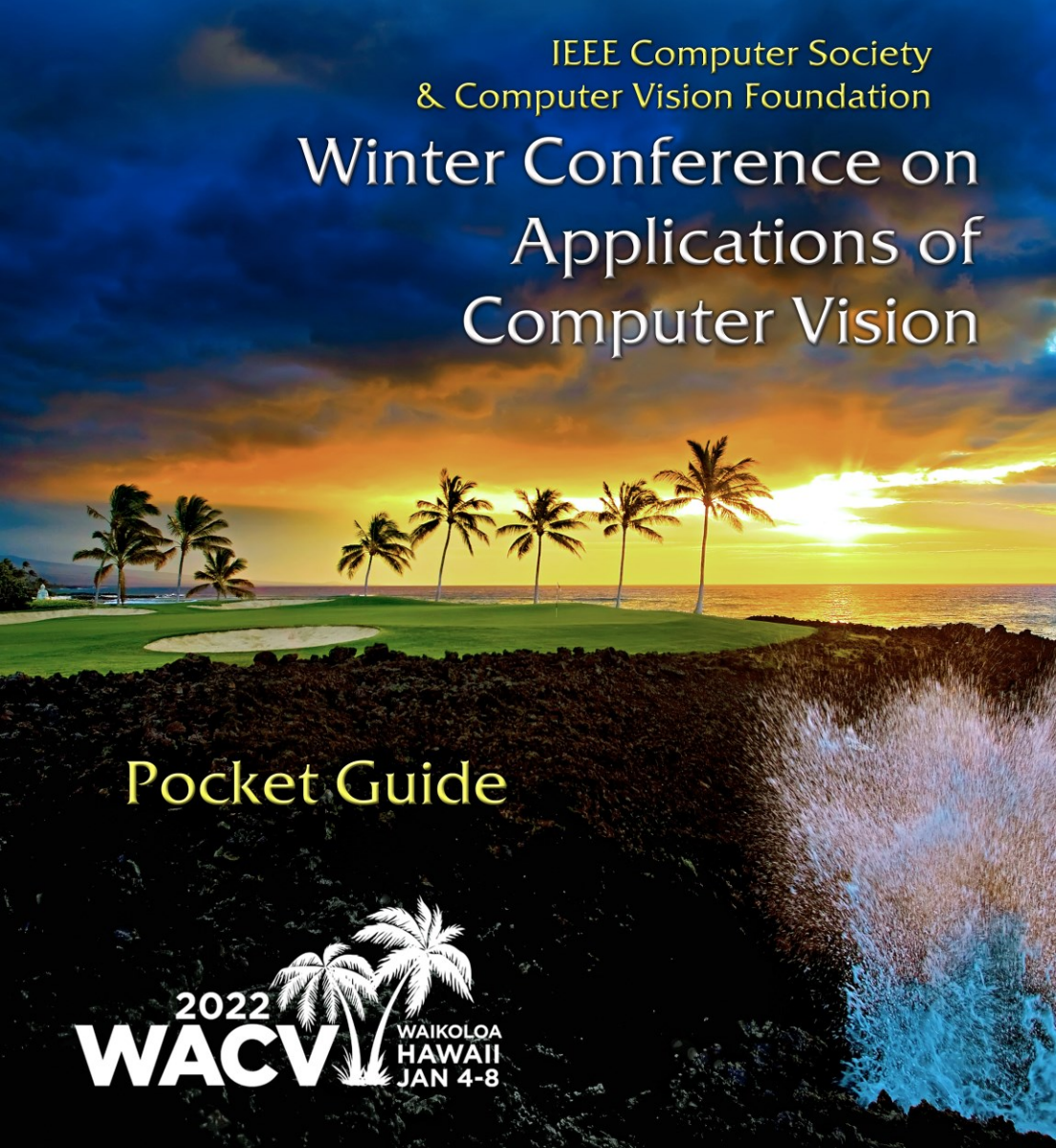
IEEE Computer Society
& Computer Vision Foundation

Winter Conference on Applications of Computer Vision



Pocket Guide

2022 WACV
WAIKOLOA HAWAII JAN 4-8

WACV 2022 At-a-Glance

Tuesday Jan. 4

Registration (Porte Cochère)

W: Video/Audio Quality in Computer Vision (Naupaka I & II, pg. 3)

W: Human Activity Detection in Multi-Camera, Continuous, Long-Duration Video (Naupaka V, pg. 4)

W: Dealing With the Novelty in Open Worlds (Naupaka VI, pg. 5)

W: Manipulation, Adversarial and Presentation Attacks in Biometrics (Naupaka III, pg. 5)

W: Explainable and Interpretable Artificial Intelligence for Biometrics (Virtual, pg. 6)

T: Reinforcement Learning and Bandits for Computer Vision (Naupaka VII, pg. 7)

T: Human-Machine Pairing to Improve Computer Vision (Naupaka VII, pg. 7)

Wednesday Jan. 5

Registration (Porte Cochère)

Welcome (Naupaka I)

Awards Session: Presentation of Award Papers (Naupaka I)

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Oral 1C (virtual) Naupaka III pg. 10
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Oral 2B (live) Naupaka V pg. 11
Oral 2C (virtual) Naupaka III pg. 12
Oral 2D (virtual) Naupaka VII pg. 12

Break (Naupaka Lawn)

Keynote: Style and Influence From In-the-Wild Fashion Photos
Kristen Grauman (Naupaka I, pg. 13)

Dinner Lū'au Grounds

Oral 3A (live) Naupaka I pg. 13
Oral 3B (live) Naupaka V pg. 13
Oral 3C (virtual) Naupaka III pg. 14
Oral 3D (virtual) Naupaka VII pg. 15

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Poster Session 1: for today's oral sessions (Naupaka IV)

Thursday Jan. 6

Exhibits (Paniolo I-III, pg. 16): Refreshments offered throughout the day

Doctoral Consortium (by invitation only) Naupaka Lawn, pg. 16

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Oral 4C (virtual) Naupaka III pg. 17
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Oral 5D (virtual) Naupaka VII pg. 20

Break (Paniolo)

Keynote: Art at the Age of AI
Ahmed Elgammal (Naupaka I, pg. 20)

Dinner Lū'au Grounds

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Oral 6D (virtual) Naupaka VII pg. 22

Dessert Naupaka Lawn

Poster Session 2: for today's oral sessions (Naupaka IV)

Friday Jan. 7

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Oral 7D (virtual) Naupaka VII pg. 24

Break (Naupaka Lawn)

Oral 8A (live) Naupaka I pg. 25
Oral 8B (live) Naupaka V pg. 25
Oral 8C (virtual) Naupaka III pg. 26
Oral 8D (virtual) Naupaka VII pg. 26

Break (Naupaka Lawn)

Keynote: Integrated Physical-Digital World and Digital Human
Zhengyou Zhang (Naupaka I, pg. 27)

Dinner Lū'au Grounds

Oral 9A (live) Naupaka I pg. 27
Oral 9B (live) Naupaka V pg. 28
Oral 9C (virtual) Naupaka III pg. 28
Oral 9D (virtual) Naupaka VII pg. 29

Dessert Naupaka Lawn

Poster Session 3: for today's oral sessions (Naupaka IV)

Saturday Jan. 8

Registration

W: Hazard Perception in Intelligent Vehicles (Virtual, pg. 30; live from 2 am–9 am)

W: Demographic Variations in Performance of Biometrics and Related Technology (Naupaka I, pg. 31)

W: Real-World Surveillance: Applications and Challenges (Naupaka V, pg. 31)

W: Computer Vision for Winter Sports (Naupaka III, pg. 32)

W: Applications of Computational Imaging (Naupaka VI, pg. 33; starts at 12:15)

T: Binary Neural Networks & Applications (Naupaka VII, pg. 34)

T: AI for Commercial Driver Safety (Naupaka VII, pg. 34)

2022 WACV WAIKOLOA HAWAII JAN 4-8

Message from the General and Program Chairs

Welcome to the 22nd edition of the Winter Conference on Applications of Computer Vision (WACV) 2022. WACV is the premier outlet for research advances in applications of computer vision technology. For the first time, WACV will be held as a hybrid event, with the in-person component at Waikoloa on the island of Hawaii. WACV in Snowmass Village, CO in March 2020 was the last major computer vision conference to be held in person prior to the pandemic and (at the time of this writing) WACV 2022 will be the first with a significant in-person component. After nearly two years away, we are very excited to bring together at least a small part of our community.

We gratefully acknowledge the contributions of our corporate supporters: Amazon Science, Google, Kitware, MITRE, and Verisk. We are also fortunate to have three great keynote speakers: Kristen Grauman, Ahmed Elgammal, and Zhengyou Zhang.

WACV 2022 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. Along with the paper presentations are activities including tutorials, workshops, a doctoral consortium, and social events.

WACV 2022 continued to attract a large number of submissions, reaching 1172 this year, even in the uncertain covid era. After the diligent work from 88 area chairs and 1487 reviewers, including those who helped in the last minutes as emergency reviewers, 406 papers were accepted. The review process is multi-round and multi-track, which puts emphasis on either novel algorithmic components or vision systems for real-world applications. Each paper received at least 3 full reviews, and the acceptance decisions were made within AC triplets, and additional conflict-free panels were brought in when necessary. Following the best practices in the community, the chairs did not place any restrictions on acceptance, and the final acceptance rate is 34.6%.

We would like to thank everyone involved in making WACV 2022 a success, especially during the pandemic and with the hybrid mode. We wish to thank our Finance Chairs, Terry Boult and Ginger Boult, our Workshops Chairs, Vito Struc and Margrit Betke, our Tutorials Chair, Philippos Mordohai, our Doctoral Consortium Chair, Nathan Jacobs, our Publication Chair, Eric Mortensen, our Diversity, Equity, and Inclusion Chair, Georgia Gkioxari, and our Awards Committee Larry Davis, Jana Kosecka, Greg Mori, Jianbo Shi, and Tanveer Syeda-Mahmood. We want to give special thanks to Nicole Finn, who has kept WACV running smoothly for many years now. This year, in particular, with the ever-changing challenges due to the pandemic, her efforts have been quite invaluable.

Last but not least, we thank all of you for attending WACV, either in person or virtually. We sincerely hope that you enjoy WACV 2022! Aloha!

Kevin Bowyer, Gérard Medioni, Walter Scheirer
General Co-Chairs

Saket Anand, Ryan Farrell, Richard Souvenir, Catherine Zhao
Program Co-Chairs

Organizing Committee & Area Chairs

WACV 2022 Organizing Committee

General Chairs:	Gérard Medioni Kevin Bowyer Walter Scheirer
Program Chairs:	Ryan Farrell Catherine Zhao Saket Anand Richard Souvenir
Workshops Chairs:	Vitomir Štruc Margrit Betke
Tutorials Chair:	Philippos Mordohai
Finance Chairs:	Terry Boult Ginger Boult
Publications Chair:	Eric Mortensen
Doctoral Consortium Chair:	Nathan Jacobs
Diversity, Equity, & Inclusion Chair:	Georgia Gkioxari
Conference Organizer:	Nicole Finn

WACV 2022 Area Chairs

Karteek Alahari
Rushil Anirudh
Chetan Arora
Soma Biswas
Anirban Chakraborty
Shayok Chakraborty
Li Cheng
Jonghyun Choi
Mooi Choo Chuah
Ondrej Chum
Brian Clipp
David Crandall
Kosta Derpanis
Abhinav Dhall
Enrique Dunn
Ehsan Elhamifar
Heng Fan
Yi Fang
Giovanni Farinella
Cornelia Fermuller
Amanda Fernandez
Basura Fernando
Orazio Gallo
Chuang Gan
Rohit Girdhar
Douglas Gray
Chunhui Gu
Tanaya Guha
Danna Gurari
Mehrtash Harandi
Anthony Hoogs
Jia-Bin Huang
Seong Jae Hwang
Nazli Ikizler-Cinbis
Nathan Jacobs
Angjoo Kanazawa
Leonid Karlinsky
Yosi Keller
Hilde Kuehne
Gim Hee Lee
Haoxiang Li
Yin Li
Haibin Ling
Feng Liu
Jingen Liu
Jun Liu
Yanxi Liu
Simon Lucey
Subhransu Maji
Yasushi Makihara
Brais Martinez
Scott McCloskey
Henry Medeiros
Jingjing Meng
Vlad Morariu
Vineeth N. Balasubramanian
Anoop Namboodiri
Vinay Namboodiri
Rameswar Panda
Brian Price
Venkatesh Babu Radhakrishnan
Shanmuganathan Raman
Vignesh Ramanathan
Zhou Ren
William Schwartz
Rajiv Shah
Gaurav Sharma
Boxin Shi
Min Shin
Vikas Singh
Vivek Singh
Abby Stylianou
A Subramanyam
Akihiro Sugimoto
Yu-Wing Tai
Tatiana Tommasi
He Wang
Ruiping Wang
Yang Wang
Yunchao Wei
Yongkang Wong
Chang Xu
Jiaolong Yang
Ming-Hsuan Yang
Kuk-Jin Yoon
Dingwen Zhang
Bolei Zhou
Jiantao Zhou

Monday, January 3

1600–1800 Registration (Porte Cochère)

Tuesday, January 4

0800– 1600 Registration (Porte Cochère)

Video/Audio Quality in Computer Vision

Organizers: Kevin Bowyer
Larry Davis
Zongyi Liu
Yarong Feng

Location: Naupaka I & II

Schedule: Full Day

0820 **Opening Remarks**

0830 **Keynote** [remote]**:** Audio Quality and Its Impact on Sound and Music Processing, *Serra Xavier (Univ. Pompeu Fabra)*

0930 Break

S1: Oral Presentations I (0940-1040)

0940 [video] Task Adaptive Network for Image Restoration With Combined Degradation Factors, *Jingyuan Zhou, Chaktou Leong, Minyi Lin, Wantong Liao, Congduan Li*

0955 [live] A No-Reference Model for Detecting Audio Artifacts Using Pretrained Audio Neural Networks, *David Higham, Ayush Bagla, Veneta Haralampieva*

1010 [video] RainGAN: Unsupervised Raindrop Removal via Decomposition and Composition, *Xu Yan, Yuan Ren Loke*

1025 [video] DILIE: Deep Internal Learning for Image Enhancement, *Indra Deep Mastan, Shanmuganathan Raman, Prajwal Singh*

1040 Break

1055 **Keynote** [live]**:** Want a Smarter Deep CNN? *Kevin Bowyer (Univ. of Notre Dame)*

1155 Lunch (on your own)

S2: Oral Presentations II (1300-1400)

1300 [live] Utilizing Network Features To Detect Erroneous Inputs, *Matt Gorbett, Nathaniel Blanchard*

1315 [video] Uncertainty Quantification Using Variational Inference for Biomedical Image Segmentation, *Abhinav Sagar*

1330 [video] SAPNet: Segmentation-Aware Progressive Network for Perceptual Contrastive Deraining, *Shen Zheng, Changjie Lu, Yuxiong Wu, Gaurav Gupta*

1345 [video] Depth Completion Auto-Encoder, *Kaiyue Lu, Nick Barnes, Saeed Anwar, Liang Zheng*

1400 Break

S3: Oral Presentations III (1415-1515)

1415 [live] Subjective Quality Assessment of User-Generated Content Gaming Videos, *Xiangxu Yu, Zhengzhong Tu, Zhenqiang Ying, Alan C. Bovik, Neil Birkbeck, Yilin Wang, Balu Adsumilli*

1430 [video] FaceQvec: Vector Quality Assessment for Face Biometrics Based on ISO Compliance, *Javier Hernandez-Ortega, Julian Fierrez, Luis F. Gomez, Aythami Morales, Jose Luis Gonzalez-de-Suso, Francisco Zamora-Martinez*

1445 [live] Image Quality Assessment Using Synthetic Images, *Pavan C. Madhusudana, Neil Birkbeck, Yilin Wang, Balu Adsumilli, Alan C. Bovik*

1500 [video] Improved EDVR Model for Robust and Efficient Video Super-Resolution, *Yulin Huang, Junying Chen*

1515 Break

1530 **Keynote** [video + remote Q&A]**:** Why Is Video Quality Prediction So Hard? *Alan Bovik (Univ. of Texas at Austin)*

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

Organizers: Afzal Godil
Jonathan G. Fiscus
Yooyoung Lee
Anthony Hoogs
Reuven Meth

Location: Naupaka V

Schedule: Full Day

0900 **Welcome**

0905 **Invited Talk:** Beyond HADCV -What is Next? *Alexander Hauptmann (Carnegie Mellon Univ.)*

S1: ActEV SRL Challenge Results & Top-Performers (0955-1125)

0955 **ActEV SRL Challenge Results,** *Jon Fiscus, Yooyoung Lee, Andrew Delgado, Afzal Godil, Lukas Diduch, Eliot Godard, Baptiste Chocot, Jesse Zhang, Jim Golden*

1015 **[SRL Rank1]** BUPT-MCPRL at ActEV-SRL 2021:215 AOD, *Junfeng Wan, Zhihang Tong, Xiyu Zhao*

1030 Morning Break (Naupaka Lawn)

1045 **[SRL Rank2]** Argus++: Robust Real-Time Activity Detection for Unconstrained Video Streams With Overlapping Cube Proposals, *Lijun Yu, Yijun Qian, Wenhe Liu, Alexander G. Hauptmann*

1105 **[SRL Rank3]** GabriellaV2: Towards Better Generalization in Surveillance Videos for Action Detection, *Ishan Dave, Zacchaeus Scheffer, Akash Kumar, Sarah Shiraz, Yogesh Singh Rawat, Mubarak Shah*

S2: Video Analytics & Infrastructure (1125-1155)

1125 Modelling Ambiguous Assignments for Multi-Person Tracking in Crowds, *Daniel Stadler, Jürgen Beyerer*

1140 From Leaderboard to Operations: DIVA Transition Experiences, *Bharadwaj Ravichandran, Roderic Collins, Keith Fieldhouse, Kellie Corona, Anthony Hoogs*

1155 Lunch (on your own)

S3: Activity Detection & Recognition (1315-1450)

1315 **Invited Talk:** DIVA Program Retrospective: Autonomous Detection of (Some) Activities in Security Video, *Jack Cooper (IARPA)*

1405 TRM: Temporal Relocation Module for Video Recognition, *Yijun Qian, Guoliang Kang, Lijun Yu, Wenhe Liu, Alexander G. Hauptmann*

1420 Win-Fail Action Recognition, *Paritosh Parmar, Brendan Morris*

1435 Actor-Centric Tubelets for Real-Time Activity Detection in Extended Videos, *Effrosyni Mavroudi, Prashast Bindal, René Vidal*

1450 Afternoon Break (Naupaka Lawn)

S4: Activity Recognition & Video Analytics (1505-1650)

1505 Sign Pose-Based Transformer for Word-Level Sign Language Recognition, *Matyáš Boháček, Marek Hrúz*

1520 Video Action Re-Localization Using Spatio-Temporal Correlation, *Akshaya Ramaswamy, Karthik Seemakurthy, Jayavardhana Gubbi, Balamuralidhar P*

1535 PP-HumanSeg: Connectivity-Aware Portrait Segmentation with a Large-Scale Teleconferencing Video Dataset, *Lutao Chu, Yi Liu, Zewu Wu, Shiyu Tang, Guowei Chen, Yuying Hao, Juncai Peng, Zhiliang Yu, Zeyu Chen, Baohua Lai, Haoyi Xiong*

1550 **Invited Talk:** Fine-grained Activities of People Worldwide, *Jeffrey Byrne (Visym Labs)*

1640 **ActEV Challenges and Datasets Group Discussion**

Dealing With the Novelty in Open Worlds

Organizers: Pulkit Kumar
Anubhav
Shu Kong
Christopher Funk
Terrance Boult
Bill Ferguson
Abhinav Shrivastava

Location: Naupaka VI

Schedule: Full Day

0930 **Opening Remarks**

0945 **Invited Talk** [live]**:** Activity-Based Novelty and Anomaly Detection in Videos, *Anthony Hoggs (Kitware)*

1015 **Invited Talk** [remote]**:** Initial Experiences With Multi-Task Novelty Detection, *Thomas G. Dietterich (Oregon State Univ.)*

1045 **Invited Talk** [remote]**:** TBA, *Kate Saenko (Boston Univ.)*

S1: Paper Session I (1115-1215)

1115 Unsupervised BatchNorm Adaptation (UBNA): A Domain Adaptation Method for Semantic Segmentation Without Using Source Domain Representations, *Marvin Klingner, Jan-Aike Termöhlen, Jacob Ritterbach, Tim Fingscheidt*

1130 Attention Guided Cosine Margin To Overcome Class-Imbalance in Few-Shot Road Object Detection, *Ashutosh Agarwal, Anay Majee, Anbumani Subramanian, Chetan Arora*

1145 Inductive Biases for Low Data VQA: A Data Augmentation Approach, *Narjes Askarian, Ehsan Abbasnejad, Ingrid Zukerman, Wray Buntine, Gholamreza Haffari*

1200 Uncertainty Aware Proposal Segmentation for Unknown Object Detection, *Yimeng Li, Jana Košecká*

1215 Lunch (on your own)

1300 **Invited Talk** [live]**:** Robust Perception With Natural Supervision, *Carl Vondrick (Columbia Univ.)*

1330 **Invited Talk** [live]**:** Actionable Representation Learning for Open-World Vision, *Stella Yu (UC Berkeley)*

S2: Paper Session II (1400-1430)

1400 Reconstructive Training for Real-World Robustness in Image Classification, *David Patrick, Michael Geyer, Richard Tran, Amanda Fernandez*

1415 Towards Unsupervised Online Domain Adaptation for Semantic Segmentation, *Yevhen Kuznietsov, Marc Proesmans, Luc Van Gool*

1430 Afternoon Break (Naupaka Lawn)

S2: Paper Session III (1500-1530)

1500 Auto QA: The Question Is Not Only What, but Also Where, *Sumit Kumar, Badri N. Patro, Vinay P. Namboodiri*

1515 VQuAD: Video Question Answering Diagnostic Dataset, *Vivek Gupta, Badri N. Patro, Hemant Parihar, Vinay P. Namboodiri*

1530 **Invited Talk** [live]**:** Open World Learning of New Classes, *Terrance Boult & Mohsen Jafarzadeh (Univ. of Colorado Colorado Springs)*

1600 **Panel Discussion**

Manipulation, Adversarial and Presentation Attacks in Biometrics

Organizers: Kiran Raja
Naser Damer
Raghavendra Ramachandra
Julian Fierrez

Location: Naupaka III

Schedule: Half Day — Morning

0900 **Opening Remarks**

0910 **Keynote:** Advances in DeepFake Detection, *Wael Abd-Almageed (Univ. of Southern California)*

S1: Oral Session I (1010-1110)

1010 Synthesizing Face Images From Match Scores, *Thomas Swearingen, Arun Ross*

1030 Powerful Physical Adversarial Examples Against Practical Face Recognition Systems, *Inderjeet Singh, Toshinori Araki, Kazuya Kakizaki*

1050 Morph Detection Enhanced by Structured Group Sparsity, *Poorya Aghdaie, Baaria Chaudhary, Sobhan Soleymani, Jeremy Dawson, Nasser M. Nasrabadi*

1110 Morning Break (Naupaka Lawn)

1120 **Keynote:** Deepfake Detection: State-of-the-Art and Future Directions, *Luisa Verdoliva (Univ. Federico II of Naples)*

S1: Oral Session II (1220-1320)

1220 OTB-Morph: One-Time Biometrics via Morphing Applied to Face Templates, *Mahdi Ghafourian, Julian Fierrez, Ruben Vera-Rodriguez, Ignacio Serna, Aythami Morales*

1240 Saliency-Guided Textured Contact Lens-Aware Iris Recognition, *Lucas Parzianello, Adam Czajka*

1300 A Personalized Benchmark for Face Anti-Spoofing, *Davide Belli, Debasmit Das, Bence Major, Fatih Porikli*

1320 **Closing Remarks**

Explainable and Interpretable Artificial Intelligence for Biometrics

Organizers: Jaime S. Cardoso
Ana F. Sequeira
Arun Ross
Peter Eisert
Cynthia Rudin

Location: Virtual / Online

Schedule: Half Day — Afternoon

1400 **Opening Remarks**

1410 **Keynote:** Visual Psychophysics for Making Face Recognition Algorithms More Explainable, *Walter Scheirer (Univ. of Notre Dame)*

S1: Oral Session I (1510-1610)

1510 Explainability of the Implications of Supervised and Unsupervised Face Image Quality Estimations Through Activation Map Variation Analyses in Face Recognition Models, *Biying Fu, Naser Damer*

1530 Interpretable Deep Learning-Based Forensic Iris Segmentation and Recognition, *Andrey Kuehlkamp, Aidan Boyd, Adam Czajka, Kevin Bowyer, Patrick Flynn, Dennis Chute, Eric Benjamin*

1550 Skeleton-Based Typing Style Learning for Person Identification, *Lior Gelberg, David Mendlovic, Dan Raviv*

1610 Afternoon Break (Naupaka Lawn)

1620 **Keynote:** Trustworthy Face Recognition, *Xiaoming Liu (Michigan State Univ.)*

S2: Oral Session II (1720-1820)

1720 Supervised Contrastive Learning for Generalizable and Explainable DeepFakes Detection, *Ying Xu, Kiran Raja, Marius Pedersen*

1740 Myope Models – Are Face Presentation Attack Detection Models Short-Sighted? *Pedro C. Neto, Ana F. Sequeira, Jaime S. Cardoso*

1800 Semantic Network Interpretation, *Pei Guo, Ryan Farrell*

1820 **Closing Remarks**

Notes:

Tuesday, January 4

0800–1600 Registration (Porte Cochère)

Reinforcement Learning and Bandits for Computer Vision

Organizers: Baihan Lin
Djallel Bouneffouf

Location: Naupaka VII

Time: 0900-1200 (Half Day — Morning)

In recent years, reinforcement learning and bandits have transformed a wide range of real-world applications including healthcare, finance, recommendation systems, speech and audio processing, natural language processing and last but not least, computer vision. While most computer vision applications of reinforcement learning algorithms are centered around self-driving cars and robotics, there are still many grounds to explore to utilize the benefits of reinforcement learning, such as its reward-driven adaptability, state representations, temporal structures and optimization flexibility. In this half-day tutorial, we will overview the recent advancements of reinforcement learning and bandits and discuss how they can be employed to solve various computer vision problems with models that are interpretable and scalable. First, we briefly introduce the basic concept of reinforcement learning and bandits, as well as the major variant problem settings in this machine learning domain. Second, we translate various computer vision tasks into the reinforcement learning problems and show the key challenges. Third, we introduce some reinforcement learning and bandit techniques and their varieties for computer vision tasks and their machine learning formulations. Fourth, we present several state-of-the-art applications of reinforcement learning in different fields of computer vision. Lastly, we will discuss some open problems in reinforcement learning and bandits to show how to further develop more advanced algorithms for computer vision in the future.

Human-Machine Pairing to Improve Computer Vision

Organizers: Aidan Boyd
Daniel Moreira
Adam Czajka
Kevin Bowyer

Location: Naupaka VII

Time: 1400-1700 (Half Day — Afternoon)

Humans are "visual creatures" and solve many visual tasks sufficiently well (e.g., face recognition). Can humans guide machine learning, including deep learning-based models, towards a better detection of abnormal visual inputs, e.g., printed irises or GAN-generated fake faces?

In this tutorial we will show how to incorporate human perceptual intelligence into training strategies of selected machine learning algorithms, focusing on modern deep neural networks, with the main goal of increasing the generalization capabilities of the obtained models. We will start with a discussion on the methods of collecting human perception information, using (a) specially-designed (and open-sourced to the community) on-line annotation tools, and (b) eye tracking devices. Next, we will present the ways of creating human saliency maps based on the collected inputs, which is not trivial, especially for eye tracking data. The last part of the tutorial will present ways of incorporating human saliency maps into training data and training strategies. We will demonstrate that these approaches allow to guide computer vision algorithms "where to look", what in consequence ends up with models that (a) achieve significantly better accuracy in open-set recognition regime, (b) are less prone to overfitting, and (c) present higher stability in terms of selection of features used in recognition, when compared to other models either

trained from random weights or without the incorporation of human intelligence. Although the methods presented in this tutorial are domain-agnostic, we will focus on practical applications, such as biometric presentation attacks, including recognition of GAN-generated faces ("deep fakes") and abnormal irises.

Notes:

Wednesday, January 5

1200–1700 Registration (Porte Cochère)

1300–1315 Welcome by the General/Program Chairs (Naupaka I; overflow in Naupaka II, III, V, VI, & VII)

1315–1415 Awards Session (Naupaka I; overflow in Naupaka II, III, V, VI, & VII)

1415–1430 Break (Naupaka Lawn)

1430–1530 1A (in-person)**: Computational Photography and Image Processing** (Naupaka I; overflow in Naupaka II)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

1. Evaluation of Correctness in Unsupervised Many-to-Many Image Translation, *Dina Bashkirova, Ben Usman, Kate Saenko*
2. Fast and Explicit Neural View Synthesis, *Pengsheng Guo, Miguel Angel Bautista, Alex Colburn, Liang Yang, Daniel Ulbricht, Joshua M. Susskind, Qi Shan*
3. Training a Task-Specific Image Reconstruction Loss, *Aamir Mustafa, Aliaksei Mikhailiuk, Dan Andrei Iliescu, Varun Babbar, Rafał K. Mantiuk*
4. GANs Spatial Control via Inference-Time Adaptive Normalization, *Karin Jakoel, Liron Efraim, Tamar Rott Shaham*
5. Single-Photon Camera Guided Extreme Dynamic Range Imaging, *Yuhao Liu, Felipe Gutierrez-Barragan, Atul Ingle, Mohit Gupta, Andreas Velten*
6. Extracting Vignetting and Grain Filter Effects From Photos, *Abdelrahman Abdelhamed, Jonghwa Yim, Abhijith Punnappurath, Michael S. Brown, Jihwan Choe, Kihwan Kim*
7. High Dynamic Range Imaging of Dynamic Scenes With Saturation Compensation but Without Explicit Motion Compensation, *Haesoo Chung, Nam Ik Cho*
8. HERS Superpixels: Deep Affinity Learning for Hierarchical Entropy Rate Segmentation, *Hankui Peng, Angelica I. Aviles-Rivero, Carola-Bibiane Schönlieb*
9. Improving Single-Image Defocus Deblurring: How Dual-Pixel Images Help Through Multi-Task Learning, *Abdullah Abuolaim, Mahmoud Afifi, Michael S. Brown*
10. Image Restoration by Deep Projected GSURE, *Shady Abu-Hussein, Tom Tirer, Se Young Chun, Yonina C. Eldar, Raja Giryes*
11. Non-Blind Deblurring for Fluorescence: A Deformable Latent Space Approach With Kernel Parameterization, *Ziqiao Guan, Esther H. R. Tsai, Xiaojing Huang, Kevin G. Yager, Hong Qin*
12. Controlled GAN-Based Creature Synthesis via a Challenging Game Art Dataset – Addressing the Noise-Latent Trade-Off, *Vaibhav Vavilala, David Forsyth*

1430–1530 1B (in-person)**: Action and Pose** (Naupaka V; overflow in Naupaka VI)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

13. Hierarchical Modeling for Task Recognition and Action Segmentation in Weakly-Labeled Instructional Videos, *Reza Ghoddoosian, Saif Sayed, Vassilis Athitsos*
14. Quantified Facial Expressiveness for Affective Behavior Analytics, *Md Taufeeq Uddin, Shaun Canavan*
15. Pose and Joint-Aware Action Recognition, *Anshul Shah, Shlok Mishra, Ankan Bansal, Jun-Cheng Chen, Rama Chellappa, Abhinav Shrivastava*
16. Equine Pain Behavior Classification via Self-Supervised Disentangled Pose Representation, *Maheen Rashid, Sofia Broomé, Katrina Ask, Elin Hernlund, Pia Haubro Andersen, Hedvig Kjellström, Yong Jae Lee*
17. Domain Generalization Through Audio-Visual Relative Norm Alignment in First Person Action Recognition, *Mirco Planamente, Chiara Plizzari, Emanuele Alberti, Barbara Caputo*

18. SSCAP: Self-Supervised Co-Occurrence Action Parsing for Unsupervised Temporal Action Segmentation, *Zhe Wang, Hao Chen, Xinyu Li, Chunhui Liu, Yuanjun Xiong, Joseph Tighe, Charless Fowlkes*
19. Multi-Stream Dynamic Video Summarization, *Mohamed Elfeki, Liqiang Wang, Ali Borji*
20. SporeAgent: Reinforced Scene-Level Plausibility for Object Pose Refinement, *Dominik Bauer, Timothy Patten, Markus Vincze*
21. A Structure-Aware Method for Direct Pose Estimation, *Hunter Blanton, Scott Workman, Nathan Jacobs*

1430–1530 1C (virtual): 3D Computer Vision (Naupaka III; online)

Format (5 min. video)

- Stylizing 3D Scene via Implicit Representation and HyperNetwork, *Pei-Ze Chiang, Meng-Shiun Tsai, Hung-Yu Tseng, Wei-Sheng Lai, Wei-Chen Chiu*
- SIDE: Center-Based Stereo 3D Detector With Structure-Aware Instance Depth Estimation, *Xidong Peng, Xinge Zhu, Tai Wang, Yuexin Ma*
- Learning To Reconstruct 3D Non-Cuboid Room Layout From a Single RGB Image, *Cheng Yang, Jia Zheng, Xili Dai, Rui Tang, Yi Ma, Xiaojun Yuan*
- Single-Shot Dense Active Stereo With Pixel-Wise Phase Estimation Based on Grid-Structure Using CNN and Correspondence Estimation Using GCN, *Ryo Furukawa, Michihiro Mikamo, Ryusuke Sagawa, Hiroshi Kawasaki*
- EllipsoidNet: Ellipsoid Representation for Point Cloud Classification and Segmentation, *Yecheng Lyu, Xinming Huang, Ziming Zhang*
- What Makes for Effective Few-Shot Point Cloud Classification? *Chuangguan Ye, Hongyuan Zhu, Yongbin Liao, Yanggang Zhang, Tao Chen, Jiayuan Fan*
- Mending Neural Implicit Modeling for 3D Vehicle Reconstruction in the Wild, *Shivam Duggal, Zihao Wang, Wei-Chiu Ma, Sivabalan Manivasagam, Justin Liang, Shenlong Wang, Raquel Urtasun*
- HybVIO: Pushing the Limits of Real-Time Visual-Inertial Odometry, *Otto Seiskari, Pekka Rantalankila, Juho Kannala, Jerry Ylilammi, Esa Rahtu, Arno Solin*
- Occlusion Resistant Network for 3D Face Reconstruction, *Hitika Tiwari, Vinod K. Kurmi, K.S. Venkatesh, Yong-Sheng Chen*
- StickyLocalization: Robust End-to-End Relocalization on Point Clouds Using Graph Neural Networks, *Kai Fischer, Martin Simon, Stefan Milz, Patrick Mäder*
- Symmetric-Light Photometric Stereo, *Kazuma Minami, Hiroaki Santo, Fumio Okura, Yasuyuki Matsushita*
- Lightweight Monocular Depth With a Novel Neural Architecture Search Method, *Lam Huynh, Phong Nguyen, Jiří Matas, Esa Rahtu, Janne Heikkilä*

1430–1530 1D (virtual): Transfer, Few-Shot, Semi-, and Un-Supervised Learning (Naupaka VII; online)

Format (5 min. video)

- Knowledge Capture and Replay for Continual Learning, *Saisubramaniam Gopalakrishnan, Pranshu Ranjan Singh, Haytham Fayek, Savitha Ramasamy, ArulMurugan Ambikapathi*
- Meta-Learning for Multi-Label Few-Shot Classification, *Christian Simon, Piotr Koniusz, Mehrtash Harandi*
- Cleaning Noisy Labels by Negative Ensemble Learning for Source-Free Unsupervised Domain Adaptation, *Waqar Ahmed, Pietro Morerio, Vittorio Murino*
- Learning Foreground-Background Segmentation From Improved Layered GANs, *Yu Yang, Hakan Bilen, Qiran Zou, Wing Yin Cheung, Xiangyang Ji*
- To Miss-Attend Is to Misalign! Residual Self-Attentive Feature Alignment for Adapting Object Detectors, *Vaishnavi Khindkar, Chetan Arora, Vineeth N Balasubramanian, Anbumani Subramanian, Rohit Saluja, C.V. Jawahar*
- Contrast To Divide: Self-Supervised Pre-Training for Learning With Noisy Labels, *Evgenii Zheltonozhskii, Chaim Baskin, Avi Mendelson, Alex M. Bronstein, Or Litany*
- PICA: Point-Wise Instance and Centroid Alignment Based Few-Shot Domain Adaptive Object Detection With Loose Annotations, *Chaoliang Zhong, Jie Wang, Cheng Feng, Ying Zhang, Jun Sun, Yasuto Yokota*

- Calibrating CNNs for Few-Shot Meta Learning, *Peng Yang, Shaogang Ren, Yang Zhao, Ping Li*
- FLUID: Few-Shot Self-Supervised Image Deraining, *Shyam Nandan Rai, Rohit Saluja, Chetan Arora, Vineeth N Balasubramanian, Anbumani Subramanian, C.V. Jawahar*
- MaskSplit: Self-Supervised Meta-Learning for Few-Shot Semantic Segmentation, *Mustafa Sercan Amac, Ahmet Sencan, Bugra Baran, Nazli Ikizler-Cinbis, Ramazan Gokberk Cinbis*

1530–1545 Break (Naupaka Lawn)

1545–1645 2A (in-person)**: Image / Video / Multimedia** (Naupaka I; overflow in Naupaka II)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

22. All the Attention You Need: Global-Local, Spatial-Channel Attention for Image Retrieval, *Chull Hwan Song, Hye Joo Han, Yannis Avrithis*
23. Hierarchical Proxy-Based Loss for Deep Metric Learning, *Zhibo Yang, Muhammet Bastan, Xinliang Zhu, Douglas Gray, Dimitris Samaras*
24. A Fast Partial Video Copy Detection Using KNN and Global Feature Database, *Weijun Tan, Hongwei Guo, Rushuai Liu*
25. Learning With Label Noise for Image Retrieval by Selecting Interactions, *Sarah Ibrahimi, Arnaud Sors, Rafael Sampaio de Rezende, Stéphane Clinchant*
26. Video and Text Matching With Conditioned Embeddings, *Ameen Ali, Idan Schwartz, Tamir Hazan, Lior Wolf*
27. Re-Compose the Image by Evaluating the Crop on More Than Just a Score, *Yang Cheng, Qian Lin, Jan P. Allebach*
28. Discovering Underground Maps From Fashion, *Utkarsh Mall, Kavita Bala, Tamara Berg, Kristen Grauman*
29. Strumming to the Beat: Audio-Conditioned Contrastive Video Textures, *Medhini Narasimhan, Shiry Ginosar, Andrew Owens, Alexei A. Efros, Trevor Darrell*
30. MovingFashion: A Benchmark for the Video-To-Shop Challenge, *Marco Godi, Christian Joppi, Geri Skenderi, Marco Cristani*
31. Challenges in Procedural Multimodal Machine Comprehension: A Novel Way To Benchmark, *Pritish Sahu, Karan Sikka, Ajay Divakaran*
32. Video Salient Object Detection via Contrastive Features and Attention Modules, *Yi-Wen Chen, Xiaojie Jin, Xiaohui Shen, Ming-Hsuan Yang*

1545–1645 2B (in-person)**: Language, Text, and Documents** (Naupaka V; overflow in Naupaka VI)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

33. Multimodal Learning Using Optimal Transport for Sarcasm and Humor Detection, *Shraman Pramanick, Aniket Roy, Vishal M. Patel*
34. DeepPatent: Large Scale Patent Drawing Recognition and Retrieval, *Michal Kucer, Diane Oyen, Juan Castorena, Jian Wu*
35. Typenet: Towards Camera Enabled Touch Typing on Flat Surfaces Through Self-Refinement, *Ben Maman, Amit Bermano*
36. Less Can Be More: Sound Source Localization With a Classification Model, *Arda Senocak, Hyeonggon Ryu, Junsik Kim, In So Kweon*
37. SeeTek: Very Large-Scale Open-Set Logo Recognition With Text-Aware Metric Learning, *Chenge Li, István Fehérvári, Xiaonan Zhao, Ives Macedo, Srikar Appalaraju*
38. SAC: Semantic Attention Composition for Text-Conditioned Image Retrieval, *Surgan Jandial, Pinkesh Badjatiya, Pranit Chawla, Ayush Chopra, Mausoom Sarkar, Balaji Krishnamurthy*
39. 3DRefTransformer: Fine-Grained Object Identification in Real-World Scenes Using Natural Language, *Ahmed Abdelreheem, Ujjwal Upadhyay, Ivan Skorokhodov, Rawan Al Yahya, Jun Chen, Mohamed Elhoseiny*

1545–1645 2C (virtual)**: 3D Computer Vision** (Naupaka III; online)

Format (5 min. video)

- Monocular Depth Estimation With Adaptive Geometric Attention, *Taher Naderi, Amir Sadovnik, Jason Hayward, Hairong Qi*
- Shadow Art Revisited: A Differentiable Rendering Based Approach, *Kaustubh Sadekar, Ashish Tiwari, Shanmuganathan Raman*
- Deep Two-Stream Video Inference for Human Body Pose and Shape Estimation, *Ziwen Li, Bo Xu, Han Huang, Cheng Lu, Yandong Guo*
- RGL-NET: A Recurrent Graph Learning Framework for Progressive Part Assembly, *Abhinav Narayan, Rajendra Nagar, Shanmuganathan Raman*
- Spatial-Temporal Transformer for 3D Point Cloud Sequences, *Yimin Wei, Hao Liu, Tingting Xie, Qiuhong Ke, Yulan Guo*
- SBEVNet: End-to-End Deep Stereo Layout Estimation, *Divam Gupta, Wei Pu, Trenton Tabor, Jeff Schneider*
- MobileStereoNet: Towards Lightweight Deep Networks for Stereo Matching, *Faranak Shamsafar, Samuel Woerz, Rafia Rahim, Andreas Zell*
- Data Augmented 3D Semantic Scene Completion With 2D Segmentation Priors, *Aloisio Dourado, Frederico Guth, Teofilo de Campos*
- 3D Modeling Beneath Ground: Plant Root Detection and Reconstruction Based on Ground-Penetrating Radar, *Yawen Lu, Guoyu Lu*
- An Experimental Comparison of Multi-View Stereo Approaches on Satellite Images, *Alvaro Gómez, Gregory Randall, Gabriele Facciolo, Rafael Grompone von Gioi*
- Creating and Reenacting Controllable 3D Humans With Differentiable Rendering, *Thiago L. Gomes, Thiago M. Coutinho, Rafael Azevedo, Renato Martins, Erickson R. Nascimento*
- Transferable 3D Adversarial Textures Using End-to-End Optimization, *Camilo Pestana, Naveed Akhtar, Nazanin Rahnavard, Mubarak Shah, Ajmal Mian*

1545–1645 2D (virtual)**: Action and Behavior Recognition** (Naupaka VII; online)

Format (5 min. video)

- Spatiotemporal Initialization for 3D CNNs With Generated Motion Patterns, *Hirokatsu Kataoka, Kensho Hara, Ryusuke Hayashi, Eisuke Yamagata, Nakamasa Inoue*
- MUGL: Large Scale Multi Person Conditional Action Generation With Locomotion, *Shubh Maheshwari, Debtanu Gupta, Ravi Kiran Sarvadevabhatla*
- Busy-Quiet Video Disentangling for Video Classification, *Guoxi Huang, Adrian G. Bors*
- Contextual Proposal Network for Action Localization, *He-Yen Hsieh, Ding-Jie Chen, Tyng-Luh Liu*
- Multi-Level Attentive Adversarial Learning With Temporal Dilation for Unsupervised Video Domain Adaptation, *Peipeng Chen, Yuan Gao, Andy J. Ma*
- MM-ViT: Multi-Modal Video Transformer for Compressed Video Action Recognition, *Jiawei Chen, Chiu Man Ho*
- PERF-Net: Pose Empowered RGB-Flow Net, *Yinxiao Li, Zhichao Lu, Xuehan Xiong, Jonathan Huang*
- Action Anticipation Using Latent Goal Learning, *Debaditya Roy, Basura Fernando*
- Leaky Gated Cross-Attention for Weakly Supervised Multi-Modal Temporal Action Localization, *Jun-Tae Lee, Sungrack Yun, Mihir Jain*
- NUTA: Non-Uniform Temporal Aggregation for Action Recognition, *Xinyu Li, Chunhui Liu, Bing Shuai, Yi Zhu, Hao Chen, Joseph Tighe*
- Skeleton-DML: Deep Metric Learning for Skeleton-Based One-Shot Action Recognition, *Raphael Memmesheimer, Simon Häring, Nick Theisen, Dietrich Paulus*
- Self-Supervised Video Representation Learning With Cross-Stream Prototypical Contrasting, *Martine Toering, Ioannis Gatopoulos, Maarten Stol, Vincent Tao Hu*

1645–1700 Break (Naupaka Lawn)

1700–1800 Keynote Session (Naupaka I; overflow in Naupaka II, III, V, VI, & VII)

- **Keynote:** Style and Influence From In-the-Wild Fashion Photos, *Kristen Grauman (Univ. of Texas at Austin / Facebook AI Research)*
- **Abstract:** The fashion domain is a magnet for computer vision. New vision problems are emerging in step with the fashion industry's rapid evolution towards an online, social, and personalized business. Style models, trend forecasting, and recommendation all require visual understanding with rich detail and subtlety. I will present our work developing computer vision methods for fashion. To begin, we explore how to discover styles from Web photos, so as to optimize mix-and-match wardrobes, suggest minimal edits to make an outfit more fashionable, or recommend clothing that flatters diverse human body shapes. Next, turning to the world stage, we investigate fashion forecasting and influence. Learned directly from photos, our models discover the "underground map" of a city based on the different clothes people wear, and they forecast what styles will be popular in the future by capturing how trends propagate across 44 major world cities. Finally, building on this notion of fashion influence, we quantify which cultural factors (as captured by millions of news articles) most affect the clothes people choose to wear across a century of fashion photos.

1800–1930 Dinner (Lū'au Grounds)

1930–2045 3A (in-person)**: Computational Photography and Image Processing** (Naupaka I; overflow in Naupaka II)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

40. Novel-View Synthesis of Human Tourist Photos, *Jonathan Freer, Kwang Moo Yi, Wei Jiang, Jongwon Choi, Hyung Jin Chang*
41. Deep Online Fused Video Stabilization, *Zhenmei Shi, Fuhao Shi, Wei-Sheng Lai, Chia-Kai Liang, Yingyu Liang*
42. Normalizing Flow as a Flexible Fidelity Objective for Photo-Realistic Super-Resolution, *Andreas Lugmayr, Martin Danelljan, Fisher Yu, Luc Van Gool, Radu Timofte*
43. Deep Feature Prior Guided Face Deblurring, *Soo Hyun Jung, Tae Bok Lee, Yong Seok Heo*
44. Deep Photo Scan: Semi-Supervised Learning for Dealing With the Real-World Degradation in Smartphone Photo Scanning, *Man M. Ho, Jinjia Zhou*
45. Learning Color Representations for Low-Light Image Enhancement, *Bomi Kim, Sunhyeok Lee, Nahyun Kim, Donggon Jang, Dae-Shik Kim*
46. DAQ: Channel-Wise Distribution-Aware Quantization for Deep Image Super-Resolution Networks, *Cheeun Hong, Heewon Kim, Sungyong Baik, Junghun Oh, Kyoung Mu Lee*
47. Supervised Compression for Resource-Constrained Edge Computing Systems, *Yoshitomo Matsubara, Ruihan Yang, Marco Levorato, Stephan Mandt*
48. Auto White-Balance Correction for Mixed-Illuminant Scenes, *Mahmoud Afifi, Marcus A. Brubaker, Michael S. Brown*
49. Adversarial Open Domain Adaptation for Sketch-to-Photo Synthesis, *Xiaoyu Xiang, Ding Liu, Xiao Yang, Yiheng Zhu, Xiaohui Shen, Jan P. Allebach*
50. AE-StyleGAN: Improved Training of Style-Based Auto-Encoders, *Ligong Han, Sri Harsha Musunuri, Martin Renqiang Min, Ruijiang Gao, Yu Tian, Dimitris Metaxas*
51. Late-Resizing: A Simple but Effective Sketch Extraction Strategy for Improving Generalization of Line-Art Colorization, *Dohyun Kim, Dajung Je, Kwangjin Lee, Moohyun Kim, Han Kim*

1930–2045 3B (in-person)**: Transfer Learning** (Naupaka V; overflow in Naupaka VI)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

52. Hierarchically Decoupled Spatial-Temporal Contrast for Self-Supervised Video Representation Learning, *Zehua Zhang, David Crandall*

53. Boosting Contrastive Self-Supervised Learning With False Negative Cancellation, *Tri Huynh, Simon Kornblith, Matthew R. Walter, Michael Maire, Maryam Khademi*
54. Self-Supervised Learning of Domain Invariant Features for Depth Estimation, *Hiroyasu Akada, Shariq Farooq Bhat, Ibraheem Alhashim, Peter Wonka*
55. Adversarial Branch Architecture Search for Unsupervised Domain Adaptation, *Luca Robbiano, Muhammad Rameez Ur Rahman, Fabio Galasso, Barbara Caputo, Fabio Maria Carlucci*
56. Forgery Detection by Internal Positional Learning of Demosaicing Traces, *Quentin Bammey, Rafael Grompone von Gioi, Jean-Michel Morel*
57. Distance-Based Hyperspherical Classification for Multi-Source Open-Set Domain Adaptation, *Silvia Bucci, Francesco Cappio Borlino, Barbara Caputo, Tatiana Tommasi*
58. Few-Shot Weakly-Supervised Object Detection via Directional Statistics, *Amirreza Shaban, Amir Rahimi, Thalaiyasingam Ajanthan, Byron Boots, Richard Hartley*
59. Self-Supervised Pretraining Improves Self-Supervised Pretraining, *Colorado J Reed, Xiangyu Yue, Ani Nrusimha, Sayna Ebrahimi, Vivek Vijaykumar, Richard Mao, Bo Li, Shanghang Zhang, Devin Guillory, Sean Metzger, Kurt Keutzer, Trevor Darrell*
60. SC-UDA: Style and Content Gaps Aware Unsupervised Domain Adaptation for Object Detection, *Fuxun Yu, Di Wang, Yinpeng Chen, Nikolaos Karianakis, Tong Shen, Pei Yu, Dimitrios Lymberopoulos, Sidi Lu, Weisong Shi, Xiang Chen*
61. Coupled Training for Multi-Source Domain Adaptation, *Ohad Amosy, Gal Chechik*
62. Federated Multi-Target Domain Adaptation, *Chun-Han Yao, Boqing Gong, Hang Qi, Yin Cui, Yukun Zhu, Ming-Hsuan Yang*
63. Unsupervised Learning for Human Sensing Using Radio Signals, *Tianhong Li, Lijie Fan, Yuan Yuan, Dina Katabi*
64. Few-Shot Object Detection by Attending to Per-Sample-Prototype, *Hojun Lee, Myunggi Lee, Nojun Kwak*
65. Estimating Image Depth in the Comics Domain, *Deblina Bhattacharjee, Martin Everaert, Mathieu Salzmann, Sabine Süsstrunk*

1930–2045 3C (virtual)**: Biometrics** (Naupaka III; online)

Format (5 min. video)

- A Deep Insight Into Measuring Face Image Utility With General and Face-Specific Image Quality Metrics, *Biying Fu, Cong Chen, Olaf Henniger, Naser Damer*
- Learnable Multi-Level Frequency Decomposition and Hierarchical Attention Mechanism for Generalized Face Presentation Attack Detection, *Meiling Fang, Naser Damer, Florian Kirchbuchner, Arjan Kuijper*
- Attribute-Based Deep Periocular Recognition: Leveraging Soft Biometrics to Improve Periocular Recognition, *Veeru Talreja, Nasser M. Nasrabadi, Matthew C. Valenti*
- Face Verification With Challenging Imposters and Diversified Demographics, *Adrian Popescu, Liviu-Daniel Ştefan, Jérôme Deshayes-Chossart, Bogdan Ionescu*
- MTGLS: Multi-Task Gaze Estimation With Limited Supervision, *Shreya Ghosh, Munawar Hayat, Abhinav Dhall, Jarrod Knibbe*
- Complete Face Recovery GAN: Unsupervised Joint Face Rotation and De-Occlusion From a Single-View Image, *Yeong-Joon Ju, Gun-Hee Lee, Jung-Ho Hong, Seong-Whan Lee*
- Matching and Recovering 3D People From Multiple Views, *Alejandro Perez-Yus, Antonio Agudo*
- On Black-Box Explanation for Face Verification, *Domingo Mery, Bernardita Morris*
- LwPosr: Lightweight Efficient Fine Grained Head Pose Estimation, *Naina Dhingra*
- Mobile Based Human Identification Using Forehead Creases: Application and Assessment Under COVID-19 Masked Face Scenarios, *Rohit Bharadwaj, Gaurav Jaswal, Aditya Nigam, Kamlesh Tiwari*
- 3DFaceFill: An Analysis-by-Synthesis Approach To Face Completion, *Rahul Dey, Vishnu Naresh Boddeti*
- Disentangled Representation With Dual-Stage Feature Learning for Face Anti-Spoofing, *Yu-Chun Wang, Chien-Yi Wang, Shang-Hong Lai*

- Joint Classification and Trajectory Regression of Online Handwriting Using a Multi-Task Learning Approach, *Felix Ott, David Rügamer, Lucas Heublein, Bernd Bischl, Christopher Mutschler*
- Human-Aided Saliency Maps Improve Generalization of Deep Learning, *Aidan Boyd, Kevin W. Bowyer, Adam Czajka*

1930–2045 3D (virtual): Object Detection and Recognition (Naupaka VII; online)

Format (5 min. video)

- ImVoxelNet: Image to Voxels Projection for Monocular and Multi-View General-Purpose 3D Object Detection, *Danila Rukhovich, Anna Vorontsova, Anton Konushin*
- Fusion Point Pruning for Optimized 2D Object Detection With Radar-Camera Fusion, *Lukas Stäcker, Philipp Heidenreich, Jason Rambach, Didier Stricker*
- Detecting Tear Gas Canisters With Limited Training Data, *Ashwin D'Cruz, Christopher Tegho, Sean Greaves, Lachlan Kermode*
- Online Continual Learning via Candidates Voting, *Jiangpeng He, Fengqing Zhu*
- A Semi-Supervised Generalized VAE Framework for Abnormality Detection Using One-Class Classification, *Renuka Sharma, Satvik Mashkaria, Suyash P. Awate*
- YOLO-ReT: Towards High Accuracy Real-Time Object Detection on Edge GPUs, *Prakhar Ganesh, Yao Chen, Yin Yang, Deming Chen, Marianne Winslett*
- Improving Object Detection by Label Assignment Distillation, *Chuong H. Nguyen, Thuy C. Nguyen, Tuan N. Tang, Nam L.H. Phan*
- Robustly Recognizing Irregular Scene Text by Rectifying Principal Irregularities, *Changsheng Xu, Yang Wang, Fan Bai, Jihong Guan, Shuigeng Zhou*
- Multi-Head Deep Metric Learning Using Global and Local Representations, *Mohammad K. Ebrahimpour, Gang Qian, Allison Beach*
- Extractive Knowledge Distillation, *Takumi Kobayashi*
- Recursive Contour-Saliency Blending Network for Accurate Salient Object Detection, *Yun Yi Ke, Takahiro Tsubono*
- Adversarial Robustness of Deep Sensor Fusion Models, *Shaojie Wang, Tong Wu, Ayan Chakrabarti, Yevgeniy Vorobeychik*
- WEPDTOF: A Dataset and Benchmark Algorithms for In-the-Wild People Detection and Tracking From Overhead Fisheye Cameras, *Ozan Tezcan, Zhihao Duan, Mertcan Cokbas, Prakash Ishwar, Janusz Konrad*
- A Context-Enriched Satellite Imagery Dataset and an Approach for Parking Lot Detection, *Yifang Yin, Wenmiao Hu, An Tran, Hannes Kruppa, Roger Zimmermann, See-Kiong Ng*
- Densely-Packed Object Detection via Hard Negative-Aware Anchor Attention, *Sungmin Cho, Jinwook Paeng, Junseok Kwon*

2045–2200 Poster Session 1 (Naupaka IV)

Posters for Sessions 1A, 1B, 2A, 2B, 3A, and 3B.

2045–2200 Dessert (Naupaka Lawn)

Notes:

Thursday, January 6

1400–1700 Registration (Porte Cochère)

1130–1330 Doctoral Consortium (Naupaka Lawn) (by invitation only)

- Fatemeh Azimi (TU Kaiserslautern)
- Nuri Benbarka (Univ. of Tübingen)
- Zhenhua Chen (Indiana Univ.)
- Bruno Degardin (Univ. da Beira Interior)
- Keval Doshi (Univ. of South Florida)
- Xuan Gong (Univ. at Buffalo)
- Annika Hagemann (Karlsruhe Inst. of Technology)
- Sara Hahner (Univ. of Bonn)
- Qinwen Huang (Duke Univ.)
- Sarah Ibrahimi (Univ. of Amsterdam)
- Suraj Kothawade (Univ. of Texas at Dallas)
- Utkarsh Mall (Cornell Univ.)
- Gaurav Kumar Nayak (IIS Bangalore)
- Lukas Picek (Univ. of West Bohemia)
- Fabio Pizzati (Inria; PSL Univ.)
- Md Taufeeq Uddin (Univ. of South Florida)
- Chuhua Wang (Indiana Univ.)
- Zehua Zhang (Indiana Univ.)

1300–1930 Exhibits (Paniolo I-III)

Refreshments offered throughout the day here.

- Amazon Science
- Google
- Kitware
- Mitre
- Verisk

1430–1530 4A (in-person)**: Remote Sensing and Vision Systems** (Naupaka I; overflow in Naupaka II)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

1. Robust 3D Garment Digitization From Monocular 2D Images for 3D Virtual Try-On Systems, *Sahib Majithia, Sandeep N. Parameswaran, Sadbhavana Babar, Vikram Garg, Astitva Srivastava, Avinash Sharma*
2. PPCD-GAN: Progressive Pruning and Class-Aware Distillation for Large-Scale Conditional GANs Compression, *Duc Minh Vo, Akihiro Sugimoto, Hideki Nakayama*
3. Billion-Scale Pretraining With Vision Transformers for Multi-Task Visual Representations, *Josh Beal, Hao-Yu Wu, Dong Huk Park, Andrew Zhai, Dmitry Kislyuk*
4. Multi-Task Classification of Sewer Pipe Defects and Properties Using a Cross-Task Graph Neural Network Decoder, *Joakim Bruslund Haurum, Meysam Madadi, Sergio Escalera, Thomas B. Moeslund*
5. Pixel-Level Bijective Matching for Video Object Segmentation, *Suhwan Cho, Heansung Lee, Minjung Kim, Sungjun Jang, Sangyoun Lee*
6. Extraction of Positional Player Data From Broadcast Soccer Videos, *Jonas Theiner, Wolfgang Gritz, Eric Müller-Budack, Robert Rein, Daniel Memmert, Ralph Ewerth*
7. Interpretable Semantic Photo Geolocation, *Jonas Theiner, Eric Müller-Budack, Ralph Ewerth*
8. Active Learning for Improved Semi-Supervised Semantic Segmentation in Satellite Images, *Shasvat Desai, Debasmita Ghose*
9. Lane-Level Street Map Extraction From Aerial Imagery, *Songtao He, Hari Balakrishnan*

Notes:

1430–1530 4B (in-person)**: Explainable AI** (Naupaka V; overflow in Naupaka VI)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

10. Discrete Neural Representations for Explainable Anomaly Detection, *Stanislaw Szymanowicz, James Charles, Roberto Cipolla*
11. Auditing Saliency Cropping Algorithms, *Abeba Birhane, Vinay Uday Prabhu, John Whaley*
12. Agree To Disagree: When Deep Learning Models With Identical Architectures Produce Distinct Explanations, *Matthew Watson, Bashar Awwad Shiekh Hasan, Noura Al Moubayed*
13. Visualizing Paired Image Similarity in Transformer Networks, *Samuel Black, Abby Stylianou, Robert Pless, Richard Souvenir*
14. X-MIR: EXplainable Medical Image Retrieval, *Brian Hu, Bhavan Vasu, Anthony Hoogs*
15. Uncertainty Learning Towards Unsupervised Deformable Medical Image Registration, *Xuan Gong, Luckyson Khaidem, Wentao Zhu, Baochang Zhang, David Doermann*
16. How Good Is Your Explanation? Algorithmic Stability Measures To Assess the Quality of Explanations for Deep Neural Networks, *Thomas Fel, David Vigouroux, Rémi Cadène, Thomas Serre*
17. SWAG-V: Explanations for Video Using Superpixels Weighted by Average Gradients, *Thomas Hartley, Kirill Sidorov, Christopher Willis, David Marshall*

1430–1530 4C (virtual)**: Transfer, Few-Shot, Semi-, and Un-Supervised Learning** (Naupaka III; online)

Format (5 min. video)

- SEGA: Semantic Guided Attention on Visual Prototype for Few-Shot Learning, *Fengyuan Yang, Ruiping Wang, Xilin Chen*
- Enhancing Few-Shot Image Classification With Unlabelled Examples, *Peyman Bateni, Jarred Barber, Jan-Willem van de Meent, Frank Wood*
- A Pixel-Level Meta-Learner for Weakly Supervised Few-Shot Semantic Segmentation, *Yuan-Hao Lee, Fu-En Yang, Yu-Chiang Frank Wang*
- COCOA: Context-Conditional Adaptation for Recognizing Unseen Classes in Unseen Domains, *Puneet Mangla, Shivam Chandhok, Vineeth N Balasubramanian, Fahad Shahbaz Khan*
- Meta-Meta Classification for One-Shot Learning, *Arkabandhu Chowdhury, Dipak Chaudhari, Swarat Chaudhuri, Chris Jermaine*
- Transfer Learning for Pose Estimation of Illustrated Characters, *Shuhong Chen, Matthias Zwicker*
- From Node To Graph: Joint Reasoning on Visual-Semantic Relational Graph for Zero-Shot Detection, *Hui Nie, Ruiping Wang, Xilin Chen*
- Mutual Learning of Joint and Separate Domain Alignments for Multi-Source Domain Adaptation, *Yuanyuan Xu, Meina Kan, Shiguang Shan, Xilin Chen*
- Generalized Clustering and Multi-Manifold Learning With Geometric Structure Preservation, *Lirong Wu, Zicheng Liu, Jun Xia, Zelin Zang, Siyuan Li, Stan Z. Li*
- Trading-Off Information Modalities in Zero-Shot Classification, *Jorge Sánchez, Matías Molina*
- Semi-Supervised Domain Adaptation via Sample-to-Sample Self-Distillation, *Jeongbeen Yoon, Dahyun Kang, Minsu Cho*

1430–1530 4D (virtual)**: Medical Imaging / Imaging for Bioinformatics / Biological and Cell Microscopy** (Naupaka VII; online)

Format (5 min. video)

- Towards Durability Estimation of Bioprosthetic Heart Valves via Motion Symmetry Analysis, *Maryam Alizadeh, Melissa Cote, Alexandra Branzan Albu*
- Co-Net: A Collaborative Region-Contour-Driven Network for Fine-to-Finer Medical Image Segmentation, *Anran Liu, Xiangsheng Huang, Tong Li, Pengcheng Ma*

- Biomass Prediction With 3D Point Clouds From LiDAR, *Liyuan Pan, Liu Liu, Anthony G. Condon, Gonzalo M. Estavillo, Robert A. Coe, Geoff Bull, Eric A. Stone, Lars Petersson, Vivien Rolland*
- Dynamic CNNs Using Uncertainty To Overcome Domain Generalization for Surgical Instrument Localization, *Markus Philipp, Anna Alperovich, Marielena Gutt-Will, Andrea Mathis, Stefan Saur, Andreas Raabe, Franziska Mathis-Ullrich*
- Self-Supervised Generative Style Transfer for One-Shot Medical Image Segmentation, *Devavrat Tomar, Behzad Bozorgtabar, Manana Lortkipanidze, Guillaume Vray, Mohammad Saeed Rad, Jean-Philippe Thiran*
- UNETR: Transformers for 3D Medical Image Segmentation, *Ali Hatamizadeh, Yucheng Tang, Vishwesh Nath, Dong Yang, Andriy Myronenko, Bennett Landman, Holger R. Roth, Daguang Xu*
- Consistent Cell Tracking in Multi-Frames With Spatio-Temporal Context by Object-Level Warping Loss, *Junya Hayashida, Kazuya Nishimura, Ryoma Bise*
- Semi-Supervised Semantic Segmentation of Vessel Images Using Leaking Perturbations, *Jinyong Hou, Xuejie Ding, Jeremiah D. Deng*
- Compressed Sensing MRI Reconstruction With Co-VeGAN: Complex-Valued Generative Adversarial Network, *Bhavya Vasudeva, Puneesh Deora, Saumik Bhattacharya, Pyari Mohan Pradhan*
- Knowledge-Augmented Contrastive Learning for Abnormality Classification and Localization in Chest X-Rays With Radiomics Using a Feedback Loop, *Yan Han, Chongyan Chen, Ahmed Tewfik, Benjamin Glicksberg, Ying Ding, Yifan Peng, Zhangyang Wang*
- T-Net: A Resource-Constrained Tiny Convolutional Neural Network for Medical Image Segmentation, *Tariq M. Khan, Antonio Robles-Kelly, Syed S. Naqvi*

1530–1545 Break (Paniolo)

1545–1645 5A (in-person)**: Vision for Robotics and Other Applictions** (Naupaka I; overflow in Naupaka II)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

18. Automated Defect Inspection in Reverse Engineering of Integrated Circuits, *Ann-Christin Bette, Patrick Brus, Gabor Balazs, Matthias Ludwig, Alois Knoll*
19. CFLOW-AD: Real-Time Unsupervised Anomaly Detection With Localization via Conditional Normalizing Flows, *Denis Gudovskiy, Shun Ishizaka, Kazuki Kozuka*
20. Fully Convolutional Cross-Scale-Flows for Image-Based Defect Detection, *Marco Rudolph, Tom Wehrbein, Bodo Rosenhahn, Bastian Wandt*
21. Network Generalization Prediction for Safety Critical Tasks in Novel Operating Domains, *Molly O'Brien, Mike Medoff, Julia Bukowski, Gregory D. Hager*
22. CoordiNet: Uncertainty-Aware Pose Regressor for Reliable Vehicle Localization, *Arthur Moreau, Nathan Piasco, Dzmitry Tsishkou, Bogdan Stanciulescu, Arnaud de La Fortelle*
23. SIGNAV: Semantically-Informed GPS-Denied Navigation and Mapping in Visually-Degraded Environments, *Alex Krasner, Mikhail Sizintsev, Abhinav Rajvanshi, Han-Pang Chiu, Niluthpol Mithun, Kevin Kaighn, Philip Miller, Ryan Villamil, Supun Samarasekera*
24. Self-Supervised Domain Adaptation for Visual Navigation With Global Map Consistency, *Eun Sun Lee, Junho Kim, Young Min Kim*
25. FT-DeepNets: Fault-Tolerant Convolutional Neural Networks With Kernel-Based Duplication, *Iljoo Baek, Wei Chen, Zhihao Zhu, Soheil Samii, Raj Rajkumar*
26. Learning Maritime Obstacle Detection From Weak Annotations by Scaffolding, *Lojze Žust, Matej Kristan*
27. Siamese Transformer Pyramid Networks for Real-Time UAV Tracking, *Daitao Xing, Nikolaos Evangeliou, Athanasios Tsoukalas, Anthony Tzes*
28. FastAno: Fast Anomaly Detection via Spatio-Temporal Patch Transformation, *Chaewon Park, MyeongAh Cho, Minhyeok Lee, Sangyoun Lee*

1545–1645 5B (in-person)**: Segmentation** (Naupaka V; overflow in Naupaka VI)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

29. Temporally Stable Video Segmentation Without Video Annotations, *Aharon Azulay, Tavi Halperin, Orestis Vantzos, Nadav Bornstein, Ofir Bibi*
30. D2Conv3D: Dynamic Dilated Convolutions for Object Segmentation in Videos, *Christian Schmidt, Ali Athar, Sabarinath Mahadevan, Bastian Leibe*
31. Single-Shot Path Integrated Panoptic Segmentation, *Sukjun Hwang, Seoung Wug Oh, Seon Joo Kim*
32. Robust Lane Detection via Expanded Self Attention, *Minhyeok Lee, Junhyeop Lee, Dogyoon Lee, Woojin Kim, Sangwon Hwang, Sangyoun Lee*
33. Pixel-by-Pixel Cross-Domain Alignment for Few-Shot Semantic Segmentation, *Antonio Tavera, Fabio Cermelli, Carlo Masone, Barbara Caputo*
34. VCSeg: Virtual Camera Adaptation for Road Segmentation, *Gong Cheng, James H. Elder*
35. Maximizing Cosine Similarity Between Spatial Features for Unsupervised Domain Adaptation in Semantic Segmentation, *Inseop Chung, Daesik Kim, Nojun Kwak*
36. Hyper-Convolution Networks for Biomedical Image Segmentation, *Tianyu Ma, Adrian V. Dalca, Mert R. Sabuncu*
37. Plugging Self-Supervised Monocular Depth Into Unsupervised Domain Adaptation for Semantic Segmentation, *Adriano Cardace, Luca De Luigi, Pierluigi Zama Ramirez, Samuele Salti, Luigi Di Stefano*
38. Shallow Features Guide Unsupervised Domain Adaptation for Semantic Segmentation at Class Boundaries, *Adriano Cardace, Pierluigi Zama Ramirez, Samuele Salti, Luigi Di Stefano*

1545–1645 5C (virtual)**: Transfer, Few-shot, Semi-, and Un- Supervised Learning** (Naupaka III; online)

Format (5 min. video)

- Bayesian Uncertainty and Expected Gradient Length – Regression: Two Sides of the Same Coin? *Megh Shukla*
- The Hitchhiker's Guide to Prior-Shift Adaptation, *Tomáš Šipka, Milan Šulc, Jiří Matas*
- Ortho-Shot: Low Displacement Rank Regularization With Data Augmentation for Few-Shot Learning, *Uche Osahor, Nasser M. Nasrabadi*
- Tensor Feature Hallucination for Few-Shot Learning, *Michalis Lazarou, Tania Stathaki, Yannis Avrithis*
- HierMatch: Leveraging Label Hierarchies for Improving Semi-Supervised Learning, *Ashima Garg, Shaurya Bagga, Yashvardhan Singh, Saket Anand*
- Identifying Wrongly Predicted Samples: A Method for Active Learning, *Rahaf Aljundi, Nikolay Chumerin, Daniel Olmeda Reino*
- Multi-Domain Incremental Learning for Semantic Segmentation, *Prachi Garg, Rohit Saluja, Vineeth N Balasubramanian, Chetan Arora, Anbumani Subramanian, C.V. Jawahar*
- Few-Shot Open-Set Recognition of Hyperspectral Images With Outlier Calibration Network, *Debabrata Pal, Valay Bundele, Renuka Sharma, Biplab Banerjee, Yogananda Jeppu*
- Multi-Motion and Appearance Self-Supervised Moving Object Detection, *Fan Yang, Srikrishna Karanam, Meng Zheng, Terrence Chen, Haibin Ling, Ziyan Wu*
- Masking Modalities for Cross-Modal Video Retrieval, *Valentin Gabeur, Arsha Nagrani, Chen Sun, Karteek Alahari, Cordelia Schmid*
- Single Source One Shot Reenactment Using Weighted Motion From Paired Feature Points, *Soumya Tripathy, Juho Kannala, Esa Rahtu*

1545–1645 5D (virtual)**: Multimedia and Other Applications** (Naupaka VII; online)

Format (5 min. video)

- Sign Language Translation With Hierarchical Spatio-Temporal Graph Neural Network, *Jichao Kan, Kun Hu, Markus Hagenbuchner, Ah Chung Tsoi, Mohammed Bennamoun, Zhiyong Wang*
- Transductive Weakly-Supervised Player Detection Using Soccer Broadcast Videos, *Chris Andrew Gadde, C.V. Jawahar*
- Beyond Mono to Binaural: Generating Binaural Audio From Mono Audio With Depth and Cross Modal Attention, *Kranti Kumar Parida, Siddharth Srivastava, Gaurav Sharma*
- Unsupervised Sounding Object Localization With Bottom-Up and Top-Down Attention, *Jiayin Shi, Chao Ma*
- Visually Guided Sound Source Separation and Localization Using Self-Supervised Motion Representations, *Lingyu Zhu, Esa Rahtu*
- V-SlowFast Network for Efficient Visual Sound Separation, *Lingyu Zhu, Esa Rahtu*
- CrossLocate: Cross-Modal Large-Scale Visual Geo-Localization in Natural Environments Using Rendered Modalities, *Jan Tomešek, Martin Čadík, Jan Brejcha*
- C-VTON: Context-Driven Image-Based Virtual Try-On Network, *Benjamin Fele, Ajda Lampe, Peter Peer, Vitomir Struc*
- Predicting Levels of Household Electricity Consumption in Low-Access Settings, *Simone Fobi, Joel Mugyenyi, Nathaniel J. Williams, Vijay Modi, Jay Taneja*
- Occlusion-Robust Object Pose Estimation With Holistic Representation, *Bo Chen, Tat-Jun Chin, Marius Klimavicius*
- Dual-Head Contrastive Domain Adaptation for Video Action Recognition, *Victor G. Turrisi da Costa, Giacomo Zara, Paolo Rota, Thiago Oliveira-Santos, Nicu Sebe, Vittorio Murino, Elisa Ricci*
- Towards Class-Oriented Poisoning Attacks Against Neural Networks, *Bingyin Zhao, Yingjie Lao*

1645–1700 Break (Paniolo)

1700–1800 Keynote Session (Naupaka I; overflow in Naupaka II, III, V, VI, & VII)

- **Keynote:** Art at the Age of AI, *Ahmed Elgammal (Rutgers Univ.)*

  Abstract: In this talk, I will present results of recent research activities at the Art and Artificial Intelligence Laboratory at Rutgers University. We investigate perceptual and cognitive tasks related to human creativity in visual art. In particular, we study problems related to art styles, influence, and the quantification of creativity. We develop computational models that aim at providing answers to questions about what characterizes the sequence and evolution of changes in style over time. The talk will also cover advances in using AI for art and music generation.

1800–1930 Dinner (Lūʻau Grounds)

1930–2045 6A (in-person)**: 3D Computer Vision** (Naupaka I; overflow in Naupaka II)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

39. Tensor-Based Non-Rigid Structure From Motion, *Stella Graßhof, Sami Sebastian Brandt*
40. Registration of Human Point Set Using Automatic Key Point Detection and Region-Aware Features, *Amar Maharjan, Xiaohui Yuan*
41. Style Agnostic 3D Reconstruction via Adversarial Style Transfer, *Felix Petersen, Bastian Goldluecke, Oliver Deussen, Hilde Kuehne*
42. Seeing Implicit Neural Representations As Fourier Series, *Nuri Benbarka, Timon Höfer, Hamd ul-Moqeet Riaz, Andreas Zell*
43. M3DETR: Multi-Representation, Multi-Scale, Mutual-Relation 3D Object Detection With Transformers, *Tianrui Guan, Jun Wang, Shiyi Lan, Rohan Chandra, Zuxuan Wu, Larry Davis, Dinesh Manocha*

44. Neural Architecture Search for Efficient Uncalibrated Deep Photometric Stereo, *Francesco Sarno, Suryansh Kumar, Berk Kaya, Zhiwu Huang, Vittorio Ferrari, Luc Van Gool*
45. Shape-Coded ArUco: Fiducial Marker for Bridging 2D and 3D Modalities, *Lilika Makabe, Hiroaki Santo, Fumio Okura, Yasuyuki Matsushita*
46. Modeling Dynamic Target Deformation in Camera Calibration, *Annika Hagemann, Moritz Knorr, Christoph Stiller*
47. Information Bottlenecked Variational Autoencoder for Disentangled 3D Facial Expression Modelling, *Hao Sun, Nick Pears, Yajie Gu*
48. Mesh Convolutional Autoencoder for Semi-Regular Meshes of Different Sizes, *Sara Hahner, Jochen Garcke*

1930–2045 6B (in-person): Deep Learning (Naupaka V; overflow in Naupaka VI)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

49. Auto-X3D: Ultra-Efficient Video Understanding via Finer-Grained Neural Architecture Search, *Yifan Jiang, Xinyu Gong, Junru Wu, Humphrey Shi, Zhicheng Yan, Zhangyang Wang*
50. EdgeConv With Attention Module for Monocular Depth Estimation, *Minhyeok Lee, Sangwon Hwang, Chaewon Park, Sangyoun Lee*
51. On the Maximum Radius of Polynomial Lens Distortion, *Matthew J. Leotta, David Russell, Andrew Matrai*
52. Non-Semantic Evaluation of Image Forensics Tools: Methodology and Database, *Quentin Bammey, Tina Nikoukhah, Marina Gardella, Rafael Grompone von Gioi, Miguel Colom, Jean-Michel Morel*
53. Addressing Out-of-Distribution Label Noise in Webly-Labelled Data, *Paul Albert, Diego Ortego, Eric Arazo, Noel E. O'Connor, Kevin McGuinness*
54. SpectraNet: Learned Recognition of Artificial Satellites From High Contrast Spectroscopic Imagery, *J. Zachary Gazak, Ian McQuaid, Ryan Swindle, Matthew Phelps, Justin Fletcher*
55. Improving Fractal Pre-Training, *Connor Anderson, Ryan Farrell*
56. Multi-Domain Semantic Segmentation With Overlapping Labels, *Petra Bevandić, Marin Oršić, Ivan Grubišić, Josip Šarić, Siniša Šegvić*
57. GraN-GAN: Piecewise Gradient Normalization for Generative Adversarial Networks, *Vineeth S. Bhaskara, Tristan Aumentado-Armstrong, Allan D. Jepson, Alex Levinshtein*

1930–2045 6C (virtual): Vision & Language / Document Analysis (Naupaka III; online)

Format (5 min. video)

- Co-Segmentation Aided Two-Stream Architecture for Video Captioning, *Jayesh Vaidya, Arulkumar Subramaniam, Anurag Mittal*
- Improve Image Captioning by Estimating the Gazing Patterns From the Caption, *Rehab Alahmadi, James Hahn*
- GraDual: Graph-Based Dual-Modal Representation for Image-Text Matching, *Siqu Long, Soyeon Caren Han, Xiaojun Wan, Josiah Poon*
- Let There Be a Clock on the Beach: Reducing Object Hallucination in Image Captioning, *Ali Furkan Biten, Lluís Gómez, Dimosthenis Karatzas*
- Is an Image Worth Five Sentences? A New Look Into Semantics for Image-Text Matching, *Ali Furkan Biten, Andrés Mafla, Lluís Gómez, Dimosthenis Karatzas*
- Variational Stacked Local Attention Networks for Diverse Video Captioning, *Tonmoay Deb, Akib Sadmanee, Kishor Kumar Bhaumik, Amin Ahsan Ali, M Ashraful Amin, A K M Mahbubur Rahman*
- QUALIFIER: Question-Guided Self-Attentive Multimodal Fusion Network for Audio Visual Scene-Aware Dialog, *Muchao Ye, Quanzeng You, Fenglong Ma*
- An Investigation of Critical Issues in Bias Mitigation Techniques, *Robik Shrestha, Kushal Kafle, Christopher Kanan*

- Natural Language Video Moment Localization Through Query-Controlled Temporal Convolution, *Lingyu Zhang, Richard J. Radke*
- Post-OCR Paragraph Recognition by Graph Convolutional Networks, *Renshen Wang, Yasuhisa Fujii, Ashok C. Popat*
- Visual Understanding of Complex Table Structures From Document Images, *Sachin Raja, Ajoy Mondal, C.V. Jawahar*
- Parsing Line Chart Images Using Linear Programming, *Hajime Kato, Mitsuru Nakazawa, Hsuan-Kung Yang, Mark Chen, Björn Stenger*
- One-Shot Compositional Data Generation for Low Resource Handwritten Text Recognition, *Mohamed Ali Souibgui, Ali Furkan Biten, Sounak Dey, Alicia Fornés, Yousri Kessentini, Lluís Gómez, Dimosthenis Karatzas, Josep Lladós*
- Efficient Counterfactual Debiasing for Visual Question Answering, *Camila Kolling, Martin More, Nathan Gavenski, Eduardo Pooch, Otávio Parraga, Rodrigo C. Barros*
- InfographicVQA, *Minesh Mathew, Viraj Bagal, Rubèn Tito, Dimosthenis Karatzas, Ernest Valveny, C.V. Jawahar*

1930–2045 6D (virtual)**: Segmentation, Tracking, and Scene Understanding** (Naupaka VII; online)

Format (5 min. video)

- Mixed-Dual-Head Meets Box Priors: A Robust Framework for Semi-Supervised Segmentation, *Chenshu Chen, Tao Liu, Wenming Tan, Shiliang Pu*
- Self-Supervised Test-Time Adaptation on Video Data, *Fatemeh Azimi, Sebastian Palacio, Federico Raue, Jörn Hees, Luca Bertinetto, Andreas Dengel*
- Modeling Aleatoric Uncertainty for Camouflaged Object Detection, *Jiawei Liu, Jing Zhang, Nick Barnes*
- Perceptual Consistency in Video Segmentation, *Yizhe Zhang, Shubhankar Borse, Hong Cai, Ying Wang, Ning Bi, Xiaoyun Jiang, Fatih Porikli*
- AuxAdapt: Stable and Efficient Test-Time Adaptation for Temporally Consistent Video Semantic Segmentation, *Yizhe Zhang, Shubhankar Borse, Hong Cai, Fatih Porikli*
- Time-Space Transformers for Video Panoptic Segmentation, *Andra Petrovai, Sergiu Nedevschi*
- Inferring the Class Conditional Response Map for Weakly Supervised Semantic Segmentation, *Weixuan Sun, Jing Zhang, Nick Barnes*
- Semi-Supervised Multi-Task Learning for Semantics and Depth, *Yufeng Wang, Yi-Hsuan Tsai, Wei-Chih Hung, Wenrui Ding, Shuo Liu, Ming-Hsuan Yang*
- Compensation Tracker: Reprocessing Lost Object for Multi-Object Tracking, *Zhibo Zou, Junjie Huang, Ping Luo*
- Hole-Robust Wireframe Detection, *Naejin Kong, Kiwoong Park, Harshith Goka*
- Global Assists Local: Effective Aerial Representations for Field of View Constrained Image Geo-Localization, *Royston Rodrigues, Masahiro Tani*
- Dynamic Iterative Refinement for Efficient 3D Hand Pose Estimation, *John Yang, Yash Bhalgat, Simyung Chang, Fatih Porikli, Nojun Kwak*
- FASSST: Fast Attention Based Single-Stage Segmentation Net for Real-Time Instance Segmentation, *Yuan Cheng, Rui Lin, Peining Zhen, Tianshu Hou, Chiu Wa Ng, Hai-Bao Chen, Hao Yu, Ngai Wong*
- RLSS: A Deep Reinforcement Learning Algorithm for Sequential Scene Generation, *Azimkhon Ostonov, Peter Wonka, Dominik L. Michels*
- Learning Temporal Video Procedure Segmentation From an Automatically Collected Large Dataset, *Lei Ji, Chenfei Wu, Daisy Zhou, Kun Yan, Edward Cui, Xilin Chen, Nan Duan*

2045–2200 Poster Session 2 (Naupaka IV)

Posters for Sessions 4A, 4B, 5A, 5B, 6A, and 6B.

2045–2200 Dessert (Naupaka Lawn)

Friday, January 7

1400–1700 Registration (Porte Cochère)

1430–1530 7A (in-person)**: Adversarial Methods, Biometrics and Face Processing** (Naupaka I; overflow in Naupaka II)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

1. Geometry-Aware Hierarchical Bayesian Learning on Manifolds, *Yonghui Fan, Yalin Wang*
2. Generative Adversarial Graph Convolutional Networks for Human Action Synthesis, *Bruno Degardin, João Neves, Vasco Lopes, João Brito, Ehsan Yaghoubi, Hugo Proença*
3. A Riemannian Framework for Analysis of Human Body Surface, *Emery Pierson, Mohamed Daoudi, Alice-Barbara Tumpach*
4. Detection and Localization of Facial Expression Manipulations, *Ghazal Mazaheri, Amit K. Roy-Chowdhury*
5. Generalized Facial Manipulation Detection With Edge Region Feature Extraction, *Dong-Keon Kim, Kwang-Su Kim*
6. Digital and Physical-World Attacks on Remote Pulse Detection, *Jeremy Speth, Nathan Vance, Patrick Flynn, Kevin W. Bowyer, Adam Czajka*
7. Unsupervised Robust Domain Adaptation Without Source Data, *Peshal Agarwal, Danda Pani Paudel, Jan-Nico Zaech, Luc Van Gool*
8. Attack Agnostic Detection of Adversarial Examples via Random Subspace Analysis, *Nathan Drenkow, Neil Fendley, Philippe Burlina*
9. Evaluating the Robustness of Semantic Segmentation for Autonomous Driving Against Real-World Adversarial Patch Attacks, *Federico Nesti, Giulio Rossolini, Saasha Nair, Alessandro Biondi, Giorgio Buttazzo*
10. ADC: Adversarial Attacks Against Object Detection That Evade Context Consistency Checks, *Mingjun Yin, Shasha Li, Chengyu Song, M. Salman Asif, Amit K. Roy-Chowdhury, Srikanth V. Krishnamurthy*
11. Semantically Stealthy Adversarial Attacks Against Segmentation Models, *Zhenhua Chen, Chuhua Wang, David Crandall*
12. One-Class Learned Encoder-Decoder Network With Adversarial Context Masking for Novelty Detection, *John Taylor Jewell, Vahid Reza Khazaie, Yalda Mohsenzadeh*

1430–1530 7B (virtual)**: Deep Learning, Diverse Applications in Computer Vision** (Naupaka V; online)

Format (5 min. video)

- Fair and Accurate Age Prediction Using Distribution Aware Data Curation and Augmentation, *Yushi Cao, David Berend, Palina Tolmach, Guy Amit, Moshe Levy, Yang Liu, Asaf Shabtai, Yuval Elovici*
- BiHPF: Bilateral High-Pass Filters for Robust Deepfake Detection, *Yonghyun Jeong, Doyeon Kim, Seungjai Min, Seongho Joe, Youngjune Gwon, Jongwon Choi*
- How and What To Learn: Taxonomizing Self-Supervised Learning for 3D Action Recognition, *Amor Ben Tanfous, Aimen Zerroug, Drew Linsley, Thomas Serre*
- Cross-Modal Adversarial Reprogramming, *Paarth Neekhara, Shehzeen Hussain, Jinglong Du, Shlomo Dubnov, Farinaz Koushanfar, Julian McAuley*
- The Untapped Potential of Off-the-Shelf Convolutional Neural Networks, *Matthew Inkawhich, Nathan Inkawhich, Eric Davis, Hai Li, Yiran Chen*
- MisConv: Convolutional Neural Networks for Missing Data, *Marcin Przewięźlikowski, Marek Śmieja, Łukasz Struski, Jacek Tabor*
- Surrogate Model-Based Explainability Methods for Point Cloud NNs, *Hanxiao Tan, Helena Kotthaus*
- AttWalk: Attentive Cross-Walks for Deep Mesh Analysis, *Ran Ben Izhak, Alon Lahav, Ayellet Tal*

- Self-Supervised Knowledge Transfer via Loosely Supervised Auxiliary Tasks, *Seungbum Hong, Jihun Yoon, Min-Kook Choi, Junmo Kim*
- Sandwich Batch Normalization: A Drop-In Replacement for Feature Distribution Heterogeneity, *Xinyu Gong, Wuyang Chen, Tianlong Chen, Zhangyang Wang*
- In-Field Phenotyping Based on Crop Leaf and Plant Instance Segmentation, *Jan Weyler, Federico Magistri, Peter Seitz, Jens Behley, Cyrill Stachniss*

1430–1530 7C (virtual): Applications and Systems (Naupaka III; online)

Format (5 min. video)

- PhotoWCT2: Compact Autoencoder for Photorealistic Style Transfer Resulting From Blockwise Training and Skip Connections of High-Frequency Residuals, *Tai-Yin Chiu, Danna Gurari*
- MAPS: Multimodal Attention for Product Similarity, *Nilotpal Das, Aniket Joshi, Promod Yenigalla, Gourav Agrwal*
- mToFNet: Object Anti-Spoofing With Mobile Time-of-Flight Data, *Yonghyun Jeong, Doyeon Kim, Jaehyeon Lee, Minki Hong, Solbi Hwang, Jongwon Choi*
- A Modular and Unified Framework for Detecting and Localizing Video Anomalies, *Keval Doshi, Yasin Yilmaz*
- PROVES: Establishing Image Provenance Using Semantic Signatures, *Mingyang Xie, Manav Kulshrestha, Shaojie Wang, Jinghan Yang, Ayan Chakrabarti, Ning Zhang, Yevgeniy Vorobeychik*
- Multi-Branch Neural Networks for Video Anomaly Detection in Adverse Lighting and Weather Conditions, *Sam Leroux, Bo Li, Pieter Simoens*
- Rethinking Video Anomaly Detection – A Continual Learning Approach, *Keval Doshi, Yasin Yilmaz*
- LEAD: Self-Supervised Landmark Estimation by Aligning Distributions of Feature Similarity, *Tejan Karmali, Abhinav Atrishi, Sai Sree Harsha, Susmit Agrawal, Varun Jampani, R. Venkatesh Babu*
- Pro-CCaps: Progressively Teaching Colourisation to Capsules, *Rita Pucci, Christian Micheloni, Gian Luca Foresti, Niki Martinel*
- Multi-Scale Patch-Based Representation Learning for Image Anomaly Detection and Segmentation, *Chin-Chia Tsai, Tsung-Hsuan Wu, Shang-Hong Lai*
- Short-Term Solar Irradiance Prediction From Sky Images With a Clear Sky Model, *Huiyu Gao, Miaomiao Liu*
- Intelligent Camera Selection Decisions for Target Tracking in a Camera Network, *Anil Sharma, Saket Anand, Sanjit K Kaul*

1430–1530 7D (virtual): Computational Photography, Image and Video Synthesis (Naupaka VII; online)

Format (5 min. video)

- Revealing Disocclusions in Temporal View Synthesis Through Infilling Vector Prediction, *Vijayalakshmi Kanchana, Nagabhushan Somraj, Suraj Yadwad, Rajiv Soundararajan*
- Pose-Guided Generative Adversarial Net for Novel View Action Synthesis, *Xianhang Li, Junhao Zhang, Kunchang Li, Shruti Vyas, Yogesh S. Rawat*
- Facial Attribute Transformers for Precise and Robust Makeup Transfer, *Zhaoyi Wan, Haoran Chen, Jie An, Wentao Jiang, Cong Yao, Jiebo Luo*
- Enhanced Correlation Matching Based Video Frame Interpolation, *Sungho Lee, Narae Choi, Woong Il Choi*
- Robust High-Resolution Video Matting With Temporal Guidance, *Shanchuan Lin, Linjie Yang, Imran Saleemi, Soumyadip Sengupta*
- Tailor Me: An Editing Network for Fashion Attribute Shape Manipulation, *Youngjoong Kwon, Stefano Petrangeli, Dahun Kim, Haoliang Wang, Viswanathan Swaminathan, Henry Fuchs*
- Fast and Efficient Restoration of Extremely Dark Light Fields, *Mohit Lamba, Kaushik Mitra*
- S2FGAN: Semantically Aware Interactive Sketch-To-Face Translation, *Yan Yang, Md Zakir Hossain, Tom Gedeon, Shafin Rahman*

- Resolution-Robust Large Mask Inpainting With Fourier Convolutions, *Roman Suvorov, Elizaveta Logacheva, Anton Mashikhin, Anastasia Remizova, Arsenii Ashukha, Aleksei Silvestrov, Naejin Kong, Harshith Goka, Kiwoong Park, Victor Lempitsky*
- CharacterGAN: Few-Shot Keypoint Character Animation and Reposing, *Tobias Hinz, Matthew Fisher, Oliver Wang, Eli Shechtman, Stefan Wermter*
- Fast Nonlinear Image Unblending, *Daichi Horita, Kiyoharu Aizawa, Ryohei Suzuki, Taizan Yonetsuji, Huachun Zhu*
- Measuring Hidden Bias Within Face Recognition via Racial Phenotypes, *Seyma Yucer, Furkan Tektas, Noura Al Moubayed, Toby P. Breckon*

1530–1545 Break (Naupaka Lawn)

1545–1645 8A (in-person)**: Imaging for Medical and Bioinformatics** (Naupaka I; overflow in Naupaka II)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

13. Weakly Supervised Branch Network With Template Mask for Classifying Masses in 3D Automated Breast Ultrasound, *Daekyung Kim, Chang-Mo Nam, Haesol Park, Mijung Jang, Kyong Joon Lee*
14. Weakly-Supervised Convolutional Neural Networks for Vessel Segmentation in Cerebral Angiography, *Arvind Vepa, Andrew Choi, Noor Nakhaei, Wonjun Lee, Noah Stier, Andrew Vu, Greyson Jenkins, Xiaoyan Yang, Manjot Shergill, Moira Desphy, Kevin Delao, Mia Levy, Cristopher Garduno, Lacy Nelson, Wandi Liu, Fan Hung, Fabien Scalzo*
15. METGAN: Generative Tumour Inpainting and Modality Synthesis in Light Sheet Microscopy, *Izabela Horvath, Johannes Paetzold, Oliver Schoppe, Rami Al-Maskari, Ivan Ezhov, Suprosanna Shit, Hongwei Li, Ali Ertürk, Bjoern Menze*
16. TA-Net: Topology-Aware Network for Gland Segmentation, *Haotian Wang, Min Xian, Aleksandar Vakanski*
17. Non-Local Attention Improves Description Generation for Retinal Images, *Jia-Hong Huang, Ting-Wei Wu, C.-H. Huck Yang, Zenglin Shi, I-Hung Lin, Jesper Tegner, Marcel Worring*
18. Weakly Supervised Learning for Joint Image Denoising and Protein Localization in Cryo-Electron Microscopy, *Qinwen Huang, Ye Zhou, Hsuan-Fu Liu, Alberto Bartesaghi*
19. AFTer-UNet: Axial Fusion Transformer UNet for Medical Image Segmentation, *Xiangyi Yan, Hao Tang, Shanlin Sun, Haoyu Ma, Deying Kong, Xiaohui Xie*

1545–1645 8B (in-person)**: Recognition** (Naupaka V; overflow in Naupaka VI)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

20. Danish Fungi 2020 – Not Just Another Image Recognition Dataset, *Lukáš Picek, Milan Šulc, Jiří Matas, Thomas S. Jeppesen, Jacob Heilmann-Clausen, Thomas Læssøe, Tobias Frøslev*
21. Multi-View Fusion of Sensor Data for Improved Perception and Prediction in Autonomous Driving, *Sudeep Fadadu, Shreyash Pandey, Darshan Hegde, Yi Shi, Fang-Chieh Chou, Nemanja Djuric, Carlos Vallespi-Gonzalez*
22. Learned Event-Based Visual Perception for Improved Space Object Detection, *Nikolaus Salvatore, Justin Fletcher*
23. Dataset Knowledge Transfer for Class-Incremental Learning Without Memory, *Habib Slim, Eden Belouadah, Adrian Popescu, Darian Onchis*
24. Learning to Weight Filter Groups for Robust Classification, *Siyang Yuan, Yitong Li, Dong Wang, Ke Bai, Lawrence Carin, David Carlson*
25. Low-Cost Multispectral Scene Analysis With Modality Distillation, *Heng Zhang, Elisa Fromont, Sébastien Lefèvre, Bruno Avignon*

26. HHP-Net: A Light Heteroscedastic Neural Network for Head Pose Estimation With Uncertainty, *Giorgio Cantarini, Federico Figari Tomenotti, Nicoletta Noceti, Francesca Odone*
27. Batch Normalization Tells You Which Filter Is Important, *Junghun Oh, Heewon Kim, Sungyong Baik, Cheeun Hong, Kyoung Mu Lee*
28. Novel Ensemble Diversification Methods for Open-Set Scenarios, *Miriam Farber, Roman Goldenberg, George Leifman, Gal Novich*
29. Measuring Representation of Race, Gender, and Age in Children's Books: Face Detection and Feature Classification in Illustrated Images, *Teodora Szasz, Emileigh Harrison, Ping-Jung Liu, Ping-Chang Lin, Hakizumwami Birali Runesha, Anjali Adukia*

1545–1645 8C (virtual): Vision for Robotics / Deep Learning (Naupaka III; online)

Format (5 min. video)

- CeyMo: See More on Roads – A Novel Benchmark Dataset for Road Marking Detection, *Oshada Jayasinghe, Sahan Hemachandra, Damith Anhettigama, Shenali Kariyawasam, Ranga Rodrigo, Peshala Jayasekara*
- Towards Active Vision for Action Localization With Reactive Control and Predictive Learning, *Shubham Trehan, Sathyanarayanan N. Aakur*
- ForeSI: Success-Aware Visual Navigation Agent, *Mahdi Kazemi Moghaddam, Ehsan Abbasnejad, Qi Wu, Javen Qinfeng Shi, Anton Van Den Hengel*
- DG-Labeler and DGL-MOTS Dataset: Boost the Autonomous Driving Perception, *Yiming Cui, Zhiwen Cao, Yixin Xie, Xingyu Jiang, Feng Tao, Yingjie Victor Chen, Lin Li, Dongfang Liu*
- TricubeNet: 2D Kernel-Based Object Representation for Weakly-Occluded Oriented Object Detection, *Beomyoung Kim, Janghyeon Lee, Sihaeng Lee, Doyeon Kim, Junmo Kim*
- AirCamRTM: Enhancing Vehicle Detection for Efficient Aerial Camera-Based Road Traffic Monitoring, *Rafael Makrigiorgis, Nicolas Hadjittoouli, Christos Kyrkou, Theocharis Theocharides*
- StyleMC: Multi-Channel Based Fast Text-Guided Image Generation and Manipulation, *Umut Kocasari, Alara Dirik, Mert Tiftikci, Pinar Yanardag*
- Self-Guidance: Improve Deep Neural Network Generalization via Knowledge Distillation, *Zhenzhu Zheng, Xi Peng*
- REFICS: A Step Towards Linking Vision With Hardware Assurance, *Ronald Wilson, Hangwei Lu, Mengdi Zhu, Domenic Forte, Damon L. Woodard*
- Data InStance Prior (DISP) in Generative Adversarial Networks, *Puneet Mangla, Nupur Kumari, Mayank Singh, Balaji Krishnamurthy, Vineeth N. Balasubramanian*

1545–1645 8D (virtual): Deep Learning - Architectures, Training, and Inference (Naupaka VII; online)

Format (5 min. video)

- Online Knowledge Distillation by Temporal-Spatial Boosting, *Chengcheng Li, Zi Wang, Hairong Qi*
- Multi-Dimensional Dynamic Model Compression for Efficient Image Super-Resolution, *Zejiang Hou, Sun-Yuan Kung*
- Contextual Gradient Scaling for Few-Shot Learning, *Sanghyuk Lee, Seunghyun Lee, Byung Cheol Song*
- Channel Pruning via Lookahead Search Guided Reinforcement Learning, *Zi Wang, Chengcheng Li*
- Progressive Automatic Design of Search Space for One-Shot Neural Architecture Search, *Xin Xia, Xuefeng Xiao, Xing Wang, Min Zheng*
- Meta Approach to Data Augmentation Optimization, *Ryuichiro Hataya, Jan Zdenek, Kazuki Yoshizoe, Hideki Nakayama*
- Approximate Neural Architecture Search via Operation Distribution Learning, *Xingchen Wan, Binxin Ru, Pedro M. Esparança, Fabio Maria Carlucci*
- Resource-Efficient Hybrid X-Formers for Vision, *Pranav Jeevan, Amit Sethi*

- Leveraging Test-Time Consensus Prediction for Robustness Against Unseen Noise, *Anindya Sarkar, Anirban Sarkar, Vineeth N Balasubramanian*
- Latent Reweighting, an Almost Free Improvement for GANs, *Thibaut Issenhuth, Ugo Tanielian, David Picard, Jérémie Mary*
- Towards a Robust Differentiable Architecture Search Under Label Noise, *Christian Simon, Piotr Koniusz, Lars Petersson, Yan Han, Mehrtash Harandi*
- EZCrop: Energy-Zoned Channels for Robust Output Pruning, *Rui Lin, Jie Ran, Dongpeng Wang, King Hung Chiu, Ngai Wong*

1645–1700 Break (Naupaka Lawn)

1700–1800 Keynote Session (Naupaka I; overflow in Naupaka II, III, V, VI, & VII)

- **Keynote:** Integrated Physical-Digital World and Digital Human, *Zhengyou Zhang (Tencent)*

  Abstract: With the rapid development of digital technologies such as AI, VR, AR, XR, and more importantly the almost ubiquitous mobile broadband coverage, we are entering an Integrated Physical-Digital World (IPhD), the tight integration of virtual world with the physical world. The IPhD is characterized with four key technologies: Virtualization of the physical world, Realization of the virtual world, Holographic internet, and Intelligent Agent. Internet will continue its development with faster speed and broader bandwidth, and will eventually be able to communicate holographic contents including 3D shape, appearance, spatial audio, touch sensing and smell. Intelligent agents, such as digital human, and digital/physical robots, travels between digital and physical worlds. In this talk, we will describe our work on IPhD and especially digital human for this IPhD world. This includes: computer vision techniques for building digital humans, multimodal text-to-speech synthesis (voice and lip shapes), speech-driven face animation, neural-network-based body motion control, human-digital-human interaction, and an emotional video game anchor.

1800–1930 Dinner (Lū'au Grounds)

1930–2045 9A (in-person)**: Deep Learning** (Naupaka I; overflow in Naupaka II)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

30. PRECODE – A Generic Model Extension To Prevent Deep Gradient Leakage, *Daniel Scheliga, Patrick Mäder, Marco Seeland*
31. S2-MLP: Spatial-Shift MLP Architecture for Vision, *Tan Yu, Xu Li, Yunfeng Cai, Mingming Sun, Ping Li*
32. Preventing Catastrophic Forgetting and Distribution Mismatch in Knowledge Distillation via Synthetic Data, *Kuluhan Binici, Nam Trung Pham, Tulika Mitra, Karianto Leman*
33. FalCon: Fine-Grained Feature Map Sparsity Computing With Decomposed Convolutions for Inference Optimization, *Zirui Xu, Fuxun Yu, Chenxi Liu, Zhe Wu, Hongcheng Wang, Xiang Chen*
34. Model Compression Using Optimal Transport, *Suhas Lohit, Michael Jones*
35. Sharing Decoders: Network Fission for Multi-Task Pixel Prediction, *Steven Hickson, Karthik Raveendran, Irfan Essa*
36. Hessian-Aware Pruning and Optimal Neural Implant, *Shixing Yu, Zhewei Yao, Amir Gholami, Zhen Dong, Sehoon Kim, Michael W. Mahoney, Kurt Keutzer*
37. Latent to Latent: A Learned Mapper for Identity Preserving Editing of Multiple Face Attributes in StyleGAN-Generated Images, *Siavash Khodadadeh, Shabnam Ghadar, Saeid Motiian, Wei-An Lin, Ladislau Bölöni, Ratheesh Kalarot*

Notes:

1930–2045 9B (in-person)**: Recognition**
(Naupaka V; overflow in Naupaka VI)

Paper # represents poster # in today's poster session.

Format (5 min. short presentation)

38. SeaDronesSee: A Maritime Benchmark for Detecting Humans in Open Water, *Leon Amadeus Varga, Benjamin Kiefer, Martin Messmer, Andreas Zell*
39. Meta-UDA: Unsupervised Domain Adaptive Thermal Object Detection Using Meta-Learning, *Vibashan VS, Domenick Poster, Suya You, Shuowen Hu, Vishal M. Patel*
40. Class-Balanced Active Learning for Image Classification, *Javad Zolfaghari Bengar, Joost van de Weijer, Laura Lopez Fuentes, Bogdan Raducanu*
41. Single Image Object Counting and Localizing Using Active-Learning, *Inbar Huberman-Spiegelglas, Raanan Fattal*
42. F-CAM: Full Resolution Class Activation Maps via Guided Parametric Upscaling, *Soufiane Belharbi, Aydin Sarraf, Marco Pedersoli, Ismail Ben Ayed, Luke McCaffrey, Eric Granger*
43. Learning To Generate the Unknowns as a Remedy to the Open-Set Domain Shift, *Mahsa Baktashmotlagh, Tianle Chen, Mathieu Salzmann*
44. Fast-CLOCs: Fast Camera-LiDAR Object Candidates Fusion for 3D Object Detection, *Su Pang, Daniel Morris, Hayder Radha*
45. Learnable Adaptive Cosine Estimator (LACE) for Image Classification, *Joshua Peeples, Connor H. McCurley, Sarah Walker, Dylan Stewart, Alina Zare*
46. Self-Supervised Shape Alignment for Sports Field Registration, *Feng Shi, Paul Marchwica, Juan Camilo Gamboa Higuera, Michael Jamieson, Mehrsan Javan, Parthipan Siva*
47. Inpaint2Learn: A Self-Supervised Framework for Affordance Learning, *Lingzhi Zhang, Weiyu Du, Shenghao Zhou, Jiancong Wang, Jianbo Shi*

1930–2045 9C (virtual)**: Explainability, Robustness and Ethics in Vision**
(Naupaka III; online)

Format (5 min. video)

- DAD: Data-Free Adversarial Defense at Test Time, *Gaurav Kumar Nayak, Ruchit Rawal, Anirban Chakraborty*
- Physical Adversarial Attacks on an Aerial Imagery Object Detector, *Andrew Du, Bo Chen, Tat-Jun Chin, Yee Wei Law, Michele Sasdelli, Ramesh Rajasegaran, Dillon Campbell*
- Geometrically Adaptive Dictionary Attack on Face Recognition, *Junyoung Byun, Hyojun Go, Changick Kim*
- On the Effectiveness of Small Input Noise for Defending Against Query-Based Black-Box Attacks, *Junyoung Byun, Hyojun Go, Changick Kim*
- REGroup: Rank-Aggregating Ensemble of Generative Classifiers for Robust Predictions, *Lokender Tiwari, Anish Madan, Saket Anand, Subhashis Banerjee*
- Generative Adversarial Attack on Ensemble Clustering, *Chetan Kumar, Deepak Kumar, Ming Shao*
- Adversarial Semantic Hallucination for Domain Generalized Semantic Segmentation, *Gabriel Tjio, Ping Liu, Joey Tianyi Zhou, Rick Siow Mong Goh*
- Unveiling Real-Life Effects of Online Photo Sharing, *Van-Khoa Nguyen, Adrian Popescu, Jérôme Deshayes-Chossart*
- Reconstructing Training Data From Diverse ML Models by Ensemble Inversion, *Qian Wang, Daniel Kurz*
- Evaluating and Mitigating Bias in Image Classifiers: A Causal Perspective Using Counterfactuals, *Saloni Dash, Vineeth N Balasubramanian, Amit Sharma*
- Fair Visual Recognition in Limited Data Regime Using Self-Supervision and Self-Distillation, *Pratik Mazumder, Pravendra Singh, Vinay P. Namboodiri*
- Does Data Repair Lead to Fair Models? Curating Contextually Fair Data To Reduce Model Bias, *Sharat Agarwal, Sumanyu Muku, Saket Anand, Chetan Arora*
- Generating and Controlling Diversity in Image Search, *Md. Mehrab Tanjim, Ritwik Sinha, Krishna Kumar Singh, Sridhar Mahadevan, David Arbour, Moumita Sinha, Garrison W. Cottrell*

- PoP-Net: Pose Over Parts Network for Multi-Person 3D Pose Estimation From a Depth Image, *Yuliang Guo, Zhong Li, Zekun Li, Xiangyu Du, Shuxue Quan, Yi Xu*
- Improving Model Generalization by Agreement of Learned Representations From Data Augmentation, *Rowel Atienza*

1930–2045 9D (virtual)**: Low-Level Vision / Image Processing** (Naupaka VII; online)

Format (5 min. video)

- Event-Based Kilohertz Eye Tracking Using Coded Differential Lighting, *Timo Stoffregen, Hossein Daraei, Clare Robinson, Alexander Fix*
- MEGAN: Memory Enhanced Graph Attention Network for Space-Time Video Super-Resolution, *Chenyu You, Lianyi Han, Aosong Feng, Ruihan Zhao, Hui Tang, Wei Fan*
- Single Image Deraining Network With Rain Embedding Consistency and Layered LSTM, *Yizhou Li, Yusuke Monno, Masatoshi Okutomi*
- Neural Radiance Fields Approach to Deep Multi-View Photometric Stereo, *Berk Kaya, Suryansh Kumar, Francesco Sarno, Vittorio Ferrari, Luc Van Gool*
- Detail Preserving Residual Feature Pyramid Modules for Optical Flow, *Libo Long, Jochen Lang*
- No-Reference Image Quality Assessment via Transformers, Relative Ranking, and Self-Consistency, *S. Alireza Golestaneh, Saba Dadsetan, Kris M. Kitani*
- Learning From the CNN-Based Compressed Domain, *Zhenzhen Wang, Minghai Qin, Yen-Kuang Chen*
- MoESR: Blind Super-Resolution Using Kernel-Aware Mixture of Experts, *Mohammad Emad, Maurice Peemen, Henk Corporaal*
- edge-SR: Super-Resolution for the Masses, *Pablo Navarrete Michelini, Yunhua Lu, Xingqun Jiang*
- Image-Adaptive Hint Generation via Vision Transformer for Outpainting, *Daehyeon Kong, Kyeongbo Kong, Kyunghun Kim, Sung-Jun Min, Suk-Ju Kang*
- Hyperspectral Image Super-Resolution With RGB Image Super-Resolution as an Auxiliary Task, *Ke Li, Dengxin Dai, Luc Van Gool*
- Deep Optimization Prior for THz Model Parameter Estimation, *Tak Ming Wong, Hartmut Bauermeister, Matthias Kahl, Peter Haring Bolívar, Michael Möller, Andreas Kolb*
- Geometry-Inspired Top-K Adversarial Perturbations, *Nurislam Tursynbek, Aleksandr Petiushko, Ivan Oseledets*
- Nonnegative Low-Rank Tensor Completion via Dual Formulation With Applications to Image and Video Completion, *Tanmay Kumar Sinha, Jayadev Naram, Pawan Kumar*
- PredStereo: An Accurate Real-Time Stereo Vision System, *Diksha Moolchandani, Nivedita Shrivastava, Anshul Kumar, Smruti R. Sarangi*

2045–2200 Poster Session 3 (Naupaka IV)

Posters for Sessions 7A, 8A, 8B, 9A, and 9B.

2045–2200 Dessert (Naupaka Lawn)

Notes:

Saturday, January 8

0900–1200 Registration (Porte Cochère)

Hazard Perception in Intelligent Vehicles

Organizers: Ardhendu Behera
R Venkatesh Babu
Dima Damen
Nik Bessis
Yonghuai Liu
C. S. Shankar Ram

Location: Virtual / Online

Schedule: **Full Day** (times listed in HST)

0200 **Welcome**

0205 **Keynote:** Self-Driving at Scale: Where Are We Headed? *Arjun Jain (UAVIO Labs; IISc Bangalore)*

0250 **Invited Talk:** Generalize Then Adapt: Source-Free Domain Adaptive Semantic Segmentation, *Jogendra Nath Kundu (Facebook AI Research, IISc Bangalore)*

0310 **Invited Talk:** Efficient Defenses against Real World Adversarial Attacks, *Sravanti Addepalli (IISc Bangalore)*

0330 Short Break

0340 Robust 3D Object Detection for Moving Objects Based on PointPillars, *Ryota Nakamura, Shuichi Enokida*

0355 Weakly-Supervised Free Space Estimation Through Stochastic Co-Teaching, *François Robinet, Claudia Parera, Christian Hundt, Raphaël Frank*

0410 AA3DNet: Attention Augmented Real Time 3D Object Detection, *Abhinav Sagar*

0425 **Keynote:** Towards Safe Driving in Unstructured Environments, *C. V. Jawahar (IIIT Hyderabad)*

0510 Long Break

0540 **Keynote:** On Perception and Transition Controls for Safe Autonomous Driving, *Mohan M. Trivedi (UC San Diego)*

0625 **Invited Talk:** Autonomous Driving in Dense, Heterogeneous, and Unstructured Traffic Environments, *Rohan Chandra (Univ. of Maryland)*

0645 **Invited Talk:** Key-Point Based Deep Attentional Networks for Driver's Distraction State Recognition, *Asish Bera (Edge Hill Univ.; SRM University)*

0705 Short Break

0715 On Salience-Sensitive Sign Classification in Autonomous Vehicle Path Planning: Experimental Explorations With a Novel Dataset, *Ross Greer, Jason Isa, Nachiket Deo, Akshay Rangesh, Mohan M. Trivedi*

0730 More or Less (MoL): Defending Against Multiple Perturbation Attacks on Deep Neural Networks Through Model Ensemble and Compression, *Hao Cheng, Kaidi Xu, Zhengang Li, Pu Zhao, Chenan Wang, Xue Lin, Bhavya Kailkhura, Ryan Goldhahn*

0745 Monocular Depth Estimation Using Multi Scale Neural Network and Feature Fusion, *Abhinav Sagar*

0800 **Keynote:** From Learning-Based Traffic Reconstruction to Autonomous Driving, *Ming C. Lin (Univ. of Maryland)*

0845 **Closing Remarks**

Notes:

Demographic Variations in Performance of Biometrics and Related Technology

Organizers: Kevin Bowyer
Michael King
Karl Ricanek
Arun Ross
Nisha Srinivas

Location: Naupaka I

Schedule: Full Day

0830 **Welcome & Introduction**

0840 Algorithmic Fairness in Face Morphing Attack Detection, *Raghavendra Ramachandra, Kiran Raja, Christoph Busch*

0900 **Keynote:** Results in Trustworthy Machine Learning That Go Against Conventional Wisdom, *Kush R. Varshney (IBM Research)*

0945 Morning Break (Naupaka Lawn)

1000 **Keynote:** Exploring New Dimensions of Face Recognition Bias, *Nisha Srinivas (Trueface)*

1035 **Keynote:** Finding Causes of Demographic Accuracy Difference in Face Recognition, *Kevin Bowyer (Univ. of Notre Dame)*

1110 **Keynote:** Identifying and Evaluating Racial Bias in Facial Recognition Technologies, *Nicol Turner Lee (Brookings Institution)*

1155 Lunch (on your own)

1300 Similarities in African Ethnic Faces From the Biometric Recognition Viewpoint, *Ogechukwu Iloanusi, Patrick J. Flynn, Patrick Tinsley*

1320 Analysis of Manual and Automated Skin Tone Assignments, *K. S. Krishnapriya, Gabriella Pangelinan, Michael C. King, Kevin W. Bowyer*

1340 **Panel Discussion:** Bias, Fairness, and Ethics in Biometrics

1430 **Closing Remarks**

Real-World Surveillance: Applications and Challenges

Organizers: Kamal Nasrollahi
Sergio Escalera Guerrero
Radu Ionescu
Fahad Shahbaz Khan
Thomas Moeslund
Anthony Hoogs
Shmuel Peleg
Mubarak Shah

Location: Naupaka V

Schedule: Full Day

0830 **Keynote:** Multimodal Anomaly Detection, *Barry Norton (Milestone Systems)*

0915 On the Importance of Appearance and Interaction Feature Representations for Person Re-Identification, *Richard Blythman, Andrea Zunino, Christopher Murray, Vittorio Murino*

0930 Semantic Segmentation Guided Real-World Super-Resolution, *Andreas Aakerberg, Anders S. Johansen, Kamal Nasrollahi, Thomas B. Moeslund*

0945 Event-Driven Re-Id: A New Benchmark and Method Towards Privacy-Preserving Person Re-Identification, *Shafiq Ahmad, Gianluca Scarpellini, Pietro Morerio, Alessio Del Bue*

1000 Morning Break (Naupaka Lawn)

1015 **Keynote:** Deep Learning in the Service of Video Investigations, *Igal Dvir (BriefCam)*

1100 Class-Aware Object Counting, *Andreas Michel, Wolfgang Gross, Fabian Schenkel, Wolfgang Middelmann*

1115 Real-Time Bangla License Plate Recognition System for Low Resource Video-Based Applications, *Alif Ashrafee, Akib Mohammed Khan, Mohammad Sabik Irbaz, MD Abdullah Al Nasim*

1130 Multi-Target Multi-Camera Tracking of Vehicles by Graph Auto-Encoder and Self-Supervised Camera

Link Model, *Hung-Min Hsu, Yizhou Wang, Jiarui Cai, Jenq-Neng Hwang*

1145 Learning From Synthetic Vehicles, *Tae Soo Kim, Bohoon Shim, Michael Peven, Weichao Qiu, Alan Yuille, Gregory D. Hager*

1200 Lunch (on your own)

1300 **Keynote:** The Legal Landscape of Vision-Based Surveillance, *Matthew Turk (Toyota Technological Inst. at Chicago; UC Santa Barbara)*

1345 Small or Far Away? Exploiting Deep Super-Resolution and Altitude Data for Aerial Animal Surveillance, *Mowen Xue, Theo Greenslade, Majid Mirmehdi, Tilo Burghardt*

1400 DIOR: DIstill Observations to Representations for Multi-Object Tracking and Segmentation, *Jiarui Cai, Yizhou Wang, Hung-Min Hsu, Haotian Zhang, Jenq-Neng Hwang*

1415 Video Representation Learning Through Prediction for Online Object Detection, *Masato Fujitake, Akihiro Sugimoto*

1430 Improving Person Re-Identification With Temporal Constraints, *Julia Dietlmeier, Feiyan Hu, Frances Ryan, Noel E. O'Connor, Kevin McGuinness*

1445 Afternoon Break (Naupaka Lawn)

1500 **Keynote:** Face Recognition and Surveillance: Enhancing Privacy and Fairness, *Arun Ross (Michigan State Univ.)*

1545 Fight Detection From Still Images in the Wild, *Şeymanur Aktı, Ferda Ofli, Muhammad Imran, Hazim Kemal Ekenel*

1600 Multiple Object Tracking and Forecasting: Jointly Predicting Current and Future Object Locations, *Oluwafunmilola Kesa, Olly Styles, Victor Sanchez*

1615 Fast and Lightweight Online Person Search for Large-Scale Surveillance Systems, *Andreas Specker, Lennart Moritz, Mickael Cormier, Jürgen Beyerer*

1630 Semantic-Guided Zero-Shot Learning for Low-Light Image/Video Enhancement, *Shen Zheng, Gaurav Gupta*

1645 Where Are We With Human Pose Estimation in Real-World Surveillance? *Mickael Cormier, Aris Clepe, Andreas Specker, Jürgen Beyerer*

1700 Cloth-Changing Person Re-Identification With Self-Attention, *Vaibhav Bansal, Gian Luca Foresti, Niki Martinel*

Computer Vision for Winter Sports

Organizers: Matteo Dunnhofer
Nicola Conci
Christian Micheloni

Location: Naupaka III

Schedule: Half Day — Morning

0800 **Welcome & Opening Remarks**

0815 **Invited Talk** [Industry]**:** *Zvika Popper (HYPE Sports Innovation)*

0845 **Invited Talk** [Industry]**:** *Nicola Moret (Cortina 2021 World Ski Championships)*

0915 **Invited Talk** [Academic]**:** *Pascal Fua (École Polytechnique Fédérale de Lausanne)*

0945 Morning Break (Naupaka Lawn)

1030 **Invited Talk** [Academic]**:** *James Elder (York Univ.)*

1100 Detecting Arbitrary Intermediate Keypoints for Human Pose Estimation With Vision Transformers, *Katja Ludwig, Philipp Harzig, Rainer Lienhart*

1115 Refining OpenPose With a New Sports Dataset for Robust 2D Pose Estimation, *Takumi Kitamura, Hitoshi Teshima, Diego Thomas, Hiroshi Kawasaki*

1130 Video-Based Ski Jump Style Scoring From Pose Trajectory, *Dejan Štepec, Danijel Skočaj*

1145 APE-V: Athlete Performance Evaluation Using Video, *Chaitanya Roygaga, Dhruva Patil, Michael*

Boyle, William Pickard, Raoul Reiser, Aparna Bharati, Nathaniel Blanchard

1200 **Extended Abstract Spotlights**

1215 **Winter Sports Hackathon Spotlight** - Last Edition's Winners Presentations

1230 **Closing Remarks**

Applications of Computational Imaging

Organizers: Scott McCloskey
Keigo Hirakawa

Location: Naupaka VI

Schedule: Half Day — Afternoon

1215 **Welcome**

1230 **Invited Talk:** *Tali Treibitz (Univ. of Haifa)*

S1: Paper Session I (1315-1400)

1315 [In-person] Multi-View Motion Synthesis via Applying Rotated Dual-Pixel Blur Kernels, *Abdullah Abuolaim, Mahmoud Afifi, Michael S. Brown*

1326 [In-person] Feature-Align Network With Knowledge Distillation for Efficient Denoising, *Lucas D. Young, Fitsum A. Reda, Rakesh Ranjan, Jon Morton, Jun Hu, Yazhu Ling, Xiaoyu Xiang, David Liu, Vikas Chandra*

1337 [Virtual] Temporally Consistent Relighting for Portrait Videos, *Sreenithy Chandran, Yannick Hold-Geoffroy, Kalyan Sunkavalli, Zhixin Shu, Suren Jayasuriya*

1348 [Virtual] Joint Multi-Scale Tone Mapping and Denoising for HDR Image Enhancement, *Litao Hu, Huaijin Chen, Jan P. Allebach*

1400 Afternoon Break (Naupaka Lawn)

1415 **Poster Session**

1515 **Invited Talk:** *Suren Jayasuriya (Arizona State Univ.)*

S2: Paper Session II (1600-1645)

1600 [Virtual] IDEA-Net: Adaptive Dual Self-Attention Network for Single Image Denoising, *Zheming Zuo, Xinyu Chen, Han Xu, Jie Li, Wenjuan Liao, Zhi-Xin Yang, Shizheng Wang*

1611 [Virtual] Hyperspectral Image Super-Resolution in Arbitrary Input-Output Band Settings, *Zhongyang Zhang, Zhiyang Xu, Zia Ahmed, Asif Salekin, Tauhidur Rahman*

1622 [Virtual] Generalizing Imaging Through Scattering Media With Uncertainty Estimates, *Jared M. Cochrane, Matthew Beveridge, Iddo Drori*

1633 [Virtual] STP-Net: Spatio-Temporal Polarization Network for Action Recognition Using Polarimetric Videos, *R. Krishna Kanth, Akshaya Ramaswamy, A. Anil Kumar, Jayavardhana Gubbi, Balamuralidhar P*

1645 **Invited Talk:** *Michael Brown (York Univ.)*

1730 **Concluding Remarks**

Notes:

Saturday, January 8

0900–1200 Registration (Porte Cochère)

Binary Neural Networks and Their Applications in Computer Vision

Organizers: Adrian Bulat
Georgios Tzimiropoulos
Lukas Cavigelli

Location: Naupaka VII

Time: 0900-1200 (Half Day — Morning)

An open problem in deep learning is how to develop models which are more compact, lightweight, and power efficient so that they can be effectively deployed on power and computing-constrained devices. A prominent direction that achieves all these goals is given by Binary Networks in which both the features and the weights can take only 2 values. In this case, the binary convolution can be efficiently implemented using bitwise-operation, resulting in ~32x smaller and ~58x faster models. However, these gains come at the cost of reduced accuracy. An open problem is how to train Binary Networks which maintain the same accuracy levels as their real-valued counterparts.

This tutorial aims to cover and review both the development of novel methodologies for Binary Neural Networks and their application to Computer Vision from both a theoretical and practical point of view, describing practical strategies for deploying such models on devices. Specifically, we will present the concept of network binarization and discuss fundamental concepts in BNNs positioning them in the larger topic of network quantization while providing an in-depth introduction of classic and more recent methods. Two predominant research paths followed by the community will be presented that focus either on improving the binarization procedure itself or the network architecture, where practical considerations for training, implementing, and deploying binary networks will be discussed. Limitations of the top performing methods and future research directions will be discussed. The last part of the tutorial will cover ultra-low power, hardware-based binary neural network accelerators and platforms.

AI for Commercial Driver Safety

Organizers: Hsien-Ting Cheng
Ijaz Akhter
Ahmid Ali
Hussam Khan
Muhammad Faisal
Ali Hassan
Ali Rehan

Location: Naupaka VII

Time: 1400-1700 (Half Day — Afternoon)

Today, about 6% of trucks run into accidents every year. The cost of these accidents is pretty significant. According to FMCSA, it's about $96,000 on average when there's just property damages, it's $200,000 when there's an injury involved, and it can be $3.5MM on average if there's a fatality involved in the crash. Also, according to DoT research, Close Following and Distracted driving are some of the major reasons for collisions. We published our previous research at WACV last year on our preliminary results of lightweight single-camera perception solutions. We have now integrated these core elements into our products that are being used in the trucking industry to improve driver behavior. Our Close Following technology is integrated into Cloud & Edge products that are being used by 27,000+ Trucking fleets in the US. In this tutorial, we want to talk about the long road of development that it takes to productize research into a commercially feasible/viable product generating tens of millions of annual recurring revenue.

We'll demonstrate how a commercial-grade driver safety system can be deployed on commodity hardware with very limited compute and a single camera. We'll walk through

the complete lifecycle of our advanced deep learning technology from developing and train- ing the models to porting them on the hardware maintaining a careful balance between speed and accuracy. The tutorial topics are:

- Camera auto initialization and calibration
- Model development (close following event and driver distraction event)
- Model deployment (on-premise and cloud)
- Feedback loop and data pipeline for product improvement

Furthermore, we will discuss some important decision-making processes and principles on model development from an industry perspective. For example:

- Why don't we use state-of-the-art backbone architecture?
- Isn't it obvious that sequential logic building blocks are easier to manage than an end-to-end Deep Learning model?
- Precision vs recall, do we have to make the choice?
- How can we efficiently source corner cases to improve our model?

Notes:

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