integrated AI and Communication, one of the most important target scenarios of 6G. First, we presented an overview of the 6G Vision Recommendation of the ITU-R and the evolution of the 3GPP network structure for AI and machine learning (ML). Subsequently, we discussed the advancement of the ongoing Network Data Analytics Function (NWDAF) related to 5G-Advanced network intelligence, which is currently discussed in 3GPP standards. Moreover, we discussed the technologies and trends for applications in 5G-Advanced systems and air interfaces for AI/ML.

Finally, we presented the latest AI/ML technologies that can be adopted in 6G, such as offline reinforcement learning, federated learning, split learning, and transfer learning/meta-learning technologies, and their adoption to 6G networks.

We believe that this workshop helped the utilization of 5G-Advanced in Korea and pave the path for research and development of core technologies for 6G communication networks.

NOTEWORTHY ISSUES IN KOREA

Popular Articles and Research Trend

by Taewoon Kim, Pusan National University, South Korea

One effective way to identify the recent research directions and trends is to pay attention to the most popular research papers. This article reviews such most accessed and downloaded papers in Journal of Communications and Networks (JCN) and Information & Communications Technology Express (ICT Express), both of which are published by The Korean Institute of Communications and Information Sciences (KICS).

JCN Popular Articles

PAPER

SW. Kim et al., "Towards deep learning-aided wireless channel estimation and channel state information feedback for 6G," vol. 25, no. 1, Feb. 2023.

DOI

https://doi.org/10.23919/JCN.2022.000037

ABSTRACT

Deep learning (DL), a branch of artificial intelligence (AI) techniques, has shown great promise in various disciplines such as image classification and segmentation, speech recognition, language translation, among others. This remarkable success of DL has stimulated increasing interest in applying this paradigm to wireless channel estimation in recent years. Since DL principles are inductive in nature and distinct from the conventional rule-based algorithms, when one tries to use DL technique to the channel estimation, one might easily get stuck and confused by so many knobs to control and small details to be aware of. The primary purpose of this paper is to discuss key issues and possible solutions in DL-based wireless channel estimation and channel state information (CSI) feedback including the DL model selection, training data acquisition, and neural network design for 6G. Specifically, we present several case studies together with the numerical experiments to demonstrate the effectiveness of the DL-based wireless channel estimation framework.

JCN Popular Articles

PAPER

S. Subbiah et al., "Intrusion detection technique in wireless sensor network using grid search random forest with Boruta feature selection algorithm," vol. 24, no. 2, Apr. 2022.

DOI

https://doi.org/10.23919/JCN.2022.000002

ABSTRACT

Attacks in wireless sensor networks (WSNs) aim to prevent or eradicate the network's ability to perform its anticipated functions. Intrusion detection is a defense used in wireless sensor networks that can detect unknown attacks. Due to the incredible development in computer-related applications and massive Internet usage, it is indispensable to provide host and network security. The development of hacking technology tries to compromise computer security through intrusion. Intrusion detection system (IDS) was employed with the help of machine learning (ML) Algorithms to detect intrusions in the network. Classic ML algorithms like support vector machine (SVM), K-nearest neighbour (KNN), and filter-based feature selection often led to poor accuracy and misclassification of intrusions. This article proposes a novel framework for IDS that can be enabled by Boruta feature selection with grid search random forest (BFS-GSRF) algorithm to overcome these issues. The performance of BFS-GSRF is compared with ML algorithms like linear discriminant analysis (LDA) and classification and regression tree (CART) etc. The proposed work was implemented and tested on network security laboratory — knowledge on discovery dataset (NSL-KDD). The experimental results show that the proposed model BFS-GSRF yields higher accuracy (i.e., 99%) in detecting attacks, and it is superior to LDA, CART, and other existing algorithms.

ICT Express Popular Articles

PAPER

Y. Jamtsho et al., "Real-time license plate detection for non-helmeted motorcyclist using YOLO," vol. 7, no. 1, Mar. 2021.

DOI

https://doi.org/10.1016/j.icte.2020.07.008

ABSTRACT

Nowadays, detection of license plate (LP) for non-helmeted motorcyclist has become mandatory to ensure the safety of the motorcyclists. This paper presents the real-time detection of LP for non-helmeted motorcyclist using the real-time object detector YOLO (You Only Look Once). In this proposed approach, a single convolutional neural network was deployed to automatically detect the LP of a non-helmeted motorcyclist from the video stream. The centroid tracking method with a horizontal reference line was used to eliminate the false positive generated by the helmeted motorcyclist as they leave the video frames. The overall LP detection rate was 98.52%.

ICT Express Popular Articles

PAPER

A. Sen et al., "Categorization of actions in soccer videos using a combination of transfer learning and Gated Recurrent Unit," vol. 8, no. 1, Mar. 2022.

DOI

https://doi.org/10.1016/j.icte.2021.03.004

ABSTRACT

Extraction of knowledge from soccer videos has enormous applications like context-based advertisement, content-based video retrieval, match summarization, and highlight extraction. Overlapping soccer actions and uncontrolled video capturing conditions make it challenging to detect action accurately. For overcoming these problems, Convolutional Neural Network and Recurrent Neural Network are used jointly to classify different lengths of soccer actions. Initially, transfer learning from pre-trained VGG network extracts characteristic spatial features. Afterwards, Gated Recurrent Unit deals with temporal dependency and solves the vanishing gradient problem. Finally, softmax layer assigns decimal probabilities to each class. Experimental results demystify the significance of the proposed architecture.

Machine learning (ML) and deep learning (DL) techniques are continuously advancing and their applications have extended to wireless communications and network security and several other fields. One notable research proposed by Kim et al. showed that deep learning can be an effective solution to the challenge of wireless channel estimation in wireless communication. It is well known that channel adaptive signaling can enhance the performance of wireless communication systems to a large extent. However, obtaining an accurate knowledge of channel state at the transmitter is challenging in practice. To address this challenge, especially for future wireless systems with high-frequency bands, Kim et al. presented a comprehensive study on (i) the choice of an adequate deep learning model, (ii) designing a neural network architecture, and (iii) data acquisition for training the model.

This article begins with a summary of the conventional and DL-based approaches for wireless channel estimation. It then discusses commonly arising design issues in DL-based channel estimation, such as training data acquisition and design of the neural network architecture. Finally, in the DL-aided Channel Estimation and Exploration section, the authors explore diverse neural network models designed to solve the problems of channel estimation. For example, Fig. 1 shows the proposed LSTM-based parametric channel estimation model for mmWave/THz MIMO communications.

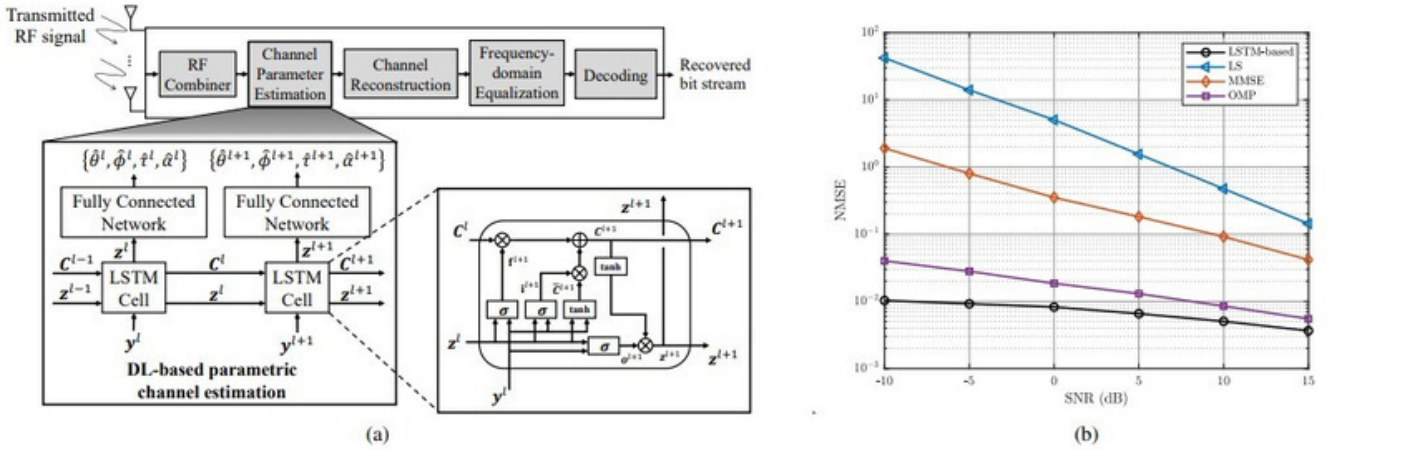


Figure 1. (a) LSTM-based channel estimation (b) Evaluation results [Kim et al.]

Furthermore, application of grid search and random forest machine learning model to the problem of intrusion detection in wireless sensor networks (WSN) was proposed by Subbiah et al. WSN are widely used networks dedicated to transmitting sensed readings in diverse applications, such as healthcare and manufacturing.

Although many applications of WSN carry private and/or confidential information, they are vulnerable to security attacks because they operate in an unattended environment, communicate with each other in a broadcast manner, and are resource-constrained. Thus, to enhance the level of security of WSNs, an intrusion detection system (IDS) is required to protect legitimate user information from attackers.

The use of large-scale WSNs over a long period of time results in a huge dataset that can be effectively handled by ML techniques. Many approaches use ML to enhance the performance of IDS; however, the importance of feature selection has been underestimated. Subbiah et al. proposed an effective feature selection algorithm with grid search and random forest to further enhance IDS for WSNs. The widely used KDDCUP dataset with 490 thousand samples and 42 features was used in their study, and the authors proposed two models that enhance the accuracy of IDS, referred to as Model 1 and Model 2.

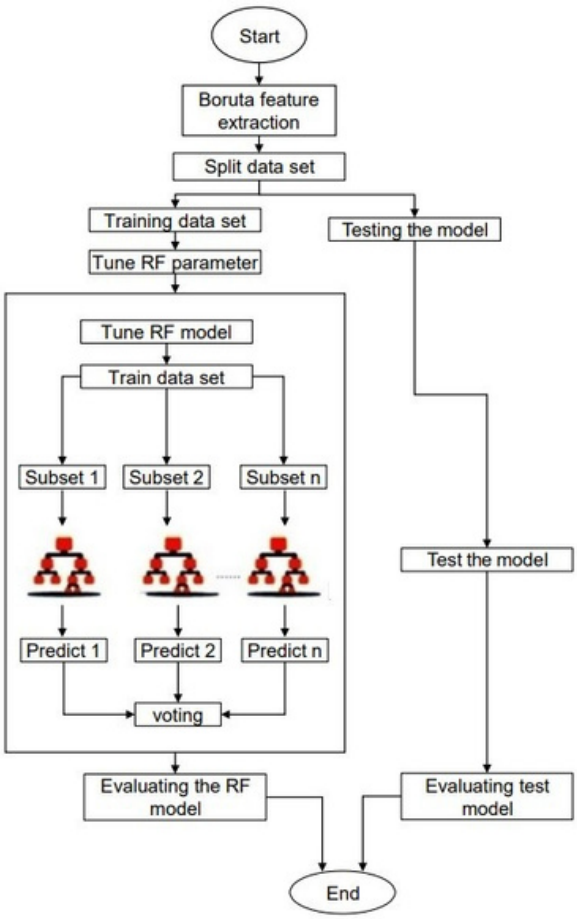


Figure 2. BFS-GSRF algorithm [Subbiah et al.]

The proposed Model 1, called BFS-GSRF, uses the Boruta feature selection algorithm to select the features and then runs grid search random forest algorithm for detection classification. The detailed operation of BFS-GSRF is illustrated in Fig. 2.

The Model 2, on the contrary, uses the Pearson's correlation coefficient to select features. It then uses linear discriminant analysis, and classification and regression tree to detect attacks accurately.

In this issue, we chose two papers from ICT Express that introduce the use of well-known DL models in computer vision applications. Jamtsho et al. proposed the use of YOLO v2 to detect the license plates of motorcycles if the driver is not wearing a helmet.

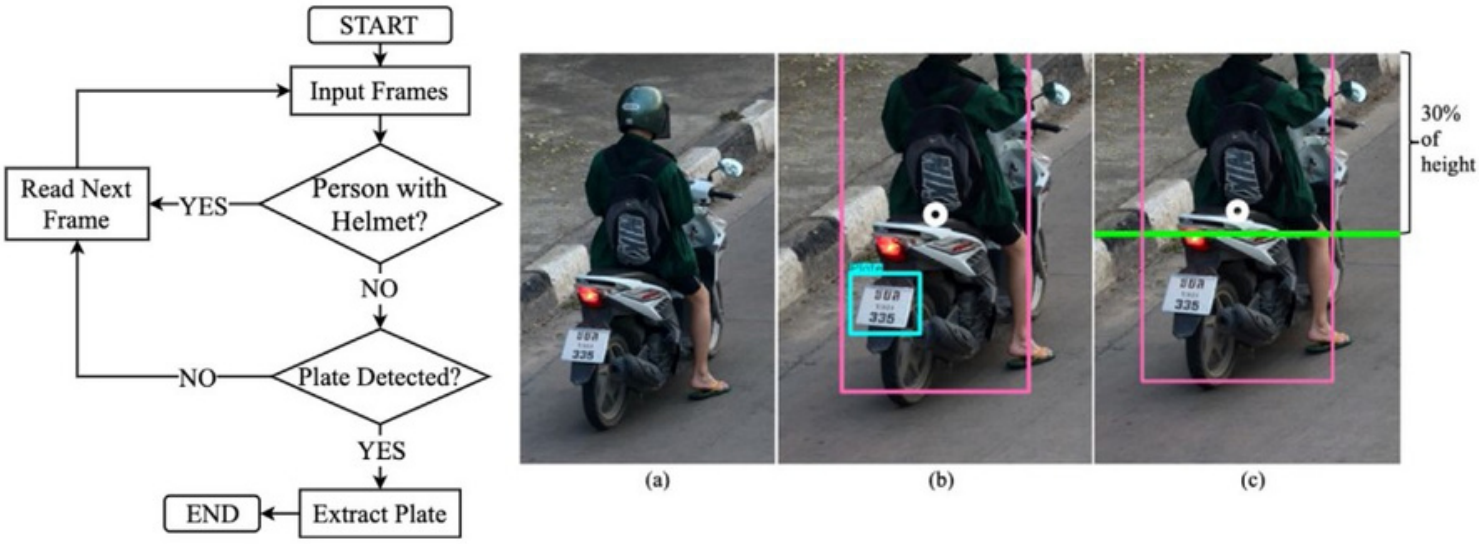


Fig. 3. Overview of the proposed MobiRPL [H. Kim et al.]

Fig. 3 shows the workflow of the proposed approach and its detection results. As shown in the flowchart, when a person is detected in a given image, the proposed approach first searches for a helmet. If the helmet is missing in the image, the next step is to find the license plate. Fig. 3(a) shows that license plate detection was not performed, given the presence of a helmet. Contrarily, Fig. 3(b) shows that the license plate detection step is carried out if the helmet is missing. However, the detection of license plate in Fig. 3(b) may be unnecessary if the helmet is found missing only because the helmet is outside the frame boundaries. To overcome such problems, the authors proposed using the centroid-tracking method that detects the center of a detected human object. If the center is above a predefined threshold, as indicated by the green horizontal line in Fig. 3(c), the proposed approach does not attempt to detect the license plate. This study reports that the overall accuracy of license plate detection was 98.52%.

Sen et al. applied DL to vision-based sports applications, namely, action categorization in soccer videos. The objective of this study was to detect and classify ten soccer actions including corner, foul, free-kick, short-pass, and throw-in. To train the proposed DL model effectively and validate its performance, the authors developed custom data from the recorded videos. The proposed approach for soccer player's action classification is named SAC which is short for Soccer Action Categorization, and its detailed workload and network architecture are depicted in Fig. 4.

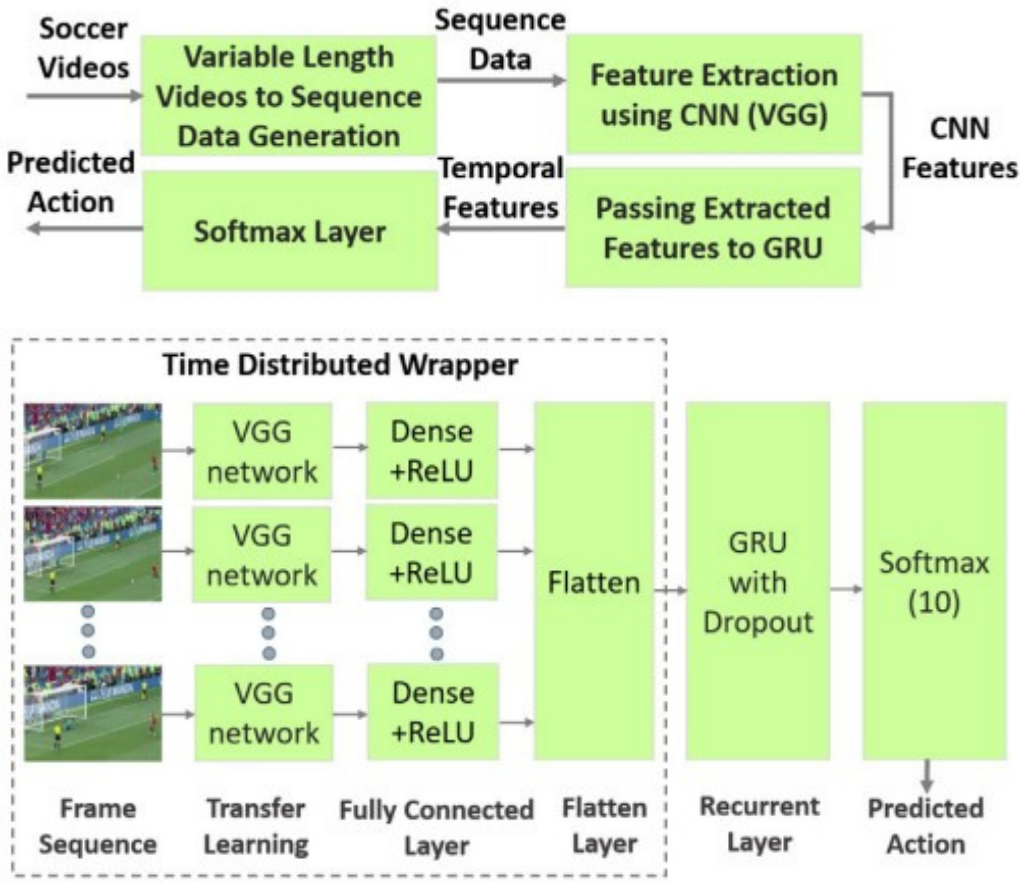


Figure 4. Soccer action categorization (SAC) scheme [Sen et al.]

The main contributions of this work are twofold: First, it uses a pretrained VGG to extract features from the recorded soccer-playing image dataset. Subsequently, using the GRUs, the authors carry out transfer learning was performed to correctly categorize the player's play. The extensive evaluation results reported in the study suggest that the proposed approach achieves an accuracy of 94%.

Nineteenth Haedong and Fifth KICS Fellow Awards Ceremony

by Seong-Ho Jeong, Hankuk University of Foreign Studies, South Korea

The 19th Haedong Award Ceremony, 5th KICS Fellow Award Ceremony, and Year-End Party were held at the Plaza Hotel in Seoul, South Korea on Friday, December 1, 2023. The Haedong Award is sponsored by the Haedong Science Foundation and awarded by five organizations, including KICS. Professor Chan-Byoung Chae of Yonsei University received the Haedong Academic Award; HFR CEO Jong-Min Cheong received the Haedong Technology Award, and Professor Haneul Ko of Kyung Hee University received the Haedong Young Engineer Award (Academic Award).

Chan-Byoung Chae, an Underwood Distinguished Professor at Yonsei University, is an expert in next-generation communication networks and has published a total of 300 papers, including more than 50 top-level SCIE-level papers over the past three years. He won the best paper award from a top 1% journal for technology related to multiple input/output antennas and best demo awards at the IEEE INFOCOM, ICC, DySPAN, and WCNC conferences by demonstrating full-duplex, molecular communications, and magnetic field multiple input/output technologies.

Jong-Min Cheong, CEO of HFR, contributed to the world's first commercialization of LTE and 5G fronthaul equipment, development of simultaneous LTE and 5G service transmission devices through LTE frequencies, and commercialization of private 5G end-to-end solutions that can promote digital innovation in small and medium-sized enterprises, as well as wired and wireless communication equipment. He has contributed substantially to strengthening the national technological competitiveness of related industries, achieved maximum exports through WDM technology as the company’s representative technology, and led technological innovation by commercializing O-RAN compliant technology in Korea, Japan, and the United States.

Professor Haneul Ko of Kyung Hee University received his doctoral degree from the Department of Electrical and Electronic Engineering at Korea University for research on resource and mobility management in heterogeneous networks. Recently, he has conducted research in areas such as 5G·6G mobile core, network automation, in-network computing, and edge computing. To date, he has published 68 papers in SCI international academic journals, more than 40 of which are top-tier journals. In addition, he published more than 30 papers at international conferences and secured 20 domestic and foreign patents.

The Haedong Award was instituted by late Chung-Shik Kim, Chairman of Daeduck Electronics who devoted himself to the PCB business for 50 years, to honor talented individuals with great achievements in the academic and technological development of Korea's electronic engineering and related fields by establishing the Haedong Science Foundation.

Additionally, Professor Byonghyo Shim of Seoul National University was selected the 5th KICS Fellow. The KICS Fellow is a system under which KICS selects recipients every year from the top 1% of its member researchers. Professor Byonghyo Shim was recognized for his contribution to the development of the domestic mobile communications industry through more than 250 academic research papers over 20 years and various industry–academia collaborations.

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KICS Winter Conference 2024

Date | January 31 - February 2, 2024
Location | Yong Pyong Resort, Pyeongchang, Gangwon Province, South Korea

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ICAIIC 2024

Date | February 19-22, 2024
Location | Nakanoshima Center Osaka University, Osaka, Japan & Virtual Conference

VISIT WEBSITE!

ICT Convergence Korea 2024

Date | March 13-14, 2024
Location | The-K Hotel Seoul, South Korea

VISIT WEBSITE!

AI Frontiers Summit 2024

Date | May 23, 2024
Location | ST Center, Seoul, South Korea

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KICS GN The Korean Institute of Communications and Information Sciences - Global Newsletter | KICS Global Newsletter ISSN 2671-891X

Published on 29 December 2023
Published by The Korean Institute of Communications and Information Sciences
Publisher Een-Kee Hong
Editor-in-Chief Seokjoo Shin

Editorial and Publishing Office
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