IEEE Computer Society

Winter Conference on Applications of Computer Vision

Pocket Guide

WACV

January 7-11, 2019
Waikoloa Village, Hawaii

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Message from the General and Program Chairs

Welcome to Waikoloa Village, Hawaii, and to the 19th edition of the Winter Conference on Applications of Computer Vision (WACV), jointly sponsored by the IEEE Computer Society and the IEEE Biometrics Council. WACV is the premier outlet for research advances in applications of computer vision technology, and this year's meeting is the largest WACV ever, following the continued growth of the field.

WACV 2019 spans five days, with a three-day, two-track, main conference program in which authors will present each accepted paper as a short oral and a poster. Starting with WACV 2016, the conference adopted a two-track core program, with two parallel oral sessions. In addition, we have several co-located events, including four workshops, six tutorials, and a Ph.D. forum. The main conference also includes three keynote presentations: Yaser Sheikh (Carnegie Mellon Univ.), Devi Parikh and Dhruv Batra (Georgia Tech and Facebook), and Blaise Agüera y Arcas (Google).

The review process involved researchers from both academia and industry, in a multi-round, multi-track process. The two tracks were "Algorithms" and "Systems & Applications," with the former emphasizing novel algorithmic components and the latter emphasizing vision systems for real-world applications. Reviewers and Area Chairs (ACs) were instructed to consider papers with respect to the criteria of the track to which the paper was submitted. In addition to acceptance or rejection, ACs and Program Co-Chairs could recommend that first round papers be re-submitted to the second round after authors address reviewer comments. As in past multi-round WACVs, this allowed both advanced acceptance of papers and a chance for papers not accepted on the results of the first review to be improved and re-evaluated by the same reviewers. In addition, authors were invited to provide a rebuttal of reviews during the second round. ACs made recommendations based on the reviews, rebuttals, and reviewer discussions; PCs made final decisions based on these recommendations.

While the multi-round review process provides constructive feedback and consistent reviewing for authors, it is not without additional effort. For this, we're thankful to the 340 reviewers, 39 area chairs, and the three Program Co-Chairs (PCs), selected from among active researchers in both academia and industry. We used Microsoft's Conference Management Toolkit (CMT) to manage the submission and selection of papers. ACs were excluded from handling papers from their research groups, affiliated institutions, or collaborators. The PCs, and other members of the committee who had privileged access to the CMT, agreed not to submit papers to the conference to further avoid conflicts of interest.

In the first round, we received 239 valid submissions, of which 60 (25%) were accepted and another 68 invited for re-submission. In the second round, 66 re-submissions were received, of which 44 were accepted (66%). In addition, the second round received 350 new submissions, of which 126 (36%) were accepted. As intended, authors who respond to reviewers' concerns significantly improve their chances of acceptance, and have the assurance of a consistent set of reviewers in both rounds. In total, out of the 589 valid submissions for both rounds, 230 papers were selected to appear in the WACV 2019 program.

We wish to thank all members of the Organizing Committee, the Area Chairs, reviewers, and authors for the immense amount of hard work and professionalism that went into making WACV 2019 a first-rate conference.

We are grateful to our sponsors: Air Force Research Laboratory, Amazon, Honeywell, Ancestry, Cognex, Google, Kitware, Perceptive Automata, SAP, Verisk Analytics, Voxel51, Qualcomm, and Wolfram Language. Through their generous financial contributions, we were able to keep the registration costs down and support the PhD forum.

We truly hope you enjoy the conference!

Kevin Bowyer, Sven Dickinson, Gérard Medioni
General Co-Chairs

Michael Brown, Yanxi Liu, Peyman Milanfar
Program Co-Chairs

Organizing Committee & Area Chairs

QR Codes for the IEEE CPS Mobile App

Apple iTunes App Store (iOS)

Google Play (Android)

Sunday, January 6

1800–2000 Registration (Waikoloa Promenade)

Monday, January 7

0830–1500 Registration (Waikoloa Promenade)

Human Activity Detection in Multi-Camera, Continuous, Long-Duration Video

Organizers: Afzal Godil
Jonathan G. Fiscus
Terry Adams
Anthony Hoogs
Reuven Meth

Location: Kona 4

Schedule: Full Day

0900 **Welcome**

0910 **Invited Talk:** Detecting Activities with Less, *Cees Snoek (Univ. of Amsterdam)*

0940 **Invited Talk:** Activity Detection in Extended Videos - The IARPA DIVA Program, *Jeff Alstott (IARPA)*

1000 **Morning Break**

S1: ActEV Challenge Results & Best Performer Presentations (1030-1210)

1030 ActEV18: Human Activity Detection Evaluation for Extended Videos, *Yooyoung Lee, Jonathan Fiscus, Afzal Godil, David Joy, Andrew Delgado, E. Jim Golden*

1055 Recent Results from a Proposal-based Approach for Action Detection in Untrimmed Videos, *Carlos Castillo*

1120 Object-Centric Spatio-Temporal Activity Detection, *Quanfu Fan*

1145 Novel Activities Detection Algorithm in Extended Videos, *Li Yao, Ying Qian*

S2: Video Analytics (1210-1300)

1210 Supporting Real-time Public Safety Analytics in the NIST PSCR Public Safety Analytics Portfolio, *John Garofolo*

1235 A Continuous, Full-Scope, Spatio-Temporal Tracking Metric Based on KL-Divergence, *Terrence Adams*

1300 **Lunch** (on your own)

S3: Activity Detection/Recognition Session (1430-1700)

1430 **Invited Talk:** View Invariant and Few Shot Action Recognition, *Mubarak Shah (Univ. of Central Florida)*

1510 **Afternoon Break & Poster Session**

- Joint Event Detection and Description in Continuous Video Streams, *Huijuan Xu, Boyang Li, Vasili Ramanishka, Leonid Sigal, Kate Saenko*
- A Scalable System Architecture for Activity Detection With Simple Heuristics, *Rico Thomanek, Christian Roschke, Benny Platte, Robert Manthey, Tony Rolletschke, Manuel Heinzig, Matthias Vodel, Frank Zimmer, Maximilian Eibl, Marc Ritter*
- Synthesizing Attributes With Unreal Engine for Fine-Grained Activity Analysis, *Tae Soo Kim, Michael Peven, Weichao Qiu, Alan Yuille, Gregory D. Hager*
- Fine-Grained Action Detection in Untrimmed Surveillance Videos, *Sathyanarayanan Aakur, Daniel Sawyer, Sudeep Sarkar*

1615 Minding the Gaps in a Video Action Analysis Pipeline, *Jia Chen, Jiang Liu, Junwei Liang, Ting-Yao Hu, Wei Ke, Wayner Barrios, Dong Huang, Alexander Hauptmann*

1640 **ActEV & ActEV-PC Group Discussion**

1700 **Closing Remarks**

Notes:

Cross-Domain Biometric Recognition

Organizers: Nathan Short
Shuowen (Sean) Hu
Benjamin Riggan
Vishal Patel

Location: Kona 5

Schedule: Half Day - Afternoon

1300 **Welcome**

1315 **Tutorial:** Domain Adaptation and Cross-Domain
Biometric Recognition, *Vishal Patel (JHU), Nathan Short
(BAH), Ben Riggan (ARL)*

1400 **Keynote:** Demographic Effects in Face Recognition,
Kevin Bowyer (Univ. of Notre Dame)

1430 Afternoon Break

1445 A New Multi-Spectral Iris Acquisition Sensor for
Biometric Verification and Presentation Attack
Detection, *Sushma Venkatesh, Raghavendra
Ramachandra, Kiran Raja, Christoph Busch*

1515 Cross-Sensor Evaluation of Textural Descriptors for
Inferring Gender From Fingerprints, *Emanuela Marasco,
Stefany Cando, Larry Tang, Elham Tabassi*

1545 **Keynote:** TBA

1615 **HFR Demonstrations**

1645 **Closing Remarks**

Notes:

Monday, January 7

0830–1500 Registration (Waikoloa Promenade)

3D Sensing, Reconstruction and Understanding of People, Objects and Environments

Organizers: Sean Fanello   Julien Valentin
Shahram Izadi   Sofien Bouaziz
Christoph Rhemann   Mingsong Dou
Adarsh Kowdle   Kaiwen Guo
Sameh Khamis   Danhang Tang
Jonathan Taylor   David Kim
Rohit Pandey

Location: Kona 3

Time: 0900-1400 (Full Day)

Description: The emergence of virtual and augmented reality has exacerbated the demand for robust systems for 3D capture, reconstruction and understanding. Designing such systems involves developing high quality sensors and efficient algorithms that can leverage new and existing sensing technology. To this end, we leverage a new depth sensing technology with two properties that drastically simplify the problem of fusing incomplete sensor data. First, an ultra fast depth stream, frame to frame motion. Second, by allowing multiple sensors to be easily combined (without interference) to eliminate occlusion. As a result, we have developed a wide range of efficient algorithms for reconstruction, tracking and understanding that are designed to work with this technology.

This tutorial will walk the attendee through the ins and outs of building such a stack from the ground up. From building such a sensor to applications for mixed reality with particular emphasis on high speed 3D capture systems.

Video CNNs for Activity Recognition

Organizers: Michael Ryoo
Chen Sun

Location: Kona 1

Time: 0900-1200 (Half Day — Morning)

Description: In the recent years, the field of human activity recognition has grown dramatically, reflecting its importance in many high-impact societal applications including robot perception, online video search and retrieval, and smart homes/offices/cities. With the initial success of convolutional neural network models to learn video representations for their classification, the field is gradually moving towards detecting and forecasting more complex human activities in continuous videos for various realistic scenarios.

This tutorial will review video CNN models designed for human activity recognition. These not only include standard two-stream CNNs and 3-D spatio-temporal XYT CNNs for segmented fixed-size videos, but covers also more recent models to capture longer temporal information in very continuous videos. The use of temporal pooling, recurrent networks, temporal attention, and various temporal convolutions will be covered. Video models for less-traditional topics, including activity forecasting/anticipating, protecting privacy in activity videos, and understanding robot-centric videos will be discussed as well.

Notes:

Active Learning for Computer Vision

Organizers: Shayok Chakraborty

Location: Kona 2

Time: 0900-1200 (Half Day — Morning)

Description: The widespread emergence and deployment of inexpensive video cameras has resulted in the generation of enormous amounts of digital data (as images and videos) in today's world. While this has expanded the possibilities of solving real world problems (such as understanding the behavior of people, objects and activities) using computational learning frameworks, selecting the salient data samples from such huge collections of data has proved to be a significant and practical challenge. Further, to train a reliable classification model, it is important to have a large quantity of labeled training data. Manual annotation of large amounts of data is an expensive process in terms of time, labor and human expertise. This has set the stage for research in the field of active learning. Active learning algorithms automatically select the salient and exemplar instances from large quantities of unlabeled data and thereby tremendously reduce human annotation effort in training an effective classifier. It can be applied across all existing classification / regression methods and with any kind of data, thus making it a very generalizable approach. The success of active learning in several applications (such as image retrieval, image recognition) has resulted in the extension of the framework to problem settings beyond regular classification / regression. Active learning concepts have been extended to newer problem settings (such as feature selection, video summarization, matrix completion) and have also been combined with other learning paradigms such as deep learning and transfer learning. This tutorial will seek to present a comprehensive overview of active learning with a focus on computer vision applications, including historical perspectives, theoretical analysis and novel paradigms. The novelty of this tutorial lies in its focus on the emerging trends, algorithms and applications of active learning. It will aim at introducing concepts and open perspectives that motivate further work in this domain, ranging from fundamentals to applications and systems.

Local Features — Past, Present, and Future

Organizers: Vassileios Baltas

Location: Kona 1

Time: 1400-1700 (Half Day — Afternoon)

Description: Local feature matching is one of the cornerstones of "classical" computer vision. Despite the recent advances of deep learning, a crucial question still remains which is whether the learned local feature methods can outperform the classical methods. Recent results have shown that classical non-deep learning methods are still very competitive and can outperform recent deep learning methods. This tutorial will aim to present a comprehensive overview of the classical local feature methods, explore the current solutions that are based on deep learning, and finally examine the drawbacks and strengths of both sides in order to provide researchers with pointers about current challenges and inspire future work.

Notes:

Combinatorial Approaches for Visual Data Summarization

Organizers: Rishabh Iyer

Location: Kona 2

Time: 1400-1700 (Half Day — Afternoon)

Description: Visual Data in the form of images, videos and live streams have been growing at an unprecedented rate in the last few years. While this massive data is a blessing to data science by helping improve predictive accuracy, it is also a curse since humans are unable to consume this large amount of data. Moreover, today, machine generated videos (via drones, dash-cams, body-cams, security cameras, GoPro etc.) are being generated at a rate higher than what we as humans can process. Moreover, majority of this data is plagued with redundancy. Given this data explosion, machine learning techniques which automatically understand, organize and categorize this data are of utmost importance. Visual Data summarization attempts to solve this problem in two ways.

1. Create a highlight of the most critical and important events in the video (or an image collection), giving the viewer a quick glimpse of the entire video (or photo album) in a short amount of time. It is not uncommon today for us to click thousands of photographs while on a vacation, and can we automatically find the highlights of the trip to send friends? Similarly security officers have to go through several hours of footage to find important events: Can this be done automatically to save human time?

2. Create data summaries for training visual classification and detection models. Datasets today are growing, thereby creating the need for expensive and large GPU clusters, and larger experimental turn around times. Moreover, labeling these large datasets is getting more and more expensive and time consuming. Visual data subset selection attempts to extract the most critical aspects of the data to reduce both training time and labeling efforts.

Drone Vision Algorithms for Media Production

Organizers: Ioannis Pitas

Location: Kona 3

Time: 1400-1700 (Half Day — Afternoon)

Description: The aim of drone cinematography is to develop innovative intelligent single- and multiple-drone platforms for media production. Such systems should be able to cover outdoor events (e.g., sports) that are typically distributed over large expanses, ranging, for example, from a stadium to an entire city. Computer vision plays pivotal roles both for drone cinematographic shooting and for drone safety. The drone or drone team, to be managed by the production director and his/her production crew, shall have: a) increased multiple drone decisional autonomy, hence allowing event coverage in the time span of around one hour in an outdoor environment and b) improved multiple drone robustness and safety mechanisms (e.g., communication robustness/safety, embedded flight regulation compliance, enhanced crowd avoidance and emergency landing mechanisms), enabling it to carry out its mission against errors or crew inaction and to handle emergencies. Such robustness is particularly important, as the drones will operate close to crowds and/or may face environmental hazards (e.g., wind). Therefore, it must be contextually aware and adaptive, towards maximizing shooting creativity and productivity, while minimizing production costs. Drone vision and machine learning play a very important role towards this end, covering the following topics: a) drone localization, b) drone visual analysis for target/obstacle/crowd/point of interest detection, c) 2D/3D target tracking, and d) privacy protection technologies in drones (e.g. face de-identification). The tutorial will offer an overview of all the above plus other related topics, stressing the algorithmic aspects, such as: a) drone imaging b) drone/target localization and world mapping c) target detection and tracking, d) privacy protection in drones.

Tuesday, January 8

1230–1730 Registration (Waikoloa Promenade)

1250–1300 Welcome by the General/Program Chairs (Kona 4–5)

1300–1440 Oral 1A: Action Recognition, Infrared/Spectral Imaging, Medical & Bioinformatics Imaging, Real-Time Tracking (Kona 4)

**Papers in this session are also in Poster Session 1.
Paper # represents poster board #.**

  Chair: Chen Sun *(Google)*

  Format (5 min. short presentation)

1. A Progressively-Trained Scale-Invariant and Boundary-Aware Deep Neural Network for the Automatic 3D Segmentation of Lung Lesions, *Bo Zhou, Randolph Crawford, Belma Dogdas, Gregory Goldmacher, Antong Chen*

2. IEGAN: Multi-Purpose Perceptual Quality Image Enhancement Using Generative Adversarial Network, *Soumya Shubhra Ghosh, Yang Hua, Sankha Subhra Mukherjee, Neil Robertson*

3. FreeLabel: A Publicly Available Annotation Tool Based on Freehand Traces, *Philipe A. Dias, Zhou Shen, Amy Tabb, Henry Medeiros*

4. EGO-SLAM: A Robust Monocular SLAM for Egocentric Videos, *Suvam Patra, Kartikeya Gupta, Faran Ahmad, Chetan Arora, Subhashis Banerjee*

5. Multi-Scale Dense Networks for Deep High Dynamic Range Imaging, *Qingsen Yan, Dong Gong, Pingping Zhang, Qinfeng Shi, Jinqiu Sun, Ian Reid, Yanning Zhang*

6. Video Action Recognition With an Additional End-to-End Trained Temporal Stream, *Guojing Cong, Giacomo Domeniconi, Chih-Chieh Yang, Joshua Shapiro, Barry Chen*

7. Skeleton-Based Action Recognition of People Handling Objects, *Sunoh Kim, Kimin Yun, Jongyoul Park, Jin Young Choi*

8. Where to Focus on for Human Action Recognition?, *Srijan Das, Arpit Chaudhary, Francois Bremond, Monique Thonnat*

9. Exploring Classification of Histological Disease Biomarkers From Renal Biopsy Images, *Puneet Mathur, Meghna P. Ayyar, Rajiv Ratn Shah, Shree G. Sharma*

10. Cascade Attention Machine for Occluded Landmark Detection in 2D X-Ray Angiography, *Liheng Zhang, Vivek Singh, Guo-Jun Qi, Terrence Chen*

11. Model-Free Tracking With Deep Appearance and Motion Features Integration, *Xiaolong Jiang, Peizhao Li, Xiantong Zhen, Xianbin Cao*

12. Still Image Action Recognition by Predicting Spatial-Temporal Pixel Evolution, *Marjaneh Safaei, Hassan Foroosh*

13. Semi-Supervised 3D Abdominal Multi-Organ Segmentation via Deep Multi-Planar Co-Training, *Yuyin Zhou, Yan Wang, Peng Tang, Song Bai, Wei Shen, Elliot K. Fishman, Alan Yuille*

14. A Proposal-Based Solution to Spatio-Temporal Action Detection in Untrimmed Videos, *Joshua Gleason, Rajeev Ranjan, Steven Schwarcz, Carlos D. Castillo, Jun-Cheng Chen, Rama Chellappa*

15. TAN: Temporal Aggregation Network for Dense Multi-Label Action Recognition, *Xiyang Dai, Bharat Singh, Joe Yue-Hei Ng, Larry S. Davis*

16. Online Multi-Object Tracking With Instance-Aware Tracker and Dynamic Model Refreshment, *Peng Chu, Heng Fan, Chiu C Tan, Haibin Ling*

17. Starts Better and Ends Better: A Target Adaptive Image Signature Tracker, *Xingchao Liu, Ce Li, Hongren Wang, Xiantong Zhen, Baochang Zhang, Qixiang Ye*

18. Video Jigsaw: Unsupervised Learning of Spatiotemporal Context for Video Action Recognition, *Unaiza Ahsan, Rishi Madhok, Irfan Essa*

19. Going Deeper With Semantics: Video Activity Interpretation Using Semantic Contextualization, *Sathyanarayanan Aakur, Fillipe DM de Souza, Sudeep Sarkar*

20. Coupled Generative Adversarial Network for Continuous Fine-Grained Action Segmentation, *Harshala Gammulle, Tharindu Fernando, Simon Denman, Sridha Sridharan, Clinton Fookes*

1300–1440 Oral 1B: Early & Biologically-Inspired Vision, Evaluation & Comparison of Vision Algorithms, Vision & Language, Vision for Robotics (Kona 5)

Papers in this session are also in Poster Session 1.
Paper # represents poster board #.

Chair: Walter Scheirer *(Univ. of Notre Dame)*

Format (5 min. short presentation)

21. A Comparative Analysis of Visual-Inertial SLAM for Assisted Wayfinding of the Visually Impaired, *He Zhang, Lingqiu Jin, Hao Zhang, Cang Ye*

22. Self-Paced Adversarial Training for Multimodal Few-Shot Learning, *Frederik Pahde, Oleksiy Ostapenko, Patrick Jähnichen, Tassilo Klein, Moin Nabi*

23. Spatial Knowledge Distillation to Aid Visual Reasoning, *Somak Aditya, Rudra Saha, Yezhou Yang, Chitta Baral*

24. Attention Based Natural Language Grounding by Navigating Virtual Environment, *Abhishek Sinha, Akilesh B, Mausoom Sarkar, Balaji Krishnamurthy*

25. MAC: Mining Activity Concepts for Language-Based Temporal Localization, *Runzhou Ge, Jiyang Gao, Kan Chen, Ram Nevatia*

26. TextCaps: Handwritten Character Recognition With Very Small Datasets, *Vinoj Jayasundara, Sandaru Jayasekara, Hirunima Jayasekara, Jathushan Rajasegaran, Suranga Seneviratne, Ranga Rodrigo*

27. Improving Diversity of Image Captioning Through Variational Autoencoders and Adversarial Learning, *Li Ren, Guo-Jun Qi, Kien Hua*

28. Digging Deeper Into Egocentric Gaze Prediction, *Hamed R. Tavakoli, Esa Rahtu, Juho Kannala, Ali Borji*

29. Improving Image Captioning by Leveraging Knowledge Graphs, *Yimin Zhou, Yiwei Sun, Vasant Honavar*

30. Colorful Trees: Visualizing Random Forests for Analysis and Interpretation, *Ronny Hänsch, Philipp Wiesner, Sophie Wendler, Olaf Hellwich*

31. Euclidean Invariant Recognition of 2D Shapes Using Histograms of Magnitudes of Local Fourier-Mellin Descriptors, *Xinhua Zhang, Lance R. Williams*

32. Good Choices for Deep Convolutional Feature Encoding, *Yu Wang, Jien Kato*

33. Multi-Scale Convolution Aggregation and Stochastic Feature Reuse for DenseNets, *Mingjie Wang, Jun Zhou, Wendong Mao, Minglun Gong*

34. Learning On-Road Visual Control for Self-Driving Vehicles With Auxiliary Tasks, *Yilun Chen, Praveen Palanisamy, Priyantha Mudalige, Katharina Muelling, John M. Dolan*

35. End-to-End Video Captioning With Multitask Reinforcement Learning, *Lijun Li, Boqing Gong*

36. Interpretable Visual Question Answering by Visual Grounding From Attention Supervision Mining, *Yundong Zhang, Juan Carlos Niebles, Alvaro Soto*

37. C4Synth: Cross-Caption Cycle-Consistent Text-to-Image Synthesis, *K J Joseph, Arghya Pal, Sailaja Rajanala, Vineeth N Balasubramanian*

38. Instance-Based Deep Transfer Learning, *Tianyang Wang, Jun Huan, Michelle Zhu*

39. No-Reference Image Quality Assessment: An Attention Driven Approach, *Diqi Chen, Yizhou Wang, Hongyu Ren, Wen Gao*

40. Deep Micro-Dictionary Learning and Coding Network, *Hao Tang, Heng Wei, Wei Xiao, Wei Wang, Dan Xu, Yan Yan, Nicu Sebe*

1440–1520 Afternoon Break (Waikoloa Promenade)

1520–1700 Oral 2A: Vision Systems & Applications (Kona 4)

Papers in this session are also in Poster Session 1.
Paper # represents poster board #.

Chair: Shayok Chakraborty *(Florida State Univ.)*

Format (5 min. short presentation)

41. Joint Event Detection and Description in Continuous Video Streams, *Huijuan Xu, Boyang Li, Vasili Ramanishka, Leonid Sigal, Kate Saenko*

42. Recovering Faces From Portraits With Auxiliary Facial Attributes, *Fatemeh Shiri, Xin Yu, Fatih Porikli, Richard Hartley, Piotr Koniusz*

43. Human-Centric Light Sensing and Estimation From RGBD Images: The Invisible Light Switch, *Theodore Tsesmelis, Irtiza Hasan, Marco Cristani, Alessio Del Bue, Fabio Galasso*

44. Toward Computer Vision Systems That Understand Real-World Assembly Processes, *Jonathan D. Jones, Gregory D. Hager, Sanjeev Khudanpur*

45. Stochastic Gradient Descent With Hyperbolic-Tangent Decay on Classification, *Bo-Yang Hsueh, Wei Li, I-Chen Wu*

46. AsiANet: Autoencoders in Autoencoder for Unsupervised Monocular Depth Estimation, *John Paul T. Yusiong, Prospero C. Naval, Jr.*

47. Demystifying Multi-Faceted Video Summarization: Tradeoff Between Diversity, Representation, Coverage and Importance, *Vishal Kaushal, Rishabh Iyer, Khoshrav Doctor, Anurag Sahoo, Pratik Dubal, Suraj Kothawade, Rohan Mahadev, Kunal Dargan, Ganesh Ramakrishnan*

48. Fashion Attributes-to-Image Synthesis Using Attention-Based Generative Adversarial Network, *Hanbit Lee, Sang-goo Lee*

49. Online Video Summarization: Predicting Future to Better Summarize Present, *Shamit Lal, Shivam Duggal, Indu Sreedevi*

50. Bringing Vision to the Blind: From Coarse to Fine, One Dollar at a Time, *Tri Huynh, Jay Pillai, Eunyoung Kim, Kristen Aw, Jack Sim, Ken Goldman, Rui Min*

51. A Hierarchical Grocery Store Image Dataset With Visual and Semantic Labels, *Marcus Klasson, Cheng Zhang, Hedvig Kjellström*

52. RGBD2lux: Dense Light Intensity Estimation With an RGBD Sensor, *Theodore Tsesmelis, Irtiza Hasan, Marco Cristani, Fabio Galasso, Alessio Del Bue*

53. Understanding Image Quality and Trust in Peer-to-Peer Marketplaces, *Xiao Ma, Lina Mezghani, Kimberly Wilber, Hui Hong, Robinson Piramuthu, Mor Naaman, Serge Belongie*

54. Ancient Painting to Natural Image: A New Solution for Painting Processing, *Tingting Qiao, Weijing Zhang, Miao Zhang, Zixuan Ma, Duanqing Xu*

55. Matching Disparate Image Pairs Using Shape-Aware ConvNets, *Shefali Srivastava, Abhimanyu Chopra, Arun CS Kumar, Suchendra M. Bhandarkar, Deepak Sharma*

56. Online and Batch Supervised Background Estimation via L1 Regression, *Aritra Dutta, Peter Richtárik*

57. Data-Efficient Graph Embedding Learning for PCB Component Detection, *Chia-Wen Kuo, Jacob D. Ashmore, David Huggins, Zsolt Kira*

58. Spatial Focal Loss for Pedestrian Detection in Fisheye Imagery, *Xishuai Peng, Yi Lu Murphey, Simon Stent, Yuanxiang Li, Zihao Zhao*

59. Classification and Re-Identification of Fruit Fly Individuals Across Days With Convolutional Neural Networks, *Nihal Murali, Jonathan Schneider, Joel D. Levine, Graham W. Taylor*

60. Multi-Component Image Translation for Deep Domain Generalization, *Mohammad Mahfujur Rahman, Clinton Fookes, Mahsa Baktashmotlagh, Sridha Sridharan*

1520–1700   Oral 2B: Document Analysis, Image/Video Indexing & Retrieval, Industrial Inspection, Remote Sensing (Kona 5)

Papers in this session are also in Poster Session 1. Paper # represents poster board #.

Chair: Scott McCloskey *(Honeywell)*

Format (5 min. short presentation)

61. Generalization in Metric Learning: Should the Embedding Layer Be Embedding Layer?, *Nam Vo, James Hays*

62. HiBsteR: Hierarchical Boosted Deep Metric Learning for Image Retrieval, *Georg Waltner, Michael Opitz, Horst Possegger, Horst Bischof*

63. Texture Synthesis Guided Deep Hashing for Texture Image Retrieval, *Ayan Kumar Bhunia, Perla Sai Raj Kishore, Pranay Mukherjee, Abhirup Das, Partha Pratim Roy*

64. Lidar Cloud Detection With Fully Convolutional Networks, *Erol Cromwell, Donna Flynn*

65. Deep Representation Learning Characterized by Inter-Class Separation for Image Clustering, *Dipanjan Das, Ratul Ghosh, Brojeshwar Bhowmick*

66. Hierarchy-Based Image Embeddings for Semantic Image Retrieval, *Björn Barz, Joachim Denzler*

67. Sensor Adaptation for Improved Semantic Segmentation of Overhead Imagery, *Marc Bosch, Gordon A. Christie, Christopher M. Gifford*

68. An Universal Image Attractiveness Ranking Framework, *Ning Ma, Alexey Volkov, Aleksandr Livshits, Pawel Pietrusinski, Houdong Hu, Mark Bolin*

69. A Framework Towards Domain Specific Video Summarization, *Vishal Kaushal, Sandeep Subramanian, Suraj Kothawade, Rishabh Iyer, Ganesh Ramakrishnan*

70. TextContourNet: A Flexible and Effective Framework for Improving Scene Text Detection Architecture With a Multi-Task Cascade, *Dafang He, Xiao Yang, Daniel Kifer, C. Lee Giles*

71. Deployment Conscious Automatic Surface Crack Detection, *Yuki Inoue, Hiroto Nagayoshi*

72. Binary Constrained Deep Hashing Network for Image Retrieval Without Manual Annotation, *Thanh-Toan Do, Tuan Hoang, Dang-Khoa Le Tan, Trung Pham, Huu Le, Ngai-Man Cheung, Ian Reid*

73. VelocityGAN: Subsurface Velocity Image Estimation Using Conditional Adversarial Networks, *Zhongping Zhang, Yue Wu, Zheng Zhou, Youzuo Lin*

74. Scalable Logo Recognition Using Proxies, *István Fehérvári, Srikar Appalaraju*

75. SPaSe – Multi-Label Page Segmentation for Presentation Slides, *Monica Haurilet, Ziad Al-Halah, Rainer Stiefelhagen*

76. Satellite Imagery Multiscale Rapid Detection With Windowed Networks, *Adam Van Etten*

77. Semi-Supervised Convolutional Neural Networks for In-Situ Video Monitoring of Selective Laser Melting, *Bodi Yuan, Brian Giera, Gabe Guss, Manyalibo Matthews, Sara McMains*

78. Video Summarization via Actionness Ranking, *Mohamed Elfeki, Ali Borji*

79. Mask R-CNN With Pyramid Attention Network for Scene Text Detection, *Zhida Huang, Zhuoyao Zhong, Lei Sun, Qiang Huo*

80. Zero Shot License Plate Re-Identification, *Mayank Gupta, Abhinav Kumar, Sriganesh Madhvanath*

1730–1830 Keynote Session (Kona 4–5)

- **Keynote Talk:** Machine Perception of Social Signals, *Yaser Sheikh (Facebook Reality Lab / Carnegie Mellon Univ.)*

1830–2000 Dinner (Lagoon Lanai)

1830–2000 PhD Forum (Lagoon Lanai – Reserved) (by invitation only)

- Rodrigo de Bem *(Univ. of Oxford)*
- Le Anh Vu Ha *(Univ. of Houston)*
- Shu Kong *(Univ. of California at Irvine)*
- Vismay Patel *(IIT Madras)*
- Omar Vidal Pino *(Universidade Federal de Minas Gerais)*
- Xiang Xu *(Univ. of Houston)*

1930–2200 Exhibits (Kona 1–3)

- Amazon
- Ancestry
- Air Force Research Lab
- Perceptive Automata
- Verisk Analytics
- Voxel51

1930–2200 Poster Session 1 (Kona 1–3)

Posters for Oral Sessions 1A, 1B, 2A, and 2B.

Notes:

Wednesday, January 9

1230–1730 Registration (Waikoloa Promenade)

1300–1440 Oral 3A: Biometrics, Statistical Methods & Learning (Kona 4)

 Papers in this session are also in Poster Session 2.
 Paper # represents poster board #.

 Chair: Terry Boult *(Univ. of Colorado, Colorado Springs)*

 Format (5 min. short presentation)

1. Ordinal Regression Using Noisy Pairwise Comparisons for Body Mass Index Range Estimation, *Luisa F. Polanía, Dongning Wang, Glenn M. Fung*

2. Learning Privacy Preserving Encodings Through Adversarial Training, *Francesco Pittaluga, Sanjeev J. Koppal, Ayan Chakrabarti*

3. Active Learning With *n*-ary Queries for Image Recognition, *Aditya R. Bhattacharya, Shayok Chakraborty*

4. Learning Generator Networks for Dynamic Patterns, *Tian Han, Lu Yang, Jiawen Wu, Xianglei Xing, Ying Nian Wu*

5. DIMAL: Deep Isometric Manifold Learning Using Sparse Geodesic Sampling, *Gautam Pai, Ronen Talmon, Alex Bronstein, Ron Kimmel*

6. Which Body Is Mine?, *Mona Ragab Sayed, Terence Sim, Joo-Hwee Lim, Keng-Teck Ma*

7. SAF-BAGE: Salient Approach for Facial Soft-Biometric Classification – Age, Gender, and Facial Expression, *Ayesha Gurnani, Kenil Shah, Vandit Gajjar, Viraj Mavani, Yash Khandhediya*

8. Style and Content Disentanglement in Generative Adversarial Networks, *Hadi Kazemi, Seyed Mehdi Iranmanesh, Nasser M. Nasrabadi*

9. Student Attendance System in Crowded Classrooms Using a Smartphone Camera, *Domingo Mery, Ignacio Mackenney, Esteban Villalobos*

10. Iris Recognition: Comparing Visible-Light Lateral and Frontal Illumination to NIR Frontal Illumination, *Daniel P. Benalcazar, Claudio A. Perez, Diego Bastias, Kevin W. Bowyer*

11. Iris Presentation Attack Detection Based on Photometric Stereo Features, *Adam Czajka, Zhaoyuan Fang, Kevin W. Bowyer*

12. Skip Residual Pairwise Networks With Learnable Comparative Functions for Few-Shot Learning, *Akshay Mehrotra, Ambedkar Dukkipati*

13. Latent Fingerprint Enhancement Using Generative Adversarial Networks, *Indu Joshi, Adithya Anand, Mayank Vatsa, Richa Singh, Sumantra Dutta Roy, Prem Kumar Kalra*

14. Predicting Gender From Iris Texture May Be Harder Than It Seems, *Andrey Kuehlkamp, Kevin Bowyer*

15. Optimize Deep Convolutional Neural Network With Ternarized Weights and High Accuracy, *Zhezhi He, Boqing Gong, Deliang Fan*

16. On the Importance of Feature Aggregation for Face Reconstruction, *Xiang Xu, Ha Le, Ioannis A. Kakadiaris*

17. Task Relation Networks, *Jianshu Li, Pan Zhou, Yunpeng Chen, Jian Zhao, Sujoy Roy, Shuicheng Yan, Jiashi Feng, Terence Sim*

18. Performance of Humans in Iris Recognition: The Impact of Iris Condition and Annotation-Driven Verification, *Daniel Moreira, Mateusz Trokielewicz, Adam Czajka, Kevin W. Bowyer, Patrick J. Flynn*

19. Improving Robustness of Random Forest Under Label Noise, *Xu Zhou, Pak Lun Kevin Ding, Baoxin Li*

20. Domain-Specific Human-Inspired Binarized Statistical Image Features for Iris Recognition, *Adam Czajka, Daniel Moreira, Kevin W. Bowyer, Patrick J. Flynn*

1300–1440 Oral 3B: 3-D Modeling, Scene Understanding (Kona 5)

 Papers in this session are also in Poster Session 2.
 Paper # represents poster board #.

 Chair: Bohyung Han *(Seoul National Univ.)*

 Format (5 min. short presentation)

21. Fashion Is Taking Shape: Understanding Clothing Preference Based on Body Shape From Online Sources, *Hosnieh Sattar, Gerard Pons-Moll, Mario Fritz*

22. Low-Shot Learning From Imaginary 3D Model, *Frederik Pahde, Mihai Puscas, Jannik Wolff, Tassilo Klein, Nicu Sebe, Moin Nabi*

23. Ventral-Dorsal Neural Networks: Object Detection via Selective Attention, *Mohammad K. Ebrahimpour, Jiayun Li, Yen-Yun Yu, Jackson Reese, Azadeh Moghtaderi, Ming-Hsuan Yang, David C. Noelle*

24. Single-Shot Analysis of Refractive Shape Using Convolutional Neural Networks, *Jonathan Dyssel Stets, Zhengqin Li, Jeppe Revall Frisvad, Manmohan Chandraker*

25. Improving 3D Human Pose Estimation via 3D Part Affinity Fields, *Ding Liu, Zixu Zhao, Xinchao Wang, Yuxiao Hu, Lei Zhang, Thomas S. Huang*

26. A Self-Supervised Bootstrap Method for Single-Image 3D Face Reconstruction, *Yifan Xing, Rahul Tewari, Paulo R. S. Mendonça*

27. Pixel-Wise Attentional Gating for Scene Parsing, *Shu Kong, Charless Fowlkes*

28. DGC-Net: Dense Geometric Correspondence Network, *Iaroslav Melekhov, Aleksei Tiulpin, Torsten Sattler, Marc Pollefeys, Esa Rahtu, Juho Kannala*

29. Revisiting Single Image Depth Estimation: Toward Higher Resolution Maps With Accurate Object Boundaries, *Junjie Hu, Mete Ozay, Yan Zhang, Takayuki Okatani*

30. Dense 3D Point Cloud Reconstruction Using a Deep Pyramid Network, *Priyanka Mandikal, R. Venkatesh Babu*

31. Semantic Matching by Weakly Supervised 2D Point Set Registration, *Zakaria Laskar, Hamed R. Tavakoli, Juho Kannala*

32. Recurrent Iterative Gating Networks for Semantic Segmentation, *Rezaul Karim, Md Amirul Islam, Neil D. B. Bruce*

33. Resultant Based Incremental Recovery of Camera Pose From Pairwise Matches, *Yoni Kasten, Meirav Galun, Ronen Basri*

34. Real-Time Progressive 3D Semantic Segmentation for Indoor Scenes, *Quang-Hieu Pham, Binh-Son Hua, Duc Thanh Nguyen, Sai-Kit Yeung*

35. High Fidelity Semantic Shape Completion for Point Clouds Using Latent Optimization, *Shubham Agrawal, Swaminathan Gurumurthy*

36. Region-Based Active Learning for Efficient Labeling in Semantic Segmentation, *Tejaswi Kasarla, G. Nagendar, Guruprasad M. Hegde, Vineeth Balasubramanian, C.V. Jawahar*

37. Soft Transfer Learning via Gradient Diagnosis for Visual Relationship Detection, *Diqi Chen, Xiaodan Liang, Yizhou Wang, Wen Gao*

38. Attention Mechanisms for Object Recognition With Event-Based Cameras, *Marco Cannici, Marco Ciccone, Andrea Romanoni, Matteo Matteucci*

39. Semantic Correspondence in the Wild, *Akila Pemasiri, Kien Nguyen Thanh, Sridha Sridharan, Clinton Fookes*

40. CDNet: Single Image De-Hazing Using Unpaired Adversarial Training, *Akshay Dudhane, Subrahmanyam Murala*

1440–1520 Afternoon Break (Waikoloa Promenade)

1520–1700 Oral 4A: Object Recognition (Kona 4)

Papers in this session are also in Poster Session 2. Paper # represents poster board #.

Chair: Srikar Appalaraju *(Amazon)*

Format (5 min. short presentation)

41. Memory Warps for Long-Term Online Video Representations and Anticipation, *Tuan-Hung Vu, Wongun Choi, Samuel Schulter, Manmohan Chandraker*

42. Stability Based Filter Pruning for Accelerating Deep CNNs, *Pravendra Singh, Vinay Sameer Raja Kadi, Nikhil Verma, Vinay P. Namboodiri*

43. GAN-Based Pose-Aware Regulation for Video-Based Person Re-Identification, *Alessandro Borgia, Yang Hua, Elyor Kodirov, Neil M. Robertson*

44. Power Normalizing Second-Order Similarity Network for Few-Shot Learning, *Hongguang Zhang, Piotr Koniusz*

45. 3DCapsule: Extending the Capsule Architecture to Classify 3D Point Clouds, *Ali Cheraghian, Lars Petersson*

46. Learning Receptive Field Size by Learning Filter Size, *Yekang Lee, Heechul Jung, Dongyoon Han, Kyungsu Kim, Junmo Kim*

47. AddressNet: Shift-Based Primitives for Efficient Convolutional Neural Networks, *Yihui He, Xianggen Liu, Huasong Zhong, Yuchun Ma*

48. Data Augmentation Using Part Analysis for Shape Classification, *Vismay Patel, Niranjan Mujumdar, Prashanth Balasubramanian, Smit Marvaniya, Anurag Mittal*

49. Prototypicality Effects in Global Semantic Description of Objects, *Omar Vidal Pino, Erickson R. Nascimento, Mario F. M. Campos*

50. ADA: Adversarial Data Augmentation for Object Detection, *Sima Behpour, Kris M. Kitani, Brian D. Ziebart*

51. Weakly-Supervised Spatial Context Networks, *Zuxuan Wu, Larry S. Davis, Leonid Sigal*

52. Improved Mixed-Example Data Augmentation, *Cecilia Summers, Michael J. Dinneen*

53. Taylor Convolutional Networks for Image Classification, *Xiaodi Wang, Ce Li, Yipeng Mou, Baochang Zhang, Jungong Han, Jianzhuang Liu*

54. Crowd Counting Using Scale-Aware Attention Networks, *Mohammad Asiful Hossain, Mehrdad Hosseinzadeh, Omit Chanda, Yang Wang*

55. Learning From Less Data: A Unified Data Subset Selection and Active Learning Framework for Computer Vision, *Vishal Kaushal, Rishabh Iyer, Suraj Kothawade, Rohan Mahadev, Khoshrav Doctor, Ganesh Ramakrishnan*

56. Local Gradients Smoothing: Defense Against Localized Adversarial Attacks, *Muzammal Naseer, Salman H. Khan, Fatih Porikli*

57. Zero-Shot Learning via Recurrent Knowledge Transfer, *Bo Zhao, Xinwei Sun, Xiaopeng Hong, Yuan Yao, Yizhou Wang*

58. Multi-Layer Pruning Framework for Compressing Single Shot MultiBox Detector, *Pravendra Singh, Manikandan R, Neeraj Matiyali, Vinay P. Namboodiri*

59. Learning to See the Invisible: End-to-End Trainable Amodal Instance Segmentation, *Patrick Follmann, Rebecca König, Philipp Härtinger, Michael Klostermann, Tobias Böttger*

60. Defocus Magnification Using Conditional Adversarial Networks, *Parikshit Sakurikar, Ishit Mehta, P. J. Narayanan*

Notes:

1520–1700 Oral 4B: Human Motion Analysis/Capture, Vision for Aerial/Drone/Underwater/Ground Vehicles, Vision for Graphics (Kona 5)

Papers in this session are also in Poster Session 2. Paper # represents poster board #.

Chair: Orazio Gallo *(NVIDIA Research)*

Format (5 min. short presentation)

61. BRDF Estimation of Complex Materials With Nested Learning, *Raquel Vidaurre, Dan Casas, Elena Garces, Jorge Lopez-Moreno*

62. A 2D-3D Object Detection System for Updating Building Information Models With Mobile Robots, *Max Ferguson, Kincho Law*

63. "Keep Me In, Coach!": A Computer Vision Perspective on Assessing ACL Injury Risk in Female Athletes, *Nathaniel Blanchard, Kyle Skinner, Aden Kemp, Walter J. Scheirer, Patrick J. Flynn*

64. Gated Context Aggregation Network for Image Dehazing and Deraining, *Dongdong Chen, Mingming He, Qingnan Fan, Jing Liao, Liheng Zhang, Dongdong Hou, Lu Yuan, Gang Hua*

65. FuturePose – Mixed Reality Martial Arts Training Using Real-Time 3D Human Pose Forecasting With a RGB Camera, *Erwin Wu, Hideki Koike*

66. MURAUER: Mapping Unlabeled Real Data for Label AUstERity, *Georg Poier, Michael Opitz, David Schinagl, Horst Bischof*

67. Photo-Sketching: Inferring Contour Drawings From Images, *Mengtian Li, Zhe Lin, Radomír Měch, Ersin Yumer, Deva Ramanan*

68. 3D Reconstruction and Texture Optimization Using a Sparse Set of RGB-D Cameras, *Wei Li, Xiao Xiao, James K. Hahn*

69. Action-Agnostic Human Pose Forecasting, *Hsu-kuang Chiu, Ehsan Adeli, Borui Wang, De-An Huang, Juan Carlos Niebles*

70. Local Color Mapping Combined With Color Transfer for Underwater Image Enhancement, *Rafał Protasiuk, Adel Bibi, Bernard Ghanem*

71. VeGAN: Using GANs for Augmentation in Latent Space to Improve the Semantic Segmentation of Vehicles in Images From an Aerial Perspective, *Robert Krajewski, Tobias Moers, Lutz Eckstein*

72. A Conditional Deep Generative Model of People in Natural Images, *Rodrigo de Bem, Arnab Ghosh, Adnane Boukhayma, Thalaiyasingam Ajanthan, N. Siddharth, Philip Torr*

73. Unsupervised Feature Learning of Human Actions As Trajectories in Pose Embedding Manifold, *Jogendra Nath Kundu, Maharshi Gor, Phani Krishna Uppala, R. Venkatesh Babu*

74. Action Quality Assessment Across Multiple Actions, *Paritosh Parmar, Brendan Tran Morris*

75. 3D Human Pose Estimation With 2D Marginal Heatmaps, *Aiden Nibali, Zhen He, Stuart Morgan, Luke Prendergast*

76. Autonomous Curiosity for Real-Time Training Onboard Robotic Agents, *Ervin Teng, Bob Iannucci*

77. MultiNet: Multi-Modal Multi-Task Learning for Autonomous Driving, *Sauhaarda Chowdhuri, Tushar Pankaj, Karl Zipser*

78. Observing Pianist Accuracy and Form With Computer Vision, *Jangwon Lee, Bardia Doosti, Yupeng Gu, David Cartledge, David J. Crandall, Christopher Raphael*

79. Guided Image Inpainting: Replacing an Image Region by Pulling Content From Another Image, *Yinan Zhao, Brian Price, Scott Cohen, Danna Gurari*

1730–1830 Keynote Session (Kona 4–5)

- **Keynote Talk:** A-STAR: Agents that See, Talk, Act, and Reason, *Devi Parikh & Dhruv Batra (Georgia Tech / Facebook AI Research)*

1830–1835 Best Paper Awards (Kona 4–5)

1835–2000 Dinner (Lagoon Lanai)

1830–2000 PhD Forum (Lagoon Lanai – Reserved) (by invitation only)

- Sandipan Banerjee *(Univ. of Notre Dame)*
- Aparna Bharati *(Univ. of Notre Dame)*
- Baharul Islam *(Multimedia Univ., Malaysia)*
- Mohammad Mahfujur Rahman *(Queensland Univ. of Tech.)*
- Mina Rezaei *(Universität Potsdam)*
- Huijuan Xu *(Boston Univ.)*

1930–2200 Exhibits (Kona 1–3)

- Same as Tuesday Evening (see page 11).

1930–2200 Poster Session 2 (Kona 1–3)

Posters for Oral Sessions 3A, 3B, 4A, and 4B.

Notes:

Thursday, January 10

1230–1730 Registration (Waikoloa Promenade)

1300–1440 Oral 5A: Multimedia Applications, Stereo Processing, Virtual & Augmented Reality, Vision Systems & Applications (Kona 4)

Papers in this session are also in Poster Session 3.
Paper # represents poster board #.

Chair: Bryan Morse *(Brigham Young Univ.)*

Format (5 min. short presentation)

1. Semantic Stereo for Incidental Satellite Images, *Marc Bosch, Kevin Foster, Gordon Christie, Sean Wang, Gregory D. Hager, Myron Brown*
2. Attentive Conditional Channel-Recurrent Autoencoding for Attribute-Conditioned Face Synthesis, *Wenling Shang, Kihyuk Sohn*
3. CNN Based Dense Underwater 3D Scene Reconstruction by Transfer Learning Using Bubble Database, *Kazuto Ichimaru, Ryo Furukawa, Hiroshi Kawasaki*
4. Video-Rate Video Inpainting, *Rito Murase, Yan Zhang, Takayuki Okatani*
5. Advanced Super-Resolution Using Lossless Pooling Convolutional Networks, *Farzad Toutounchi, Ebroul Izquierdo*
6. A Generative Model of Worldwide Facial Appearance, *Zachary Bessinger, Nathan Jacobs*
7. Attentive and Adversarial Learning for Video Summarization, *Tsu-Jui Fu, Shao-Heng Tai, Hwann-Tzong Chen*
8. Semi-Dense Stereo Matching Using Dual CNNs, *Wendong Mao, Mingjie Wang, Jun Zhou, Minglun Gong*
9. DAC: Data-Free Automatic Acceleration of Convolutional Networks, *Xin Li, Shuai Zhang, Bolan Jiang, Yingyong Qi, Mooi Choo Chuah, Ning Bi*
10. Deep Neural Networks in Fully Connected CRF for Image Labeling With Social Network Metadata, *Chengjiang Long, Roddy Collins, Eran Swears, Anthony Hoogs*
11. Unbounded Sparse Census Transform Using Genetic Algorithm, *Carl Ahlberg, Miguel Leon Ortiz, Fredrik Ekstrand, Mikael Ekström*
12. Eyemotion: Classifying Facial Expressions in VR Using Eye-Tracking Cameras, *Steven Hickson, Nick Dufour, Avneesh Sud, Vivek Kwatra, Irfan Essa*
13. Keep Your Eye on the Puck: Automatic Hockey Videography, *Hemanth Pidaparthy, James H. Elder*
14. LUCFER: A Large-Scale Context-Sensitive Image Dataset for Deep Learning of Visual Emotions, *Pooyan Balouchian, Marjaneh Safaei, Hassan Foroosh*
15. Warping-Based Stereoscopic 3D Video Retargeting With Depth Remapping, *Md Baharul Islam, Lai-Kuan Wong, Chee-Onn Wong, Kok-Lim Low*
16. Low- and Semantic-Level Cues for Forensic Splice Detection, *Asongu Tambo, Michael Albright, Scott McCloskey*
17. Automatic Detection and Segmentation of Lentil Crop Breeding Plots From Multi-Spectral Images Captured by UAV-Mounted Camera, *Imran Ahmed, Mark Eramian, Ilya Ovsyannikov, William van der Kamp, Karsten Nielsen, Hema Sudhakar Duddu, Arafia Rumali, Steve Shirtliffe, Kirstin Bett*
18. Learning Sports Camera Selection From Internet Videos, *Jianhui Chen, Keyu Lu, Sijia Tian, James J. Little*
19. Beyond Pixels: Image Provenance Analysis Leveraging Metadata, *Aparna Bharati, Daniel Moreira, Joel Brogan, Patricia Hale, Kevin W. Bowyer, Patrick J. Flynn, Anderson Rocha, Walter J. Scheirer*

1300–1440 Oral 5B: Gesture Recognition, Large Scale Vision Applications, Segmentation & Grouping (Kona 5)

Papers in this session are also in Poster Session 3.
Paper # represents poster board #.

Chair: Ryan Farrell *(Brigham Young Univ.)*

Format (5 min. short presentation)

20. Recurrent Flow-Guided Semantic Forecasting, *Adam M. Terwilliger, Garrick Brazil, Xiaoming Liu*
21. Deep Semantic Instance Segmentation of Tree-Like Structures Using Synthetic Data, *Kerry Halupka, Rahil Garnavi, Stephen Moore*

22. Tukey-Inspired Video Object Segmentation, *Brent A. Griffin, Jason J. Corso*

23. Segmenting Sky Pixels in Images: Analysis and Comparison, *Cecilia La Place, Aisha Urooj, Ali Borji*

24. IDD: A Dataset for Exploring Problems of Autonomous Navigation in Unconstrained Environments, *Girish Varma, Anbumani Subramanian, Anoop Namboodiri, Manmohan Chandraker, C.V. Jawahar*

25. CNN-Based Semantic Segmentation Using Level Set Loss, *Youngeun Kim, Seunghyeon Kim, Taekyung Kim, Changick Kim*

26. Deep-Hurricane-Tracker: Tracking and Forecasting Extreme Climate Events, *Sookyung Kim, Hyojin Kim, Joonseok Lee, Sangwoong Yoon, Samira E. Kahou, Karthik Kashinath, Mr Prabhat*

27. FgGAN: A Cascaded Unpaired Learning for Background Estimation and Foreground Segmentation, *Prashant W. Patil, Subrahmanyam Murala*

28. Semantic Instance Meets Salient Object: Study on Video Semantic Salient Instance Segmentation, *Trung-Nghia Le, Akihiro Sugimoto*

29. ThunderNet: A Turbo Unified Network for Real-Time Semantic Segmentation, *Wei Xiang, Hongda Mao, Vassilis Athitsos*

30. Sem-GAN: Semantically-Consistent Image-to-Image Translation, *Anoop Cherian, Alan Sullivan*

31. Unsupervised Adversarial Visual Level Domain Adaptation for Learning Video Object Detectors From Images, *Avisek Lahiri, Sri Charan Ragireddy, Prabir Kumar Biswas, Pabitra Mitra*

32. Scene Parsing via Dense Recurrent Neural Networks With Attentional Selection, *Heng Fan, Peng Chu, Longin Jan Latecki, Haibin Ling*

33. Space-Time Event Clouds for Gesture Recognition: From RGB Cameras to Event Cameras, *Qinyi Wang, Yexin Zhang, Junsong Yuan, Yilong Lu*

34. Conditional Generative Adversarial Refinement Networks for Unbalanced Medical Image Semantic Segmentation, *Mina Rezaei, Haojin Yang, Konstantin Harmuth, Christoph Meinel*

35. Hidden States Exploration for 3D Skeleton-Based Gesture Recognition, *Xin Liu, Henglin Shi, Xiaopeng Hong, Haoyu Chen, Dacheng Tao, Guoying Zhao*

36. Learning to Segment With Image-Level Supervision, *Gaurav Pandey, Ambedkar Dukkipati*

37. A Domain Agnostic Normalization Layer for Unsupervised Adversarial Domain Adaptation, *Rob Romijnders, Panagiotis Meletis, Gijs Dubbelman*

38. Aligned to the Object, Not to the Image: A Unified Pose-Aligned Representation for Fine-Grained Recognition, *Pei Guo, Ryan Farrell*

1440–1520 Afternoon Break (Waikoloa Promenade)

1520–1700 Oral 6A: Computational Photography, Human-Computer Interaction, Security/Surveillance (Kona 4)

Papers in this session are also in Poster Session 3. Paper # represents poster board #.

Chair: Peyman Milanfar *(Google)*

Format (5 min. short presentation)

39. Good Similar Patches for Image Denoising, *Si Lu*

40. Training Adversarial Discriminators for Cross-Channel Abnormal Event Detection in Crowds, *Mahdyar Ravanbakhsh, Enver Sangineto, Moin Nabi, Nicu Sebe*

41. Multi-Modal Detection Fusion on a Mobile UGV for Wide-Area, Long-Range Surveillance, *Matt Brown, Keith Fieldhouse, Eran Swears, Paul Tunison, Adam Romlein, Anthony Hoogs*

42. Gyroscope-Aided Motion Deblurring With Deep Networks, *Janne Mustaniemi, Juho Kannala, Simo Särkkä, Jiri Matas, Janne Heikkilä*

43. Multispectral Direct-Global Separation of Dynamic Scenes, *Moriaki Torii, Takahiro Okabe, Toshiyuki Amano*

44. Domain Randomization for Scene-Specific Car Detection and Pose Estimation, *Rawal Khirodkar, Donghyun Yoo, Kris M. Kitani*

45. Scale Pyramid Network for Crowd Counting, *Xinya Chen, Yanrui Bin, Nong Sang, Changxin Gao*

46. Detecting Abnormal Events in Video Using Narrowed Normality Clusters, *Radu Tudor Ionescu, Sorina Smeureanu, Marius Popescu, Bogdan Alexe*

47. Analyzing Modern Camera Response Functions, *Can Chen, Scott McCloskey, Jingyi Yu*

48. Rapid Technique to Eliminate Moving Shadows for Accurate Vehicle Detection, *Kratika Garg, Nirmala Ramakrishnan, Alok Prakash, Thambipillai Srikanthan, Punit Bhatt*

49. Fast Geometrically-Perturbed Adversarial Faces, *Ali Dabouei, Sobhan Soleymani, Jeremy Dawson, Nasser M. Nasrabadi*

50. Omnidirectional Pedestrian Detection by Rotation Invariant Training, *Masato Tamura, Shota Horiguchi, Tomokazu Murakami*

51. Shadow Patching: Guided Image Completion for Shadow Removal, *Ryan Hintze, Bryan S. Morse*

52. Alignment by Composition, *Berk Sevilmis, Benjamin B. Kimia*

53. Cross Domain Residual Transfer Learning for Person Re-Identification, *Furqan M. Khan, Francois Bremond*

54. Visualizing Deep Similarity Networks, *Abby Stylianou, Richard Souvenir, Robert Pless*

55. Location-Velocity Attention for Pedestrian Trajectory Prediction, *Hao Xue, Du Q. Huynh, Mark Reynolds*

56. Give Me a Hint! Navigating Image Databases Using Human-in-the-Loop Feedback, *Bryan A. Plummer, Hadi Kiapour, Shuai Zheng, Robinson Piramuthu*

1520–1700 Oral 6B: Face Processing, Motion Processing (Kona 5)

Papers in this session are also in Poster Session 3. Paper # represents poster board #.

Chair: Nathan Jacobs *(Univ. of Kentucky)*

Format (5 min. short presentation)

57. Is Pose Really Solved? A Frontalization Study On Off-Angle Face Matching, *Sekhar Bhagavatula, Dipan K. Pal, Yutong Zheng, Ran Tao, Marios Savvides*

58. Understanding Kernel Size in Blind Deconvolution, *Li Si-Yao, Dongwei Ren, Qian Yin*

59. A Fusion Approach for Multi-Frame Optical Flow Estimation, *Zhile Ren, Orazio Gallo, Deqing Sun, Ming-Hsuan Yang, Erik B. Sudderth, Jan Kautz*

60. SfMLearner++: Learning Monocular Depth & Ego-Motion Using Meaningful Geometric Constraints, *Vignesh Prasad, Brojeshwar Bhowmick*

61. Photo-Realistic Facial Texture Transfer, *Parneet Kaur, Hang Zhang, Kristin J. Dana*

62. Video-Based Face Alignment With Local Motion Modeling, *Romain Belmonte, Nacim Ihaddadene, Pierre Tirilly, Marius Bilasco, Chaabane Djeraba*

63. Single Image Deblurring and Camera Motion Estimation With Depth Map, *Liyuan Pan, Yuchao Dai, Miaomiao Liu*

64. Fast Face Image Synthesis With Minimal Training, *Sandipan Banerjee, Walter J. Scheirer, Kevin W. Bowyer, Patrick J. Flynn*

65. On Measuring the Iconicity of a Face, *Prithviraj Dhar, Carlos D. Castillo, Rama Chellappa*

66. Illumination-Invariant Face Recognition With Deep Relit Face Images, *Ha A. Le, Ioannis A. Kakadiaris*

67. Multi-Scale Aggregation Network for Direct Face Alignment, *Peizhao Li, Anran Zhang, Lei Yue, Xiantong Zhen, Xianbin Cao*

68. A Deep Learning Approach to Solar-Irradiance Forecasting in Sky-Videos, *Talha A. Siddiqui, Samarth Bharadwaj, Shivkumar Kalyanaraman*

69. Multi-Modality Empowered Network for Facial Action Unit Detection, *Peng Liu, Zheng Zhang, Huiyuan Yang, Lijun Yin*

70. DAFE-FD: Density Aware Feature Enrichment for Face Detection, *Vishwanath A. Sindagi, Vishal M. Patel*

71. High-Speed Video From Asynchronous Camera Array, *Si Lu*

1730–1830 Keynote Session (Kona 4–5)

- **Keynote Talk:** Scaling Laws, Neural Computation, and Personal Augmentation, *Blaise Agüera y Arcas (Google)*

1830–2000 Dinner (Lagoon Lanai)

1930–2200 Exhibits (Kona 1–3)

- Same as Tuesday Evening (see page 11).

1930–2200 Poster Session 3 (Kona 1–3)

Posters for Oral Sessions 5A, 5B, 6A, and 6B.

Friday, January 11

0900–1400 Registration (Waikoloa Promenade)

Image and Video Forensics

Organizers: Christian Riess
Anthony Hoogs
Paul L. Rosin
Xianfang Sun

Location: Kona 4

Schedule: Full Day

0930 **Welcome**

0935 **Invited Talk:** *Matthew Turek (DARPA)*

1030 Morning Break

1100 MFC Datasets: Large-Scale Benchmark Datasets for Media Forensic Challenge Evaluation, *Haiying Guan, Mark Kozak, Eric Robertson, Yooyoung Lee, Amy N. Yates, Andrew Delgado, Daniel Zhou, Timothee Kheyrkhah, Jeff Smith, Jonathan Fiscus*

1130 Deep Representation Learning for Metadata Verification, *Bor-Chun Chen, Larry S. Davis*

1200 Lunch (on your own)

1330 **Invited Talk:** *Luisa Verdoliva (Univ. of Naples)*

1430 Exploiting Visual Artifacts to Expose Deepfakes and Face Manipulations, *Falko Matern, Christian Riess, Marc Stamminger*

1500 Can Liveness Be Automatically Detected From Latent Fingerprints? *Emanuela Marasco, Stefany Cando, Larry Tang*

1530 **Closing Remarks**

Demographic Variations in Performance of Biometric Algorithms

Organizers: Kevin Bowyer
Michael King
Karl Ricanek, Jr.
Arun Ross

Location: Kona 5

Schedule: Full Day

0830 **Opening Comments:** Demographic Biases in Biometric Systems

0840 **Presentation:** Demographic Effects of Race on Face Recognition, *Michael King (Florida Inst. of Technology), Kevin Bowyer (Univ. of Notre Dame)*

0900 **Keynote:** Seven Lessons I Learned From Two Decades Investigating Demographics and Face Recognition, *Jonathon Phillips (NIST)*

0930 **Presentation:** A Generative Model of Worldwide Facial Appearance, *Nathan Jacobs (Univ. of Kentucky)*

0950 **Presentation:** SAF- BAGE: Salient Approach for Facial Soft-Biometric Classification - Age, Gender, and Facial Expression, *Viraj Mavani (Univ. of Texas at Dallas / L. D. College of Engineering, India)*

1010 **Presentation:** Predicting Gender From Iris Texture May Be Harder Than It Seems, *Andrey Kuehlkamp (Univ. of Notre Dame)*

1030 Morning Break

1100 **Keynote:** Estimating Relative Skin Reflectance and Measuring Its Effect on Recognition, *Yevgeniy Sirotin (SAIC)*

1130 **Presentation:** Improving Generalizability of Facial Retouching Detection Using Race and Gender Information, *Aparna Bharati (Univ. of Notre Dame)*

1150 Considering Race a Problem of Transfer Learning, *Akbir Khan, Marwa Mahmoud*

1210 Lunch (on your own)

1350 Exploring Automatic Face Recognition on Match Performance and Gender Bias for Children, *Nisha*

Srinivas, Matthew Hivner, Kevin Gay, Harleen Atwal, Michael King, Karl Ricanek Jr.

1410 Predicting Soft Biometric Attributes From 30 Pixels: A Case Study in NIR Ocular Images, *Denton Bobeldyk, Arun Ross*

1430 **Keynote:** Demographic Dependencies in Contemporary Face Recognition Algorithms, *Patrick Grother (NIST)*

1500 **Afternoon Break**

1530 **Presentation:** Semi-Adversarial Networks for Imparting Age, Gender and Race Privacy to Face Images, *Vahid Mirjalili (Michigan State Univ.)*
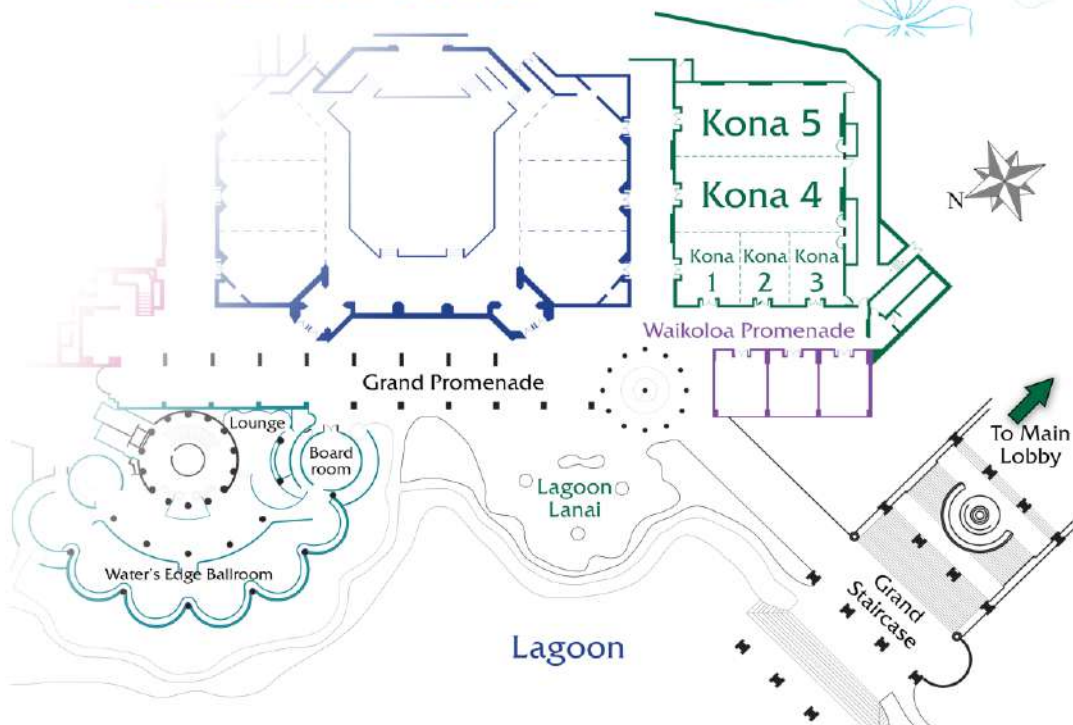
1550 **Panel Discussion:** Are Biometric Systems Biased? *Keynote Speakers & Workshop Chairs*

Notes:

WACV 2019 At-a-Glance

Friday (Jan. 11)

- **W: Demographic Variations in Performance of Biometric Algorithms** (Kona 5): pg. 19
- **W: Image and Video Forensics** (Kona 4): pg. 19
- Registration (Waikoloa Promenade)

Thursday (Jan. 10)

- **Oral 5A:** Multimedia Applications, Stereo Processing, Virtual & Augmented Reality, Vision Systems & Applications (Kona 4): pg. 16
- **Oral 5B:** Gesture Recognition, Large Scale Vision Applications, Segmentation & Grouping (Kona 5): pg. 16
- Break (Waikoloa Promenade)
- **Oral 6A:** Computational Photography, Human-Computer Interaction, Security, Surveillance (Kona 4): pg. 17
- **Oral 6B:** Face Processing, Motion Processing (Kona 5): pg. 18
- Registration (Waikoloa Promenade)
- **Keynote:** Scaling Laws, Neural Computation, and Personal Augmentation, **Blaise Agüera y Arcas** (Kona 4–5): pg. 18
- Dinner (Lagoon Lanai)
- Exhibits (Kona 1–3)
- **Poster Session 3** for Oral Sessions 5A, 5B, 6A, and 6B (Kona 1–3)

Wednesday (Jan. 9)

- **Oral 3A:** Biometrics, Statistical Methods & Learning (Kona 4): pg. 12
- **Oral 3B:** 3-D Modeling, Scene Understanding (Kona 5): pg. 12
- Break (Waikoloa Promenade)
- **Oral 4A:** Object Recognition (Kona 4): pg. 13
- **Oral 4B:** Human Motion Analysis/Capture, Vision for Aerial/Drone/Underwater/Ground Vehicles, Vision for Graphics (Kona 5): pg. 14
- Registration (Waikoloa Promenade)
- **Keynote:** A-STAR: Agents that See, Talk, Act, and Reason, **Devi Parikh & Dhruv Batra** (Kona 4–5): pg. 15
- Best Paper Awards (Kona 4–5)
- PhD Forum (Lagoon Lanai): pg. 15
- Dinner (Lagoon Lanai)
- Exhibits (Kona 1–3)
- **Poster Session 2** for Oral Sessions 3A, 3B, 4A, and 4B (Kona 1–3)

Tuesday (Jan. 8)

- Welcome (Kona 4–5)
- **Oral 1A:** Action Recognition, Infrared/Spectral Imaging, Medical & Bioinformatics Imaging, Real-Time Tracking (Kona 4): pg. 8
- **Oral 1B:** Early & Biologically-Inspired Vision, Evaluation & Comparison, Vision & Language, Vision for Robotics (Kona 5): pg. 9
- Break (Waikoloa Promenade)
- **Oral 2A:** Vision Systems & Applications (Kona 4): pg. 9
- **Oral 2B:** Early & Document Analysis, Image/Video Indexing & Retrieval, Industrial Inspection, Remote Sensing (Kona 5): pg. 10
- Registration (Waikoloa Promenade)
- **Keynote:** Machine Perception of Social Signals, **Yaser Sheikh** (Kona 4–5): pg. 11
- PhD Forum (Lagoon Lanai): pg. 11
- Dinner (Lagoon Lanai)
- Exhibits (Kona 1–3)
- **Poster Session 1** for Oral Sessions 1A, 1B, 2A, and 2B (Kona 1–3)

Monday (Jan. 7)

- **T: 3D Sensing, Reconstruction and Understanding of People, Objects and Environments** (Kona 3): pg. 5
- **T: Active Learning for Computer Vision** (Kona 2): pg. 6
- **T: Video CNNs for Activity Recognition** (Kona 1): pg. 5
- **T: Drone Vision Algorithms for Media Production** (Kona 3): pg. 7
- **T: Combinatorial Approaches for Visual Data Summarization** (Kona 2): pg. 7
- **T: Local Features — Past, Present, and Future** (Kona 1): pg. 6
- **W: Cross-Domain Biometric Recognition** (Kona 5): pg. 4
- **W: Human Activity Detection in Multi-Camera, Continuous, Long-Duration Video** (Kona 4): pg. 3
- Registration (Waikoloa Promenade)

Hilton Waikoloa Village Convention Center

Kona 5

Kona 4

Kona 1   Kona 2   Kona 3

N

Waikoloa Promenade

Grand Promenade

Lounge

Board room

Lagoon Lanai

To Main Lobby

Grand Staircase

Water's Edge Ballroom

Lagoon

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