

19th International Symposium on Visual Computing

October 21-23, 2024, Lake Tahoe, Nevada, USA



ISVC 2024

Contents

MONDAY, OCTOBER 21 st	3
TUESDAY, OCTOBER 22 nd	5
WEDNESDAY, OCTOBER 23 rd	7
Poster Session	9
Keynote Speakers	10
Steering Committee/Area Chairs	17
International Program Committee	18
Special Tracks	24
Tutorials	25

Registration Desk Hours: Sunday, October 20th (4:00pm – 6:00pm)
Monday, October 21st – Wednesday, October 23rd (8:00am-5:00pm)



Monday, October 21st

8:50 – 9:00	<i>Welcome – <u>George Bebis</u>, University of Nevada, Reno</i>	
9:00–10:00	<i>Keynote: <u>Jim Duncan</u>, Yale University, USA (Sand Harbor II) Chair: <u>George Bebis</u></i>	
Parallel Sessions		
10:10-12:10	Deep Learning I (Sand Harbor II) Chair: <u>Seristina Viriri</u>	Computer Graphics (Tahoe A&B) Chair: <u>Robert Lewis</u>
	10:10	Thomas Pöllabauer, Sarah Berkei, Volker Knauthe and Arjan Kuijper. Advanced Post-Processing for Object Detection Dataset Generation
	10:30	Junho Oh and Amos Abbott. Estimation of Global Illumination using Cycle-Consistent Adversarial Networks
	10:30	Yunling Zheng, Zeyi Xu, Fanghui Xue, Biao Yang, Jiancheng Lyu, Shuai Zhang, Yingyong Qi and Jack Xin. AFIDAF: Alternating Fourier and Image Domain Adaptive Filters as an Efficient Alternative to Attention in ViTs
	10:50	Brian Yang and David Mould. Anisotropic Point Synthesis by Example
	10:50	Adarsh Sehgal, Muskan Sehgal and Hung La. Multi-Actor-Critic Deep Reinforcement Learning with Hindsight Experience Replay RECORDED
	10:50	Kohei Aoyama, Yuto Hayakawa and Issei Fujishiro. 3D Fluid Shape Control by Direct Manipulation
11:10-11:30	<i>Coffee Break</i>	
	11:30	Thomas Poellabauer, Johannes Weyel, Volker Knauthe, Sarah Berkei and Arjan Kuijper. Improving Zero-Shot Template-Based 6D Pose Estimation with Geometric Features
	11:50	Joel Pepper and David Breen. An Epithelium-Inspired Deformation Modeling Framework for 4D Sheets
	11:50	Lucas Pascotti Valem, Daniel C. G. Pedronette and Mohand Said Allili. Contrastive Loss based on Contextual Similarity for Image Classification
	11:50	Russel Arbore, Jeffrey Liu, Aidan Wefel, Steven Gao and Eric Shaffer. Hybrid Voxel Formats for Efficient Ray Tracing
10:10-12:10	Video Analysis and Event Recognition (Sand Harbor I) Chair: <u>Mircea Nicolescu</u>	
	10:10	Bao Yikai, Saito Yukihiro and Nishio Nobuhiko. PIEPredict++: An Improved Pedestrian Intention Estimation Model Incorporating Comprehensive Environment Information
	10:30	Christopher Rasmussen, Amani Kiruga, Julie Orlando and Michele Lobo. Infant Video Interaction Recognition using Monocular Depth Estimation
	10:50	Kittimate Chulajata, Sean Wu, Eric Laukien, Fabien Scalzo and Eun Sang Cha. Real-Time Predictor in Two-Players Fighting Game via Vision Transformer
11:10-11:30	<i>Coffee Break</i>	
	11:30	Hui Yang, Mostepha Khouadjia, Nacera Seghouani, Yue Ma and Serge Delmas. Explainable Action-Recognition based Approach for Unsupervised Video Anomaly Detection RECORDED
	11:50	Soroush Oraki, Harry Zhuang and Jie Liang. LORTSAR: Low-Rank Transformer for Skeleton-based Action Recognition
12:10-1:30	<i>Lunch Break</i>	

1:30-2:30	<i>Keynote: Alex Endert, Georgia Institute of Technology, USA (Sand Harbor II)</i> Chair: <u>Andrea Salgian</u>	
	Parallel Sessions	
2:40-4:40	Motion and Tracking (Sand Harbor II) Chair: <u>Christopher Rasmussen</u>	N/A (Tahoe A&B) Chair: TBD
	2:40	Md Mohibullah, Yuhei Hironaka, Yusuke Suda, Ryota Suzuki, Mahmudul Hasan and Yoshinori Kobayashi. Pedestrian tracking using ankle-level 2D-LiDAR based on ByteTrack
	3:00	Pyunghwa Shin and Ohung Kwon. Real-Time Human Pose Estimation Technology with Image Processing: Application to ID Assignment in the Wild
	3:20	Huseyin Seckin Demir, Noah Rajbharti, Sloan Sciarappo, Jennifer Blain Christen and Sule Ozev. Evaluating the Impact of Dehazing Algorithms on Visual Object Tracking Performance
3:40-4:10	<i>Coffee Break</i>	
	4:10	Qinghua Song and Xiaolei Wang. RGB-T-UV Multi-Modal Object Tracking Based on Transformer Network RECORDED
	4:30	Islam Abdelfattah and Mohamed Shehata. MEM: Mask Enhancement Model for Video Object Segmentation
2:40-4:40	Detection and Recognition (Sand Harbor I) Chair: <u>Andrea Salgian</u>	
	2:40	Sean Tronsen, Elizabeth Francois, Christina Scovel and Nathan DeBardeleben. Analysis Automation for High Explosive Breakout Symmetry
	3:00	Yongqing Liang, Huijun Han and Xin Li. CLAP: Concave Linear APproximation for Quadratic Graph Matching
	3:20	Thomas Pöllabauer, Tristan Wirth, Paul Weitz, Volker Knauthe, Arjan Kuijper and Dieter W. Fellner. Generalizing Neural Radiance Fields for Robust 6D Pose Estimation of Unseen Appearances
3:40-4:10	<i>Coffee Break</i>	
	4:10	Sushrut Patwardhan, Sushma Venkatesh and R. Raghavendra. Effectiveness of Residual Noise based Methods for Single Image based Morphing Attack Detection: A Comparative Study
	4:30	Alexander Sunderhaft, Ram Bhagat, John Birchwood, Julia Heller, Ilke Demir and Umur Ciftci. Black Box Adversarial Face Transformation Network

Tuesday, October 22nd

9:00-10:00	<i>Keynote: Jernej Barbic, University of Southern California, USA (Sand Harbor II)</i> Chair: <u>Rahul Singh</u>	
Parallel Sessions		
10:10-12:10	Deep Learning II (Sand Harbor II) Chair: <u>Kostas Karydis</u>	Visualization (Tahoe A&B) Chair: <u>Fred Harris</u>
10:10	Samson Akinpelu and Serestina Viriri. Bi-Feature Selection Deep Learning-based Techniques for Speech Emotion Recognition	Kristen Schumacher, Sonali Joshi, Dhruv Srivastava, Alex Shaffer, Anisha Jog, Jasmine Shih and Eric Shaffer. Visualizing Polarization Effects of Gravitational Waves Using Particle Rings and Surfaces in Virtual Reality
10:30	Azeez Idris and Wallapak Tavanapong. ActiveConfusion: A Time-Efficient Approach to the Cold-Start Problem in Active Learning by Incorporating Confusion from Pretext Task	Bhavana Doppalapudi, Dilshadur Rahman and Paul Rosen. Seeing is Believing: The Role of Scatterplots in Recommender System Trust and Decision-Making
10:50	Andreas Langeland Teigen, Mauhing Yip, Victor Hamran, Vegard Skui, Annette Stahl and Rudolf Mester. Removing Adverse Volumetric Effects from Trained Neural Radiance Fields	Debra Hogue, D. Shane Elliott and Chris Weaver. Interactive Visual Analysis of Camouflaged Objects
11:10-11:30	<i>Coffee Break</i>	
11:30	Patricia L. Suárez R. and Angel D. Sappa. Thermal Image Synthesis: Bridging the Gap between Visible and Infrared Spectrum	Kriti Sharma, Thomas Shrek, Vatsa Patel, Minh-Triet Tran and Tam Nguyen. GAIA: A Benchmark of Analyzing User Rankings for Synthesized Images
11:50	Thura Zaw and Takashi Komuro. Anomaly Detection in Mutual Actions: Unsupervised Classification of Fighting and Non-Fighting Behaviors using Transformer-based Variational Autoencoder	
10:10-12:10	Medical Image Analysis (Sand Harbor I) Chair: <u>Rahul Singh</u>	
10:10	Adam Holsinger, Fangshi Zhou, Tianming Zhao and Zhongmei Yao. Motion and Light Artifact Mitigation for Remote PPG with Noise-Aware Post-Processor Network	
10:30	Erik Ostrowski and Muhammad Shafique. J-Net: A Low-Resolution Lightweight Neural Network for Semantic Segmentation in the Medical field for Embedded Deployment RECORDED	
10:50	Fangshi Zhou, Tianming Zhao, Adam Holsinger and Zhongmei Yao. Accurate Remote PPG Waveform Recovery from Video Using a Multi-Task Learning Temporal Model	
11:10-11:30	<i>Coffee Break</i>	
11:30	Anura Hiranman, Serestina Viriri and Mandlenkosi Gwetu. Efficient Lung Segmentation for Tumour Detection	
11:50		
12:10-1:30	<i>Lunch Break</i>	

1:30-2:30	Keynote: Mohammed Safayet Arefin , Colorado State University, USA (Sand Harbor II) Chair: <u>Emily Hand</u>	
Parallel Sessions		
2:40-3:40	Segmentation (Sand Harbor II) Chair: <u>Emily Hand</u>	Recognition (Tahoe A&B) Chair: <u>Andrea Salgian</u>
	2:40 Gunner Stone, Sushmita Sarker, Jonathan Greenberg and Alireza Tavakkoli Generating Synthetic Tree Point Clouds for Deep Learning Applications in Remote Sensing	Thiago César Castilho Almeida, Lucas Pascotti Valem and Daniel C. G. Pedronette. Unsupervised Effectiveness Estimation Measure Based on Rank Correlation for Image Retrieval
	3:00 Jiadong Yu and Rahul Singh. Image Segmentation by Latent Space Phase-Gating with Applications in High-Content Screening	Mingzhe Hu. VLPSR: Enhancing Zero-shot Object ReID with Vision-language Model
	3:20 Paul Julius Kühn, Thomas Pöllabauer and Alexander Hartmann. Evaluating Segmentation of Human Body Parts across Datasets	Andrea Salgian, Brielle Damiani, Benjamin Guerrieri and Shannon Joseph. Sign Language Recognition using Visual Hand Landmarks and the Parameters of American Sign Language
3:40-4:10	<i>Coffee Break</i>	
2:40-3:40	ST: Generalization in Visual Machine Learning (Sand Harbor I) Chair: <u>Tianming Zhao</u>	
	2:40 Ala'A Alshubbak, Cyrille Ewoudi Ewoudi and Daniel Görge. Self-Supervised Segmentation to Pose Estimation Model for Mechanical Systems with Complex Kinematics	
	3:00 Muhammad Shaheryar, Jong Taek Lee and Soon Ki Jung. Selective Noise-Aided Machine Unlearning with Deep Feature Visualization	
	3:20 Isha Shah, Tim Mammadov, Mohamed Sami Shehata and Rasika Rajapakshe. Investigating the Impact of a Foundational Medical Image Model for CT Classification	
3:40-4:10	<i>Coffee Break</i>	
4:10-5:40	Poster Session (Sand Harbor II)	
6:30-9:30	Banquet Dinner & Best Paper Award (Sand Harbor III) Keynote: Greg Mori , Simon Fraser University and Borealis AI, Canada (at 8:00 pm) Chair: <u>George Bebis</u>	

Wednesday, October 23rd

9:00-10:00	<i>Keynote: Gang Hua, Dolby Laboratories, USA (Sand Harbor II)</i> Chair: <u>Mircea Nicolescu</u>	
Parallel Sessions		
10:10-12:10	ST: Vision and Robotics for Agriculture (Sand Harbor II) Chairs: <u>Dimitris Zermas</u> & <u>Kostas Karydis</u>	Virtual Reality (Tahoe A&B) Chair: <u>Ourania Spantidi</u>
10:10	Pamodya Peiris, Aritra Samanta, Caio Mucchiani, Cody Simons, Amit Roy-Chowdhury and Konstantinos Karydis. Vision-based Xylem Wetness Classification in Stem Water Potential Determination	Matthew Sturgeon, Evan Anspach, Francisco Ortega, Indrakshi Ray and Mohammed Safayet Arefin. Impact of Cyber Attacks on Human Performance in Optical See-Through Augmented Reality
10:30	Naghmeh Shafiee Roudbari, Ursula Eicker, Charalambos Poullis and Zachary Patterson. HydroVision: LiDAR-Guided Hydrometric Prediction with Vision Transformers and Hybrid Graph Learning RECORDED	Jorde Stojanov, Lazaros Rafail Kouzelis and Ourania Spantidi. Toward Dynamic NPC Interactions: Integrating GPT-Driven Agents in 3D Virtual Environments
10:50	Thomas Rowland, Mark Hansen, Melvyn Smith and Lyndon Smith. Machine Vision and Deep Learning, for Robotic Harvesting of Shiitake Mushrooms	Daniel Hepperle and Matthias Wölfel. Exploring Ecological Validity: A Comparative Study of the Mere Exposure Effect on Screens and in Immersive Virtual Reality
11:10-11:30	<i>Coffee Break</i>	
11:30	Danxu Wang, Emma Regentova, Venkatesan Muthukumar, Markus Berli and Frederick Harris. Video Analyses of Water Drop Penetration Time Using Temporal Action Localization for Evaluating Soil Water Repellency	Fabio Genz and Dieter Kranzlmüller. Increasing Training Efficiency of Motion-Intensive Virtual Reality Training with Adaptations based on Physiological Measurement Data
11:50	Upasana Sivaramakrishnan, Song Li, Sanchari Kundu and Bastiaan Bargmann. SAMPLS: A prompt engineering approach using Segment-Anything-Model for PLant Science research RECORDED	
10:10-12:10	Applications (Sand Harbor I) Chair: <u>Mircea Nicolescu</u>	
10:10	Siyuan Yao, Siavash Ghorbany, Matthew Sisk, Ming Hu and Chaoli Wang. Leveraging Zero-Shot Learning on Street-View Imagery for Built Environment Variable Analysis	
10:30	Sadia Nasrin Tisha and Geethanjali Nallani. Enhancing Classification of Aquatic Species through Supervised Contrastive Learning and Advanced Image Super-Resolution	
10:50	Tanzina Akter Tani, Andrew Scouten, Evan G Ortiz, Dr. Robert J C McLean and Dr. Jelena Tešić. Automated Corrosion Identification in Metal Imagery: Traditional vs. Deep Learning	
11:10-11:30	<i>Coffee Break</i>	
11:30	Huseyin Seckin Demir, Jennifer Blain Christen and Sule Ozev. Underwater Image Restoration using Light Attenuation	
11:50	William Valentine, Megan Webb, Christopher Collum, Dave Feil-Seifer and Emily Hand. HCC: An explainable framework for classifying discomfort from video	
12:10-1:30	<i>Lunch Break</i>	

1:30-2:30	<p style="text-align: center;"><i>Keynote:</i> <u>Mik Cieslak</u>, GreenMatterAI, Germany (Sand Harbor II) Chair: <u>Dimitris Zermas</u></p>
2:40-6:00	<p style="text-align: center;">Tutorial (Sand Harbor II)</p>
2:40-4:00	<p style="text-align: center;">Confronting Social Injustice in the Era of Generative AI CANCELLED</p> <p><i>Organizer:</i> Marina L. Gavrilova, University of Calgary, Canada</p>
4:00-4:30	<p style="text-align: center;"><i>Coffee Break</i></p>
4:30-6:00	<p style="text-align: center;">Confronting Social Injustice in the Era of Generative AI CANCELLED</p> <p style="text-align: center;">(cont'd)</p>

Poster Session (Sand Harbor II)

Tuesday, October 22nd (4:10-5:40)

(poster set up: 12:10pm – 1:30pm or 3:40pm – 4:10pm)

<p>Ayesh Meepaganithage, Mircea Nicolescu and Monica Nicolescu. Enhanced Maritime Safety through Deep Learning and Feature Selection</p>
<p>Alexander Taylor, Jonathan Morrison, Phillip Tregidgo and Neill Campbell. Discrete Anomalous Regions (DAR) - going beyond heatmaps and predicting usable discrete regions</p>
<p>Satoru Morita. Learning Flight Path Based on Recording Image and Flight Operation</p>
<p>Wellington Rodrigues, Emília Nogueira, Thamer Nascimento, Gabriel Vieira, Debora Fernandes and Fabrizzio Soares. MobileNetV2-Enhanced Depth Map Super-Resolution through Multi-Scale Image Guidance</p>
<p>Reyansh Mishra, Vatsa Patel, Hongjo Kim and Tam Nguyen. Road Surface Material Recognition from Dashboard Cameras</p>
<p>Erik Ostrowski and Muhammad Shafique. Embedded-ViT: A Framework for Embedded Deployment of Vision-Transformer in Medical Applications</p>
<p>Sida Zhang, Richard Povinelli and Joseph Domblesky. An Image-Based Method for Defect Detection on Metal Surfaces</p>
<p>Matthew Munson and Clark Olson. Real-Time Evaluation of Aircraft Instruments</p>
<p>Priyanka Mudgal and Feng Liu. Enhancing Learned Image Compression via Cross Window-based Attention</p>
<p>Haechan Park and Nakhoon Baek. A Design of Real-Time Style-Transfer Operations in a Game Engine</p>
<p>Kira Riggs and Chris Weaver. PLOV: A Visualization Tool for Exploring Visibility in Family Living Situations</p>
<p>Leonardo Yago Nascimento Silva, Deborah Fernandes, Emília Nogueira, Juliana Félix, Luciana Cardoso, Renan Vinicius Aranha, Thamer Nascimento and Fabrizzio Soares. Exploring Gesture-Based Interaction in Smartwatch Games: A Comparative Study between Continuous Gesture Recognition and Hidden Markov Models</p>

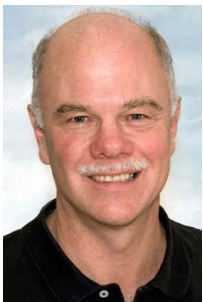
KEYNOTE TALK

Monday, October 21, 2024, at 9am

Neuroimage Analysis in Autism: from Model-Based Estimation to Data-driven Learning

James S Duncan
Yale University

Abstract: Functional magnetic resonance imaging (fMRI) has been shown to be helpful for the study of autism spectrum disorders (ASD). This talk will describe the evolution of efforts in this area within our group that carry promise for producing objective biomarkers for ASD, as well as predicting patient response to a behavioral therapy known as Pivotal Response Treatment (PRT), using task-based fMRI. Such biomarkers would provide an important step for better understanding the underlying pathophysiology of ASD that could help with objective and personalized diagnosis, provide new targets for development of new treatments, and provide a way to monitor patient progress. Initially a robust, group-wise unified Bayesian framework to detect both hyper and hypo-active communities from connectivity maps will be described. Next, more recent work will be presented that has focused on deriving ASD biomarkers from individual subject's time-series data, based on the classification of individual subjects (into ASD or typical control) and identifying spatially-specific key regions using graph convolutional neural networks and ablation analysis of regions. In addition, a strategy based on recurrent neural networks (using long-short-term memories or LSTMs) will be presented that predicts patient response to PRT behavioral therapy from baseline imaging while incorporating subject-specific phenotypic information for network initialization. Finally, initial efforts on the use of a spatiotemporal transformer strategy for classification and early work on the use of effective connectivity based on whole brain dynamic causal modeling as an alternative or an adjunct to functional connectivity for classification and biomarker analysis will be discussed.



Speaker Bio-Sketch: James S. Duncan is the Ebenezer K. Hunt Professor of Biomedical Engineering and a Professor of Radiology & Biomedical Engineering, Electrical Engineering and Statistics & Data Science at Yale University, and is currently the Chair of the Department of Biomedical Engineering. Dr. Duncan received his B.S.E.E. with honors from Lafayette College, his M.S. degree from the University of California, Los Angeles and his Ph.D. in Electrical Engineering from the University of Southern California. Dr. Duncan's research efforts have been in the areas of computer vision, image processing, and medical imaging, with an emphasis on biomedical image analysis and image-based machine learning. He has published over 300 peer-reviewed articles and has been the principal investigator on a number of peer-reviewed grants from both the National Institutes of Health and the National Science Foundation over the past 35 years. He is a Life Fellow of the Institute of Electrical and Electronic Engineers (IEEE), and a Fellow of the American Institute for Medical and Biological Engineering (AIMBE) and of the Medical Image Computing and Computer Assisted Intervention (MICCAI) Society. In 2014 he was elected to the Connecticut Academy of Science & Engineering. He has served as co-Editor-in-Chief of Medical Image Analysis, Associate Editor of IEEE Transactions on Medical Imaging, and on the Editorial Board of the Proceedings of the IEEE. He is a past President of the MICCAI Society. In 2012, he was elected to the Council of Distinguished Investigators, Academy of Radiology Research and in 2017 received the "Enduring Impact Award" from the MICCAI Society. He served as General Co-Chair of the 2023 MICCAI meeting in Vancouver, Canada.

KEYNOTE TALK

Monday, October 21, 2024, at 1:30pm

Fostering Mixed-Initiative Visual Analytics through Guidance

Alex Endert

Georgia Institute of Technology

Abstract: Visual analytic tools emphasize the importance of combining interactive visualizations with data analytic models to give people insight into data. Through user interactions with these systems, people prepare data, explore and analyze it, and make decisions. Often, various computational or AI models guide users throughout their exploration, and people provide feedback to these models as analysis proceeds. Thus, how can we design and build mixed-initiative visual analytic tools that support users in their tasks via guidance? This talk will discuss the opportunities and challenges of guidance during visual data analysis, and give examples of how the field is moving closer towards the goals and principles of mixed-initiative systems.



Speaker Bio-Sketch: Alex Endert is an Associate Professor and the Associate Chair of Operations and Special Initiatives at the School of Interactive Computing at the Georgia Institute of Technology. He directs the Visual Analytics (VA) Lab and conducts research to help people make sense of data through interactive visualizations and visual analytic systems. His lab's research is also often tested in practice in domains such as intelligence analysis, cybersecurity, manufacturing safety, and others. The lab's work receives support from NSF, DARPA, DOD, DHS, NIJ, and generous industry partners. In 2018, Endert was awarded an NSF CAREER Award for his work on Visual Analytics by Demonstration. In 2013, his work on Semantic Interaction was awarded the IEEE VGTC VPG Pioneers Group Doctoral Dissertation Award and the Virginia Tech Computer Science Best Dissertation Award.

KEYNOTE TALK

Tuesday, October 22, 2024, at 9am

Anatomically-Based Hand Simulation

Jernej Barbic

University of Southern California

Abstract: I will present the multi-year efforts on modeling and animating human hands, performed in my laboratory at USC. Hands are important in many applications, such as computer games, film, ergonomic design, tracking, and medical treatment. I will discuss how to acquire complete human hand anatomy in multiple poses using magnetic resonance imaging (MRI). Acquiring human hand anatomy in multiple poses was previously difficult because MRI scans must be long for high-precision results (over 10 minutes), and because humans cannot hold their hands perfectly still in non-trivial and badly supported poses. We invented a manufacturing process whereby lifecasting materials commonly employed in film special effects industry are used to stabilize the hand during MRI scanning. We demonstrate how to efficiently segment the MRI scans

into individual bone, muscle, tendon, ligament, fat and skin meshes in all poses, and how to correspond each organ's mesh to the same mesh connectivity across all scanned poses. Next, we give a method to simulate the volumetric shape of the organs to any pose in the hand's range of motion, producing both external skin shapes and internal organ shapes that match ground truth optical scans and medical images (MRI) in multiple scanned poses. We achieve this by combining MRI images in multiple hand poses with FEM multibody nonlinear elasto-plastic simulation. This enables us to start with an arbitrary animation of the hand joint hierarchy, and produce a matching high-quality skin and internal organ animation of the hand. Our system models bones, muscles, tendons, ligaments and fat as separate volumetric organs that mechanically interact through contact and attachments, and whose shape matches medical images (MRI) in the MRI-scanned hand poses. We use our method to produce volumetric renders of the internal anatomy of the human hand in motion, and to compute and render highly realistic hand surface shapes.



Speaker Bio-Sketch: Jernej Barbic is a Full Professor of Computer Science at USC. His interests include computer graphics, animation, interactive physics, haptic rendering, visual effects for film, medical simulation and imaging, deformable objects, biomechanics, sound simulation, model reduction, intellectual property law and startup companies. He has published over 50 publications in computer graphics and related fields. He was also a co-founder and CTO of a successful computer animation startup company "Ziva Dynamics" (acquired by Unity Technologies), whereby he contributed technical and business leadership on real-time character deformation, anatomically based modeling, nonlinear elasticity and digital humans. In 2014, he was named a Sloan Research Fellow. In 2011, MIT Technology Review named him one of the Top 35 Innovators under the age of 35 in the world (TR35). Jernej is also the author of Vega FEM, a free C/C++ software physics library for deformable object simulation. He received

his Ph.D. from CMU, followed by Postdoctoral Research at MIT.

KEYNOTE TALK

Tuesday, October 22, 2024, at 1:30 pm

Perceptual Focus Issues in Augmented Reality

Mohammed Safayet Arefin
Colorado State University, USA

Abstract: In an Optical See-through (OST) Augmented Reality (AR) system, virtual information is conveyed via the optics of the AR head-mounted display (HMD) and can appear at varying distances from the user. Sometimes, it's necessary for users to combine information from these diverse distances by shifting both visual attention and focus. For example, imagine a surgeon using an OST AR display during surgery. To perform the surgery, the surgeon needs to look at a flat panel display to gather patient information that is far away while also viewing virtual information (e.g., information regarding the surgery guidance) that is optically closer. Thus, the surgeon needs to adjust both the eye's focus depth and visual attention to synthesize the information, which may lead to oversight of crucial data and unexpected mistakes. This challenge is relevant beyond surgery, encompassing other fields such as military operations, maintenance, and industry. The initial segment of the talk will cover two perceptual aspects of OST AR: (1) context switching—where users shift their visual and cognitive attention between real and virtual information and (2) focus distance switching—where users must accommodate (change the shape of the eye's lens) to see, in sharp focus, information at a new distance. Perceptual focus distance switching can occur in two forms: continuous and perpetual focus depth switching. To counteract the drawbacks of continuous focus depth switching, the talk will discuss a focus correction algorithm built on perceptual image processing principles, introducing a new font for AR systems. We termed this "*SharpView font*," which looks sharper than standard fonts when seen out-of-focus. Lastly, the talk will discuss the behavior of the human visual system with changes in perceptual depth in the real world and AR with eye tracking as a potential solution to the perpetual focus depth switching.



Speaker Bio-Sketch: Dr. Mohammed Safayet Arefin is an Assistant Professor in the Department of Computer Science at Colorado State University (CSU). Before joining CSU, Dr. Arefin was a Postdoctoral Fellow at the DEVCOM US Army Research Laboratory West (ARL West). Dr. Arefin achieved his Ph.D. and MS in Computer Science from Mississippi State University, USA. His research has been broad-based, centering on the topics of augmented reality, applied and visual perception, perceptual imaging, virtual reality, eye tracking, and human-computer interaction. Dr. Arefin won the 'Certificate of Commendation' from the SES Executive Deputy to the Commanding General of the US Army Futures Command and the 'Director's Commendation Award' in recognition of outstanding research achievement. For the seventh consecutive term, Dr. Arefin has served as a Publication Co-chair in the IEEE Virtual Reality (VR) and IEEE International Symposium on Mixed and Augmented Reality (ISMAR) conference committees. In addition, Dr. Arefin is co-founder and co-organizer of the Workshop on Replication in Extended Reality (WoR XR).

BANQUET KEYNOTE TALK

Tuesday, October 22, 2024, at 8pm

Foundation Model Challenges and Opportunities in Financial Services

Greg Mori

Simon Fraser University and Borealis AI

Abstract: Financial services are at the core of our economy. Opportunities for machine learning abound in this space, from capital markets to insurance services to wealth management to lending to tools that assist clients in managing their money. Modern machine learning methods have transformed industries, yet particular challenges exist in realizing the full potential of machine learning in financial services. These include explainability, data imbalance, partial observations, distribution shift, and self-supervised learning in low-signal settings. I will describe the ATOM foundation model, which specializes in learning from asynchronous event sequences, to maximally utilize the richness of transactional data in financial services.



Speaker Bio-Sketch: Greg Mori is VP, RBC AI Fellow at Borealis AI, where he leads AI Research and Innovation. He is also an Adjunct Professor in the School of Computing Science at Simon Fraser University. He received a Ph.D. in Computer Science from UC Berkeley in 2004 and an Hon. B.Sc. in Computer Science and Mathematics from the University of Toronto in 1999. He was a Visiting Scientist at Google in Mountain View, California in 2014-2015. He served as Director of the School of Computing Science at Simon Fraser University from 2015-2018. Dr. Mori conducts research in computer vision and machine learning. He received the ICCV Helmholtz Prize in 2017. He was a Program Chair for CVPR 2020 and a General Chair for CVPR 2023. At Borealis AI his team builds AI-based products for financial services. These include the award-winning NOMI Forecast and

numerous other industry-leading machine learning solutions.

KEYNOTE TALK

Wednesday, October 23, 2024, at 9:00am

Perception from Generation

Gang Hua

Dolby Laboratories

Abstract: Deep generative models have shown great capability in learning representations for downstream machine perception tasks. To this end, we will present two pieces of our recent research work on 1) how representations learnt from a text-to-video generative model enables spatiotemporal consistent video understanding, and 2) how representations learnt from an implicit auto-encoder can better generalize for 3D perception from point clouds. We will explain in detail why such generative representation could facilitate corresponding perception tasks. We argue that with the capacity of deep generative model increases to fit the distribution of large dataset, it is the right time for us to revisit the analysis by synthesis Bayes regime for computer vision. The analysis by synthesis approach was considered “ahead of its time” mainly due to the lack of generative models that can very well model the prior distribution of “world”. To this end, we will present our most recent work on dexterous grasping, where a unified generative diffusion model is proposed along with a physics-based discriminator to achieve new state-of-the-art following the analysis by synthesis approach. We conclude the talk with some of our own reflections on future research directions of Generative AI, and if time allows, discuss the notion of “human-in-control” AI for media generation.



Speaker Bio-Sketch: Gang Hua is the Vice President of Multimodal Experiences Research Lab at Dolby Laboratories. His research focuses on computer vision, pattern recognition, machine learning, robotics, towards Artificial General Intelligence, with primary applications in cloud and edge intelligence, and currently with a focus on media and entertainment. Before that, he was CTO of Convenience Bee, and Chief Scientist of its research branch, Wormpex AI Research. He served in various roles at Microsoft (2015-18) as the Science/Technical Adviser to the CVP of the Computer Vision Group, Director of Computer Vision Science Team in Redmond and Taipei ATL, and Senior Principal Researcher/Research Manager at Microsoft Research. He was an Associate Professor at Stevens Institute of Technology (2011-15). During 2014-15, he took leave and worked on the Amazon-Go project. He was a Visiting Researcher (2011-14) and a Research Staff Member (2010-11) at IBM Research T. J. Watson Center, a Senior Researcher (2009-10) at Nokia Research Center Hollywood, and a Scientist (2006-09) at Microsoft Live labs Research. He received a Ph.D. degree in Electrical and Computer Engineering from Northwestern University in 2006, and a M.S. in pattern recognition and intelligence system from Xi'an Jiaotong University (XJTU) in 2002. He was selected to the Special Class for the Gifted Young of XJTU in 1994 and received a B.S. in Electrical Engineering in 1999. He is the recipient of the 2015 IAPR Young Biometrics Investigator Award. He is an IEEE Fellow, an IAPR Fellow, and an ACM Distinguished Scientist. He has published over 260 peer reviewed papers in top journals and conferences. To date, he holds 19 US patents and has 15 more patents pending. He was a Program Chair for CVPR2019 and CVPR2022.

KEYNOTE TALK

Wednesday, October 23, 2024, at 1:30pm

Synthetic Data and Plant Phenotyping

Mik Cieslak

GreenMatterAI GmbH

Abstract: Computer vision in agriculture benefits from diverse labeled datasets, with synthetic images offering enhanced accuracy, diversity, and cost-effectiveness compared to real ones. This talk explores the generation of synthetic plant images using advanced procedural models, from individual plants in controlled environments to fields under varying conditions. I will discuss the importance of biologically accurate models and the role of model calibration in improving deep neural network training. Additionally, I will present findings showing that networks trained on a mix of real and synthetic data outperform those trained on solely real or synthetic datasets, with improved generalization. Nonetheless, a domain gap remains between real and synthetic images, and I will address potential solutions for bridging this gap.



Speaker Bio-Sketch: Mik Cieslak is a Senior Research Scientist at GreenMatterAI GmbH, a startup providing synthetic data for various industries including precision agriculture. He received a PhD in mathematics from the University of Queensland (2010, Australia), and completed postdoctoral fellowships at the Institut National de la Recherche Agronomique - Plants and Cropping Systems in Horticulture (2012, France) and in the Biological Modeling and Visualization Laboratory at the University of Calgary (2015). Before joining GreenMatterAI, he was a Senior Research Associate in the Biological Modelling and Visualization Laboratory in the Department of Computer Science at the University of Calgary (2024). He is an expert in computational plant modelling and worked on the mechanistic modelling of plant development in the scope of the Plant Phenotyping and Imaging Research Centre based at the University of Saskatchewan (2024). His current work includes a study of the diversity of phenotypes observed in closely related plants, methodological

advancements in plant modelling, and the use of computer-generated models as annotated data for training neural networks for image-based phenotyping and vision-related agricultural tasks.

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Rodgers	Peter	University of Kent

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University of Bremen

Czech Technical University in Prague

Xi'an Jiaotong University

Sentera

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Mohamed S. Shehata, University of British Columbia, BC, Canada

Minglun Gong, University of Guelph, Ontario, Canada

Thierry Bouwmans, La Rochelle Université, La Rochelle, France

Ahmed R. Hussein, University of Guelph, Ontario, Canada

Paola Barra, Università degli studi di Napoli « Parthenope », Italy

Deepak Kumar Jain, University of Chinese Academy of Sciences, China

Soon Ki Jung, Kyungpook National University, South Korea

Sajid Javad, Khalifa University of Science and Technology, UAE

Vision and Robotics for Agriculture

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Nikos Papanikolopoulos, University of Minnesota, USA

Kostas Alexis, Norwegian University of Science and Technology, Norway

George Bebis, University of Nevada – Reno, USA

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Confronting Social Injustice in the Era of Generative AI

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Marina L. Gavrilova, University of Calgary, Canada