

MMSys '25

Multimedia Systems Conference

31 March – 4 April



Welcome

Dear MMSys 2025 Participants,

On behalf of the organizers, we are very pleased to welcome you to the 16th ACM Multimedia Systems Conference, taking place for the first time in Africa, in the university town of Stellenbosch (South Africa).

MMSys is a premier conference dedicated to the exciting and multidisciplinary field of multimedia, with a specific focus on its systems and applications. The conference provides a platform for researchers from both academia and industry to share their latest findings in the multimedia systems research area. Many international researchers, practitioners, engineers, and students from academia, industry, standardization bodies, and government agencies join the MMSys conference each year.

In addition, since its inception, MMSys has been:

- Among the first conferences to emphasize the long-term scientific and practical impact of research by promoting and offering Reproducibility Badges, publishing Open Datasets and Software, and arranging Industrial and Technical Demo Sessions.
- Fostering and supporting young researchers and students by providing mentoring opportunities, arranging Doctoral Symposia, and offering travel grants and discounted registration fees.
- Inviting multiple high-profile keynote speakers from academia and industry to share with the community their research thoughts and latest advancements in the multimedia systems area.
- Hosting multiple high-quality workshops that attract diverse and international research participants.

In continuity with the MMSys conference series and building upon its success, MMSys'25 provides a platform allowing prominent researchers from around the world to meet and interact. Additionally, two social events have been organized: the welcome reception taking place at the Stellenbosch Institute for Advanced Study (STIAS) in Stellenbosch, and the social dinner held at De Warenmarkt, in the central part of Stellenbosch.

MMSys'25 spans five days, featuring an exciting program that includes the MMSys Research Track, the Open Dataset and Software Track, the Technical Demos Track, and the Doctoral Symposium.

Furthermore, the program includes three exciting keynote speeches. The first speech, entitled "*On the Road to Scalable, Interoperable and Cost-Efficient Realistic Holographic Communications*", will be delivered by Mario Montagud Climent, a Consolidated Research Scientist at University of Valencia and the i2CAT Foundation in Spain. The second keynote, entitled "*Art & Tech - A multimedia journey from VR Ndebele painting to Creative Robotic performances*" will be delivered by Vali Lalioti, the Director of Programmes, Creative Computing Institute (CCI), University of Arts London (UAL) and a renowned expert in human-robot interaction and designing robotic movement with culture in mind. The third keynote, "*Multi-CDN Streaming: Architectures and Optimization Problems*" will be presented by Yuriy Reznik, Technology Fellow and Vice President of Research at Brightcove, Inc, an expert in the field of several multimedia coding and delivery standards. In addition, the technical programme contains a special session on Equality, Diversity and Inclusion (EDI). A panel, composed by experts from different industry/private sector/academia related to the topics of the conference, will discuss various EDI issues and how

diverse and inclusive are the topics, methodologies and evaluations of the Multimedia Systems community.

The first and final days of MMSys'25 will be dedicated to two focused and engaging workshops. The workshop for the first day is the 17th International Workshop on Immersive Mixed and Virtual Environment Systems (MMVE). The workshop on the final day of MMSys'25 is the long-running 34th ACM SIGMM Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV). The workshops are held on separate days so that participants can attend both workshops.

We wish to extend our sincere gratitude to all the members of the Organizing Committee and volunteers. The organization of MMSys '25 would not have been possible without your dedication and support!

Last but certainly not least, we wish to thank the generous support of our supporters: platinum supporters Adobe; silver supporters DASH-IF and the Electrical and Electronic Engineering department of Stellenbosch University; bronze supporters Alphawave.

We look forward to hosting you in Stellenbosch and we hope MMSys'25 will provide you with the opportunity for personal exchange of scientific results, facilitate the making of new acquaintances, and strengthen personal friendships among participants from different parts of the world.

Herman Engelbrecht (Stellenbosch University, South Africa)
ACM Multimedia Systems 2025 General Chair

Silvia Rossi (Centrum Wiskunde & Informatica, The Netherlands)
ACM Multimedia Systems 2025 Programme Coordinator



Herman Engelbrecht
(Stellenbosch University, South Africa)
ACM Multimedia Systems 2025
General Chair



Silvia Rossi
(Centrum Wiskunde & Informatica, The Netherlands)
ACM Multimedia Systems 2025
Programme Coordinator

Conference Venue and Location



MMSys 2025 is taking place at The Stellenbosch Institute for Advanced Study (STIAS) at the Wallenberg Research Centre, which is situated on the historic Mostertsdrift farm in the heart of Stellenbosch. The idea for such an Institute was first conceived in 2000 and was immediately positively received by the local and international research community. However, it was only in 2005 when a donation from the Marianne and Marcus Wallenberg foundation enabled STIAS to build a modern research and seminar centre that the Institute came into its own. Here, sustainable architecture and beautiful, tranquil surroundings have been fused to form a 'Creative Space For The Mind' where top researchers and intellectual leaders are nurtured and encouraged to find innovative and sustainable solutions to issues facing the world and in particular the country and the continent of Africa. To counter the loss of its best minds and promising young leaders, it provides the opportunity for high-level research and intellectual development in an international context. STIAS is attracting some of the world's leading scholars and researchers and is enjoying international growth and recognition.

Address

10 Marais Rd, Mostertsdrift
Stellenbosch, South Africa

Website

<https://stias.ac.za/>

Practical Information

Local Transport

Walking

Stellenbosch is ideal for exploring on foot and this is the perfect way to experience the energy and vibrancy of the town.

Cycling

Cycling is a convenient choice of transport in Stellenbosch. The town is known by local and international mountain bike and road bike professionals as one of the best areas in the world for cycling. With endless trails and open roads in and around Stellenbosch, leisure cyclists and technical riders are definitely spoilt for choice.

Car Rental

Stellenbosch offers a wide selection of car rental companies with good road systems. An international driver's license is required and driving is on the left-hand side of the road.

Ride-hailing

The online travel services, Uber and Bolt also offer a convenient way to travel around Stellenbosch.

Parking

Parking is limited in Stellenbosch. At the Wallenberg Conference Centre we are fortunate to have free underground and outside parking available. We do have security on the premises to regulate and allocate parking. For the overflow of cars we also use the Dutch Reformed Churches parking right across the street.

Is Stellenbosch Safe?

Stellenbosch is a large university town in the cosmopolitan Western Cape. As such, we would advise travellers to exercise the same level of vigilance they would exercise when visiting any city in the world.

This includes ensuring you follow basic safety tips such as keeping emergency numbers on hand, avoiding carrying large sums of cash and keeping your valuables safe at all times. The overwhelming majority of visitors to Stellenbosch and the Western Cape, enjoyed a positive and memorable experience.

We want you to leave our beautiful region with nothing but with happy memories. To ensure a pleasurable trip, please keep in mind a few precautions that you can employ on all your travels across the world:

- Avoid walking in deserted and dark places at night
- Never allow strangers to assist you in any way at ATMs
- At night, park in a secure and well-lit area with street guards. Keep photocopies and all valuable documents in a safe place

Registration

The registration desk is situated in the foyer at STIAS. You can collect your registration pack at the following times:

Monday, 31 March 2025:	08h00 - 09h00
Tuesday, 1 April 2025:	08h00 - 09h00
Wednesday, 2 April 2025:	08h00 - 09h00
Thursday, 3 April 2025:	08h00 - 09h00
Friday, 4 April 2025:	08h00 - 09h00

Internet

WiFi is available throughout the venue through Eduroam secure roaming and an WiFi network operated by STIAS.

Social Events

• **Welcome Reception:** STIAS 1 April at 17:30
The welcome reception will be held at STIAS at the conference venue.

• **Conference Banquet:** De Warenmarkt Restaurant 2 April at 19:00
For an authentic Stellenbosch experience, De Warenmarkt Restaurant combines flavours with cultural heritage. Housed in a historic building, it features a warm, rustic ambience that reflects the area's history.

The banquet venue is 1.2km from the conference venue (about 15 minutes walking distance). Attendees can join a group walking from STIAS to De Warenmarkt, leaving at 18:45 from STIAS.

Address

20 Ryneveld Street
Stellenbosch, South Africa

Programme Overview

Monday, 31 March

- Workshop: MMVE

Tuesday, 1 April

- Keynote: On the Road to Scalable, Interoperable and Cost-Efficient Realistic Holographic Communications (Mario Montagud Climent, i2CAT Foundation & University of Valencia)
- Main Conference: Paper Presentations
- Main Conference: Demo and Industry Track, Doctoral Symposium
- Welcome Reception: Stellenbosch Institute for Advanced Studies

Wednesday, 2 April

- Keynote: Art & Tech - A multimedia journey from VR Ndebele painting to Creative Robotic performances (Vali Lalioti, University of the Arts London)
- Main Conference: Paper Presentations
- Main Conference: Open Source and Dataset Track, Doctoral Symposium Breakfast
- Main Conference: Diversity Panel
- Conference Banquet: De Warenmarkt

Thursday, 3 April

- Keynote: Multi-CDN Streaming: Architectures and Optimization Problems (Yuriy Reznik, Brightcove Inc.)
- Main Conference Paper Presentations
- Main Conference: MMSys'25 Closing

Friday, 4 April

- Workshop: NOSSDAV

Detailed Programme

Monday 31 March	
08:00 – 09:00	Registration (STIAS Foyer)
09:00 – 09:15	MMVE'25 Welcome
09:15 – 10:00	Keynote: Exploring Accessibility through Interactive Discussion and Real-World Applications Mario Montagud Climent, i2CAT Foundation & University of Valencia
10:00 – 10:30	Coffee Break
10:30 – 12:30	MMVE Session 1: Content Creation/Analysis <ul style="list-style-type: none">• Multimodal User Experience in Extended Reality: Exploring Hand Tracking, Voice, and Passthrough Interactions <i>Tanja Kojic, Maurizio Vergari, Maximilian Warsinke, Danish Ali, Sebastian Möller, Jan-Niklas Voigt-Antons</i>• Evaluation of Segmentation Algorithms for Embodiment Improvement in an XR Application <i>Amaya Jiménez-Moreno, Elena Conderana-Medem, Silvia Casino-Colom, Marta Orduna, Ester Gonzalez-Sosa, Pablo Perez, Alvaro Villegas</i>

	<ul style="list-style-type: none"> • Analysis of User Experience and Task Performance in a Multi-User Cross-Reality Virtual Object Manipulation Task <i>Lea Brzica, Filip Matanović, Sara Vlahović, Nina Pavlin Bernardić, Lea Skorin-Kapov</i> • Virtual Tool Embodiment in Simulated Gravity Conditions <i>Amir Jahanian Najafabadi, Jean Botev, Ningyuan Sun, Carolyn Kroger</i> • Impact of VR Embodiment on Users' Perception in V-Commerce <i>Jit Chatterjee, Tom Bovie, Bram Beysens, Maria Torres Vega</i> • The Stereo Microscope: Stereo 3D images for complex remote soldering teaching <i>Simon N.B. Gunkel, Tessa Klunder, Frank Ansoerge, Piotr Zuraniewski</i>
12:30 – 13:30	Lunch
13:30 – 15:30	<p>MMVE</p> <p>Session 2: Embodiment/UX</p> <ul style="list-style-type: none"> • Exploring Entropy-Based Solutions for Trajectory Prediction in Virtual Reality <i>Varun Pradhan, Silvia Rossi, Pablo César</i> • Joint Learning of Point Clouds and Motion Vectors for Volumetric Video <i>Cheng-Tse Lee, Yuan-Chun Sun, Yuang Shi, Mufeng Zhu, Wei Tsang Ooi, Yao Liu, Chun-Ying Huang, Cheng-Hsin Hsu</i> • Sketch and Patch: Efficient 3D Gaussian Representation for Man-Made Scenes <i>Yuang Shi, Simone Gasparini, Geraldine Morin, Chenggang Yang, Wei Tsang Ooi</i> • Acceptable Latency in Predictable First-Person VR Cloud Games <i>Håkon Medhus Fornes, Elias Hoel Birketvedt, Carsten Griwodz, Magnus Skjegstad, Michael Welzl, Özgü Alay</i> • Emerging Telepresence Technologies for Hybrid Meetings: Experiences and Lessons Learned from an Interactive Workshop <i>Marta Orduna, Ester Gonzalez-Sosa, Andriana Boudouraki, Houda Elmimouni, Veronica Ahumada, Pablo Perez, Jesus Gutiérrez, Pablo César</i>
15:30 – 16:00	Coffee Break
16:00	Personal Time

Tuesday 1 April

08:00 – 09:00	Registration (STIAS Foyer)
09:00 – 10:00	Keynote: On the road to scalable, interoperable and cost-efficient realistic holographic communications Mario Montagud Climent, i2CAT Foundation & University of Valencia
10:00 – 10:30	Coffee Break
10:30 – 11:00	MMSys'25 Opening
11:00 – 11:30	MMSys Research Track Session 1: Real-Time and Adaptive Video Streaming <ul style="list-style-type: none">• Palantir: Towards Efficient Super Resolution for Ultra-high-definition Live Streaming <i>Xinqi Jin, Zhui Zhu Xikai Sun, Fan Dang, Jiangchuan Liu, Jingao Xu, Kebin Liu, Xinlei Chen, Yunhao Liu</i>• StreamWise: An Intelligent Content Steering for DASH <i>Chidambar Joshi, Jashanjot Singh Sidhu, Abdelhak Bentaleb</i>• COMPACT: Content-aware Multipath Live Video Streaming for Online Classes using Video Tiles <i>Shubham Chaudhary, Navneet Mishra, Keshav Gambhir, Tanmay Rajore, Arani Bhattacharya, Mukulika Maity</i>
12:00 – 12:30	Doctoral Symposium and Technical Demo Pitches
12:30 – 14:00	Lunch (Technical Demo Setup)
14:00 – 15:30	Doctoral Symposium posters <ul style="list-style-type: none">• 3D Gaussian-based Immersive Media Streaming in Networked Extended Reality <i>Yuang Shi</i>• Time-Varying Mesh Compression <i>Guodong Chen</i> Technical Demos <ul style="list-style-type: none">• Danger Detection and Cloud-Based Vocal Assistance System for Visually Impaired Users Using Meta Quest 3 <i>Fabrizio De Fiore, John Barrett, Niall Murray, Conor Keighrey</i>• Real-time Point Cloud Transmission for Immersive Teleoperation of Autonomous Mobile Robots <i>Nunzio Barone, Walter Brescia, Gabriele Santangelo, Antonio Pio Maggio, Ivan Cisternino, Luca De Cicco, Saverio Mascolo</i>• Streaming Face-Off: A Testbed Analysis of Media-over-QUIC and Low-Latency DASH <i>Minh Nguyen, Philip Nys, Stefan Pham, Daniel Silhavy, Stefan Arbanowski, Stephan Steglich</i>• No code XR-CAX experience creation workflows for conducting Equipment Design Reviews <i>Sahir Sharma, Conor Keighrey, James Lardner, Shane Gilligan, Niall Murray</i>

	<ul style="list-style-type: none"> • Learned Compression in Adaptive Point Cloud Streaming: Opportunities, Challenges and Limitations <i>Michael Rudolph, Amr Rizk</i> • Efficient and Accurate Scene Text Recognition with Cascaded-Transformers <i>Savas Ozkan, Andrea Maracani, Mete Ozay, Hyowon Kim, Sijun Cho, Eunchung Noh, Jeongwon Min, Jung Min Cho</i> • A Multi-CDN Playground for Dash.js: Enabling Integration of CDN Switching Strategies <i>Jashanjot Singh Sidhu, Chidambar Joshi, Abdelhak Bentaleb</i> • Continual Error Correction on Low-Resource Devices <i>Kirill Paramonov, Mete Ozay, Aristeidis Mystakidis, Nikolaos Tsalikidis, Dimitrios Sotos, Anastasios Drosou, Dimitrios Tzovaras, Hyunjun Kim, Kiseok Chang, Sangdok Mo, Namwoong Kim, Woojong Yoo, Ji Joong Moon, Umberto Michieli</i>
15:30 – 16:00	Coffee Break
16:00 – 17:30	MMSys Research Track Session 2: User Interaction in XR systems <ul style="list-style-type: none"> • 360 Video Viewing with Virtual Reality Headsets: Connecting User Head Movements to Intentions <i>Mohammed Metwaly, Alexander J. Quinn</i> • Spatial Visibility and Temporal Dynamics: Rethinking Field of View Prediction in Adaptive Point Cloud Video Streaming <i>Chen Li, Tongyu Zong, Yueyu Hu, Yong Liu, Yao Wang</i> • LL-Sparse: Low-Latency 6-DoF Field of View Prediction <i>Jérémy Ouellette, Abdelhak Bentaleb</i> • Enablers of Low-Latency Immersive Interaction in Future Remote-Rendered Mixed Reality Applications <i>János Dóka, Bálint György Nagy, Dávid Jocha, Bence Formanek, Iván Viciado, Adrian Rodrigo, David Gomez-Barquero, Balázs Sonkoly</i>
17:30 – 19:30	Welcome Reception (STIAS)

Wednesday 2 April	
08:00 – 09:00	Registration (STIAS Foyer) Doctoral Symposium Breakfast
09:00 – 10:00	Keynote: Art & Tech - A multimedia journey from VR Ndebele painting to Creative Robotic performances Vali Lalioti, University of the Arts London
10:00 – 10:30	Coffee Break
10:30 – 11:30	MMSys Research Track Session 3: Advances in XR Streaming and Compression <ul style="list-style-type: none"> RemoteVIO: Offloading Head Tracking in an End-to-End XR System <i>Qinjun Jiang, Yihan Pang, William Sentosa, Steven Gao, Muhammad Huzaiifa, Jeffrey Zhang, Javier Perez-Ramirez, Dibakar Das, David Gonzalez-Aguirre, Brighten Godfrey, Sarita Adve</i> TVMC: Time-Varying Mesh Compression Using Volume-Tracked Reference Meshes <i>Guodong Chen, Filip Hácha, Libor Váša, Mallesham Dasari</i> SGSS: Streaming 6-DoF Navigation of Gaussian Splat Scenes <i>Mufeng Zhu, Mingju Liu, Cunxi Yu, Cheng-Hsin Hsu, Yao Liu</i> LTS: A DASH Streaming System for Dynamic Multi-Layer 3D Gaussian Splattting Scenes <i>Yuan-Chun Sun, Yuang Shi, Cheng-Tse Lee, Mufeng Zhu, Wei Tsang Ooi, Yao Liu, Chun-Ying Huang, Cheng-Hsin Hsu</i>
12:00 – 12:30	Open Source and Dataset Pitches
12:30 – 14:00	Lunch (Open Source and Dataset Setup)
14:00 – 15:30	Open Source and Dataset Posters Session Chair: Amr Rizk <ul style="list-style-type: none"> eCHFD : extended Ceasefire Hierarchical Firearm Dataset <i>Loubna Lechelek, Sylvie Chambon, Alain Crouzil, Saddam Abdulwahab, Grégory Jalabert, Christian Brocard, Charles-Edouard Coquillard, Laurence Abadie, Bruno Sera, Thierry Hartmann, Marjorie Le Bras</i> WIDE-VR: An open-source prototype for web-based VR through adaptive streaming of 6DoF content and viewport prediction <i>May Lim, Abdelhak Bentaleb, Roger Zimmermann</i> HockeyAI: A Multi-Class Ice Hockey Dataset for Object Detection <i>Mehdi Houshmand Sarkhoosh, Sushant Gautam, Cise Midoglu, Saeed Shafiee Sabet, Tomas Kupka, Pål Halvorsen</i> uvgVPCCenc: Practical Open-Source Encoder for Fast V-PCC Compression <i>Louis Fréneau, Guillaume Gautier, Alexandre Mercat, Jarno Vanne</i>

- **OLED-EQ: A Dataset for Assessing Video Quality and Energy Consumption in OLED TVs Across Varying Brightness Levels**
Minh Nguyen, Raphael Koch, Alexander Fischer, Moustafa Ghaddar, Görkem Güclü, Martin Lasak, Robert Seeliger, Stefan Arbanowski, Stephan Steglich
- **HockeyRink: A Dataset for Precise Ice Hockey Rink Keypoint Mapping and Analytics**
Mehdi Houshmand Sarkhoosh, Sushant Gautam, Cise Midoglu, Saeed Shafiee Sabet, Tomas Kupka, Pål Halvorsen
- **VV-DASH: A Framework for Volumetric Video DASH Streaming**
Hadi Heidarirad, Mea Wang
- **Nagare Media Engine: Towards Self-Adapting MPEG NBMP Multimedia Workflows**
Matthias Neugebauer
- **A Congestion Control Test Suite for Real-Time Communication**
Quanwei Zhang, Zhiming Huang, Jinwei Zhao, Jianping Pan
- **HockeyOrient: A Dataset for Ice Hockey Player Orientation Classification**
Mehdi Houshmand Sarkhoosh, Sushant Gautam, Cise Midoglu, Saeed Shafiee Sabet, Tomas Kupka, Pål Halvorsen
- **PCVD: A Dataset of Point Cloud Video for Dynamic Human Interaction**
Jie Li, Shujiao Chen, Qiyue Li, Zhi Liu
- **AMIS: An Audiovisual Dataset for Multimodal XR Research**
Abhinav Bhattacharya, Luís Fernando de Souza Cardoso, Andy Schleising, Gareth Rendle, Adrian Kreskowski, Felix Immohr, Rakesh Rao Ramachandra Rao, Wolfgang Broll, Alexander Raake
- **MazeLab: A Large-Scale Dynamic Volumetric Point Cloud Video Dataset With User Behavior Traces**
Jérémy Ouellette, Jashanjot Singh Sidhu, Abdelhak Bentaleb

15:30 – 16:00	Coffee Break
16:00 – 17:30	Diversity Panel
17:30 – 19:00	Personal Time (and walking down to De Warenmarkt Restaurant)
19:00 – 23:00	Conference Dinner (De Warenmarkt Restaurant)

Thursday 3 April

08:00 – 09:00	Registration (STIAS Foyer)
09:00 – 10:00	Keynote: Multi-CDN Streaming: Architectures and Optimization Problems <i>Yuriy Reznik, Brightcove Inc.</i>
10:00 – 10:30	Coffee Break
10:30 – 12:30	MMSys Research Track Session 4: Emerging Immersive Applications <ul style="list-style-type: none">• Low-Latency Volumetric Video Conferencing in Congested Networks Through L4S <i>Matthias de Fré, Jeroen van der Hooff, Chia-Yu Chang, Koën de Schepper, Patrice Rondao Alfaced, Danny de Vleeschauwer, Tim Wauters, Peter Steenkiste, Filip de Turck</i>• XRgo: Design and Evaluation of Rendering Offload for Low-Power Extended Reality Devices <i>Steven Gao, Jeffrey Liu, Qinjun Jiang, Finn Sinclair, William Sentosa, Brighten Godfrey, Sarita Adve</i>• SAILS: A Synchronous Accessible Immersive Online Learning System for Young Learners <i>Yuran Sun, Zhuoying Zhang, Zhenxiao Luo, Yi King Choi, Alan William Dougherty, Man Ho Yip, Chuan Wu</i>• Decoupling Video Upscaling from Rendering for Cloud Gaming <i>Deniz Ugur, Ihab Amer, Mohamed Hefeeda</i>
12:30 – 14:00	Lunch
14:00 – 15:30	MMSys Research Track Session 5: Security, AI, and Adaptive Multimedia Optimization <ul style="list-style-type: none">• Secure the Stream, Not the Hosts: Attribute-Based Encryption for DRM Enabled Video Streaming <i>Mohammad Waquas Usmani, Susmit Shannigrahi, Michael Zink</i>• Accelerating Video Segment Access via Quality-Aware Multi-Source Selection <i>Dominik Winecki, Arnab Nandi</i>• To Cap or not to Cap: Bandwidth Capping Effects on Network Interactions and QoE of Competing Short Video Streams <i>Nikolas Wehner, Theo Karagioules, Emir Halepovic, Filip Simonovski, Tobias Hossfeld, Michael Seufert</i>• SAMPL: Self-Attention Modelled Patch Learning for Efficient Visual Understanding <i>Zhiming Hu, Salar Hosseini Khorasgani, Weiming Ren, Iqbal Mohamed</i>
15:30 – 16:00	Coffee Break
16:00 – 16:30	MMSys'25 Closing

Friday 4 April

08:00AM – 09:00AM	Registration (STIAS Foyer)
09:00AM – 10:00AM	NOSSDAV
10:00AM – 10:30AM	Coffee Break
10:30AM – 12:30PM	NOSSDAV
12:30PM – 14:00 PM	Lunch
14:00PM – 15:30PM	NOSSDAV
15:30PM – 16:00PM	Coffee Break

Keynotes

On the road to scalable, interoperable and cost-efficient realistic holographic communications



Talk Summary: Immersive technologies span beyond entertainment and rich media consumption, having become a powerful social interaction, collaboration and communication medium. In this context, Social Virtual / eXtended Reality (XR / VR) has emerged as a promising social interaction, communication, and collaboration medium, attracting the attention of both the research community and industry alike. Social VR / XR has been recently shown to provide remarkable advantages compared to traditional videoconferencing solutions, and these benefits are magnified when volumetric video technologies come into play to provide 3D holographic

representations of users. Despite the undoubted positive impact, key challenges still need to be addressed to enable a widespread deployment and adoption of such disruptive technologies. On the one hand, this talk will provide an overview of latest technological advances - and remaining challenges - in the field of volumetric video technologies and associated networking aspects to enable ubiquitous, scalable, interoperable, and cost-efficient holographic communication services. On the other hand, the talk will provide evidence of current applicability scenarios, and suggest new futuristic ones, to foster creative thinking and evoke identification of new research / collaboration opportunities.

Speaker: Mario Montagud Climent

Affiliation: i2CAT Foundation & University of Valencia

Biography: Mario Montagud Climent was born in Montitxelvo (Spain). He received a BsC in Telecommunications Engineering in 2011, an MsC degree in "Telecommunication Technologies, Systems and Networks" in 2012 and a PhD degree in Telecommunications (Cum Laude Distinction) in 2015, all of them at the Polytechnic University of Valencia (UPV, Spain). He has experience as a postdoc researcher at UPV, CWI (The National Research Institute for Mathematics and Computer Science in the Netherlands), i2CAT Foundation (Barcelona, Spain) and at University of Valencia (UV, Spain). He is currently a Consolidated Research Scientists at UV and i2CAT Foundation.

His topics of interest include Computer Networks, Interactive and Immersive Media, Media Synchronization and QoE (Quality of Experience). Dr. Montagud is (co-)author of over 100 scientific and teaching publications, has contributed to standardization, and to technology transfer to industry. He has been and is currently member of the Organization and Technical Committee of many international conferences, and of the Editorial Board of international recognized journals. He has been and is currently involved in diverse regional, national and European projects (e.g., 6G-XR, PRESENCE, HEAT), with leading roles in many of them.

Art&Tech - A multimedia journey from VR Ndebele painting to Creative Robotic performances



Summary: Immersive technologies span beyond entertainment and rich media consumption, having become a powerful social interaction, collaboration and communication medium. In this context, Social Virtual / eXtended Reality (XR / VR) has emerged as a promising social interaction, communication, and collaboration medium, attracting the attention of both the research community and industry alike. Social VR / XR has been recently shown to provide remarkable advantages compared to traditional video-conferencing solutions, and these benefits are magnified when volumetric video technologies come into play to provide 3D holographic representations of users. Despite the undoubtful

positive impact, key challenges still need to be addressed to enable a widespread deployment and adoption of such disruptive technologies. On the one hand, this talk will provide an overview of latest technological advances - and remaining challenges - in the field of volumetric video technologies and associated networking aspects to enable ubiquitous, scalable, interoperable, and cost-efficient holographic communication services. On the other hand, the talk will provide evidence of current applicability scenarios, and suggest new futuristic ones, to foster creative thinking and evoke identification of new research / collaboration opportunities.

Speaker: Vali Laloti

Affiliation: University of the Arts London

Biography: Prof. Vali Laloti is a pioneering designer, computer scientist, and innovator. She is Professor of Creative XR and Robotics and Director of Programmes at the Creative Computing Institute (CCI), University of the Arts London (UAL). With a PhD in Computer Science, an MRes in Design from the Royal College of Art (RCA), and an MBA, Vali has led interdisciplinary research and innovation worldwide, from Silicon Valley to Africa, China, Japan, and Europe. She played a key role in developing the world's first Virtual Reality (VR) systems in Germany and was instrumental in establishing Afrigraph, the first ACM SIGGRAPH-supported computer graphics conference in Southern Africa.

Her research focuses on human-robot interaction, robotic movement design, and XR for societal impact, spanning well-being, healthy aging, performance art, and the future of work. She pioneered BBC's first Augmented Reality production (2003) and has published extensively, with over 150 journal, conference papers and book contributions. Her award-winning VR/AR and robotics work has been featured in WIRED, Dezeen, and BBC Horizon and the UK press.

As Founder-Director of The Innovation Consultancy, Vali has led cutting-edge research and industry collaborations, including a ground-breaking VR/XR platform to support live performances during covid19. At CCI, she founded the Creative XR and Robotics Research Hub, developed UK's first Creative Robotics programmes and led the Institute's expansion.

Multi-CDN Streaming: Architectures and Optimization Problems



Talk Summary: This talk will offer an overview of several problems arising in the design of mass-scalable, multi-region streaming systems using multiple CDNs. These problems range from defining mechanisms for reliable and seamless traffic switching to the real-time collection of telemetry data to guide such switch decisions, setting the overall optimization objectives, and identifying classes of optimization algorithms suitable for use in such contexts. As specific examples of recent technical advances, I will mention the development of the HLS/DASH Content Steering mechanism for multi-CDN streaming, CMCD and CMCD v2 standards for telemetry data collection, and several open-source activities towards building turn-key

steering servers for optimizing QOE and efficiency of operation of multi-CDN streaming systems.

Speaker: Yuriy Reznik

Affiliation: Brightcove Inc.

Biography: Dr. Yuriy Reznik is a Technology Fellow and Vice President of Research at Brightcove, Inc. Previously, he held engineering and management positions at InterDigital, Inc. (2011-2016), Qualcomm Inc. (2005-2011), and RealNetworks, Inc. (1998-2005). In 2008 he was a Visiting Scholar at the Information Systems Laboratory at Stanford University. Since 2001 he was also involved in the work of ITU-T SG16 and MPEG standards committees and made contributions to several multimedia coding and delivery standards, including ITU-T H.264 / MPEG-4 AVC, MPEG-4 ALS, ITU-T G.718, ITU-T H.265 / MPEG HEVC, and MPEG DASH.

Several technologies, standards, and products that Yuriy Reznik has helped to develop (RealAudio / RealVideo, ITU-T H.264 / MPEG-4 AVC, Zencoder, Brightcove CAE, and MPEG-DASH) have been recognized by the NATAS Technology & Engineering Emmy Awards.

Yuriy Reznik holds a Ph.D. degree in Computer Science from Kyiv University. He is a senior member of IEEE, a senior member of SPIE, and a member of the ACM, AES, and SMPTE. He is a co-author of over 150 conference and journal papers, and co-inventor of over 80 granted US patents.

Accepted Papers

Research Track

- Palantir: Towards Efficient Super Resolution for Ultra-high-definition Live Streaming
Xinqi Jin, Zhu Zhu Xikai Sun, Fan Dang, Jiangchuan Liu, Jingao Xu, Kebin Liu, Xinlei Chen, Yunhao Liu
 - StreamWise: An Intelligent Content Steering for DASH
Chidambar Joshi, Jashanjot Singh Sidhu, Abdelhak Bentaleb
 - COMPACT: Content-aware Multipath Live Video Streaming for Online Classes using Video Tiles
Shubham Chaudhary, Navneet Mishra, Keshav Gambhir, Tanmay Rajore, Arani Bhattacharya, Mukulika Maity
 - Low-Latency Volumetric Video Conferencing in Congested Networks Through L4S
Matthias de Fré, Jeroen van der Hooft, Chia-Yu Chang, Koen de Schepper, Patrice Rondao Alface, Danny de Vleeschauwer, Tim Wauters, Peter Steenkiste, Filip de Turck
 - XRgo: Design and Evaluation of Rendering Offload for Low-Power Extended Reality Devices
Steven Gao, Jeffrey Liu, Qinjun Jiang, Finn Sinclair, William Sentosa, Brighten Godfrey, Sarita Adve
 - SALLS: A Synchronous Accessible Immersive Online Learning System for Young Learners
Yuran Sun, Zhuoying Zhang, Zhenxiao Luo, Alan William Dougherty, Man Ho Yip, Yi King Choi, Chuan Wu
 - Decoupling Video Upscaling from Rendering for Cloud Gaming
Deniz Ugur, Ihab Amer, Mohamed Hefeeda
 - RemoteVIO: Offloading Head Tracking in an End-to-End XR System
Qinjun Jiang, Yihan Pang, William Sentosa, Steven Gao, Muhammad Huzaifa, Jeffrey Zhang, Javier Perez-Ramirez, Dibakar Das, David Gonzalez-Aguirre, Brighten Godfrey, Sarita Adve
 - TVMC: Time-Varying Mesh Compression Using Volume-Tracked Reference Meshes
Guodong Chen, Filip Hácha, Libor Váša, Malleham Dasari
 - SGSS: Streaming 6-DoF Navigation of Gaussian Splat Scenes
Mufeng Zhu, Mingju Liu, Cunxi Yu, Cheng-Hsin Hsu, Yao Liu
 - LTS: A DASH Streaming System for Dynamic Multi-Layer 3D Gaussian Splatting Scenes
Yuan-Chun Sun, Yuang Shi, Cheng-Tse Lee, Mufeng Zhu, Wei Tsang Ooi, Yao Liu, Chun-Ying Huang, Cheng-Hsin Hsu
 - Secure the Stream, Not the Hosts: Attribute-Based Encryption for DRM Enabled Video Streaming
Mohammad Waquas Usmani, Susmit Shannigrahi, Michael Zink
 - Accelerating Video Segment Access via Quality-Aware Multi-Source Selection
Dominik Winecki, Arnab Nandi
 - To Cap or not to Cap: Bandwidth Capping Effects on Network Interactions and QoE of Competing Short Video Streams
Nikolas Wehner, Theo Karagioules, Emir Halepovic, Filip Simonovski, Tobias Hossfeld, Michael Seufert
-

- SAMPL: Self-Attention Modelled Patch Learning for Efficient Visual Understanding
Zhiming Hu, Salar Hosseini Khorasgani, Weiming Ren, Iqbal Mohamed
- 360 Video Viewing with Virtual Reality Headsets: Connecting User Head Movements to Intentions
Mohammed Metwaly, Alexander J. Quinn
- Spatial Visibility and Temporal Dynamics: Rethinking Field of View Prediction in Adaptive Point Cloud Video Streaming
Chen Li, Tongyu Zong, Yueyu Hu, Yong Liu, Yao Wang
- LL-Sparse: Low-Latency 6-DoF Field of View Prediction
Jérémy Ouellette, Abdelhak Bentaleb
- Enablers of Low-Latency Immersive Interaction in Future Remote-Rendered Mixed Reality Applications
János Dóka, Bálint György Nagy, Dávid Jocha, Bence Formanek, Iván Viciado, Adrian Rodrigo, David Gomez-Barquero, Balázs Sonkoly

Open Source and Dataset Track

- eCHFD : extended Ceasefire Hierarchical Firearm Dataset
Loubna Lechelek, Sylvie Chambon, Alain Crouzil, Saddam Abdulwahab, Grégory Jalabert, Christian Brocard, Charles-Edouard Coquillard, Laurence Abadie, Bruno Sera, Thierry Hartmann, Marjorie Le Bras
 - WIDE-VR: An open-source prototype for web-based VR through adaptive streaming of 6DoF content and viewport prediction
May Lim, Abdelhak Bentaleb, Roger Zimmermann
 - HockeyAI: A Multi-Class Ice Hockey Dataset for Object Detection
Mehdi Houshmand Sarkhoosh, Sushant Gautam, Cise Midoglu, Saeed Shafiee Sabet, Tomas Kupka, Pål Halvorsen
 - uvgVPCCenc: Practical Open-Source Encoder for Fast V-PCC Compression
Louis Fréneau, Guillaume Gautier, Alexandre Mercat, Jarno Vanne
 - OLED-EQ: A Dataset for Assessing Video Quality and Energy Consumption in OLED TVs Across Varying Brightness Levels
Minh Nguyen, Raphael Koch, Alexander Fischer, Moustafa Ghaddar, Görkem Güclü, Martin Lasak, Robert Seeliger, Stefan Arbanowski, Stephan Steglich
 - HockeyRink: A Dataset for Precise Ice Hockey Rink Keypoint Mapping and Analytics
Mehdi Houshmand Sarkhoosh, Sushant Gautam, Cise Midoglu, Saeed Shafiee Sabet, Tomas Kupka, Pål Halvorsen
 - VV-DASH: A Framework for Volumetric Video DASH Streaming
Hadi Heidarirad, Mea Wang
 - Nagare Media Engine: Towards Self-Adapting MPEG NBMP Multimedia Workflows
Matthias Neugebauer
 - A Congestion Control Test Suite for Real-Time Communication
Quanwei Zhang, Zhiming Huang, Jinwei Zhao, Jianping Pan
 - HockeyOrient: A Dataset for Ice Hockey Player Orientation Classification
Mehdi Houshmand Sarkhoosh, Sushant Gautam, Cise Midoglu, Saeed Shafiee Sabet, Tomas Kupka, Pål Halvorsen
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- PCVD: A Dataset of Point Cloud Video for Dynamic Human Interaction
Jie Li, Shujiao Chen, Qiyue Li, Zhi Liu
- AMIS: An Audiovisual Dataset for Multimodal XR Research
Abhinav Bhattacharya, Luis Fernando de Souza Cardoso, Andy Schleising, Gareth Rendle, Adrian Kreskowski, Felix Immohr, Rakesh Rao Ramachandra Rao, Wolfgang Broll, Alexander Raake
- MazeLab: A Large-Scale Dynamic Volumetric Point Cloud Video Dataset with user behavior traces
Jérémy Ouellette, Jashanjot Singh Sidhu, Abdelhak Bentaleb

Technical Demos

- Danger Detection and Cloud-Based Vocal Assistance System for Visually Impaired Users Using Meta Quest 3
Fabrizio De Fiore, John Barrett, Niall Murray, Conor Keighrey
 - Real-time Point Cloud Transmission for Immersive Teleoperation of Autonomous Mobile Robots
Nunzio Barone, Walter Brescia, Gabriele Santangelo, Antonio Pio Maggio, Ivan Cisternino, Luca De Cicco, Saverio Mascolo
 - Streaming Face-Off: A Testbed Analysis of Media-over-QUIC and Low-Latency DASH
Minh Nguyen, Philip Nys, Stefan Pham, Daniel Silhavy, Stefan Arbanowski, Stephan Steglich
 - No code XR-CAX experience creation workflows for conducting Equipment Design Reviews
Sahir Sharma, Conor Keighrey, James Lardner, Shane Gilligan, Niall Murray
 - Learned Compression in Adaptive Point Cloud Streaming: Opportunities, Challenges and Limitations
Michael Rudolph, Amr Rizk
 - Efficient and Accurate Scene Text Recognition with Cascaded-Transformers
Savas Ozkan, Andrea Maracani, Mete Ozay, Hyowon Kim, Sijun Cho, Eunchung Noh, Jeongwon Min, Jung Min Cho
 - A Multi-CDN Playground for Dash.js: Enabling Integration of CDN Switching Strategies
Jashanjot Singh Sidhu, Chidambar Joshi, Abdelhak Bentaleb
 - Continual Error Correction on Low-Resource Devices
Kirill Paramonov, Mete Ozay, Aristeidis Mystakidis, Nikolaos Tsalikidis, Dimitrios Sotos, Anastasios Drosou, Dimitrios Tzovaras, Hyunjun Kim, Kiseok Chang, Sangdok Mo, Namwoong Kim, Woojong Yoo, Ji Joong Moon, Umberto Michieli
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Doctoral Symposium

- 3D Gaussian-based Immersive Media Streaming in Networked extended reality
Yuang Shi
- Time-varying Mesh compression
Gaudong Chen

Closing Message

We would like to thank everyone who contributed to making MMSys 2022 a successful event: authors, reviewers, technical programme committee, and the organizing committee. We hope that you have enjoyed your time with us in Stellenbosch and wish you a safe journey home. Hopefully we will welcome you back to South Africa again in the near future.

Totsiens! Hamba kakuhle!

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