

# 19<sup>TH</sup> INTERNATIONAL CONFERENCE ON WEB ENGINEERING **ICWE 2019**

**JUNE 11 - 14, 2019**

**DAEJEON CONVENTION CENTER (DCC),  
DAEJEON, KOREA**



HOSTED BY


**KAIST** School of  
Computing

SUPPORTED BY

**KAIST** 한국정보과학회  
Korean Institute of  
Information Sciences and Engineers

**KO-IST** KOREA  
TOURISM  
ORGANIZATION

**DIME** Daejeon International  
Marketing Enterprise

 **Springer**

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## Welcome Message

Dear Participants,

Welcome to the 19th International Conference on Web Engineering (ICWE 2019), which is held at Daejeon Convention Center (DCC), Daejeon, South Korea, 11<sup>th</sup>-14<sup>th</sup> June, 2019. The conference is hosted by School of Computing, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea.

The city of Daejeon is a leading hub in the field of R&D and higher education in Northeast Asia. Daedeok Innopolis in Daejeon is a unique science cluster including over 70 world-class research institutes and universities with more than 20,000 researchers including KAIST. With regard to this infrastructure, Daejeon is known as the Silicon Valley of Asia. Daejeon is geographically located at the heart of South Korea and functions as a transportation hub. Daejeon also offers a wide range of possibilities to the travellers: hot springs, temples, cultural heritage sites, shopping areas and nightlife.

This year, the conference covers nine research themes, namely, Web Mining and Knowledge Extraction, Web Big Data and Web Data Analytics, Social Web Applications and Crowdsourcing, Web User Interfaces, Web Security and Privacy, Web Programming, Web Services and Computing, Semantic Web and Linked Open Data applications, and Web Application Modelling and Engineering.

We would like to firstly thank our distinguished keynote speakers, tutorial speakers, workshop organizers, and paper authors for their contributions to ICWE 2019. We would also like to thank our organizing committee and program committee for their hard work on organizing the conference and making a wonderful program. Finally, we would like to express our gratitude to all the sponsors supporting ICWE 2019.

We hope all ICWE 2019 participants will enjoy the conference, Daejeon and Korea.

**In-Young Ko**  
**ICWE 2019 General Chair**



## ICWE 2019 Conference Organization

### ICWE Steering Committee Liaisons

Prof. Florian Daniel (Politecnico di Milano, Italy)

Prof. Martin Gaedke (Chemnitz University of Technology, Germany)

### General Chair

Prof. In-Young Ko (Korea Advanced Institute of Science and Technology, South Korea)

### PC Co-Chair

Prof. Maxim Bakaev (Novosibirsk State Technical University, Russia)

Prof. Flavius Frasincar (Erasmus University Rotterdam, the Netherlands)

### Local Co-Chair

Prof. Soo-Kyung Kim (Hanbat National University, South Korea)

Prof. Young-Woo Kwon (Kyungpook National University, South Korea)

Prof. Seongwook Youn (Korea National University of Transportation, South Korea)

### Workshop Co-Chair

Prof. Marco Brambilla (Politecnico di Milano, Italy)

Prof. Cinzia Cappiello (Politecnico di Milano, Italy)

Prof. Siew Hock Ow (University of Malaya, Malaysia)

### Tutorial Co-Chair

Prof. Alessandro Bozzon (Delft University of Technology, the Netherlands)

Prof. Tommaso Di Noia (Polytechnic University of Bari, Italy)

Prof. Jie Zhang (Nanyang Technological University, Singapore)

### Demo and Poster Co-Chair

Prof. Oscar Diaz (University of the Basque Country, Spain)

Prof. Irene Garrigos (University of Alicante, Spain)

Prof. Angel Jimenez-Molina (University of Chile, Chile)

### PhD Symposium Co-Chair

Prof. Cesare Pautasso (University of Lugano, Switzerland)

Prof. Abhishek Srivastava (Indian Institute of Technology Indore, India)

Prof. Marco Winckler (Université Nice Sophia Antipolis, France)

### Publicity Co-Chair

Prof. Haklae Kim (Chung-Ang University, South Korea)

Prof. Kecheng Liu (University of Reading, United Kingdom)

Prof. Tomoya Noro (Fujitsu Laboratories, Japan)

Prof. Alice Oh (Korea Advanced Institute of Science and Technology, South Korea)



## Conference Information

### Secretariat Office

- ▶ Location : Room #105, 1F, DCC
- ▶ Operation Hours : Tuesday, June 11<sup>th</sup> - Thursday, June 13<sup>th</sup>, 09:00-18:00  
Friday, June 14<sup>th</sup>, 09:00-15:00

### Registration Desk

- ▶ Location : Lobby, 1F, DCC
- ▶ Operation Hours : Tuesday, June 11<sup>th</sup> - Thursday, June 13<sup>th</sup>, 09:00-18:00  
Friday, June 14<sup>th</sup>, 09:00-12:00

### Cloak Room

- ▶ Location : Lobby, 1F, DCC (\*Next to the registration desk)
- ▶ Operation Hours : Tuesday, June 11<sup>th</sup> - Thursday, June 13<sup>th</sup>, 09:00-18:00  
Friday, June 14<sup>th</sup>, 09:00-12:00

\*You can keep your luggages at the registration desk.

### Lunch

- ▶ Location : Room #107+108, 1F, DCC
- ▶ Operation Hours : Tuesday, June 11<sup>th</sup> - Thursday, June 13<sup>th</sup>, 12:30-14:00  
Friday, June 14<sup>th</sup>, 12:45-14:15

### Welcome Reception

- ▶ Location : SKY Lounge, 5F, KAIST Academic Cultural Complex (Library) (E9)
  - ▶ Date & Time : Wednesday, June 12<sup>th</sup>, 17:15-20:00 (including Campus Tour)
- \*The shuttle bus will depart at 17:15 from the DCC main entrance.

### Gala Dinner

- ▶ Location: Ssangcheong-Dang
  - ▶ Date & Time: Thursday, June 13<sup>th</sup>, 17:45-21:00
- \*The shuttle bus will depart at 17:45 from the DCC main entrance.

### Wi-Fi

Free Wi-Fi is available for ICWE 2019 participants.

### Emergency Contact

ICWE 2019 Secretariat

Ms. Sophia Lim +82-10-4445-6213

Ms. A-Young Kim +82-10-8851-8266

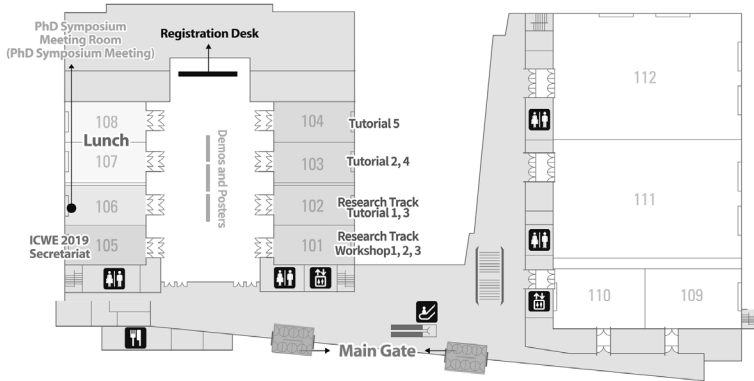
Office +82-42-472-7461



## Floor Plan



### DCC 1F



### DCC 3F





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# Keynote Speakers

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## Keynote Speakers

### Keynote 1



**Prof. Bing Liu**

*University of Illinois at Chicago, USA*

**Title :** Lifelong Learning for Sentiment Analysis

**Date :** Wednesday, June 12<sup>th</sup>, 2019

**Time :** 09:00-10:30

**Place :** Room #301, 3F

**Session Chair :** Prof. Flavius Frasincar

(Erasmus University Rotterdam, the Netherlands)

#### Biography

Bing Liu is a distinguished professor of Computer Science at the University of Illinois at Chicago (UIC). He received his Ph.D. in Artificial Intelligence (AI) from the University of Edinburgh. Before joining UIC, he was a faculty member at the School of Computing, National University of Singapore (NUS). His research interests include sentiment analysis, lifelong learning, natural language processing (NLP), data mining, machine learning, and AI. He has published extensively in top conferences and journals. Two of his papers have received Test-of-Time awards from SIGKDD (ACM Special Interest Group on Knowledge Discovery and Data Mining). He is also a recipient of ACM SIGKDD Innovation Award (the most prestigious technical award from SIGKDD). He has also authored four books: two on sentiment analysis, one on lifelong learning, and one on Web mining. Some of his work has been widely reported in the international press, including a front-page article in the New York Times. On professional services, he served as the Chair of ACM SIGKDD from 2013-2017, as program chair of many leading data mining conferences, including KDD, ICDM, CIKM, WSDM, SDM, and PAKDD, as associate editor of leading journals such as TKDE, TWEB, DMKD and TKDD, and as area chair or senior PC member of numerous NLP, AI, Web, and data mining conferences. He is a Fellow of the ACM, AAAI, and IEEE.

#### Abstract

The classic machine learning (ML) paradigm works in isolation and makes the closed-world assumption. Given a dataset, a ML algorithm is executed on the data to produce a model. The algorithm does not consider any other information in model training and the trained model cannot handle any unexpected situations in testing or applications. Although this paradigm has been very successful, it requires a large amount of training data, and is only suitable for well-defined, static and narrow domains. In contrast, we humans learn quite differently. We always learn with the help of our prior knowledge. We learn continuously, accumulate the knowledge learned in the past, and use it to help future learning and problem solving. When faced with an unfamiliar situation in an open environment, we adapt our knowledge to deal with the situation and learn from it. Lifelong learning aims to achieve this capability. In this talk, I will give an introduction to lifelong learning and discuss some of its applications in sentiment analysis and beyond.

## Keynote 2



### Prof. Sunhun Kim

*NAVER Corp., South Korea*

*Hong Kong University of Science and Technology, Hong Kong*

**Title :** Managing Deep Learning Debt @Naver/Line

**Date :** Thursday, June 13<sup>th</sup>, 2019

**Time :** 09:00-10:30

**Place :** Room #301, 3F

**Session Chair :** Prof. In-Young Ko (Korea Advanced Institute of Science and Technology, South Korea)

### Biography

Sunhun Kim is an Associate Professor of Computer Science at the Hong Kong University of Science and Technology, and currently leading the Naver Clova AI team. He got his BS in Electrical Engineering at Daegu University, Korea in 1996. He completed his Ph.D. in the Computer Science Department at the University of California, Santa Cruz in 2006. He was a postdoctoral associate at Massachusetts Institute of Technology and a member of the Program Analysis Group. He was a Chief Technical Officer (CTO), and led a 25-person team at the Nara Vision Co. Ltd, a leading Internet software company in Korea for six years. His core research area is Software Engineering, focusing on software evolution, program analysis, and empirical studies. He publishes his work on top venues such as TSE, ICSE, FSE, AAAI, SOSOP, and ISSTA. He received the Most Influential Paper Award at ICSME2018 (from his ICSME 2008 paper). He is a four-time winner of the ACM SIGSOFT Distinguished Paper Award (ICSE 2007, ASE 2012, ICSE 2013 and ISSTA 2014). He served on a variety of program committees including ICSE, FSE, and ASE. He was a program co-chair of MSR 2013 and 2014. He is the general chair of MSR 2020. He is an associate editor of IEEE Transactions on Software Engineering and Empirical Software Engineering. His online deep learning course, <https://www.youtube.com/user/hunkims> has more than 4M views and 30K subscribers. Further information is available at <http://www.cse.ust.hk/~hunkim>

### Abstract

Deep learning has shown amazing results in both academic and industry, yielding many practical services and products such as machine translation, personal assistant, image retrieval, video recommendation and photo enhancement. However, in industry, it is common to observe legacy products with deep learning debt – the tremendous cost in converting traditional machine learning systems to deep learning. In order to utilize deep learning and boost the performance of existing products, it is necessary to examine our systems and repay any deep learning dept. This talk will describe my experience at Naver/LINE on managing deep learning dept, including challenges and their potential solutions.



## Keynote 3



**Prof. Antti Oulasvirta**  
*Aalto University, Finland*

**Title :** Artificial Intelligence and the User Interface

**Date :** Friday, June 14<sup>th</sup>, 2019

**Time :** 09:00-10:30

**Place :** Room #301, 3F

**Session Chair :** Prof. Maxim Bakaev  
(Novosibirsk State Technical University, Russia)

### Biography

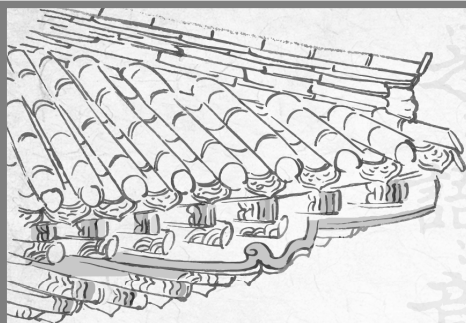
Antti Oulasvirta leads the User Interfaces research group at Aalto University. He was previously a Senior Researcher at the Max Planck Institute for Informatics and the Cluster of Excellence on Multimodal Computing and Interaction at Saarland university. He received his doctorate in Cognitive Science from the University of Helsinki in 2006, after which he was a Fulbright Scholar at the School of Information in University of California-Berkeley in 2007- 2008 and a Senior Researcher at Helsinki Institute for Information Technology HIIT in 2008 - 2011. He was awarded the ERC Starting Grant (2015-2020) for research on computational design of user interfaces. His work has been awarded the Best Paper Award and Best Paper Honorable Mention at CHI twelve times between 2008 and 2018. He has held keynote talks on computational user interface design at NordiCHI'14, CoDIT'14, EICS'16, and IHCI'17.

### Abstract

This talk describes on-going work towards intelligent user interfaces that better understand users and can better adapt to them. I discuss a type of machine intelligence where causal, predictive models of human-computer interaction are used with probabilistic inference and optimization. Several examples are presented from graphical user interfaces to the web.

**Keywords:** Intelligent user interfaces · Machine intelligence · Computational modelling · Probabilistic inference · Combinatorial optimization.





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# Tutorials

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# Tutorials

## Tutorial 1

### Powerful Data Analysis and Composition with the UNIX Shell

by Andreas Schmidt and Steffen Scholz (Karlsruhe Institute of Technology, Germany)

■ **Date & Time** : Tuesday, June 11<sup>th</sup>, 09:00-10:30

■ **Place** : Room #102, 1F

#### Short Bios



**Prof. Dr. Andreas Schmidt** is a professor at the Department of Computer Science and Business Information Systems of the Karlsruhe University of Applied Sciences (Germany). He is lecturing in the fields of database information systems, data analytics and model-driven software development. Additionally, he is a senior research fellow in computer science at the Institute for Applied Computer Science of the Karlsruhe Institute of Technology (KIT).

His research focuses on database technology, knowledge extraction from unstructured data/text, Big Data, and generative programming. Andreas Schmidt was awarded his diploma in computer science by the University of Karlsruhe in 1995 and his PhD in mechanical engineering in 2000. Dr. Schmidt has numerous publications in the field of database technology and information extraction. He regularly gives tutorials on international conferences in the field of Big Data related topics and model driven software development. Prof. Schmidt followed sabbatical invitations from renowned institutions like the Systems-Group at ETH-Zurich in Switzerland and the Database Group at the Max-Planck-Institute for Informatics in Saarbrücken/Germany.



**Dipl.-Ing Dr. Steffen G. Scholz** has more than 15 years of R&D experience in the field of polymer micro & nano replication with a special focus on injection moulding and relevant tool-making technologies. He is an expert in process optimization and algorithm design and development for micro replication processes. He studied mechanical engineering with special focus on plastic processing and micro injection moulding and obtained his degree as from the University of Aachen (RWTH). He obtained his PhD from Cardiff University in the field of process monitoring and optimization in micro injection moulding and led a team in micro tool making and micro replication at Cardiff University. Dr. Scholz joined KIT in 2012, where he is now leading the group for process optimization, information management and applications (PIA).

## Brief Description

For data analysis and knowledge discovery, typically we load the data into a dedicated tool, like a relational database, the statistic program R, mathematica, or some other specialized tools to perform our analysis.

But often, there is also another option, which can be performed on nearly every computer, having the necessary amount of mass-storage available. Many shells, like bash, csh, ... provide a bunch of powerful tools to manipulate and transform data and also to perform some sort of analysis like aggregation, etc. Beside the free availability, these tools have the advantage that they can be used immediately, without transforming and loading the data into the target system before. Another important point is, that they typically are stream based and so, huge amounts of data can be processed, without running out of main-memory. With the additional use of gnuplot, ambitious graphic plots can easily be generated.

The aim of this tutorial is to present the most useful tools like cat, grep, tr, sed, awk, comm, uniq, join, split, bzip2, wget, etc., and give an introduction on how they can be used together. So, for example, a wide number of queries which typically will be formulated with SQL, can also be performed using the tools mentioned before, as it will be shown in the tutorial. Also, selective data extraction from different webpages and the recombination of this information (mashups) can easily be performed.

The tutorial will also include hands-on parts, in which the participants do a number of practical data-analysis, transformation and visualization tasks.



## Tutorial 2

### Deep Learning-Based Sequential Recommender Systems: Concepts, Algorithms, and Evaluations

by Hui Fang (Shanghai University of Finance and Economics, China),  
Guibing Guo (Northeastern University, China),  
Danning Zhang (Shanghai University of Finance and Economics, China),  
and Yiheng Shu (Northeastern University, China)

■ **Date & Time** : Tuesday, June 11<sup>th</sup>, 09:00-10:30

■ **Place** : Room #103, 1F

#### Short Bios



**Dr. Hui Fang** is an Assistant Professor in Research Institute for Interdisciplinary Sciences. She received her Ph.D. from the School of Computer Engineering, Nanyang Technological University, Singapore. Her main research interests include trust prediction in online communities, personalized product/social recommendation, link prediction and data-driven decision making. Her research has been published in top conferences like IJCAI, AAA and AAMAS.

Presently she is the Associate Editor of the ECRA journal, and invited referees of other journals like TKDE, Cybernetics, and DSS. She also serves as a Program Committee Member for international conferences, including UMAP and IJCAI, etc.



**Dr. Guibing Guo** is an Associate Professor in the Software College, Northeastern University, Shenyang, China. He received a Ph.D degree in computer science at Nanyang Technological University, and did a post-doc at Singapore Management University. His research interests include recommender systems, deep learning, social network analysis and data mining. The main research focus is to resolve the challenges of recommender

systems, including data sparsity, cold start, diversity and so on. He is the original author (and now the team leader) of the open-source library for recommender systems, LibRec, which implements a large number (over 90) of recommender algorithms.



**Yiheng Shu** is an undergraduate student of Software College, Northeastern University, Shenyang, China. His research interests are recommender system and deep learning.



**Danning Zhang** is an undergraduate at Shanghai University of Finance and Economics, China. Her research interests are recommender system and deep learning.

### Brief Description

**Deep Learning-based Sequential Recommender Systems: Concepts, Algorithms, and Evaluations**

With the development of e-commerce and deep learning technique, deep learning based sequential recommendation has become a hot topic in recommender system field. In this tutorial, we will (1)give a comprehensive overview of sequential recommender systems based on DL techniques. (2)show an original classification framework for sequential recommendation, corresponding to three different recommendation scenarios, and then introduce the representative algorithms under each scenario. (3)summarize the influential factors for typical DL-based sequential recommendation and demonstrate their effects by empirical studies, which can serve as a guidance for sequential recommendation research and practices. (4)summarize challenges of sequential recommender system, and future research directions.



## Tutorial 3

### Non-Monotonic Reasoning on the Web

by Matteo Cristani (University of Verona, Italy)

■ **Date & Time** : Tuesday, June 11<sup>th</sup>, 14:00-17:30

■ **Place** : Room #102, 1F

#### Short Bios



**Matteo Cristani** is Senior Researcher in the Department of Computer Science of the University of Verona. His expertise is the semantic web, and in particular, web applications with natural language processing and nonmonotonic reasoning. He has got numerous journal and conference papers in the mentioned communities. He has been the co-organised of the KDWeb (Knowledge Discovery on the WEB) workshop since 2017. The workshop has been a ICWE workshop in 2018.

#### Brief Description

The development of the communities of Semantic Web and Web Engineering have been interlacing frequently in the past twenty years. Many interesting approaches to practical issues of web engineering involving reasoning techniques have been successful, as happened, for instance, in the linked data recent investigations. A specific attention has also been posed on the basic issues of porting the web onto the semantic era as related to the development of XML-embedded languages, in particular OWL, as recently approached in many different applicative contexts.

Another community of research has deeply investigated the domain of web as related to reasoning, in a much more general way, and it is generally recognized as the reasoning web community. In this specific case, many studies have been dealing with problems related to change of knowledge, trustability and preference. In many senses, a unifying semantics of the borders among the three communities (OWL-related studies, semantic web engineering, reasoning with web data) can be given by rule-based reasoning systems also known as nonmonotonic reasoning.

Although the basic knowledge on the above mentioned issues is common in practitioners and researchers of the various areas of web engineering, it is also true that a significant number of scholars and professionals, especially in the early stage of their careers can have a valuable advantage from a neater and wider survey on the nonmonotonic methods as applied to the web.

## Tutorial 4

### Architectural Styles for the Development of WoT Applications

by Javier Berrocal, Jose García-Alonso and Juan Manuel Murillo Rodríguez  
(University of Extremadura, Spain)

■ **Date & Time** : Tuesday, June 11<sup>th</sup>, 14:00-17:30

■ **Place** : Room #103, 1F

#### Short Bios



**Javier Berrocal** is an associate professor in the Department of Informatics and Telematics System Engineering at the University of Extremadura (Spain) and co-founder of the company Gloin. He received a PhD degree (with European Mention) in 2014. His main research interests are Mobile Computing, Context-Awareness, Pervasive Systems, Internet of Things and Web of Things.



**José García-Alonso** is an associate professor in the Department of Informatics and Telematics System Engineering at the University of Extremadura (Spain) and co-founder of the Startups Gloin and Viable. He received a PhD degree (with European Mention) in 2014. His main research interests are eHealthCare, eldercare, Mobile Computing, Context-Awareness and Pervasive Systems.



**Juan Manuel Murillo** is a full professor of software engineering at the University of Extremadura and co-founder of the Startups Gloin and Viable. His research interests include software architectures, mobile computing, cloud computing, Context-Awareness, eHealthCare and eldercare.

#### Brief Description

The massive adoption of smart devices has fostered the development of Web of Things (WoT) applications. Due to the limited capabilities of these devices (some of them are battery powered, or the data exchange is limited), these applications have very stringent requirements. The success or failure of these applications largely depends on how they address these requirements, being the resource consumption a crucial one. With different architectural styles we can obtain a similar behaviour, but the selected style directly impacts on the resource consumption.



## Tutorial 5

### Exploiting Side Information for Recommendation

by Qing Guo, Zhu Sun and Yin Leng Theng (Nanyang Technological University, Singapore)

■ **Date & Time** : Tuesday, June 11<sup>th</sup>, 14:00-15:30

■ **Place** : Room #104, 1F

#### Short Bios



**Qing Guo** is a Ph.D. candidate in Wee Kim Wee School of Communication and Information at Nanyang Technological University. He focuses on Point-of-Interest (POI) recommendation by exploiting the heterogeneous information in location-based social networks. He obtained his M.Sc. in The University of Hong Kong in 2014 and B.E. from University of Electronic Science and Technology of China in 2013. While doing Ph.D. study, he was also a research associate in SAP Innovation Center network from 2015 to 2018, where he participated in machine learning products development in SAP products. Now, he is a data scientist in Shopee Singapore and continue to work on recommendation research and applications.



**Zhu Sun** obtained her Ph.D. Degree from School of Computer Science and Engineering, Nanyang Technological University, Singapore, in 2018. During Ph.D. study, she focused on design efficient recommendation algorithms to improve the performance of recommender systems. Her research has been published in leading conferences and journals in related domains (e.g., ACM UMAP, ACM RecSys, IJCAI, AAI, CIKM). Zhu Sun is active in serving research communities. She is the co-chair for the international workshop on Recommender Systems for Citizens (CitRec) at ACM RecSys 2017, and local arrangement chair of ACM UMAP 2018. She has also been actively participating in industrial projects related to the research. Currently, she is a data scientist in Shopee Singapore with recommendation group.

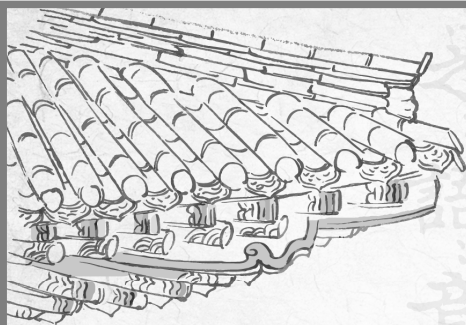


**Yin-Leng Theng** is Professor and Director of the Centre of Healthy and Sustainable Cities (CHESS) at Wee Kim Wee School of Communication and Information, and Research Director at the Research Strategy and Coordination Unit (President's Office) at Nanyang Technological University. Her research interests are mainly in user-centred design, interaction design and usability engineering. She has participated in varying capacities as principal investigator, co-investigator and collaborator in numerous research projects in the United Kingdom and Singapore since 1998.

## Brief Description

Recommender systems are indispensable tools to help tackle with the information overload problem. However, with merely relying on user-item interaction data, traditional recommender systems inherently suffer from the data sparsity and cold start issues. To address such issues, a number of recommendation algorithms have been designed by leveraging the valuable side information of users, items and their interactions to compensate for the insufficiency of rating information.

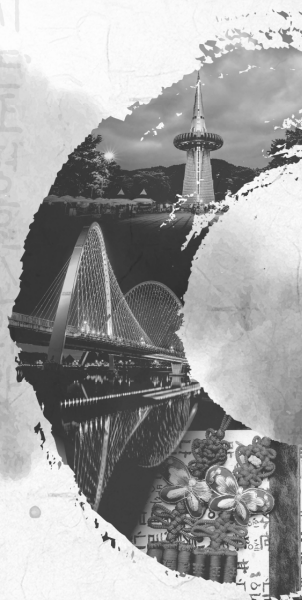
In this tutorial, we would provide a comprehensive analysis of state-of-the-art recommendation approaches with side information in a principle way from two perspectives: representation and methodology. By the end of this tutorial, the audiences would know how the recommendation approaches evolve with more complicated representations and methodologies for using various kinds of side information.



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# Workshops

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## Workshops



### Workshop 1

#### 5th International Workshop on Knowledge Discovery on the Web (KDWEB 2019)

- **Date & Time** : Tuesday, June 11<sup>th</sup>, 09:00-10:30
- **Place** : Room #101, 1F
- **Website**: <http://www.iascgroup.it/kdweb2019.html>

Knowledge Discovery is an interdisciplinary area focusing upon methodologies for identifying valid, novel, potentially useful and meaningful patterns from such data, and currently is widespread in numerous fields, including science, engineering, healthcare, business, and medicine. Recently, the rapid growth of social networks and online services entailed that Knowledge Discovery approaches focused on the World Wide Web (WWW), whose popular use as global information system led to a huge amount of digital data. KDWeb 2019 is focused on the field of Knowledge Discovery from digital data, with particular attention for Data Mining, Machine Learning, and Information Retrieval methods, systems, and applications.

KDWeb 2019 is aimed at providing a venue to researchers, scientists, students, and practitioners involved in the fields of Knowledge Discovery on Data Mining, Information Retrieval, and Semantic Web, for presenting and discussing novel and emerging ideas. KDWeb 2019 will contribute to discuss and compare suitable novel solutions based on intelligent techniques and applied in real-world applications.

#### Organizers

Giuliano Armano (University of Cagliari, Italy), Matteo Cristani (University of Verona, Italy)

## Workshop 2

### 2nd International Workshop on Maturity of Web Engineering Practices (MATWEP 2019)

- **Date & Time** : Tuesday, June 11<sup>th</sup>, 11:00-12:30
- **Place** : Room #101, 1F
- **Website** : <http://iwt2.org/matwep2019/>

MATWEP 2019 aims to be an interactive event where we invite submissions from academia and industry about experiences using techniques, methods, approaches that have specifically defined or adapted for the development of Web applications. The focus is as well on student activities as the use of Web engineering approaches in industrial or research projects. The main goal of this workshop is to offer a forum to exchange experiences and ideas related to maturity level of Web Engineering approaches in practice. Topics of interest include among others model-driven web engineering, agile development and user interface design of web applications. The workshop should provide examples how to provide bridges from the theory to the practice, showing problems in knowledge transfer as well as lessons learned. It should provide important feedback for improving Web engineering techniques, methods and approaches.

#### ■ Organizers

José González Enríquez (University of Seville), Francisco José Domínguez Mayo (University of Seville), Nora Koch (IWT2 Research group), Esteban Morillo Baro (Servinform, S.A.)



## Workshop 3

### International Workshop on Data Science and Knowledge Graph (DSKG 2019)

- **Date & Time** : Tuesday, June 11<sup>th</sup>, 14:00-17:30
- **Place** : Room #101, 1F
- **Website** : <https://datasciencekorea.github.io/>

A knowledge graph is large networks of entities, their semantic types, properties, and relationships between entities. It ultimately facilitates the creation of information necessary for machines to understand the world in the manner that humans do. Companies that aim to serve intelligent services such as Google, Microsoft, or IBM are applying the knowledge graph widely to its real-world services.

Obtaining a primary data source is critical to construct a knowledge graph, since building a new knowledge from scratch is not trivial. As we have already experienced, Wikipedia as open data has been widely used for constructing new knowledge across a variety of domains. Recently, significant amounts of data are published as open data in research, commercial and governments. These data can be a starting point for constructing a domain-specific knowledge graph through the interlinking of heterogeneous data.

This workshop aims to share and discuss about knowledge graph techniques based on open data both academia and industries. In particular, this workshop focuses on various use cases including data wrangling, data analysis, data visualization in the prospect of Data Science, and technical challenges to construct structured knowledge from large-scale raw data (focused on open data).

#### ■ Organizers

Haklae Kim (Chungang University, South Korea), Jangwon Gim (Kunsan National University, South Korea), Yuchul Jung (Kumoh National Institute of Technology, South Korea), Dongjun Suh (Kyungpook National University, South Korea), Minjung Lee (Sejong Cyber University, South Korea), Jiseong Son (Korea Institute of Science and Technology Information, South Korea)



# Daily Schedule







## Daily Schedule



### Day 1 (Tuesday, June 11<sup>th</sup>, 2019)

**Room #101 / 09:00-10:30**

#### Workshop 1 - KDWEB 2019

- ▶ **Context-Dependent Token-Wise Variational Autoencoder for Topic Modeling**  
Tomonari Masada
- ▶ **Extraction of Relations between Entities from Human-Generated Content on Social Networks**  
Marco Adriani, Marco Brambilla and Marco Di Giovanni
- ▶ **Social Networks as Communication Channels: A Logical Approach**  
Matteo Cristani, Francesco Olivieri and Katia Santacà
- ▶ **Dataset Anonymization on Cloud: Open Problems and Perspectives**  
Matteo Cristani and Claudio Tomazzoli

**Room #102 / 09:00-12:30**

#### Tutorial 1 - Powerful Data Analysis and Composition with the UNIX Shell

**Room #103 / 09:00-12:30**

#### Tutorial 2 - Deep Learning-Based Sequential Recommender Systems: Concepts, Algorithms, and Evaluations

**Room #101 / 11:00-12:30**

#### Workshop 2 - MATWEP 2019

- ▶ **Scenario Testing of AngularJS-Based Single Page Web Applications**  
Gefei Zhang and Jianjun Zhao
- ▶ **Environment-Aware and Human-Centric Software Testing Framework for Cyber-Physical Systems**  
In-Young Ko, Kyeongdeok Baek, Jung-Hyun Kwon, Hernan Lira and Hyeongcehol Moon

**Room #101 / 14:00-17:30****Workshop 3 - DSKG 2019**

- ▶ **A Design of Building Inventory for Risk Analysis Using Open Data**  
Su-Seong Chai and Dongjun Suh
- ▶ **An Automatic Keyphrase Extraction and Refinement for Scientific Articles**  
Yeonsoo Lim, Daehyeon Bong and Yuchul Jung
- ▶ **A Study on the Characteristics of the Long-Term Web Forum Users Using Social Network Analysis**  
Min Jung Lee and Jiyoung Woo
- ▶ **Quality Assessment of Public Data: Focusing on Open Standard Data**  
Jiseong Son
- ▶ **Technical Invention Trend Analysis of Applicants based on CPC Classification**  
Jiyee Jeon, Soohyeon Chae and Jangwon Gim
- ▶ **Knowledge Exploration from Tables on the Web**  
Brahmananda Sapkota and Haklae Kim

**Room #102 / 14:00-17:30****Tutorial 3 - Non-monotonic Reasoning on the Web****Room #103 / 14:00-17:30****Tutorial 4 - Architectural Styles for the Development of WoT Applications****Room #104 / 14:00-15:30****Tutorial 5 - Exploiting Side Information for Recommendation****Social Event – Daejeon Night Tour**

- Time : 18:00-21:00
- Place : Daejeon Jungang Market, Euneungjeongi Culture Street
- The shuttle bus will depart at 18:00 from the DCC main entrance.



## Day 2 (Wednesday, June 12<sup>th</sup>, 2019)

### Opening Session (Ceremony)

- Time : 08:50-09:00
- Place : Room #301, 3F

### Room #101 / 11:00-12:30

#### Web Mining and Knowledge Extraction 1

Chair: Prof. Matteo Cristani (Univ. of Verona, Italy)

- |                                       |  |
|---------------------------------------|--|
| <b>11:00 – 11:30</b><br>[Full Paper]  | <b>Web Page Structured Content Detection Using Supervised Machine Learning</b><br>Roberto Panerai Velloso and Carina Dorneles                                      |
| <b>11:30 – 12:00</b><br>[Full Paper]  | <b>Augmenting LOD-Based Recommender Systems Using Graph Centrality Measures</b><br>Bart van Rossum and Flavius Frasinca  |
| <b>12:00 – 12:15</b><br>[Short Paper] | <b>Incremental PARAFAC Decomposition for Three-Dimensional Tensors Using Apache Spark</b><br>Hyekyung Yang and Hwan-Seung Yong                                     |
| <b>12:15 – 12:30</b><br>[Short Paper] | <b>Modeling Heterogeneous Influences for Point-of-Interest Recommendation in Location-Based Social Networks</b><br>Qing Guo, Zhu Sun, Jie Zhang and Yin Leng Theng |

### Room #102 / 11:00-12:30

#### Social Web Applications and Crowdsourcing

Chair: Prof. Paolo Missier (Newcastle Univ., UK)

- |                                       |  |
|---------------------------------------|--|
| <b>11:00 – 11:30</b><br>[Full Paper]  | <b>Crowdsourced Time-Sync Video Recommendation via Semantic-Aware Neural Collaborative Filtering</b><br>Zhanpeng Wu, Yan Zhou, Di Wu, Yipeng Zhou and Jing Qin |
| <b>11:30 – 12:00</b><br>[Full Paper]  | <b>On Twitter Bots Behaving Badly: Empirical Study of Code Repositories on GitHub</b><br>Andrea Millimaggi and Florian Daniel                                  |
| <b>12:00 – 12:15</b><br>[Short Paper] | <b>CrowdDIY: How to Design and Adapt Collaborative Crowdsourcing Workflows under Budget Constraints</b><br>Rong Chen, Bo Li, Hu Xing and Yijing Wang           |
| <b>12:15 – 12:30</b><br>[Short Paper] | <b>Finding Baby Mothers on Twitter</b><br>Yihong Zhang, Adam Jatowt and Yukiko Kawai   |

**Room #101 / 14:00-15:15****Web Mining and Knowledge Extraction 2**

Chair: Prof. Rong Chen (Dalian Maritime Univ., China)

- 14:00 – 14:30**  
[Full Paper] **ST-Sem: A Multi-Modal Method for Points-of-Interest Classification Using Street-Level Imagery**  
Shahin Sharifi Noorian, Achilleas Psyllidis and Alessandro Bozzon
- 14:30 – 15:00**  
[Full Paper] **Time and Location Recommendation for Crime Prevention**  
Yihong Zhang, Panote Siriaraya, Yukiko Kawai and Adam Jatowt
- 15:00 – 15:15**  
[Short Paper] **Exploring Semantic Change of Chinese Word Using Crawled Web Data**  
Yihong Zhang, Panote Siriaraya, Yukiko Kawai and Adam Jatowt

**Room #102 / 14:00-15:15****Web User Interfaces**

Chair: Prof. Andreas Schmidt (Karlsruhe Institute of Technology, Germany)

- 14:00 – 14:30**  
[Full Paper] **An End-User Pipeline for Scrapping and Visualizing Semi-Structured Data over the Web**  
Gabriela Bosetti, Sergio Firmenich, Marco Winckler, Gustavo Rossi, Ulises Cornejo Fandos and Elöd Egyed-Zsigmond
- 14:30 – 15:00**  
[Full Paper] **DotCHA: A 3D Text-Based Scatter-Type CAPTCHA**  
Suzi Kim and Sunghee Choi
- 15:00 – 15:15**  
[Short Paper] **Entropy and Compression Based Analysis of Web User Interfaces**  
Egor Boychuk and Maxim Bakaev



## **Demos and Posters (Lobby, 1F) with Coffee Break / 15:15-16:45**

### **Demonstrations**

- ▶ **Webifying Heterogenous Internet of Things Devices**  
Mahda Noura, Sebastian Heil and Martin Gaedke
- ▶ **VR-Powered Scenario-Based Testing for Visual and Acoustic Web of Things Services**  
Kyeongdeok Baek, Hyeongcheol Moon and In-Young Ko

### **Posters**

- ▶ **User's Emotional Experience Analysis of Wizard Form Pattern Using Objective and Subjective Measures**  
Muhammad Zaki Ansaar, Jamil Hussain, Asim Abbas, Musarrat Hussain and Sungyoung Lee
- ▶ **Integration Platform for Metric-Based Analysis of Web User Interfaces**  
Maxim Bakaev, Sebastian Heil, Nikita Perminov and Martin Gaedke
- ▶ **OP Enabling the Interconnection of Smart Devices through Semantic Web Techniques**  
Daniel Flores-Martin, Javier Berrocal, José García-Alonso, Carlos Canal and Juan Manuel Murillo Rodríguez
- ▶ **Personal Information Controller Service (PICS)**  
Marco Winckler, Laurent Goncalves, Olivier Nicolas, Frédérique Biennier, Hind Benfenatki, Thierry Despeyroux, Nourhène Alaya, Alex Deslée, Mbaye Fall Diallo, Isabelle Collin-Lachaud, Gautier Ubersfeld and Christophe Cianchi

## **Social Event – KAIST Campus Tour / Welcome Reception**

- Time : 17:15-20:00
- Place : SKY Lounge, 5F, KAIST Academic Cultural Complex (Library) (E9)
- The shuttle bus will depart at 17:15 from the DCC main entrance.
- Welcome Reception will be started after KAIST Campus Tour around 18:30

## Day 3 (Thursday, June 13<sup>th</sup>, 2019)

### Room #101 / 11:00-12:30

#### Web Security and Privacy

Chair: Prof. Tommi Mikkonen (Univ. of Helsinki, Finland)

- |                                      |  |
|--------------------------------------|--|
| <b>11:00 – 11:30</b><br>[Full Paper] | <b>Domain Classifier: Compromised Machines versus Malicious Registrations</b><br>Sophie Le Page, Guy-Vincent Jourdan, Gregor Bochmann, Iosif-Viorel Onut and Jason Flood |
| <b>11:30 – 12:00</b><br>[Full Paper] | <b>The “Game Hack” Scam</b><br>Emad Badawi, Guy-Vincent Jourdan, Gregor Bochmann, Iosif-Viorel Onut and Jason Flood  |
| <b>12:00 – 12:30</b><br>[Full Paper] | <b>Decentralized Service Registry and Discovery in P2P Networks Using Blockchain Technology</b><br>Peter de Lange, Tom Janson and Ralf Klamma                            |

### Room #102 / 11:00-12:30

#### Web Services and Computing

Chair: Prof. José García-Alonso (Univ. of Extremadura, Spain)

- |                                      |   |
|--------------------------------------|---|
| <b>11:00 – 11:30</b><br>[Full Paper] | <b>Linked USDL Extension for Cloud Services Description</b><br>Hajer Nabli, Raoudha Ben Djemaa and Ikram Amous  |
| <b>11:30 – 12:00</b><br>[Full Paper] | <b>An Automatic Data Service Generation Approach for Cross-Origin Datasets</b><br>Yuanming Zhang, Langyou Huang, Jiawei Lu and Gang Xiao                                  |
| <b>12:00 – 12:30</b><br>[Full Paper] | <b>Merging Intelligent API Responses Using a Proportional Representation Approach</b><br>Tomohiro Ohtake, Alex Cummaudo, Mohammed Abdelrazek, Rajesh Vasa and John Grundy |



## Room #101 / 14:00-15:30

### Web Big Data and Web Data Analytics 1

Chair: Prof. Florian Daniel (Politecnico di Milano, Italy)

- 14:00 – 14:30**      **A Customisable Pipeline for Continuously Harvesting Socially-Minded Twitter Users**  
 [Full Paper]      Flavio Primo, Paolo Missier, Alexander Romanovsky, Mickael Figueredo  
 and Nelio Cacho
- 14:30 – 15:00**      **Predicting Graph Operator Output over Multiple Graphs**  
 [Full Paper]      Tasos Bakogiannis, Ioannis Giannakopoulos, Dimitrios Tsoumakos  
 and Nectarios Koziris
- 15:00 – 15:30**      **Streaming Event Detection in Microblogs: Balancing Accuracy and Performance**  
 [Full Paper]      Ozlem Ceren Sahin, Pinar Karagoz and Nesime Tatbul

## Room #106 / 14:00-15:20

### PhD Symposium

Chairs: Prof. Cesare Pautasso (Univ. of Lugano, Switzerland),  
 Prof. Abhishek Srivastava (Indian Institute of Technology Indore, India),  
 Prof. Marco Winckler (Univ. Nice Sophia Antipolis, France)

- 14:00 – 14:20**      **Content- and Context-Related Trust in Open Multi-Agent Systems Using Linked Data**  
 Valentin Siegart
- 14:20 – 14:40**      **Facilitating the Evolutionary Modifications in Distributed Apps via Automated Refactoring**  
 Kijin An
- 14:40 – 15:00**      **Effect-Driven Selection of Web of Things Services in Cyber-Physical Systems Using Reinforcement Learning**  
 Kyeongdeok Baek and In-Young Ko
- 15:00 – 15:20**      **Liquid Web Architectures**  
 Andrea Gallidabino

\* There will be PhD Symposium meeting after PhD Symposium session in Meeting Room (Room #106, 1F)

**Room #101 / 16:00-17:00****Web Big Data and Web Data Analytics 2**

Chair: Prof. Yihong Zhang (Kyoto Univ., Japan)

**16:00 – 16:30**

[Full Paper]

**Supervised Group Embedding for Rumor Detection in Social Media**

Yuwei Liu, Xingming Chen, Yanghui Rao, Haoran Xie, Qing Li, Jun Zhang, Yingchao Zhao and Fu Lee Wang

**16:30 – 17:00**

[Full Paper]

**Fast Incremental PageRank on Dynamic Networks**

Zexing Zhan, Ruimin Hu, Xiyue Gao and Nian Huai

**Room #102 / 16:00-17:15****Web Programming**

Chair: Prof. Guy Jourdan (Univ. of Ottawa, Canada)

**16:00 – 16:30**

[Full Paper]

**Amalgam: Hardware Hacking for Web Developers with Style (Sheets)**

Jorge Garza, Steven Swanson and Devon J. Merrill

**16:30 – 17:00**

[Full Paper]

**Jekyll RDF: Template-Based Linked Data Publication with Minimized Effort and Maximum Scalability**

Natanael Arndt, Sebastian Zänker, Gezim Sejdiu and Sebastian Tramp

**17:00 – 17:15**

[Short Paper]

**On the Web Platform Cornucopia**

Tommi Mikkonen, Cesare Pautasso, Kari Systa and Antero Taivalsaari

**Social Event – Gala Dinner**

- Time : 17:45-21:00
- Place : Ssangcheong-Dang
- The shuttle bus will depart at 17:45 from the DCC main entrance.
- Gala Dinner will be started around 18:30



## Day 4 (Friday, June 14<sup>th</sup>, 2019)

### Room #101 / 11:00-12:30

#### Semantic Web and Linked Open Data Applications

Chair: Prof. Seongwook Youn (Korea Nat'l Univ. of Transportation, South Korea)

**11:00 – 11:30**

[Full Paper]

##### Analyzing the Evolution of Linked Vocabularies

Mohammad Abdel-Qader, Iacopo Vagliano and Ansgar Scherp

**11:30 – 12:00**

[Full Paper]

##### Comparison Matrices of Semantic RESTful API Technologies

Antoine Cheron, Johann Bourcier, Olivier Barais and Antoine Michel

**12:00 – 12:30**

[Full Paper]

##### DRAGON: Decision Tree Learning for Link Discovery

Daniel Obraczka and Axel-Cyrille Ngonga Ngomo

### Room #102 / 11:00-12:30

#### Web Application Modeling and Engineering

Chair: Prof. Marco Winckler (Univ. Nice Sophia Antipolis, France)

**11:00 – 11:15**

[Short Paper]

##### Conversational Data Exploration

Nicola Castaldo, Florian Daniel, Maristella Matera and Vittorio Zaccaria

**11:15 – 11:45**

[Full Paper]

##### Catch & Release: An Approach to Debugging Distributed Full-Stack JavaScript Applications

Yuanming Zhang, Langyou Huang, Jiawei Lu and Gang Xiao

**11:45 – 12:15**

[Full Paper]

##### Multi-Device Adaptation with Liquid Media Queries

Andrea Gallidabino and Cesare Pautasso

**12:15 – 12:30**

[Short Paper]

##### Intelligent Client-Centric Personalisation

Vincent Wade and Rebekah Storan Clarke

### Social Event – Tour to Gyeongbokgung Palace in Seoul

- Time : 14:30-

- Place : Gyeongbokgung Palace, Seoul

- The shuttle bus will depart at 14:30 from the DCC main entrance.

- The bus will stop at Seoul Station after tour and will not come back to Daejeon.

- Visit Gyeongbokgung is not necessary. You can move individually when the bus arrives in Seoul.



# Social Events







## Social Events



### Daejeon Night Tour

- **Date & Time** : Tuesday, June 11th, 18:00-21:00  
(\*The shuttle bus will depart at 18:00 from the DCC main entrance.)
- **Course** : Daejeon Jungang Market, Euneungjeongi Culture Street



**Daejeon Jungang Market** is a large comprehensive market consisting of many smaller markets including the Jungang Comprehensive Market, Jungang Arcade Market, Jayu Wholesale Market, New Jungang Market, and Jungang Wholesale Market. Daejeon Jungang Market is located in downtown Dong-gu and is one of the most famous traditional markets in the city. The market has many different sections (dried seafood street, hardware street, fish street, herbal medicine street, hanbok street, delicacy street, etc.) which stretch all the way from Daejeon Station to the banks of the Daejeoncheon Stream.

**Euneungjeongi Culture Street** in Eunhaeng-dong in downtown Daejeon is the fashion epicenter of Daejeon and is comparable to the famed Myeongdong shopping district in Seoul. Packed with plenty of things to see, eat, and enjoy, the street is bursting with the lively vigor of the street's young shoppers. In addition to landmarks like the Dongbaek branch of the Galleria Department Store, the brisk economy of the area has picked up thanks to the addition of wedding shops and other business. Easily accessible via public transportation, traffic on the street is limited to create a safer environment for visitors to enjoy the thriving street culture.

## KAIST Campus Tour / Welcome Reception

- **Date & Time** : Wednesday, June 12th, 17:15-20:00  
 (\*Shuttle bus will depart at 17:15 from DCC main entrance for Campus Tour)
- **Place** : Sky Lounge, 5F, KAIST Academic Cultural Complex (Library) (E9)
- **Address** : Building # E9, 291, Daehak-ro, Yuseong-gu, Daejeon



Are you ready for the welcome reception to open ICWE 2019 officially? The welcome reception will be in held in the sky lounge of “KAIST Academic Cultural Complex (Library)” which has nice views over the campus of Korea Advanced Institute of Science and Technology, KAIST. It will start at 18:30, and shuttle buses will be arranged from venue. At the sky lounge on the top floor of the building, you can look down on KAIST campus and Gapcheon which is the symbol of Daejeon.

Before we start the reception, there will be a chance to visit Vision Hall. At the hall, you can see the past, present and the future of KAIST at the same place. KAIST vision hall includes foot prints of our university, which has aimed inclusive growth and suggested creative resolutions by challenging the road no one has been. Also, it is illuminating bright future where ‘More beautiful changes than we expected’ KAIST will make under the ‘C3’ spirit, Challenge to solve the dilemmas of mankind, creativity and caring, which includes inclusiveness and respect.



## Gala Dinner

- **Date & Time** : Thursday, June 13th, 17:45-21:00  
(\*The shuttle bus will depart at 17:45 from the DCC main entrance.)
- **Place** : Ssangcheong-Dang
- **Address** : 46-31, Dongbu-ro 33beon-gil, Dong-gu, Daejeon



It will be one of the best experiences while you are staying in Korea during the conference. The dinner will be held at Ssangcheong-Dang where is equipped as very traditional house of Korea.

## Water sports in Gapcheon

- **Date & Time** : Tuesday, June 11th ~ Thursday, June 13th,  
11:00, 12:00, 13:00, and 15:00
- **Place** : Expo Lake park Water sports area
- **Address** : 397, Manyeon-dong, Seo-gu, Daejeon

Distance from Venue →  2 min.  10 min.



Free access is available for anyone to experience water sports in the river. Hanbit Tower and Expo Bridge are a beautiful sight from the river while enjoy water sports.

- ▶ **Fee:** Free of charge
- ▶ **Category:** Boating, lifting, leisure canoe, pedal boat, water bicycle, etc.
- ▶ **Information:** First come first served / For canoe, pedal boat and water bicycle use immediately on reservation required / For boating and lifting
- ▶ **Note:** Clothes may be wet during water sports



\* Please ask to the registration desk if you want to apply for it.



## Tour to Gyeongbokgung Palace in Seoul

■ **Date & Time** : Friday, June 14th

(\*The shuttle bus will depart at 14:30 from the DCC main entrance.)

■ **Place** : Gyeongbokgung Palace, Seoul

■ **Address** : 161, Sajik-ro, Jongno-gu, Seoul, Republic of Korea

On the last day of the conference, there will be tour to Gyeongbokgung Place in Seoul, the capital city. If you are planning to stay in Seoul for few more days, we recommend taking this opportunity to come with us!



It is the largest of the five palaces constructed by the Joseon Dynasty. Joseon lasted for 500 years and laid the foundation for major aspects of Korean culture and identity, including the entrenchment of Confucian ideals and doctrines in Korean society, and the importation and adaptation of Chinese culture.

Seoul is the capital of Korea and is the heart of Korea's culture and education as well as politics and economy. Seoul is home to many historic sites and places of traditional culture. The shopping and entertainment districts also draw a large number of tourists every year. The Hangang River, which runs through the center of the city, is a distinctive landscape of Seoul that offers a myriad of resting areas for citizens.

\*The bus will stop at Seoul Station for final terminal. You can take the subway directly connected to Incheon Int'l Airport and Gimpo Int'l Airport.

## [Appendix]

### Basic Korean

Hangeul (한글), Korea's official alphabet, was first invented by King Sejong during the Joseon Dynasty. Originally called Hunminjeongeum (훈민정음), the language was conceived in 1443, and further promulgated by the King in 1446. At the time of its inception, the language consisted of 17 consonants and 11 vowels however, since then, 3 of the originally established consonants and 1 vowel have fallen into disuse bringing the total number of characters to 24. Syllables are formed by the selective combination of vowels and consonants to create words.

English	Korean	Korean Pronunciation
How are you?	안녕하세요?	Annyeong-haseyo?
Thank you.	감사합니다.	Gamsa-hamnida.
Yes.	예.	Ye.
No.	아니요.	Aniyo.
I am sorry.	미안합니다.	Mian-hamnida.
I enjoyed the meal.	잘 먹었습니다.	Jal mwogeot-sseumnida.
Please give me some more of this.	이것 더 주세요.	Igeot deo juseyo.
Do you take credit cards?	카드로 계산할 수 있습니까?	Kadeuro gyesan halsu isseumnikka?
How much is it?	얼마입니까?	Eolma-imnikka?
It is _____won.	_____원 입니다.	_____won innida.
5,000	오천	O-cheon
10,000	만	Man
15,000	만오천	Man-o-cheon
20,000	이만	I-man
30,000	삼만	Sam-man
Where is the restroom?	화장실이 어디입니까?	Hwajangsil oedi-imnikka?
Goodbye.	안녕히 계세요.	Annyeonghi gyeseyo.
My name is _____.	제 이름은 _____입니다.	Je ileum-eun _____ibnida.



**Please show the following Korean sentences  
if you meet language problems on taxi.**

대전 컨벤션센터로 가주세요.

**Please go to the DCC(Daejeon Convention Center).**

대전 청사 터미널로 가주세요. (공항버스)

**Please go to the Daejeon Government Complex Terminal.  
(For Airport)**

카이스트 학술문화관으로 가주세요

**Please go to KAIST Academic Cultural Complex (Library)  
(Welcome Reception)**

쌍청당으로 가주세요.

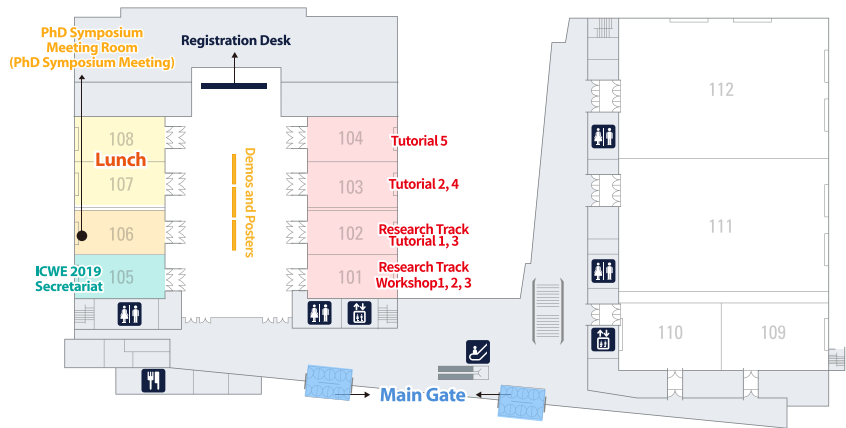
(주소 : 대전 동구 동부로 33 번길 46-31)

**Please go to Ssangcheong-Dang.  
(Gala Dinner)**

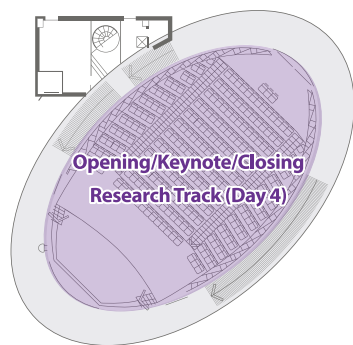


# Floor Plan

DCC 1F



DCC 3F




19<sup>TH</sup> INTERNATIONAL  
CONFERENCE ON WEB ENGINEERING

# ICWE 2019

**JUNE 11 – 14, 2019**

DAEJEON CONVENTION CENTER (DCC),  
DAEJEON, KOREA

 [icwe2019.webengineering.org](http://icwe2019.webengineering.org)

 [icwe2019@icwe2019.org](mailto:icwe2019@icwe2019.org)

**KAIST**

Korea Advanced Institute of Science and  
Technology



**한국정보과학회**

KOREAN INSTITUTE OF  
INFORMATION SCIENTISTS AND ENGINEERS

Korean Institute of Information Scientists  
and Engineers

**KCFST**

Korean Federation of Science &  
Technology Societies



KOREA  
TOURISM  
ORGANIZATION

Korea Tourism Organization

**DIME**

Daejeon International Marketing Enterprise



**Springer**

Springer