IW-FCV2019

25th International **W**orkshop on **F**rontiers of **C**omputer **V**ision

Program Booklet

Gangnung, Gangwon-do, Korea
February 20-22, 2019

KCVS
Korean Computer Vision Society

Message from Chairs

Welcome to IW-FCV2019.

The International Workshop on Frontiers of Computer Vision (IW-FCV) is the exciting chance and a place for intercommunication and discussion through many presentations of the advanced researches from the worldwide research communities of computer vision theory, applications, deep learning and big data.

In particular, IW-FCV 2019 will be held in Gangneung, the host city of the 2018 Winter Olympics, to celebrate its 25th anniversary. Gangneung is a beautiful harbor city on the east coast of Korea, full of culture, art and history, and welcomes you with warm, friendly hospitality and delicious food.

We have prepared various sessions and events so that everyone who attends can enjoy it with academic exchanges. We accepted 64 papers with 4 oral sessions, 2 poster sessions and 2 Co-operative workshop sessions in IW-FCV2019,

Co-operative workshop session aim to share research results through presentations and discussions in a Theme, with research results from universities, research institutes or industrial sites.
During the workshop, two sessions will be held under two themes: 1) Object recognition and manipulation intelligence in robotics by ETRI and 2) CV based Intelligent Systems by joint of University of Ulsan, UST and Saitama University. Thank you for your participation and enthusiastic discussion.

We have also prepared Family Program for local sightseeing and cultural experience, masquerade performance and OB program. Through these programs, we hope that you will be able to relieve tension and fatigue and find new vitality.

We thank the authors of all papers for their effort and contributions to the workshop.
We deeply thank all of the organizing committee members for supporting the success of the workshop.
We also thank all attendees for joining this workshop.

Finally, We would like to thank Gangneung City and GWCVB(Gangwon Convention & Visitors Bureau) for their support of local cultural programs and finances.

General Chairs
Weon-Geun OH (ETRI)
General Co-Chair: Hiroshi Kawasaki (Kyushu University)

Program Chairs
Jae-Ho Lee (ETRI)
Wataru Ohyama (Kyushu University)

Publicity Chair
Jae-Hean Kim (ETRI)

Organizing Committee

Local Arrangement Chair
Jinsoo Seo (Gangneung-Wonju National University)

Program Committee

Kyoung Ho Choi	(Mokpo National University, Korea)
Hyun Ki Hong	(Chung-Ang University, Korea)
Moon-Ho Jeong	(Kwangwoon University, Korea)
Soon Ki Jung	(Kyungpook National University, Korea)
Hyun-Deok Kang	(UNIST, Korea)
Hae Kwang Kim	(Sejong University, Korea)
Soo Hyung Kim	(Chonnam National University, Korea)
Sang Wook Lee	(Sogang University, Korea)
Suk Hwan Lee	(Tong Myong University)
Chul Lee	(Pukyong National University, Korea)
Jongwoo Lim	(Hanyang University, Korea)
Jang-Hee Yoo	(ETRI, Korea)
Takayuki Fujiwara	(Hokkaido Information University)
Yoshinori Kuno	(Saitama University)
Takio Kurita	(Hiroshima University)
Hidehiro Ohki	(Oita University)
Hideo Saito	(Keio University)
Atsushi Shimada	(Kyushu University)
Kenji Terada	(Tokushima University)
Takashi Anezaki	(ONCT)
Yasutomo Kawanishi	(Nagoya University)
Takayoshi Yamashita	(Chubu University)

Hironobu Fujiyoshi (Chubu University, Japan)
Masashi Toda (Kumamoto University)
Kenji Iwata (National Institute of Advanced Industrial Science and Technology (AIST))
Takeshi Nagasaki (Future University HAKODATE, Japan)
Kengo Terasawa (Future University HAKODATE, Japan)

Steering Committee

Kanghyun Jo (University of Ulsan, Korea)
Inso Kweon (KAIST, Korea)
Kiryong Kwon (Pukyong National University, Korea)
Chilwoo Lee (Chonnam National University, Korea)
Weon-Geun Oh (ETRI, Korea)
Jong-Il Park (Hanyang University, Korea)
Yongduek Seo (Sogang University, Korea)
Kyunghyun Yoon (Chung-Ang University, Korea)

Kazuhiko Yamamoto (Gifu University, Japan)
Hiroyasu Koshimizu (Chukyo University, Japan)
Rin-ichiro Taniguchi (Kyushu University, Japan)
Kunihito Kato (Gifu University, Japan)
Yoshimitsu Aoki (Keio University, Japan)
Chikahito Nakajima (CRIEPI, Japan)
Makoto Niwakawa (Meidensha,Japan)
Jun-ichiro Hayashi (Kagawa University, Japan)

IW-FCV 2019 Overall Program

■ Feb. 20, Wednesday

08:30-10:00	Registration
10:00-10:05	Opening
10:05-10:55	Invited Speaker 1 : Dr. Yeunbae Kim (Exective PM, IITP) - Talk title : AI & ICT Technologies and Social Problem Solving
11:00-12:00	Oral Session 1
12:00-13:00	Lunch
13:00-15:00	Oral Session 2
15:00-16:30	Poster Session 1
16:40-17:30	Invited Speaker 2 : Prof. Yusuke Sugano (Osaka University) - Talk title : Appearance-based Gaze Estimation for Real-World Eye Tracking Applications

■ Feb. 21, Thursday

10:00-11:00	Oral Session 3
11:10-12:00	Invited Speaker 3 : Seungjae Lee (ETRI) - Talk title : Visual Searching: Engineering Aspects
12:00-13:00	Lunch
13:00-15:00	Oral Session 4
15:00-16:30	Poster Session 2
17:30-18:00	Gwanno Mask Theater of Gangneung (강릉관노가면극, 江陵官奴假面劇) with Cocktail Party
18:00-20:00	Banquet

■ Feb. 22, Friday

09:00-10:00	Co-operative Workshop Session 1 (ETRI) - Workshop title : Object recognition and manipulation intelligence in robotics
10:10-12:00	Co-operative Workshop Session 2 (University of Ulsan, UNIST, Saitama Univ.) - Workshop title : CV based Intelligent Systems
12:00-13:30	Farewell Lunch

IW-FCV 2019 Detailed Program

■ Feb. 20, Wednesday

Invited Talk 1 (10:05~10:55) : Chair Jong-Il Park (Hanyang University)

Invited Speaker 1 : Dr. Yeunbae Kim (Exective PM, IITP)
  - Talk title : AI & ICT Technologies and Social Problem Solving

Oral Sesion 1 (11:00-12:00)

11:00-12:00	**Oral Session 1** : Chairs Michihiro Mikamo (Kagoshima University), Chi-Woo Lee (Chonnam National University) **O1-1** : SDM : Squeeze and Excitation Deformable Mask-RCNN, Hunjun Yang, Wonkeun Lee, Kyungtae Kim, Jin-Gyeom Kim, Sanghong Kim and Bowon Lee(Inha University) **O1-2** : Pedestrian Tracking and Identification by Integrating Multiple Sensor Information, Fumito Endo, Hisato Fukuda, Yoshinori Kobayashi and Yoshinori Kuno(Saitama University) **O1-3** : Knee Bone Tumor Segmentation from radiographs using Seg-Unet with Dice Loss, Nhu-Tai Do, Sang-Don Joo, Hyung-Jeong Yang, Sung Taek Jeong and Soo-Hyung Kim(Chonnam National University) **O1-4** : Exemplar-based Lip-to-Speech Synthesis Using Convolutional Neural Networks, Yuki Takashima, Tetsuya Takiguchi and Yasuo Ariki(Kobe University)
12:00-13:00	Lunch
13:00-15:00	**Oral Session 2** : Chairs Kazuhito Kato (Gifu University), Bowon Lee (Inha University) **O2-1** : Slight Dent Detection on Diffuse Surface inside Cylinder using High Gradation Camera, Akihisa Hasebe, Kunihito Kato, Takashi Yamaura and Kenya Yamaura(Gifu University, Nagano Automation Co.) **O2-2** : Bone Age Assessment With X-ray Left-hand Scan Using Hierarchical Deep Features, Cuong Pham, Hai-Duong Nguyen, Guee-Sang Lee, Hyung-Jeong Yang and Soo-Hyung Kim(Chonnam University) **O2-3** : Good Practice of Using Deep Features in Content-based Image Retrieval, Longjiao Zhao, Yu Wang, Jien Kato and Hiromi Tanaka(Nagoya University, Ritsumeikan University)

13:00-15:00	**O2-4** : Precise Road Trajectory Estimation from Mobile Mapping Data, Jingxin Su, Ruiji Miyazaki, Toru Tamaki and Kazufumi Kaneda(Hiroshima International University, Hiroshima University) **O2-5** : Music score estimation algorithm using octave hierarchy defined on logarithmic frequency, Ziang Ye, Kavitha Muthusubash, Junichi Miyao and Takio Kurita(Hiroshima University) **O2-6** : Batch Estimation for Face Modeling with Tracking on Image Sequence, Tsuyoshi Migita, Ryuichi Saito and Takeshi Shakunaga(Okayama University) **O2-7** : Time-lapse Image Analysis for Rapid Drug Susceptibility Testing, Andrey Grushnikov, Shinzaburo Hanada, Yoshimi Matsumoto, Kota Aoki and Yasushi Yagi(Osaka University) **EO2-1** : Effective Feature Learning for Deep Convolutional Neural Network, Sanghyun and In So Kweon(KAIST) **EO2-2** : 3D Vehicle Localization in Atlanta World, Kyungdon Joo, Tae-Hyun Oh and In So Kweon(MIT, KAIST)
	(EO : Extended Summary Oral Presentation)
15:00-16:30	**Poster Session 1** : Chairs　Yoshinori Kuno (Saitama University), Kyunghyun Yoon (Chung-Ang University) **P1-1** : A Structure and Generation Method of Lookup Table for Lightweight Convolutional Neural Network Design, Suwoong Lee, Seungjae Lee, Jong Gook Ko, Keundong Lee and Weon-Geun Oh(ETRI) **P1-2** : Recognition of Facial Expression in Conversation by Double-stream Recurrent Convolutional Neural Network, asaki Fukiage, Tetsushi Wakabayashi and Wataru Ohyama(Mie University, Kyushu University) **P1-3** : Egocentric Cooking Video Summarization by Convolutional Neural Networks,Naoki Shimada, Tetsushi Wakabayashi and Wataru Ohyama(Mie University, Kyushu University) **P1-4** : Merging SLAM and photometric stereo for 3D reconstruction with a moving camera, Maxence Remy, Hideo Saito and Hiroshi Kawasaki(Keio University, Kyushu University) **P1-5** : Real-Time Facial Expression Recognition System Using Raspberry Pi, Sanghong Kim, Taeyong Kim and Bowon Lee(McGill University, Inha University) **P1-6** : Evaluation method of Concrete Pole Deterioration by Image Processing, Chikahito Nakajima(Central Research Institute of Electric Power Industry)

	P1-7 : Combined Method of CNN and Decision Forests for Place Recognition, Lee Youlkyeong and Kang-Hyun Jo(University of Ulsan)
	P1-8 : An Unsupervised Feature Learning Method for the Classification of Cellular Images, Caleb Vununu, Oh-Heum Kwon, Kwang-Seok Moon, Suk-Hwan Lee, Kyung-Won Kang and Ki-Ryong Kwon(Pukyong National University, Tongmyong University;)
	P1-9 : Metal surface inspection using convolutional neural network, Minjong Kim, Sangseung Kang and Suyoung Chi(UST, ETRI)
	P1-10 : Research for inspect non-recognition defects in single 2D metal product image, Seonjong Bong, Kwangroh Park and Suyoung Chi(ETRI)
	P1-11 : 3D Point Cloud Sequence Compression Using Block Skipping, Ji-Su Kim, Jae-Han Lee and Chang-Su Kim(Korea University)
15:00-16:30	**P1-12** : Estimating Absorption Coefficient of Primary Color Woven Fabric, Shiro Tanaka and Hiromi Tanaka(Ritsumeikan University)
	P1-13 : Touch Detection for Projector-Camera System Using Temporally Embedded Pattern, Junyoung Yun and Jong-Il Park(Hanyang University)
	P1-14 : A CNN-based Depth Estimation using Stereo Images, Jong-Ho Jeong and Chil-Woo Lee(Chonnam National University)
	P1-15 : Object recognition method for installing LIDAR in different car height, Toru Nagashima, Takeshi Nagasaki, Hitoshi Matsubara(Future University Hakodate)
	P1-16 : Implementating AR Dinosaur Service Testbed Using a Prototype ARC Platform for Multi-User, Young-Suk Yoon(ETRI)
	P1-17 : Tensor-based Texture Representations for Rendering Time-varying Water Drop Condensation, Michihiro Mikamo and Hiroshi Kawasaki(Kagoshima University)

Invited Talk 2 (16:40~17:30 : Chair Wataru OHYAMA (Kyushu University)

Invited Speaker 2 : Prof. Yusuke Sugano (Osaka University
 - Talk title : Appearance-based Gaze Estimation for Real-World Eye Tracking Applications

■ Feb. 21, Thursday

10:00-11:00	**Oral Session 3** : Chairs Toru Tamaki (Hiroshima University), Lee Chul (Pukyong National University) **O3-1** : Brain MRI Segmentation using Rule-Based Hybrid Approach, Mustansar Fiaz, Kamran Ali, Abdul Rehman, M. Junaid Gul and Soon Ki Jung(University of Central Florida, Kyungpook National University) **O3-2** : Action Segmentation in Badminton videos for Shot Classification with Skeleton-based Features, Daichi Yamaoka and Yoshimitsu Aoki(Keio University) **O3-3** : Semantic Segmentation of Road Marking by Temporal Information, Daiki Kobayashi, Kunihito Kato, Hiroaki Aizawa and Akihiro Ikoma(Gifu Prefectural Research, Gifu University) **O3-4** : Entropy policy for supervoxel agglomeration of neurite segmentation, Tristan Hascoet, Baptiste Metge, Yasuo Ariki and Tetsuya Takiguchi(Kobe University, Independant)

Invited Talk 3 (11:10~12:00) : Chair Weon-Geun OH (ETRI)

Invited Speaker 3 : Seungjae Lee (ETRI)
- Talk title : Visual Searching: Engineering Aspects

12:00-13:00	Lunch
13:00-15:00	**Oral Session 4** : Chairs Hiroshi Kawasaki (Kyushu University), Yongduek Seo (Sogang University) **O4-1** : Improved Activity Forecasting for Generating Trajectories, Daisuke Ogawa, Toru Tamaki, Tsubasa Hirakawa, Bisser Raytchev, Kazufumi Kaneda and Ken Yoda(Hiroshima University, Chubu University, Nagoya University) **O4-2** : Low-Light Video Enhancement Based on Optimal Gamma Correction Parameter Estimation, Jeong Inho and Lee Chul(Pukyong National University) **O4-3** : Analysis of Shape Dissimilarity using Scale Space and Hierarchical Clustering, Christina Caraswati Liantara and Kazuhito Murakami(Aichi Prefectural University) **O4-4** : Auto-encoder factorizing into transform invariants and transform parameters, Tadashi Matsuo and Nobutaka Shimada(Ritsumeikan University) **O4-5** : Action Classification Based on 2D Coordinates Obtained by Real-time Pose Estimation, Siyi Shuai, Kavitha Muthusubash, Junichi Miyao and Takio Kurita(Hiroshima University)

13:00-15:00	**O4-6** : Improvement attempt of ISHIGAKI of The Kumamoto Castle Region Extraction System by Grabcut and Line Segments Detection, Yuuki Yamasaki, Kentarou Inoue, Masahiro Migita, Gou Koutaki, Masashi Toda and Tsuyoshi Kishigami(TOPPAN PRINTING CO., Kumamoto University) **EO4-1** : 2D pose-based motion recognition for automatic basketball video analysis, Yoonhyung Kim and Changick Kim(KAIST) **EO4-2** : Depth and Pose Estimation for Burst Image Photography, Sunghoon Im, Hae-Gon Jeon and In So Kweon(Carnegie Mellon University, KAIST)
15:00-16:30	**Poster Session 2** : Chairs Masashi Toda (Kumamoto University), Hyun-Deok Kang (UNIST) **P2-1** : A Study for Generating Paintings Reflected Human Emotions, Junghyun Lee, Teamin Lee, Sanghyun Seo and Kyunghyun Yoon(Chung-Ang University) **P2-2** : Calibration of AR Glasses with Image Projections, Jae-Hean Kim and Bon-Ki Koo(ETRI) **P2-3** : Franchise Brands Recognition based on Convolutional Neural Network, Keundong Lee, Seungjae Lee, Weon-Geun Oh, Junhyeok Lee, Giseok Kim and Juyeong Lee(ETRI, KPST) **P2-4** : Tiling Parallelization of Guided Image Filtering, eppei Tsubokawa, Masahiro Nakamura, Yoshihiro Maeda and Norishige Fukushima(Hitachi Solutions Create, Ltd, Nagoya Institute of Technology) **P2-5** : Robot Grasp Planning with Integration Map of Graspability and Object Occupancy, Masato Fukuzaki, Seiya Ito, Naoshi Kaneko and Kazuhiko Sumi(Aoyama Gakuin University) **P2-6** : Investigation of Training Samples Expansion in Method of Facial Feature Point Detection, Takayuki Fujiwara, Kyohei Onishi and Shigeru Mukaida(Hokkaido Information University) **P2-7** : Point-Inception Network for 3D Object Classification, Seon-Ho Lee and Chang-Su Kim(Korea University) **P2-8** : Adaptive Motion Refinement Based on Probabilistic Analysis of Accelerometer, Byeonggyu Kim, Jaejoon Choi, Jong-Il Park(Hanyang University) **P2-9** : Simple 3D model Reconstruction with Geometric Rotation, Hyunmin Kang, Byungjoon Kim and Yongduek Seo(Sogang University) **P2-10** : Photovoltaics Module Detection Using Thermal Imaging Drone, Kyudong Sim, Sang Hwa Lee, Jong-Il Park(Seoul National University, Hanyang University) **P2-11** : Good Deep Features for Pedestrian Detection, Misaki Kodaira, Yu Wang, Jien Kato, Hiroshi Murase and Hiromi Tanaka(Nagoya University, Ritsumeikan University)
17:30-18:00	Performance (Korea Traditional Masque) with Cocktail Party
18:00-20:00	Banquet

■ Feb. 22, Friday

09:00-10:00	**Co-operative Workshop Session 1 (ETRI)** : Chair Kyekyung Kim (ETRI) - Workshop title : Object recognition and manipulation intelligence in robotics **CO-WS1-1** : Object Pose Estimation by Contour Segment Matching, Seohyun Jeon, Sangseung Kang, Jaemin Cho and Kyekyung Kim(ETRI, UST) **CO-WS1-2** : Pose-based interest estimation and behavior recognition, Jaeyoon Jang and Hosub Yoon(ETRI) **CO-WS1-3** : Deep Learning Based Robust Outline Detection for Precise Pose Estimation, Jaemin Cho, Sang Seung Kang and Kye Kyung Kim(UST, ETRI) **CO-WS1-4** : Character Detection and Recognition for Personal Information Security in Real-World Document Image, Kyekyung Kim, Jamin Cho, Sangseung Kang and Jaehong Kim(ETRI)
10:10-12:00	**Co-operative Workshop Session 1 (University of Ulsan, UNIST, Saitama Univ.)** : Chair Kang-Hyun Jo (University of Ulsan) - Workshop title : CV based Intelligent Systems **CO-WS2-1** : Intuitive Method for Assessment of Feature-based Image Stitching, You-Jin Ha, Tae-Heon Kim and Hyun-Deok Kang(UNIST) **CO-WS2-2** : A Navigator Robot for Autonomous Wheelchair to Enhance Multiparty Cooperative Movements, Hisato Fukuda, Emi Iiyama, Seiji Yamazaki, Yoshinori Kobayashi, Yoshinori Kuno(Saitama University) **CO-WS2-3** : Illumination Invariant Foreground Object Segmentation using ForeGANs, Maryam Sultana and Jung Soon Ki(Kyungpook National University) **CO-WS2-4** : Scale Invariant Template Matching using Deep Features, Laksono Kurnianggoro and Kang-Hyun Jo(University of Ulsan) **CO-WS2-5** : Dog eye segmentation using multilayer perceptron, Taeheon Kim, Juheon Baek, Youjin Ha, Sihyeong Park and Hyundeok Kang(UNIST) **CO-WS2-6** : Stacked Hourglass with λ-Residual Block for Facial Landmarks Detection, Van-Thanh Hoang and Kang-Hyun Jo((University of Ulsan)
12:00-13:30	Farewell Lunch

(CO-WS : Co-operative Workshop Presentation)

Invited Talk

1. Invited Talk 1

Talk Title
A I & ICT Technologies and Social Problem Solving

Speaker
Yeunbae Kim (Executive PM (IITP: Institute of Information & Communications Technology Planning and Evaluation)

Yeunbae Kim

CV
Dr. Yeunbae Kim is an Executive PM at IITP and he works with the Korean Ministry of Science and ICT for R&D planning and policy making. He was a Prof. at Hanyang University and a VP at Samsung Electronics where he led numerous projects in the field of AI.

Talk Abstract
Modern societal issues occur in a broad spectrum with very high levels of complexity and challenges, many of which are becoming increasingly difficult to address without the aid of cutting-edge technology. To alleviate these social problems, the Korean government recently announced the implementation of mega-projects to solve social problems by utilizing AI and ICBM (IoT, Cloud Computing, Big Data, Mobile) technologies. In this talk, I will explain Korean government's policies and approaches toward social problem solving with actual project results.

2. Invited Talk 2

Talk Title

Appearance-based Gaze Estimation for Real-World Eye Tracking Applications

Speaker
Prof. Yusuke Sugano (Professor of Osaka University, Japan)

Yusuke Sugano

CV

Yusuke Sugano is an associate professor at Graduate School of Information Science and Technology, Osaka University. His research interests focus on computer vision and human-computer interaction. He received his Ph.D. in information science and technology from the University of Tokyo in 2010. He was previously a postdoctoral researcher at Max Planck Institute for Informatics, and a project research associate at Institute of Industrial Science, the University of Tokyo.

Talk Abstract

Gaze plays an important role for analyzing human attention and behavior. Although gaze estimation techniques has been actively studied, it is still quite challenging to estimate gaze direction from ordinary camera images. This talk will introduce recent attempts on learning-based gaze estimation using large-scale training data. I will also discuss some application researches focusing on deploying learning-based gaze estimation in real-world environments, and illustrate the potential of learning-based estimation for daily-life eye tracking applications.

3. Invited Talk 3

Talk Title
Visual Searching: Engineering Aspects

Speaker
Seungjae Lee (Senior researcher and the Project Leader, ETRI)

Seungjae Lee

CV

Seungjae Lee is a senior researcher and the project leader of visual browsing technology development at ETRI. He joined the creative content research division at ETRI in 2005 and has researched content identification, classification, and retrieval systems. He and his team participated in visual searching related challenges such as ImageNet challenge (classification and localization: 5th place in 2016, detection: 3rd place in 2017), Google Landmark Retrieval (8th place in 2018) and Low Power ImageNet Recognition Challenge (1st place in 2018)

Talk Abstract

Visual searching is one of the most complex problems and all tech giants are fiercely competing. The recent advance of deep learning and data exploration show meaningful results and promising future in visual searching. In this talk, we briefly review the visual searching problem in view of the engineering aspects. First, we will present a visual place recognition case study to explain how to solve the visual searching problem in engineering aspects. Second, ImageNet challenge will be reviewed to show how dataset and deep learning boost up visual searching such as object classification and detection. Finally, we will address speed-accuracy trade-off and efficient visual search for future visual searching applications.

■ Venue

- Lakai SANDPINE Convention Center
- Address : 536, Haean-ro, Gangneung-si, Gangwon-do, Korea

■ Wi-Fi

- ID : convention
- PWD : 12345678

■ Banquet

- Time : February 21, 2019, 17:30 ~ 20:00
- Place : Lakai SANDPINE Convention Center Lakai Balroom I
- Precautions : The "Gwanno Mask Theater of Gangneung" will be performed before the Banquet, which starts at 18:00. Please enjoy the show with light drinks and refreshments.

■ Sponsors