

# AI WORLD CUP 2018

## Program Digest



**Academic Cultural Complex (E9), 5F**  
**KAIST, Daejeon, Korea**  
**August 20–22, 2018**  
**[www.aiworldcup.org](http://www.aiworldcup.org)**

Organized by:



Sponsored by:



# Contents

## AI World Cup 2018

**Chair' s Greetings**

AI Soccer • AI Commentator • AI Reporter

**Organizing Committee**

**Advisory board**

**Sponsors**

**Program at a Glance**

**Useful Information**

**Social Events**

**Technical Program**

- Tutorial Lectures
- Lectures on AI flagship
- Keynote Talks
- Panel Discussion

**Venue Locations on KAIST Campus**

**Chair's Greetings**

## Welcome to the 1st AI World Cup 2018!



On behalf of the organizing committee, I am honored to have the first International AI World Cup (AIWC 2018) at KAIST, Daejeon, Korea on August 20 - 22, 2018. As AI technology becomes predominant, it brings changes to our lives. KAIST, as a pioneer of AI technology, plays a key role of leading AI technology in the world. This event aims to initiate a new event opportunity with AI technology, stimulate students to create AI algorithms by themselves and to challenge the competition. The source code of the AI World Cup will be offered as open source to the public, so that everyone can create AI algorithms and play with AI World Cup technology. The AI World Cup games consist of AI soccer, AI commentator and AI reporter. Prior to the games, there is a technical program including useful talks and lectures of AI professionals from around the world. There will be talks on practical solutions to pending technical issues using AI technology. Additionally, AI developers will present their process and strategies of developing the algorithms of the AI World Cup games at the poster session. This event will offer you cheerful games and informative AI technologies.

I take a pride of launching this event for the first time in the world at KAIST. I'd like to thank the organizing committee, advisory board, invited speakers, sponsors and participants for contributing to AIWC 2018. I hope that everyone can come to experience this AI World Cup at KAIST. Thank you!

Sincerely yours,

A handwritten signature in black ink that reads "Jong-Hwan Kim". The signature is written in a cursive, flowing style.

Jong-Hwan Kim

Chairman of the AI World Cup 2018 Organizing Committee

Dean of the College of Engineering, KAIST

# Organizing Committee

## Chairman



Jong-Hwan Kim    Professor    KAIST, Korea

## Vice Chairman



Hyochoong Bang    Professor    KAIST, Korea



Dongsoo Har    Professor    KAIST, Korea

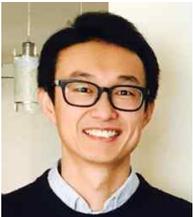
## Committee Members



Hyun Myung      Professor      KAIST, Korea



Changdong Yoo      Professor      KAIST, Korea



Sangwan Lee      Professor      KAIST, Korea



Junmo Kim      Professor      KAIST, Korea



Seungyoung Ahn      Professor      KAIST, Korea



Chihyung Jeon      Professor      KAIST, Korea



Meeyoung Cha      Professor      KAIST, Korea

## Advisory board

Olivier Michel	CEO	Cyberbotics, USA
Tzoo Hseng S. Li	Professor	National Cheng Kung University, Taiwan
Eric T. Matson	Professor	Purdue University, USA
David Claveau	Professor	California State University, USA
Jun Jo	Professor	Griffith University, Australia
Jin-Woo Jung	Professor	Dongguk University, Korea
Gourab Sen Gupta	Professor	Massey University, New Zealand
Joel Leibo	Research Scientist	Google DeepMind, England
Namik Cho	Professor	Seoul National University, Korea
Inhyok Cha	EVP	SK Telecom, Korea
Matthias Rehm	Professor	Aalborg University, Denmark
David Hogg	Professor	University of Leeds, England
Fangzhen Lin	Professor	Hong Kong University of Science and Technology, Hong Kong
Daniel Schilberg	Professor	Bochum University of Applied Sciences, Germany
Thomas Bräunl	Professor	University of Western Australia. Australia
Sanem Sariel	Professor	Istanbul Technical University, Turkey

## Contact Information

Albert Jaehyung Ahn	KAIST, Korea
e-mail:	<a href="mailto:inquiry@rit.kaist.ac.kr">inquiry@rit.kaist.ac.kr</a>
Tel:	+82-42-350-8877

# Sponsors



**Cyberbotics**



**SK Hynix**



**대전마케팅공사**

Daejeon International Marketing Enterprise

**Daejeon International Marketing Enterprise**



**Korea Robotics Society**

# AIWC 2018 Program at a Glance

Time/Date	Monday, Aug. 20	Tuesday, Aug. 21	Wednesday, Aug. 22
09:00-9:30	Registration	Registration	Registration
9:30-10:00		Opening Ceremony	Poster Session 2 (MIL & Participants)
10:00-10:30	Tutorial Lecture 1	AI Soccer Games ①	
10:30-11:00		Keynote Talk 1	AI Commentator & AI Reporter game
11:00-11:30		AI Soccer Games ②	
11:30-12:00		Lunch	Lunch
12:00-13:30	Participants meeting	AI Soccer Games ③	AI Soccer Game ⑥ (Final)
14:00-14:30	Tutorial Lecture 2	Keynote Talk 2	Award Ceremony & Closing Ceremony
14:30-15:00		AI Soccer Games ④	
15:00-15:30		Break	
15:30-16:00		Break	
16:00-16:30	Lectures on AI flagship	Panel Discussion	
16:30-17:00	Lectures on AI flagship	Poster Session 1 (MIL)	
17:00-17:30		Break	Break
17:30-18:00	Welcome Reception	Banquet	
18:00-18:30			
18:30-19:00			
19:00-20:30			

# Useful Information

## Event Venue

Chung Kunmo Conference Hall  
 5th floor of Academic Cultural Complex (E9)  
 KAIST, Daejeon, Korea

## Registration Hours

**Monday to Wednesday, 20 - 22 August, 9 am to 6 pm**

Only paid registrants will be offered a registration kit, including an eco bag, name badge, receipt, certificate of attendance, program book, and three lunch coupons. Lunch and bag will be provided on the basis of first come, first served.

## Wireless Internet Service

Wifi is available during the event.

- Wifi access to "Welcome\_KAIST"
- ID: kaist\_aiwc2018
- Password: aiworldcup2018

## Free Shuttle Bus Schedule

Bus Stop		Residence Hotel Graytone Dunsan	Lotte City Hotels Daejeon	KAIST Academic Cultural Complex (E9)	KAIST Faculty Hall (N6)	KAIST Academic Cultural Complex (E9)	Lotte City Hotels Daejeon	Residence Hotel Graytone Dunsan
Mon, Aug 20	Morning	7:40 am 8:50 am	8:00 am 9:10 am	8:20 am 9:30 am				
	Afternoon					8:30 pm	8:50 pm	9:10 pm
Tue, Aug 21	Morning	7:40 am 8:50 am	8:00 am 9:10 am	8:20 am 9:30 am				
	Afternoon			12:00 pm	12:05 pm 1:15 pm	1:20 pm 8:30 pm	8:50 pm	9:10 pm
Wed, Aug 22	Morning	7:40 am 8:50 am	8:00 am 9:10 am	8:20 am 9:30 am				
	Afternoon			12:00 pm	12:05 pm 1:15 pm	1:20 pm 3:00 pm	3:20 pm	3:40 pm

The bus schedule is subject to change due to traffic jam or program changes.

# Social Events

## Lunches

- ° Day & Time: Monday - Wednesday, August 20 - 22, 12:30 pm - 1:30 pm
- ° Place: Cafeteria (E5) 2F.
- ° Lunch coupon required.

*The Invited speakers and sponsor delegates will have lunches at Faculty Club (E5) and Faculty Hall (N6).*

*- Faculty Club(E5) : August 20 - 21*

*- Faculty Hall(N6) : August 21 - 22*

## Welcome Reception

- ° Day & Time: Monday, August 20, 6:30 pm
- ° Place: Sky Lounge, Academic Cultural Complex (E9), 5F.
- ° Name badge required.

## Banquet

- ° Day & Time: Tuesday, August 21, 6:30 pm
- ° Place: Faculty Club (E5)
- ° Name badge required.

## Others

- ° Snacks and beverages will be offered during breaks.

*Notice: Vegetarian foods will be served only on their requests in advance.*

# Technical Program

Tutorial Lecture 1

Monday, 20 Aug 10:00-12:00

---

## Deep Reinforcement Learning



Professor Sae-Young Chung  
School of Electrical Engineering  
KAIST

### Abstract

---

Deep reinforcement learning can solve seemingly intractable reinforcement learning problems such as learning to play arcade games directly from video and learning to play the game of Go. In this tutorial, I will first talk about some basics of reinforcement learning and deep reinforcement learning. I will then talk about AlphaGo and AlphaGo Zero, principles behind their operations, and how training is done for them.

### Short bio

---

Sae-Young Chung received the B.S. and M.S. degrees in electrical engineering from Seoul National University, Seoul, South Korea, in 1990 and 1992, respectively and the Ph.D. degree in electrical engineering and computer science from the Massachusetts Institute of Technology, Cambridge, MA, USA, in 2000. From September 2000 to December 2004, he was with Airvana, Inc., Chelmsford, MA, USA. Since January 2005, he has been with the School of Electrical Engineering, KAIST, Daejeon, South Korea, where he is currently a Professor. He served as Associate Editor for the IEEE Transactions on Communications from 2009 to 2013 and for the IEEE Transactions on Information Theory from 2014 to 2016. He served as the Technical Program Co-Chair of the 2014 IEEE International Symposium on Information Theory and as the Technical Program Co-Chair of the 2015 IEEE Information Theory Workshop. His research interests include information theory, deep learning, and reinforcement learning.

# Real-time Sports Commentary Generation with Deep Learning



Professor Sung Ju Hwang  
School of Computing  
KAIST

## Abstract

---

### Machine learning

- Multi-task deep learning for avoiding negative transfer on shared representations.
- Bayesian deep learning based on approximate variational inference.
- Network structure estimation and optimization for lifelong learning.
- Zero-/Few-shot learning for unseen category prediction.

### Visual recognition

- Deep-learning based survivor detection system on UAVs.
- Active incremental learning with model uncertainty for autonomous driving.

### Natural language understanding

- Deep generative model based controllable text generation.
- Personalized conversation model using memory-augmented continual learning.

### Healthcare

- Explainable AI. Uncertainty and attention mechanism based reliable prediction research.
- Physiological symptom prediction models in intensive care unit and ward environment.

### Financial prediction

- Deep gaussian process and variational approach based machine learning algorithms.
- Deep probabilistic models for algorithmic stock trading, real estate price prediction.

## Short bio

---

Sung ju Hwang is an assistant professor in the school of computing at KAIST. Prior to working at KAIST, he was an assistant professor in the School of Electric and Computer Engineering at UNIST, and prior to that he was a postdoctoral research associate at Disney Research, working under the supervision of Professor Leonid Sigal. He received a Ph.D. in computer science at University of Texas at Austin, under Professor Kristen Grauman. During his Ph.D. he also closely collaborated with Prof. Fei Sha at University of Southern California.

## Paths toward Artificial General Intelligence



Professor Sae-Young Chung  
School of Electrical Engineering  
KAIST

### Abstract

---

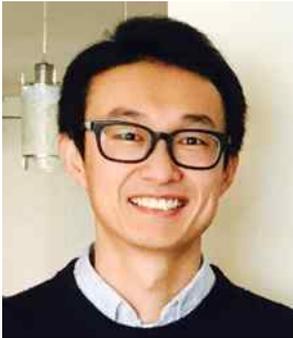
Deep learning has been very successful in many areas such as image classification, speech recognition and machine translation. However, when it comes to the scope of applications, such systems are highly limited since all of them are designed to perform only specific tasks. In this talk, I will talk about requirements and possible paths toward more general artificial intelligence that can perform more diverse tasks.

### Short bio

---

Sae-Young Chung received the B.S. and M.S. degrees in electrical engineering from Seoul National University, Seoul, South Korea, in 1990 and 1992, respectively and the Ph.D. degree in electrical engineering and computer science from the Massachusetts Institute of Technology, Cambridge, MA, USA, in 2000. From September 2000 to December 2004, he was with Airvana, Inc., Chelmsford, MA, USA. Since January 2005, he has been with the School of Electrical Engineering, KAIST, Daejeon, South Korea, where he is currently a Professor. He served as Associate Editor for the IEEE Transactions on Communications from 2009 to 2013 and for the IEEE Transactions on Information Theory from 2014 to 2016. He served as the Technical Program Co-Chair of the 2014 IEEE International Symposium on Information Theory and as the Technical Program Co-Chair of the 2015 IEEE Information Theory Workshop. His research interests include information theory, deep learning, and reinforcement learning.

## Brain-inspired AI : engineering the robot minds



Professor Sang Wan Lee  
Department of Bio and Brain Engineering  
KAIST

### Abstract

---

Reinforcement learning (RL) has demonstrated an ability to succeed in a few arduous tasks, emerging as a general framework for optimal control in robotics. However, the engineering approaches to solve this problem differ in many respects with those in which the brain implements. This brings up the question as to how the human brain develops an ability to handle a wide variety of tasks and to learn from only few observations. This talk introduces our research team's twofold approach to advancing the understanding of human RL, by juxtaposing wisdoms from neuroscience and AI.

- Understanding the nature of meta reinforcement learning in the human brain
- Creating reinforcement learning agents that make humans "superhuman"

A detailed insight into the brain-inspired AI not only permits advances in many aspects of robot control, but also helps us understand the nature of human intelligence on a deeper level.

### Short bio

---

Sang Wan Lee is currently an assistant professor with the department of bio and brain Engineering at KAIST, and the director of the laboratory for brain and machine intelligence (<http://aibrain.kaist.ac.kr>). In 2009, he received Ph.D. in Electrical Engineering and Computer Science from KAIST. During 2010-2015, he was a postdoctoral associate at McGovern institute for brain research at MIT, followed by a Della Martin postdoctoral scholar in the Computation & Neural Systems and the Behavioral & Social Neuroscience program at Caltech. He was the recipient of the Della-Martin fellowship (2014) and the Google faculty research award in computational neuroscience (2017). His research interests include brain-inspired artificial intelligence and computational neuroscience.

---

## Simulation benchmarks and competitions: a fundamental tool to foster robotics research



Dr. Olivier Michel  
CEO of Cyberbotics  
Switzerland

### Abstract

---

Robotbenchmark: a web service for simulated robot benchmarking

Robotbenchmark offers a series of robot programming challenges that address various topics across a wide range of difficulty levels, from middle school to PhD. Users don't need to install any software on their computer, cloud-based 3D robotics simulations run on a web page. They can learn programming by writing Python code to control robot behavior. The performance achieved by users is recorded and displayed online, so that they can challenge their friends and show off their skills at robot programming on social networks. Everything is designed to be extremely easy-to-use, runs on any computer, any web browser, and is totally free of charge.

### Short bio

---

Olivier Michel founded Cyberbotics Ltd, in 1998. The company develops and markets Webots, the leading proprietary robot simulation software. He has an experience of business management: founder of Cyberbotics S.à.r.l. (mobile robot simulation software) in 1998 and Gollian Interactive S.A. in 2001 (toy simulation software) for 20 years. Initially developed at EPFL, Webots is used by thousands of industrial and academic customers worldwide. Cyberbotics also offers Webots consulting for industrial customers (Sony, Stanford Research Institute, Renault Nissan, EDF/Areva/CEA, Perrone Robotics, etc.) and participates in European research projects (FP6: ICEA, FP7: RHEA, H2020: Human Brain Project). His interests are robotics, artificial intelligence, and artificial life. He won Ph.D. in Computer Science: Experiments in Artificial Neuroethology - Robotics, Artificial Neural Networks, Genetic Algorithms. Nice – Sophia Antipolis University, France in 1996.

---

## Along the lines of Artificial Intelligence in the detection and remediation of dangerous UAV's



Professor Eric T. Matson  
Purdue University  
USA

---

### Abstract

The future in the enhancement of cyber-physical system and robotic functionalities lies not only in the mechanical and electronic improvement of the robots' sensors, mobility, stability and kinematics, but also, if not mostly, in their ability to connect to other actors (human, agents, robots, machines, and sensors HARMS). The capability to communicate openly, to coordinate their goals, to optimize the division of labor, to share their intelligence, to be fully aware of the entire situation, and thus to optimize their fully coordinated actions will be necessary. Additionally, the ability for two actors to work together without preference for any specific type of actor, but simply from necessity of capability, is provided by a requirement of indistinguishability, similar to the discernment feature of rough sets. Once all of these actors can effectively communicate, they can take on group rational decision making, such as choosing which action to take that optimizes a group's effectiveness or utility. Given group decision making, optimized capability-based organization can take place to enable human-like organizational behavior. Similar to human organizations, artificial collections with the capability to organize will exhibit emergent normative behavior. In this session, we will show how these models are applied to real world problems in security, first response, defense and agriculture. Specifically, how this model working with a set of cutting edge sensors, robots and other actors can fight terrorism in the form of lethal UAV's.

---

### Short bio

Eric T. Matson, Ph.D., is a Professor in the Department of Computer and Information Technology at Purdue University, West Lafayette. Prof. Matson was an International Faculty Scholar in the Department of Electrical Engineering at Kyung Hee University, Yongin City, Korea, a Visiting Professor with the LISSI, University of Paris et Creteil (Paris 12), Paris, France, Visiting Professor, Department of Computer Science and Engineering, Dongguk University, Seoul, South Korea and in the School of Informatics at Incheon National University in Incheon, South Korea. He is the Director of the Robotic Innovation, Commercialization and Education (RICE) Research Center, Director of the Korean Software Square at Purdue and the co-founder of the M2M Lab at Purdue University, which performs research at the areas of multiagent systems, cooperative robotics and wireless communication. The application areas are focused on safety and security robotics and agricultural robotics and systems. At Purdue, he is a University Faculty Scholar and is a member of the Board on Army Science and Technology (BAST) for the National Academies of Science, Engineering and Medicine (NAS). He is on the editorial board of 4 journals, has 200 publications and managed a number of different conferences.

Prior to his position at Purdue University, Prof. Matson was in industrial and commercial software development as a consultant, software engineer, manager and director for 14 years. In his software development experience, he developed and lead numerous large software engineering projects dealing with intelligent systems, applied artificial intelligence, distributed object technologies, enterprise resource planning and product data management implementations. Prof. Matson has a Ph.D. in Computer Science and Engineering from the University of Cincinnati, M.B.A in Operations Management from Ohio State University and B.S. and M.S.E. degrees in Computer Science from Kansas State University.

## AI in Entertainment



*Moderator*  
Prof. Changdong Yoo  
KAIST



*Panelist*  
Dr. Olivier Michel,  
CEO of Cyberbotics  
Switzerland



*Panelist*  
Professor Eric T. Matson  
Purdue University  
USA



*Panelist*  
Prof. Sanem Sariel  
Istanbul Technical University  
Turkey



*Panelist*  
Prof. Tzuu Hseng S. Li  
National Cheng Kung Univ.  
Taiwan



*Panelist*  
Dr. Inhyok Cha  
SK Telecom  
Korea

# Venue Locations on KAIST Campus

## KAIST CAMPUS MAP

