

## **AVSS 2018**

**15th IEEE International Conference on Advanced Video and Signal-based Surveillance**

27-30 November 2018, Auckland University of Technology, Auckland, New Zealand



# Handbook

**AVSS18 Committee**

**Auckland, New Zealand**

**<https://avss2018.org>**

## Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Message from the Local General Chair</b>	<b>6</b>
<b>3</b>	<b>Local Organization Chair's Welcome</b>	<b>7</b>
<b>4</b>	<b>Program</b>	<b>11</b>
4.1	Challenge I: Advanced Traffic Monitoring . . . . .	12
4.2	Challenge II: Semantic Person Retrieval in Surveillance Using Soft Biometrics . . . .	15
4.3	Workshop I: Smart Image Sensor Systems . . . . .	18
4.4	Workshop II: Human Behavior Analysis Based on Video Analytics and Deep Learning	20
4.5	Workshop III: Multi-source Surveillance for Public Safety and Healthcare . . . . .	21
4.6	Workshop IV: Security of Video Surveillance Systems (SVSS) . . . . .	23
4.7	Workshop V: Traffic and Street Surveillance for Safety and Security (T4S) . . . . .	24
4.8	Workshop VI: Digital Crime and Forensics (IWDCF) . . . . .	25
4.9	Tutorial: Deep Learning and Multiple Drone Vision . . . . .	29
4.10	Keynote Speech I . . . . .	32
4.11	Keynote Speech II . . . . .	34
4.12	Keynote Speech III . . . . .	35
4.13	Keynote Speech IV . . . . .	36
4.14	Oral Session I: Event Recognition . . . . .	38
4.15	Oral Session II: Object Detection, Recognition and Tracking . . . . .	38
4.16	Oral Session III: Identification . . . . .	39
4.17	Oral Session IV: Modeling . . . . .	39
4.18	Oral Session V: Scene Understanding . . . . .	39
4.19	Oral Session VI: Deep Learning . . . . .	40
4.20	Oral Session VII: Sensors and Security . . . . .	41
4.21	Poster Session I . . . . .	42
4.22	Poster Session II . . . . .	43
4.23	Poster Session III . . . . .	43
4.24	Poster Session IV . . . . .	44
4.25	Poster Session V . . . . .	46
4.26	Poster Session VI . . . . .	47
<b>5</b>	<b>Local Program Chair's Thanks</b>	<b>49</b>
	<b>Index</b>	<b>50</b>

## 1 Introduction

The organising committee of the 15th IEEE International Conference on Advanced Video and Signal-based Surveillance (AVSS), 27-30 November 2018, welcomes you to Auckland, New Zealand. The conference is hosted by the Auckland University of Technology (AUT).

AVSS conference focuses on underlying theory, methods, systems, and applications of surveillance and invited submissions in areas listed below, especially cross-disciplinary and game-changing ones. AVSS is the premier annual international conference in the field of video and signal-based surveillance that brings together experts from academia, industry, and government to advance theories, methods, systems, and applications related to surveillance.

AVSS conference is sponsored by the IEEE, in particular the IEEE Signal Processing Society (IVMSP TC) and the IEEE Computer Society (PAMI TC). There will be a main conference as well as multiple associated workshops, and the AVSS 2018 proceedings will be published by the IEEE.

### **These have been the important dates:**

- *Preliminary Abstract Submission*: 1 June 2018
- *Paper Submission*: 30 June 2018 (23:59:59 PST)
- *Notification to Authors*: 1 September 2018
- *Early-bird Registration Deadline*: 15 September 2018
- *Workshop Papers Due*: 7 September 2018
- *Camera Ready Papers Due*: 15 September 2018
- *Conference Dates*: 27-30 November 2018

### **The Best Paper Award of AVSS18**

The best paper award at AVSS 2018 is sponsored by the MDPI Journal of Imaging.

**General Chairs**

- Mohan Kankanhalli (National University of Singapore, Singapore)
- Reinhard Klette (Auckland University of Technology, New Zealand)

**Technical Program Chairs**

- Andrea Cavallaro (Queen Mary University of London, United Kingdom)
- Wei Qi Yan (Auckland University of Technology, New Zealand)

**Area Chairs**

- ANALYTICS, SITUATION AWARENESS & DECISION-MAKING  
Anthony Hoogs (Kitware, Inc., USA)  
Tiejun Huang (Peking University, China)
- PROCESSING, DETECTION, TRACKING & RECOGNITION  
Simone Calderara (UNIMORE, Modena, Italy)  
Bohyung Han (Pohang University of Science and Technology, Korea)
- SECURITY & PRIVACY  
Patrick Grother (National Institute of Standards and Technology, USA)  
Rizwan Asghar (University of Auckland, New Zealand)
- SENSOR-CENTRIC PROCESSING  
Saibal Mukhopadhyay (Georgia Institute of Technology, USA)  
Ruli Wang (Massey University, New Zealand)
- SURVEILLANCE SYSTEMS AND APPLICATIONS  
Alessia Saggese (University of Salerno, Italy)  
Xianfeng Zhao (Chinese Academy of Sciences, China)
- VISUALIZATION AND INTERACTION CONCEPTS FOR SURVEILLANCE SYSTEMS  
Amy Loufti (University of Modena and Reggio Emilia, Italy)  
Faith Kurugollu (University of Derby, UK)

**General Workshop Chairs**

- Pradeep Atrey (State University of New York at Albany, USA)
- Cosimo Distanto (Institute of Applied Sciences and Intelligent Systems, CNR, Italy)
- Feng Liu (Chinese Academy of Sciences, China)

**Organization Chairs**

- Minh Nguyen (Auckland University of Technology, New Zealand)

- Zixiang Xiong (Texas A& M University, USA)

### **Industrial Chairs**

- John Houlker (Wellington, New Zealand)
- Lidong Zhai (Chinese Academy of Sciences, China)

### **Challenge Chairs**

- Chang-Tsun Li (Charles Sturt University, Australia)
- Chao Shen (Xi'an Jiaotong University, China)

### **Poster Chairs**

- Parma Nand (Auckland University of Technology, New Zealand)
- Hsiang-Jen Chien (Auckland Transport, New Zealand)
- Laiyun Qing (University of Chinese Academy of Sciences, China)

### **Publicity Chairs**

- Alvis Fong (Western Michigan University, USA)
- Xiaotian Wu (Jinan University, China)
- Eduardo Monari (Karlsruhe Institute of Technology, Germany)

### **Publication Chairs**

- Richard Green (University of Canterbury, New Zealand)
- Manoranjan Mohanty (University of Auckland, New Zealand)

### **Asia Liaison**

- Mukesh Saini (Indian Institute of Technology, India)
- Mutsuhiro Terauchi (Hiroshima International University, Japan)

### **Australia Liaison**

- Xufeng Lin (Charles Sturt University, Australia)
- Jian Yu (Auckland University of Technology, New Zealand)

### **America Liaison**

- Domingo Mery (Santiago, Chile)
- Faisal Qureshi (University of Ontario Institute of Technology, Canada)
- Arun Ross (Michigan State University, USA)

### **Europe Liaison**

- Nicolai Petkov (Groningen, The Netherlands)
- Dmitry A. Tarasov (Ural Federal University, Russia)
- Bernhard Rinner (Alpen-Adria-Universität Klagenfurt, Austria)

### **Conference Website Design and Editing**

- Andrew Chen (University of Auckland, New Zealand)

## 2 Message from the Local General Chair

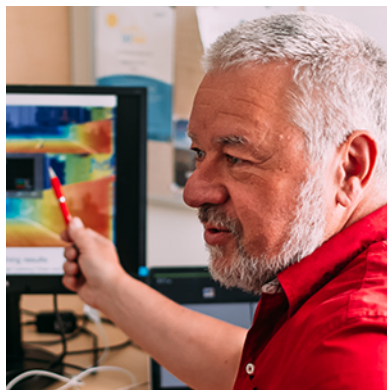
A friendly welcome to all the participants of AVSS18 at Auckland, New Zealand.

AVSS is a flagship series of IEEE conferences, and it is our great honour to have this annual event in beautiful Auckland at AUT, the youngest university of New Zealand.

New Zealand is famous for its picturesque landscapes. Our natural scenes have been recorded in movies and attract regularly visitors from all over the world. Auckland is known as the “city of sails”, due to the wide popularity of water sports activities. I hope that you also will have some opportunities to enjoy our city, or even some parts of our land, outside of the big city.

This year’s AVSS issue emphasises on deep learning, sensors, and security. The theme matches red-hot research topics of digital surveillance and artificial intelligence, such as human behaviour analysis, autonomous vehicles, and so forth.

I hope that all the participants enjoy this conference and spend a wonderful early-summer time at Auckland, New Zealand.



Prof. Reinhard Klette, General Co-Chair of AVSS 2018

**Short Biography** Professor Reinhard Klette is a Fellow of the Royal Society of New Zealand. Previously he had full professor positions at the Academy of Sciences, Berlin, at the Technical University Berlin, and at Auckland University. He is now a full professor at AUT, and the director of the Center for Robotics & Vision (CeRV).

He has close to 500 publications, among them about 100 peer-reviewed journal papers, three text books (on image processing, computer vision for 3D shape recovery, and computer vision in general), five monographs (on parallel computing, digital geometry, panoramic imaging, shortest Euclidean paths, and computer vision for modern cars), 24 edited research books and conference proceedings, 31 peer-reviewed book chapters, and more than 300 peer-reviewed conference papers in the areas of computer vision, pattern recognition, computational photography, robotics, artificial intelligence, computational geometry, parallel computing, algorithm design, digital geometry and topology, and inductive inference of recursive functions. So far he supervised 31 PhD students to their successful completion, and also more than 100 masters projects.

### 3 Local Organization Chair's Welcome

As the local organizing chair of the 15th IEEE International Conference on Advanced Video and Signal-based Surveillance (AVSS 2018), I would like to express my warm welcome to all the attendees: Welcome to Auckland - the "City of Sails". I hope that you all will have a great time here in beautiful New Zealand. If this is your first time here, you may find some of the following information useful.

**Transportation from the Airport to and around the city** (\* New Zealand has very strict biosecurity):

From the Auckland International Airport, you can get to the city centre by bus, which costs 18 NZD one way (1 NZD = 0.67 USD), visit [www.skybus.co.nz/auckland-city-express/buy-tickets](http://www.skybus.co.nz/auckland-city-express/buy-tickets), by shuttle bus (17.5 NZD) per person, see [www.supershuttle.co.nz](http://www.supershuttle.co.nz), or by Uber or taxi, which costs about 50-70 NZD to the CBD (09-300 3000 is Auckland Co-op's taxi phone number).

**Conference Venue and Conference Dinner Locations:**

The conference venue is at AUT's city campus, WA & WG building, Auckland Central. All challenges, workshops, and tutorials will be held at WG building, Level 9 classrooms. The *Welcome Reception* will be in room WA 224. The main conference is in the same room WA 224 of the Conference Centre. The Poster Display Presentations will be at WG 201.

During the conference days, you will be served morning tea, lunch, and afternoon tea. On top of that, the *conference dinner* will be at 6:30 pm on Thursday 29 November 2018. A *survivors party* will be at 6:30 pm on Friday 30 November 2018. The conference dinner is held at WG 308, AUT city Campus.

**A few Hints for Auckland:**

Within Auckland Central you can find many restaurants and food courts within walking distance. You can also find many unique restaurants on Lorne Street and near the water front. Google Map and Apple Map work well in New Zealand for navigation (using cars, walks, or public transportation).

Auckland is a relatively small city, you may get quickly to public conservation areas, beaches, rivers and mountains, typically within a 10 to 20 minutes drive (outside rush hours). To get around, Uber and taxis are convenient.

Public transportation is improving in Auckland, but still not yet perfect. You may buy an AT Hop card, to be used on the bus, train, and ferry ([at.govt.nz/bus-train-ferry/at-hop-card](http://at.govt.nz/bus-train-ferry/at-hop-card)). On a beautiful afternoon, you may walk down to the waterfront, take a 15-minute ferry to Devonport (Auckland's seaside village) and enjoy the breathtaking sea and city views; have dinner there and go back by bus. Some other points of interest within walking distance from the venue are the Sky tower, Auckland Art Gallery, Albert Park, Auckland Domain with Auckland Museum, the Viaduct, the Silo Park, or Parnell village.

**A few Hints for New Zealand:**

Outside of Auckland, you could think of visiting some of the following great points of interest: On the North Island, Waitomo Cave, the Hobbiton Movie Set, the Bay of Islands, Lake Taupo and the Tongariro National Park, Rotorua, or Coromandel Peninsula; on the South Island we have Queenstown, Fiordland National Park and Milford Sound, Fox and Franz Josef Glaciers, Abel



Tasman National Park and the Abel Tasman Coast Track, or the Aoraki / Mount Cook National Park.

**Emergency Contacts:**

If you find yourself in trouble, please contact the following numbers: In any emergency, call 111 (for fire, police or ambulance); for matters on AUT campus, you can call our Security on +64 9 921 9997, or just call myself (Minh Nguyen) on +64 21 175 4956.

I hope that you enjoy your stay here in New Zealand.



Dr. Minh Nguyen, Local Organization Chair of AVSS 2018

**Short Biography** Dr. Minh Nguyen is currently a Senior Lecturer, an Academic Advisor for AUT's School of Engineering, Computing and Mathematical Sciences. He is also a Fellow of the Higher Education Academy (UK Professional Standards Framework for teaching and learning support in higher education). Originally from Vietnam, Minh has been living in New Zealand since 2001. He completed his PhD at the University of Auckland in early 2014. Minh's research interests are in the fields of Computer Vision, Augmented and Virtual Reality, Artificial Intelligence, Internet Programming, and Mobile Applications. Minh has also extensive experience in implementing optimised applications for client server architecture systems.

## AVSS18 Road Maps










Auckland Airport ( $37^{\circ}00'29''\text{S}$   $174^{\circ}47'30''\text{E}$ )

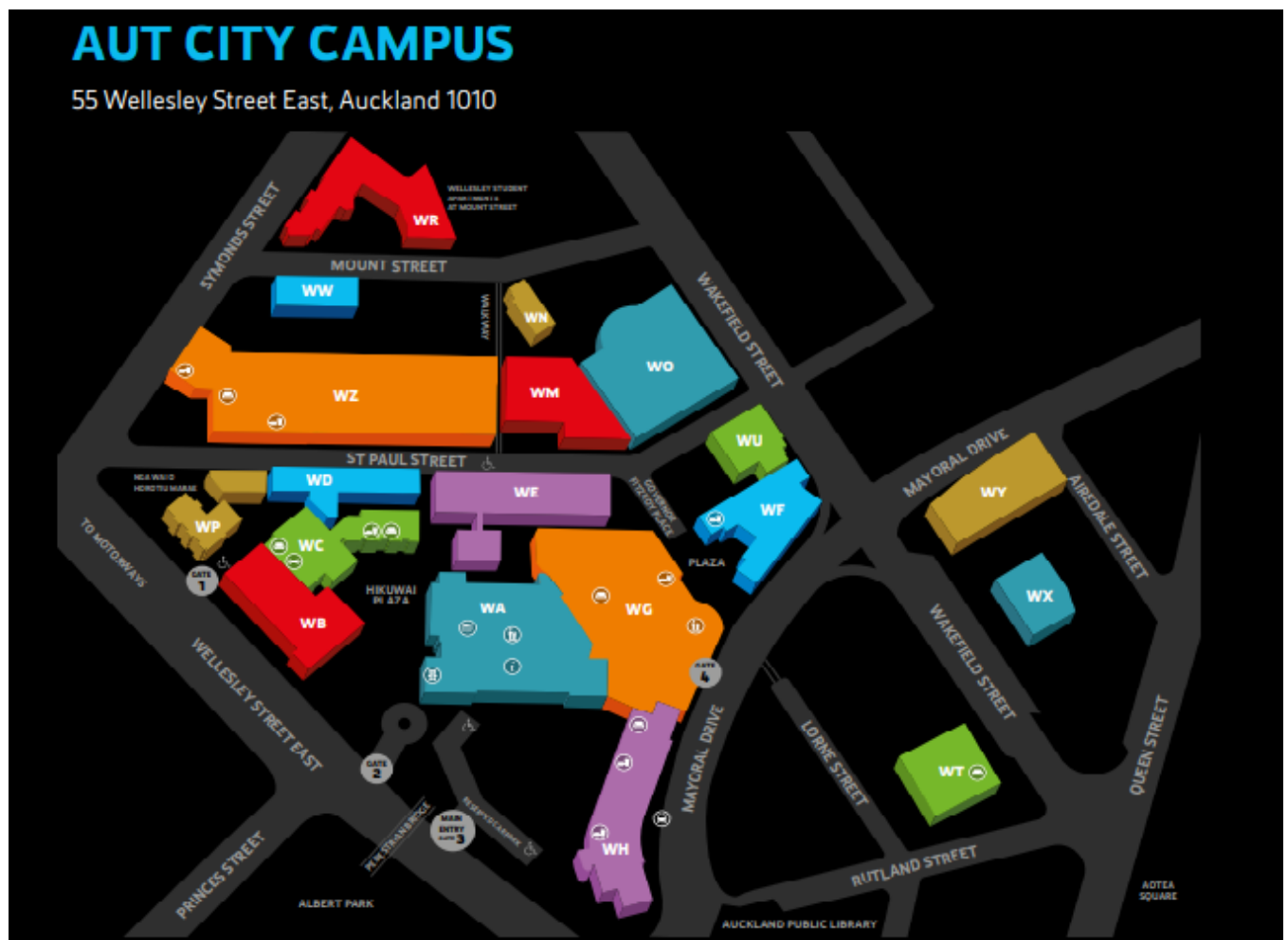
## Route Map



The Map of Auckland City

SUN 11/25	MON 11/26	TUE 11/27	WED 11/28	THU 11/29	FRI 11/30	SAT 12/1
						
20°/14°	19°/12°	19°/13°	19°/14°	21°/14°	19°/14°	19°/15°
Mostly cloudy, a thunderstorm	Clouds and sun; windy	Times of clouds and sun	Times of clouds and sun	An afternoon shower in spots	Low clouds	Rain; windy
Hist. Avg, 19°/12°	Hist. Avg, 19°/13°	Hist. Avg, 19°/13°	Hist. Avg, 19°/13°	Hist. Avg, 19°/13°	Hist. Avg, 19°/13°	Hist. Avg, 20°/13°

Expected Auckland Weather for the Week of the AVSS18 Conference



The Map of AUT City Campus

## 4 Program

- Each oral presentation should be 20 minutes in total (15 mins talk, 5 mins setup/questions)
- 1 min spotlight presentations will be given for each poster at the beginning of the poster sessions
- Authors of oral presentations have the chance to display a poster after their presentations
- An *editorial board meeting* will be during afternoon tea time on Day 2
- An introduction to AVSS 2019 is given at the Conference Dinner on Day 2

**AVSS18 Program at a Glance**

<b>Time</b>	<b>Workshops</b> (27 Nov 2018) (Tuesday)	<b>Day 1</b> (28 Nov 2018) (Wednesday)	<b>Day 2</b> (29 Nov 2018) (Thursday)	<b>Day 3</b> (30 Nov 2018) (Friday)
8.30–8.50 am	Registration (WG 201)	Registration (WG 201)	Registration (WG 201)	Registration (WG 201)
8.50–9.00 am	Registration (WG 201)	Opening Ceremony (WA 224)	Registration (WG 201)	Registration (WG 201)
9.00–10.00 am	Session 1 (WG Level 9)	Keynote 1 (WA 224)	Keynote 3 (WA 224)	Keynote 4 (WA 224)
10.00–10.30 am	Session 1 (WG Level 9)	Poster 1 (WG 201)	Poster 3 (WG 201)	Poster 5 (WG 201)
10.30–11.00 am	<b>Morning Tea</b> (WG 201)	<b>Morning Tea</b> (WG 201)	<b>Morning Tea</b> (WG 201)	<b>Morning Tea</b> (WG 201)
11.00–12.00 pm	Session 2 (WG Level 9)	Oral Session 1 (WA 224)	Oral Session 3 (WA 224)	Oral Session 5 (WA 224)
12.00–12.30 pm	Session 2 (WG Level 9)	Poster 2 (WG 201)	Poster 4 (WG 201)	Poster 6 (WG 201)
12.30 – 13.30 pm	<b>Lunch</b> (WG 201)	<b>Lunch</b> (WG 201)	<b>Lunch</b> (WG 201)	<b>Lunch</b> (WG 201)
13.30 - 15.00 pm	Session 3 (WG Level 9)	Keynote 2 (WA 224)	Oral Session 4 (WA 224)	Oral Session 6 (WA 224)
15.00 – 15.30 pm	<b>Afternoon Tea</b> (WG 201)	<b>Afternoon Tea</b> (WG 201)	<b>Afternoon Tea</b> (WG 201)	<b>Afternoon Tea</b> (WG 201)
15.30 – 17.10 pm	Session 4 (WG Level 9)	Oral Session 2 (WA 224)		Oral Session 7 (WA 224)
18.30–21.00 pm	City Tour	Welcome Reception (WA 224)	Conference Dinner (WG 308)	Farewell Paper Awards (WA 224)

## 4.1 Challenge I: Advanced Traffic Monitoring

The increasing progress of transportation systems has caused a tremendous increase in a demand for smart systems capable of monitoring traffic states and street safety. Fundamental to these applications are algorithms for multi-object detection and multi-object tracking. It is thus important for practitioners to know the pros and cons of different works in these categories. It is goal of this Challenge to provide a comprehensive performance evaluation of state-of-the-art detection and tracking algorithms.

The challenge is based on UA-DETRAC, a real-world multi-object detection and multi-object tracking benchmark. The dataset is based on a huge set of traffic video sequences opportunely annotated with bounding boxes, tracking paths, and difficult/environment difficulty levels. We divided the challenge in two different task (detection and tracking), and two different degrees of difficulty.

The challenge has been organized in conjunction with the International Workshop on Traffic and Street Surveillance for Safety and Security (IWT4S), currently proposed in AVSS 2018, in order to guarantee the publication of papers associated with the solutions proposed for the challenge.

Further Details: [iwt4s2018.wordpress.com/](http://iwt4s2018.wordpress.com/)

### Organizers:

- Marco Del Coco (Institute of Applied Sciences and Intelligent Systems, CNR, Italy)
- Siwei Lyu (University at Albany, USA)
- Pierluigi Carcagni (Institute of Applied Sciences and Intelligent Systems, CNR, Italy)
- Ming-Ching Chang (University at Albany, USA)

**Date: 27 Nov 2018; Venue: AUT WG 901**

**Program:** AVSS18 Challenge I and Workshop V

**Time:** 9.00 am - 5.10 pm

**Date:** 27 Nov 2018 (Tuesday)

**Venue:** AUT WG 908

**Chair:** Ming-Ching Chang (University at Albany, USA)

- Keynote Speech: Real time algorithm for extremely small object detection and its applications to ITS  
Jun-Wei Hsieh (National Taiwan Ocean University)
- CS I.1: Traffic Danger Recognition With Surveillance Cameras Without Training Data  
Lijun Yu (Peking University); Dawei Zhang (MIX Labs); Xiangqun Chen (Peking University); Alexander Hauptmann (Carnegie Mellon University)
- CS I.2: Comparison of Image Classification and Object Detection for Passenger Seat Belt Violation Detection Using NIR & RGB Surveillance Camera Images  
Alperen Elihos (HAVELSAN INC.), Bensu Alkan (HAVELSAN INC.), Burak Balci (HAVELSAN INC.), Yusuf Artan (HAVELSAN INC.)
- CS I.3: A Practical Person Monitoring System for City Security  
Takeharu Eda (NTT), Sanae Muramatsu (NTT), Keita Mikami (NTT), Shi Xu (NTT)
- CS I.4: Long Short Working Memory (LSWM) Integration with Polynomial Connectivity for Object Tracking in Wide Area Motion Imagery  
Evan Krieger (University of Dayton), Theus Aspiras (University of Dayton), Yakov Diskin (MZA), Vijayan Asari (University of Dayton)
- CS I.5: CADP: A Novel Dataset for CCTV Traffic Camera based Accident Analysis  
Ankit Parag Shah (Carnegie Mellon University); Jean Baptiste Lamare (Carnegie Mellon University); Tuan Nguyen Anh (University of Tokyo); Alexander Hauptmann (Carnegie Mellon University)
- CS I.6: Online and Real-Time Tracking with the GM-PHD Filter using Group Management and Relative Motion Analysis  
Young-min Song (Gwangju Institute of Science and Technology), Kwangjin Yoon (Gwangju Institute of Science and Technology), Young-Chul Yoon (Gwangju Institute of Science and Technology), Moongu Jeon (Gwangju Institute of Science and Technology)
- CS I.7: Extending IOU Based Multi-Object Tracking by Visual Information  
Erik Bochinski (TU Berlin), Tobias Senst (TU Berlin), Thomas Sikora (TU Berlin)
- Lunch
- CS I.8: Performance Enhancement of YOLOv3 by adding prediction layers with spatial pyramid pooling for vehicle detection  
Kwang-Ju Kim (Electronics and Telecommunications Research Institute (ETRI)), Yunsu Chung (Electronics and Telecommunications Research Institute (ETRI)), Doo-Hyun Choi (School of Electronics Engineering, Kyungpook National University)

- CS I.9: Integrating Multiple Inferences for Vehicle Detection by Focusing on Challenging Test Sets  
Jong Taek Lee (Electronics and Telecommunications Research Institute (ETRI)), Jang-Woon Baek (Electronics and Telecommunications Research Institute (ETRI) ), Ki Young Moon (ETRI), Kil-Taek Lim (Electronics and Telecommunications Research Institute (ETRI))
- CS I.10: Ensemble of Two-Stage Regression Based Detectors for Accurate Vehicle Detection in Traffic Surveillance Data  
Lars Sommer (Fraunhofer IOSB, Karlsruhe, Germany), Oliver Acatay (Fraunhofer IOSB, Karlsruhe, Germany), Arne Schumann (Fraunhofer IOSB), Jürgen Beyer (Karlsruhe Institute of Technology - KIT)
- CS I.11: Multi-object Tracking Cascade with Multi-Step Data Association and Occlusion Handling  
Noor Al-Shakarji (University of Missouri Columbia); Filiz Bunyak (University of Missouri-Columbia); Guna Seetharaman (Naval Research Laboratory); Kannappan Palaniappan (University of Missouri)

## 4.2 Challenge II: Semantic Person Retrieval in Surveillance Using Soft Biometrics

In surveillance and security today it is a common goal to locate a subject of interest purely from a semantic description; think an offender description form handed into a law enforcement agency. To date, these tasks are primarily undertaken by operators on the ground either by manually searching a premises or by combing through hours of video footage. As such, the Australian Federal Police identified this area as a significant problem within law enforcement. To date, researchers have focused on person re-identification methodologies to solve this complex problem, however, in circumstances where pre-search subject enrollment images are not available, these techniques fail.

Semantic search is of primary interest as it does not require pre-search subject enrollment and instead searches video footage based on a textually supplied target query. The aim of this challenge is to attempt to solve this problem through two tasks, each of these tasks aims to locate a subject of interest based on a soft biometric signature.

Website: [semanticsbsearch.wordpress.com/](http://semanticsbsearch.wordpress.com/)

### Organizers:

- Michael Halstead (Queensland University of Technology, Australia)
- Simon Denman (Queensland University of Technology, Australia)
- Clinton Fookes (Queensland University of Technology, Australia)
- YingLi Tian (The City University of New York, USA)
- Mark S. Nixon (University of Southampton, UK)

**Date: 27 Nov 2018; Venue: AUT WG 902**



**Program:** Challenge II

**Time:** 9.00 am - 1.30 pm

**Date:** 27 Nov 2018 (Tuesday)

**Venue:** AUT WG 902

**Chair:** Mark S. Nixon (University of Southampton, UK)

- CS II. 1: Soft Biometric Retrieval Using Deep Multi-Task Network  
Gabriel Resende Goncalves, Antonio Carlos Nazare, Matheus Alves Diniz, Luiz Eduardo Coelho Lima, William Robson Schwartz
- CS II. 2: Feature Selection for Subject Ranking using Soft Biometric Queries  
Emil Barbuta Cipcigan, Mark Nixon
- Morning Tea
- CS II. 3: Transfer Learning Based Approach for Semantic Person Retrieval  
Takuya Yaguchi, Mark S. Nixon
- CS II. 4: Attribute-based Person Retrieval and Search in Video Sequences  
Arne Schumann, Andreas Specker, Jürgen Beyer
- CS II. 5: Person Retrieval in Surveillance Video using Height, Color and Gender  
Hiren Galiyawala, Kenil Shah, Vandit Gajjar, Mehul S. Raval
- CS II. 6: Challenge Summary and Overview.  
Michael Halstead (Queensland University of Technology, Australia), Simon Denman (Queensland University of Technology, Australia), Clinton Fookes (Queensland University of Technology, Australia), YingLi Tian (The City University of New York, USA), Mark S. Nixon (University of Southampton, UK),
- Discussions, conclusions, and results presentation
- Lunch

## Workshops

The IEEE Conference on Advanced Video and Signal-Based Surveillance (AVSS) has developed a tradition of hosting surveillance-related workshops on the day preceding the main conference. Recent AVSS workshops included:

- Performance Evaluation of Tracking Systems (PETS)
- Resource Aware Sensor and surveillance NETworkS (RAWSNETS)
- Activity Monitoring by Multi-Camera Surveillance Systems (AMMCSS)
- Activity Monitoring by Multiple Distributed Sensing (AMMDS)
- Workshop on Multimedia Systems for Surveillance (MMSS)
- Vehicle Retrieval in Surveillance (VRS)
- Low Resolution Face Analysis (LRFA)

This tradition will continue at AVSS 2018, and workshops will be held on 27 November 2018 prior to the start of the technical program of the main AVSS conference. We welcome workshop proposals in new and emerging research areas of visual and signal-based surveillance. AVSS18 workshops include:

- **Workshop I:** Workshop on Smart Image Sensor Systems
- **Workshop II:** Human Behavior Analysis based on Video Analytics and Deep Learning
- **Workshop III:** International Workshop on Multi-source Surveillance for Public Safety and Healthcare
- **Workshop IV:** International Workshop on the Security of Video Surveillance Systems (SVSS)
- **Workshop V:** Traffic and Street Surveillance for Safety and Security (T4S)
- **Workshop VI:** International Workshop on Digital Crime and Forensics (IWD CF)

**Date: 27 Nov 2018; Venue: AUT WG Level 9**

### 4.3 Workshop I: Smart Image Sensor Systems

Smart image sensor systems that integrate sensing, computation, and memory are the next generation of smart cameras. Traditional smart cameras combine traditional sensors and embedded computing systems-on-chips to perform in-camera analysis. Smart sensor systems may combine analog and digital computation with the sensor, resulting in significantly lower latency computations as well as smaller SWaP (size, weight, and power). The novel architectures presented by smart image sensors call for a new round of algorithm/architecture co-design to leverage the capabilities of these systems. Potential topics include:

- Analog and mixed-signal on-sensor computation
- Digital on-sensor computation
- 3D VLSI architectures for smart sensors
- Computer vision applications (tracking, target identification, etc.) adapted to a chosen smart sensor platform
- Algorithm-architecture co-design for smart sensor systems
- Simulation studies of smart sensor systems
- Applications and use cases for smart sensor systems
- Distributed networks of smart sensors
- Tutorials on smart image sensors

#### Organizers:

- Marilyn Wolf (Georgia Institute of Technology)
- Ricardo Carmona Galan (IMSE-CNM)
- Anthony Griffin (AUT)

**Date: 27 Nov 2018 (Tuesday); Venue: AUT WG 903**

**Program:** AVSS18 Workshop I

**Time:** 1.30 - 5.10 pm

**Date:** 27 Nov 2018 (Tuesday)

**Venue:** AUT WG 903

**Chair:** Anthony Griffin (AUT)

- **Keynote Speech:** Francois Bremond (INRIA,France): Video Analytics
- WS I. 1: Region of interest generation for smart cameras with 3D stacks  
Evan Gebhardt, Marilyn Wolf (Georgia Tech)
- WS I. 2: Deep Learning Based Action Evaluation for Sensor Data  
Chen-Kuo Kiang

#### **4.4 Workshop II: Human Behavior Analysis Based on Video Analytics and Deep Learning**

**Summary:** Human behavior recognition (HBR) is a key area in video analysis and machine learning application. Close circuit cameras are now widely used to increase security in many high alert areas such as airport, bus stop and railway station. There are various methods for analyzing human behavior such as sensor based activity recognition, gait analysis based activity recognition. Since video is a low cost and easy to use device for monitoring activities, video based human behavior analysis is widely used. Video analytics have application in patient's behavior analysis also. Deep learning allows models that are composed of multiple processing layers to learn features of data with multiple levels of abstraction. Now-a-days deep learning techniques such as Convolutional Neural Network, Recurrent Neural Network have become popular for human activity recognition. The workshop aims at bringing computer vision and machine learning experts together for presenting their novel ideas in HBR using video processing and deep learning approach. This will give a platform to researchers from both fields to discuss their original ideas in HBR, solution of existing HBR problems and look for future scope in designing more robust model for human behavior analysis system. Scope and topics of interest include, but are not limited to:

- Human behavior analysis
- Human activity recognition
- Human/ Object tracking and classification
- Crowd behavior analysis
- Deep learning techniques application in human activity recognition
- Video analytics for patient behavior analysis

**Organizers:**

- Maheshkumar H Kolekar (Indian Institute of Technology Patna, India)
- R. Balasubramanian (Indian Institute of Technology Roorkee, India)

**Date: 27 Nov 2018 (Tuesday); Venue: AUT WG 904**

#### 4.5 Workshop III: Multi-source Surveillance for Public Safety and Healthcare

With rapid growth in sensing and communication technology, we have various new sources of information that can complement video to achieve robust and reliable surveillance, e.g. heat detector, smoke detector, infrared/thermal sensor, motion sensor, metal detectors, GPS, weather sensors, and various other sensors found on current smartphones. Additionally, online social networks and real-time news portals provide valuable information about individuals and surrounding environment. We can assimilate all these data from different sources to make accurate and reliable situation assessment using artificial intelligence (AI) and Deep learning (DL) methods. This workshop aims to bring together researchers that are specifically working on applying advanced learning techniques to exploit multi-source information for public safety and healthcare. The workshop aims to build a common platform for synergizing research efforts and develop innovative methods population health and safety. We solicit original and unpublished research papers that analyse multiple source for safety and healthcare applications. Topics for the workshop include, but are not limited to:

- Multi-source data analysis for security threat and crime detection
- Multi-source data analysis for forensics
- Multi-source data analysis for abnormal situation monitoring
- Advanced learning techniques for multi-source data analysis for safety and health
- Multi-source data analysis for population health management
- Multi-source data analysis for disease detection, diagnosis and treatment plans
- Online social network analysis for safety and health monitoring
- Multi-source data analysis for remote or tele-health management

Researchers working on multimodal analysis of single source (such as image, audio, text) for public safety and healthcare are also encouraged to submit their original work. After the workshop, we intend to submit a special issue proposal in a reputable journal for extended papers of the workshop on the same topic.

##### **Organizers:**

- Mukesh Saini (Indian Institute of Technology Ropar, India)
- Warikanath Mahapatra (IBM Research Australia)

**Date: 27 Nov 2018 (Tuesday); Venue: AUT WG 903A**

**Program:** AVSS18 Workshop III**Time:** 9.00 - 12.30 pm**Date:** 27 Nov 2018 (Tuesday)**Venue:** AUT WG 903**Chairs:** Mukesh Saini (Indian Institute of Technology Ropar, India) and Manoranjan Mohanty (University of Auckland, New Zealand)

- **WS III.1: Analysis of Motion Patterns for Pain Estimation of Horses**  
Ralf Reulke (Humboldt-Universität zu Berlin), Dominik Rueb (Humboldt-Universität zu Berlin), Niklas Deckers (HU-Berlin), Dirk Barnewitz (FZMB), Anne Wieckert (Tierärztliche Klinik für Pferde, Demmin) and Kathrin Kienapfel (Ruhr-Universität Bochum)
- **WS III.2: Hierarchical spatial object detection for ATM vandalism surveillance**  
Jun Yeop Lee (ISPL); Hanseok Ko (Korea University); Chul Jin Cho (Korea University); David K Han (Army Research Laboratory)
- **WS III.3: UNICITY: A depth maps database for people detection in security airlocks**  
Joel Dumoulin (HumanTech Institute, HES-SO Fribourg, Switzerland), Olivier Canevet (Idiap Research Institute, Martigny, Switzerland), Michael Villamizar (Idiap Research Institute, Martigny, Switzerland), Hugo Nunes (Fastcom Technology SA, Lausanne, Switzerland), Omar Abou Khaled (HumanTech Institute, HES-SO Fribourg, Switzerland), Elena Mugellini (HumanTech Institute, HES-SO Fribourg, Switzerland), Fabrice Moscheni (Fastcom Technology SA, Lausanne, Switzerland) and Jean-Marc Odobez (Fastcom Technology SA, Lausanne, Switzerland)
- **WS III.4: Deep Hybrid Network for Automatic Quantitative Analysis of Facial Paralysis**  
Gee-Sern Hsu (Taiwan University of Science and Technology); Gee-Sern Hsu (National Taiwan University of Science and Technology)
- **WS III.5: Computer vision based pose detection of agricultural implements without a priori knowledge of their geometry and visual appearance**  
Michael Erz (Robert Bosch GmbH)
- **WS III.6: Detection of Fairy Circles in UAV Images Using Deep Learning**  
Yuhong Zu (AUT), Zahra Moayed (AUT), Barbara Bollard-Breen (AUT), Ashray Doshi (AUT), Jean Baptiste Ramond (AUT), Reinhard Klette (AUT)
- **WS III.7: Improving Real-Time Pedestrian Detectors with RGB+Depth Fusion**  
Tanguy Ophoff (KU Leuven, Belgium), Kristof Van Beeck (KU Leuven, Belgium), Toon Goedeme (KU Leuven, Belgium)

## 4.6 Workshop IV: Security of Video Surveillance Systems (SVSS)

Video surveillance systems have become an important part of our lives, introducing new capabilities to improve civilian protection, reduce crime, increase the security of military and critical infrastructures, etc. As the trend of the Internet of Things (IoT) has evolved, video and signaling surveillance systems have begun to integrate new, advanced, and intelligent functionalities, such as real-time video stream analysis and detection using advanced machine learning techniques, streaming data to servers deployed in the cloud to provide access to the content by multiple devices from any location, and more. However, the integration of new functionalities into these systems exposes them to new risks that need to be considered and mitigated. For example, we cannot assume that the transmitted and visualized video is protected and reflects the true state of the monitored environment/objects, since an attacker can monitor and manipulate the data streams of such systems in real-time (e.g. reply attack) from a remote location. Some of the security problems resulting from the intersection of the digital and physical realms, introduce cyber security challenges which are unique to video and signaling surveillance systems and may cost human lives. It is therefore critical to address the emerging cyber security related problems, which can affect (compromise) various components of such surveillance systems. This workshop aims to bring together the latest cyber security research pertaining to all aspects of video surveillance systems. We are soliciting contributions on (but not limited to) the following topics:

- Secured architecture for video surveillance systems
- Intrusion detection in video surveillance systems
- Inferring information from encrypted video streams
- Cyber attacks on video surveillance systems
- Cyber attacks from video surveillance systems
- Adversarial AI aimed at video streams and surveillance systems
- Surveillance system honeypots
- Security measures for surveillance systems

Researchers working on multimodal analysis of single source (such as image, audio, text) for public safety and healthcare are also encouraged to submit their original work. After the workshop, we intend to submit a special issue proposal in a reputable journal for extended papers of the workshop on the same topic.

### Organizers:

- Yuval Elovici (Ben-Gurion University of the Negev, Israel)
- Asaf Shabtai (Ben-Gurion University of the Negev, Israel)
- Oleg Brodt (Ben-Gurion University, Israel)

**Date: 27 Nov 2018 (Tuesday); Venue: AUT WG 903A**



#### **4.7 Workshop V: Traffic and Street Surveillance for Safety and Security (T4S)**

In the last couple of decades, there has been a tremendous increase in demand for smart systems capable of monitoring street security and traffic states. Big city centers are subjected to a growing amount of people and vehicle mobility, making control and security management increasingly difficult. The contribution of automatic systems capable to centralize street control and automatically detect possible problems (accidents, traffic jam, brawls, etc.) in order to elicit and support the intervention of law enforcement agencies or medical staff is needed. The proposed workshop is organized jointly with the Challenge on Advanced Traffic Monitoring, and it is addressed to researchers interested in contributing on the general topic of security on mobility and street applications. Research papers are solicited in, but not limited to, the follow areas and topics:

- Vehicle detection and tracking
- Vehicle type classification
- Pedestrian detection and tracking
- Vehicle/pedestrian behavior
- Traffic jam detection
- Car/pedestrian accidents
- Activity monitoring systems
- Scene understanding
- Visual attention and visual saliency
- Matching vehicles across cameras
- Smart environments
- Safety and security
- Technology for cognition
- Navigation systems
- Sensory substitution
- Datasets and evaluation procedures

##### **Organizers:**

- Marco Del Coco (Institute of Applied Sciences and Intelligent Systems (CNR), Italy)
- Siwei Lyu (University at Albany, USA)
- Pierluigi Carcagni (Institute of Applied Sciences and Intelligent Systems (CNR), Italy)
- Ming-Ching Chang (University at Albany, USA)

**Date: 27 Nov 2018 (Tuesday); Venue: AUT WG 908**

#### 4.8 Workshop VI: Digital Crime and Forensics (IWDCF)

Digital forensics have gradually become a very active research area in the field of information security in the last two decades. In recent years, more and more subfields in digital forensics such as the network forensics, content forensics, source tracing, etc, were greatly developed. However, while the advance of digital technologies boosts the development of forensic techniques, it also helps criminals and law violators. Particularly, anti-forensic technologies are also widely studied nowadays. Therefore, a series of problems still exist in various areas including the mathematical modeling, computational intelligence, accuracy improvement, new method development, and performance evaluations, etc. The focus of this workshop is on calling up the research groups to remove the obstacles. The topics of this workshop cover but not limited to:

- Computational approaches to digital crime preventions
- Crime scene imaging
- Cryptologic techniques and tools for crime investigation
- Data carving and recovery
- Digital evidence
- Digital techniques for crime investigations
- Identity theft and biometrics
- Information warfare
- Machine learning, data mining, and information retrieval for crime prevention and forensics  
Policy, standards, protocols, accreditation, certification, and ethical issues related to digital crime and forensics
- Malicious codes detection Network intrusion detection
- Network attack investigation and forensics
- Network attack source tracing
- Small digital device forensics (cell phones, smartphone, PDAs, audio/video devices, cameras, flash drives, gaming devices, GPS devices, etc.)
- Multimedia content forensics
- Techniques for content tempering
- Anti-forensic technology
- Steganography and steganalysis
- Network covert communication and detection
- Analytical methodologies against terrorism
- Watermarking for digital forensics

- Digital rights Management
- Intelligent surveillance

**Organizers:**

- Feng Liu (The University of Chinese Academy of Sciences, China)
- Fei Peng (Hunan University, China)

**Date: 27 Nov 2018 (Tuesday); Venue: AUT WG 907**

**Program:** AVSS18 Workshop VI

**Time:** 8.50 am - 5.10 pm

**Date:** 27 Nov 2018 (Tuesday)

**Venue:** AUT WG 907

**Chair:** Liping Ding (Chinese Academy of Sciences, China)

- **Keynote Speech:** Professor Liping Ding (Chinese Academy of Sciences, China) **Title:** Mobile Forensics  
**Abstract:** Mobile digital forensics technology is mainly divided into mobile devices forensics, mobile operating systems forensics, mobile network forensics and mobile applications forensics. In this speech, the corresponding technical details and forensics methods are addressed respectively. The mobile digital forensics technology and the future development trend are summarized.
- WS VI.1: Fourier Mellin transform and fractal coding for secure and robust fingerprint image hashing  
Sani Mohammed Abdullahi (Southwest Jiaotong University); Hongxia Wang (Southwest Jiaotong University)
- WS VI.2: Research on Image Recognition Method Based on Deep Learning Algorithm  
Yasen Aizezi (Xinjiang Police College); Anniwaer Jiamali (Xinjiang Police College); Ruxianguli Abudurexiti (Xinjiang Police College); Xuehua Liu (Chinese Academy of Sciences & University of Chinese Academy of Sciences, Beijing); Jin Du (Yunnan Police College); Liping Ding (Guangzhou & Chinese Academy of Sciences & Institute of Software, Chinese Academy of Sciences)
- WS VI.3: Pedestrian Recognition, Localization, and Detection Using Deep Learning  
Jia Lu (Auckland University of Technology); Wei Qi Yan (Auckland University of Technology)
- WS VI.4: Detection and Recognition for Multi-flame based on Deep Learning Approach  
Chen Xin (Auckland University of Technology); Wei Qi Yan (Auckland University of Technology)
- WS VI.5: Currency Detection and Recognition Based on Deep Learning  
Qian Zhang (Auckland University of Technology); Wei Qi Yan (Auckland University of Technology)
- Lunch
- WS VI.6: Web attack forensics based on network traffic behavior characteristics and URLs  
Guozi Sun (Nanjing University of Posts and Telecommunications); Lei Zhu (Nanjing University of Posts and Telecommunications); Huakang Li (Nanjing University of Posts and Telecommunications); Wenjun Li (Beijing Public Security Bureau)
- WS VI.7: DDoS Attacks and Flash Event Detection Based on Flow Characteristics in SDN  
Wenti Jiang (Nanjing University of Posts and Telecommunications); Yu Gu (Nanjing University of Posts and Telecommunications); Danni Ren (Nanjing University of Posts and Telecommunications); Huakang Li (Nanjing University of Posts and Telecommunications); Guozi Sun (Nanjing University of Posts and Telecommunications)

- WS VI.8: Botnet Homogeneous Discrimination Based on Approximation Algorithm of Communication Characteristic Curve  
Lichao Zhai(Shanxi University of Finance and Economics)
- Coffee Break
- WS VI.9: The Dynamic Data Integrity Verification and Recovery Scheme based on MHT  
Yasen Aizezi (Xinjiang Police College); Yuhua Feng (Xinjiang Police College); Li Yu (Xinjiang Police College); Guozi Sun (Nanjing University of Posts and Telecommunications)
- WS VI.10: Comparative Evaluations of Privacy on Digital Images  
Xue Zhang (Auckland University of Technology); Wei Qi Yan (Auckland University of Technology)

## 4.9 Tutorial: Deep Learning and Multiple Drone Vision

**Speaker:** Ioannis Pitas (Aristotle University of Thessaloniki, Greece)

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

The tutorial will offer an overview of all the above plus other related topics, stressing the algorithmic aspects, such as: a) drone imaging b) drone target localization and world mapping c) target detection and tracking, d) privacy protection in drones.

**Short Biography:** Professor Ioannis Pitas (IEEE fellow, IEEE Distinguished Lecturer, EURASIP fellow) received the Diploma and PhD degree in Electrical Engineering, both from the Aristotle University of Thessaloniki, Greece. Since 1994, he has been a Professor at the Department of Informatics of the same University. He served as a Visiting Professor at several Universities.

His current interests are in the areas of image/video processing, intelligent digital media, machine learning, human centered interfaces, affective computing, computer vision, 3D imaging and biomedical imaging. He has published over 860 papers, contributed in 44 books in his areas of interest and edited or (co-)authored another 11 books. He has also been member of the program committee of many scientific conferences and workshops. In the past he served as Associate Editor or co-Editor of 9 international journals and General or Technical Chair of 4 international conferences. He participated in 69 R&D projects, primarily funded by the European Union and is/was principal investigator/researcher in 41 such projects. He has 28000+ citations (Google Scholar) to his work and h-index 81+ (Google Scholar).

Prof. Pitas leads the big European R&D project MULTIDRONE. He is also chair of the Autonomous Systems initiative.

**Date:** 27 Nov 2018; **Venue:** AUT WG 906

**Program:** AVSS18 Tutorials

**Time:** 1.30 am - 5.10 pm

**Date:** 27 Nov 2018 (Tuesday)

**Venue:** AUT WG 906

**Lecturer:** Ioannis Pitas (Aristotle University of Thessaloniki, Greece)

**Chair:** Edmund Lai (Auckland University of Technology)

- TS I: Introduction to multiple drone imaging

**Time:** 13:30-14:15

**Abstract:** This lecture will provide the general context for this new and emerging topic, presenting the aims of drone vision, the challenges (especially from an image/video analysis and computer vision point of view), the important issues to be tackled, the limitations imposed by drone hardware, regulations and safety considerations etc.

The multiple drone platform will be also detailed, beginning with platform hardware overview, issues and requirements and proceeding by discussing safety and privacy protection issues. Finally, platform integration will be the closing topic of the lecture, elaborating on drone mission planning, object detection and tracking, target pose estimation, privacy protection, ethical and regulatory issues, potential landing site detection, crowd detection, semantic map annotation and simulations.

- TS II: Mapping and localization

**Time:** 14:15-15:00

**Abstract:** The lecture includes the essential knowledge about how we obtain/get 2D and/or 3D maps that robots/drones need, taking measurements that allow them to perceive their environment with appropriate sensors. Semantic mapping includes how to add semantic annotations to the maps such as POIs, roads and landing sites. The section Localization is exploited to find the 3D drone or target location based on sensors using specifically Simultaneous mapping and localization (SLAM). Finally, the Fusion in drone localization section describes the improving accuracy on localization and mapping in Multidrone to exploit the synergies between different sensors.

- 15.00 - 15.30 Coffee Break, AUT WG 201.

- TS III: Deep learning for target detection

**Time:** 15:30-16:15

**Abstract:** Target detection using deep neural networks, Detection as search and classification task, Detection as classification and regression task, Modern architectures for target detection, RCNN, Faster RCNN, YOLO, SSD, lightweight architectures, Data augmentation, Deployment, Evaluation and benchmarking.

Utilizing Machine Learning techniques can assist in detecting objects of importance and subsequently tracking them. Hence, Visual Object Detection can greatly aid the task of video shooting using drones. Drones with Graphics Processing Units (GPUs) in particular can be aided by Deep Learning techniques, as GPUs routinely speed up common operations such as matrix multiplications. Recently, Convolutional Neural Networks (CNNs) have been used for the task of object detection with great results. However, using such models on drones for real-time face detection is prohibited by the hardware constraints that drones impose. We examine various architectures and settings to facilitate the use of CNN-based object detectors on a drone with limited computational capabilities.

- TS III: 2D Target tracking and 3D target localization

**Time:** 16:15-17:10

**Abstract:** Target tracking is a crucial component of many computer vision systems. Many approaches regarding face/object detection and tracking in videos have been proposed. In this lecture, video tracking methods using correlation filters or convolutional neural networks are presented, focusing on video trackers that are capable of achieving real time performance for long-term tracking on a UAV platform.



## 4.10 Keynote Speech I

**Title:** Spiking Neural Networks, Deep Learning, and Brain-inspired Artificial Intelligence

**Date:** 28 Nov 2018 (Wednesday)

**Time:** 9.00-10.00 am

**Venue:** AUT WA 224

**Speaker:** Nikola Kasabov (Auckland University of Technology, New Zealand)

**Chair:** Reinhard Klette (Auckland University of Technology)

**Abstract:** Brain-inspired AI (BI-AI) is the contemporary phase in the AI development that is concerned with the design and implementation of highly intelligent machines that utilise information processing principles from the human brain, along with their applications. Spiking neural networks (SNN) and deep learning algorithms in SNN are brain-inspired techniques that make it possible for a new generation of AI systems to be developed - the brain-inspired AI (BI-AI).

This presentation has two parts. The first part covers generic methodological aspects of AI and neural networks, including: Adaptive learning of evolving processes in space and time; Data, Information and Knowledge; The human brain as a deep learning system; Classical methods of ANN; Methods of SNN; Deep learning in brain-inspired SNN architectures; Evolutionary and quantum-inspired optimisation of SNN systems; Neuromorphic development software and hardware platforms for SNN.

The second part presents specific methods, systems and applications based on deep learning in SNN and BI-AI for various problems and data, including: signal processing; audio/visual data for fast moving object recognition; multisensory predictive modelling of streaming data; cybersecurity. It concludes with discussions about the future of AI. A development software system NeuCube and application systems can be found on: <http://www.kedri.aut.ac.nz/neucube/>.

**Short Biography:** Professor Nikola Kasabov is a Fellow of IEEE, Fellow of the Royal Society of New Zealand, DVF of the Royal Academy of Engineering, UK and the Scottish Computer Association. He is the Director of the Knowledge Engineering and Discovery Research Institute (KEDRI), Auckland and Professor at the School of Engineering, Computing and Mathematical Sciences at Auckland University of Technology. Kasabov is President-Elect of the Asia Pacific Neural Network Society (APNNS) to serve as the President in 2019. He is a Past President of the International Neural Network Society (INNS) and APNNS. He is a member of several technical committees of IEEE Computational Intelligence Society and a Distinguished Lecturer of the IEEE CIS (2012-2014). He is a Co-Editor-in-Chief of the Springer journal Evolving Systems and serves as Associate Editor of Neural Networks, IEEE TrNN, -Tr CDS, -TrFS, Information Science, Applied Soft Computing and other journals. Kasabov holds MSc and PhD from the TU Sofia, Bulgaria. His main research interests are in the areas of neural networks, intelligent information systems, soft computing, bioinformatics, neuroinformatics. He has published more than 600 publications that include 15 books, 220 journal papers, 28 patents and numerous chapters and conference papers.

He has extensive academic experience at various academic and research organisations in Europe and Asia, including: TU Sofia Bulgaria; University of Essex UK; University of Otago, NZ, Advisor Professor at the Shanghai Jiao Tong University, Visiting Professor at ETH/University of Zurich and Robert Gordon University in the UK. Prof. Kasabov has received a number of awards, among them: the APNNA 'Outstanding Achievements Award'; the INNS Gabor Award for 'Outstanding contributions to engineering applications of neural networks'; the EU Marie Curie Fellowship; the Bayer Science Innovation Award; the APNNA Excellent Service Award; the RSNZ Science and

Technology Medal; the 2015 AUT Medal for outstanding academic contribution; Honorable Member of the Bulgarian Academic Society for Computer Science and IT, and others. He is an Honorary Citizen of Pavlikeni and a Mentor of the “Bacho Kiro” school in the town. He has supervised to completion 46 PhD students. More information of Prof. Kasabov can be found on the KEDRI web site.

## 4.11 Keynote Speech II

**Title:** A Navigational Approach to Health

**Date:** 28 Nov 2018 (Wednesday)

**Time:** 1.30 pm-2.30 pm

**Venue:** AUT WA 224

**Speaker:** Ramesh Jain (University of California-Irvine, USA)

**Chair:** Mohan Kankanhalli (National University of Singapore, Singapore)

**Abstract:** What if an app could guide you to better health, similar to how GPS navigation directs you to your desired destination? Advances in sensors, mobile computing, artificial intelligence, data management, cloud computing, biology, and medicine allow approaching human health from a novel navigational perspective. Current episodic practice of healthcare is based on Measure-Estimate-Guide-Influence (MEGI) cycle that is initiated usually by a sick person. By navigating through health states starting from the current state to desired goal state, it is possible to perpetually guide a person using well established cybernetic principles combined with emerging technology that has demonstrated its success in many other areas. This converts current episodic approaches to so-called healthcare, which really is a sickcare, to a navigation through health state-space to guide and move to desirable states. We discuss this navigational approach and present personal health navigator that will help people accomplish this.

**Short Biography:** Professor Ramesh Jain is a Donald Bren Professor in Information & Computer Sciences at the University of California, Irvine (UCI). His current research passion is in addressing health issues using cybernetic principles, building on the progress in sensors, mobile, processing, and storage technologies. He is the founding director of the Institute for Future Health at UCI. Earlier he served at Georgia Tech, the University of California at San Diego, the University of Michigan, Ann Arbor, Wayne State University, and the Indian Institute of Technology, Kharagpur, India. He is a Fellow of AAAS, ACM, IEEE, AAAI, IAPR, and SPIE.

Professor Ramesh Jain co-founded several companies, managed them in their initial stages, and then turned them over to professional management. He enjoys new challenges and likes to use technology to solve them. He is participating in addressing the biggest challenge for us all: how to live long in good health.

## 4.12 Keynote Speech III

**Date:** 29 Nov 2018 (Thursday)

**Time:** 9.00-10.00 am

**Venue:** AUT WA 224

**Speaker:** Professor Edward Delp (Purdue University, USA)

**Chair:** Mohan Kankanhalli (National University of Singapore, Singapore)

**Abstract:** In this talk I will describe recent work in image-based plant phenotyping. Estimating the properties of plants (i.e., phenotyping) is critical to predict its viability and biomass. I will describe work in estimating phenotypic traits such as plant locations, number of plants per plot, Leaf Area Index, canopy cover, leaf length and width, and the number of leaves per plant. I discuss field-based image acquisition using UAVs and ground-based sensing. I will discuss how this area have many important problems that can be addressed by the computer vision and surveillance communities. The goal is to develop a set of tools to precisely and quickly phenotype hundreds of thousands of plants on a daily basis.

### Short Biography:

Edward J. Delp is the Charles William Harrison Distinguished Professor of Electrical and Computer Engineering and Professor of Biomedical Engineering at Purdue University. His research interests include image and video processing, image analysis, computer vision, image and video compression, multimedia security, medical imaging, multimedia systems, communication and information theory. Dr. Delp is a Fellow of the IEEE, a Fellow of the SPIE, a Fellow of the Society for Imaging Science and Technology (IST), and a Fellow of the American Institute of Medical and Biological Engineering. In 2004 Dr. Delp received the Technical Achievement Award from the IEEE Signal Processing Society for his work in image and video compression and multimedia security. In 2008 he received the Society Award from IEEE Signal Processing Society (SPS). In 2016 Dr. Delp received the Purdue College of Engineering Mentoring Award for his work in mentoring junior faculty and women graduate students.

### 4.13 Keynote Speech IV

**Title:** Evolutionary Deep Learning and Applications to Image Recognition

**Date:** 30 Nov 2018 (Friday)

**Time:** 9.00-10.00 am

**Venue:** AUT WA 224

**Speaker:** Mengjie Zhang (Victoria University of Wellington, New Zealand)

**Chair:** Reinhard Klette (Auckland University of Technology, New Zealand)

**Abstract:** Image classification and recognition problems occur in our everyday life. Recognising faces in digital images and diagnosing medical conditions from X-Ray images are just two examples of the many important tasks for which we need computer based image classification systems. Since the 1980s, many image analysis algorithms have been developed. Among those algorithms, deep learning particularly deep convolutional neural networks have received very good success and attracted attentions to industry people and researchers in computer vision and image processing, neural networks, and machine learning. However, there are at least three major limitations in deep convolutional neural networks: (1) the learning architecture including the number of layers, the number of feature maps in each layer and the number of nodes in each feature map are still very much determined manually via "trial and error", which requires a large amount of hand-crafting/trial time and good domain knowledge. However, such experts are hard to find in many cases, or using such expertise is too expensive. (2) Almost all the current deep learning algorithms need a large number of examples/instances (e.g. AlphaGo used over 30 million instances) that many problems do not have. (3) Those algorithms require a huge computational cost that big companies such as Google, Baidu, and Microsoft can cope well but most universities and research institutions cannot.

To address these limitations, evolutionary computation techniques start playing a significant role for automatically determining deep structures, transfer functions and parameters to tackle image classification tasks, and have great potential to advance the developments of deep structures and algorithms. This talk will provide an extended view of deep learning, overview the state-of-the-art work in evolutionary deep learning using GAs/PSO/DE, and discuss some recent developments using Genetic Programming (GP) to automatically evolving deep structures and feature construction for image recognition with a highlight of the interpretation capability and visualisation of constructed features. Finally, recent work and ideas on evolutionary deep transfer learning will be discussed.

**Short Biography:** Mengjie Zhang is currently Professor of Computer Science at Victoria University of Wellington, where he heads the interdisciplinary Evolutionary Computation Research Group with over 12 staff members, seven postdocs and over 25 PhD students. He is a member of the University Academic Board, a member of the University Postgraduate Scholarships Committee, a member of the Faculty of Graduate Research Board at the University, Associate Dean (Research and Innovation) for Faculty of Engineering, and Chair of the Research Committee for the School of Engineering and Computer Science. His research is mainly focused on evolutionary computation, particularly genetic programming, particle swarm optimisation and learning classifier systems with application areas of computer vision and image processing, multi-objective optimisation, and feature selection and dimension reduction for classification with high dimensions, transfer learning, classification with missing data, and scheduling and combinatorial optimisation. Prof Zhang has published over 500 research papers in fully refereed international journals and conferences in these areas. He has been supervising over 100 research thesis and project students including

over 30 PhD students.

He has been serving as an associated editor or editorial board member for ten international journals including IEEE Transactions on Evolutionary Computation, IEEE Transactions on Cybernetics, Evolutionary Computation Journal (MIT Press), IEEE Transactions Emergent Topics in CI, Genetic Programming and Evolvable Machines (Springer), Applied Soft Computing, and Engineering Applications of Artificial Intelligence, and as a reviewer of over 30 international journals. He has been a major chair for over ten international conferences including IEEE CEC, GECCO, EvoStar and SEAL.

He has also been serving as a steering committee member and a program committee member for over 80 international conferences including all major conferences in evolutionary computation. Since 2007, he has been listed as one of the top five world genetic programming researchers by the GP bibliography. He will chair and host IEEE CEC 2019 Wellington, the Capital City of New Zealand.

Professor Zhang is a Fellow of Royal Society of New Zealand. He is currently chairing the IEEE CIS Intelligent Systems and Applications Technical Committee. He is the immediate Past Chair for the Emergent Technologies Technical Committee and the IEEE CIS Evolutionary Computation Technical Committee, and a member of the IEEE CIS Award Committee. He is also a vice-chair of the IEEE CIS Task Force on Evolutionary Feature Selection and Construction, a vice-chair of the Task Force on Evolutionary Computer Vision and Image Processing, and the founding chair of the IEEE Computational Intelligence Chapter in New Zealand.

#### 4.14 Oral Session I: Event Recognition

**Time:** 10.00 am - 10.30 am

**Date:** 28 Nov 2018 (Wednesday)

**Venue:** AUT WA 224

**Chair:** Baoxin Li (Arizona State University, USA)

- **OS I.1:** Simultaneous event localization and recognition for surveillance video  
Yikang Li (Arizona State University); Tianshu Yu (Arizona State University); Baoxin Li (Arizona State University)
- **OS I.2:** Optical Flow Dataset and Benchmark for Visual Crowd Analysis  
Gregory Schroder (Technische Universität Berlin); Tobias Senst (TU Berlin); Erik Bochinski (TU Berlin); Thomas Sikora (TU Berlin)
- **OS I.3:** Fast but Not Deep: Efficient Crowd Abnormality Detection with Local Binary Tracklets  
Mahdyar Ravanbakhsh (University of Genova); Hossein Mousavi (Polytechnique Montreal); Moin Nabi (SAP); Lucio Marcenaro (Università degli Studi di Genova, Genova); Carlo Regazzoni (Università degli Studi di Genova, Genova)

#### 4.15 Oral Session II: Object Detection, Recognition and Tracking

**Time:** 11.00 pm - 12.00 pm

**Date:** 28 Nov 2018 (Wednesday)

**Venue:** AUT WA 224

**Chair:** Evan Gebhardt (The Georgia Institute of Technology)

- **OS II.1:** Wardrobe Model for Long Term Re-identification and Appearance Prediction  
Kyung Won Lee (SUNY at Buffalo); Nishant Sankaran (University at Buffalo); Srirangaraj Setlur (University at Buffalo, SUNY); Nils Napp (University at Buffalo); Venu Govindaraju (University at Buffalo, SUNY)
- **OS II.2:** Combining Local and Global Models for Robust Re-detection in Generic Object Tracking  
Goutam Bhat (Linköping University); Martin Danelljan (Linköping University); Fahad Shahbaz Khan (Linköping University); Michael Felsberg (Linköping University)
- **OS II.3:** Cascade-Dispatched Classifier Ensemble and Regressor for Pedestrian Detection  
Remi Trichet (DCU); Francois Bremond (INRIA Sophia Antipolis, France)
- **OS II.4:** CAMEL Dataset for Visual and Thermal Infrared Multiple Object Detection and Tracking  
Evan T Gebhardt (The Georgia Institute of Technology)

#### 4.16 Oral Session III: Identification

**Time:** 11.00 am - 12.00 pm

**Date:** 29 Nov 2018 (Thursday)

**Venue:** AUT WA 224

**Chair:** Shishir Shah (University of Houston)

- **OS III.1:** A Generalized Optimization Framework for Score Aggregation in Person Re-identification Systems  
Arko Barman (University of Houston); Shishir Shah (University of Houston)
- **OS III.2:** Fast Simultaneous People Detection and Re-identification in a Single Shot Network  
Wiebe Van Ranst (KU Leuven); Toon Goedeme (KU Leuven - EAVISE)
- **OS III.3:** An Intent-Based Automated Traffic Light for Pedestrians  
Christian Ertler (Graz University of Technology); Horst Possegger (Graz University of Technology); Michael Opitz (Graz University of Technology); Horst Bischof (Graz University of Technology)

#### 4.17 Oral Session IV: Modeling

**Time:** 1.30 - 3.00 pm

**Date:** 29 Nov 2018 (Thursday)

**Venue:** AUT WA 224

**Chair:** Jun-Wei Hsieh (National Taiwan Ocean University)

- **OS IV.1:** Efficient Camera Tampering Detection with Automatic Parameter Calibration  
Alexey Sidnev (Intel); Marina Barinova (Intel); Sergei Nosov (Intel)
- **OS IV.2:** Image fusion and influence function for performance improvement of ATM vandalism action recognition  
Hanseok Ko (Korea University); Yun Jeongseop (Korea university)
- **OS IV.3:** Multispectral Matching using Conditional Generative Appearance Modeling  
Christoph Bodensteiner (Fraunhofer IOSB); Sebastian W Bullinger (Fraunhofer IOSB); Michael Arens (Fraunhofer IOSB)
- **OS IV.4:** Real-Time Vehicle Re-Identification System Using Symmelets and HOMs  
Jun-Wei Hsieh (National Taiwan Ocean University)

#### 4.18 Oral Session V: Scene Understanding

**Time:** 11.00 am - 12.00 pm

**Date:** 30 Nov 2018 (Friday)

**Venue:** AUT WA 224

**Chair:** Manoranjan Mohanty (University of Auckland, New Zealand)



- **OS V.1:** GPU-accelerated Height Map Estimation with Local Geometry Priors in Large Scenes  
Alireza Rezaei (Paris Sud University); Nicola Pellicano (Paris Sud University); Emanuel Aldea (University Paris Sud)
- **OS V.2:** Online Multi-Object Tracking with Historical Appearance Matching and Scene Adaptive Detection Filtering  
Young-Chul Yoon (Gwangju Institute of Science and Technology); Abhijeet Boragule (Gwangju Institute of Science and Technology); Young-min Song (Gwangju Institute of Science and Technology); Kwangjin Yoon (Gwangju Institute of Science and Technology); Moongu Jeon (Gwangju Institute of Science and Technology)
- **OS V.3:** Scene Adaptation for Semantic Segmentation using Adversarial Learning  
Daniele Di Mauro (University of Catania); Antonino Furnari (University of Catania); Giuseppe Patane (Park Smart S.r.l.); Sebastiano Battiato (Universita di Catania); Giovanni Maria Farinella (University of Catania, Italy)

#### 4.19 Oral Session VI: Deep Learning

**Time:** 1.30 -3.00pm

**Date:** 30 Nov 2018 (Friday)

**Venue:** AUT WA 224

**Chair:** Saibal Mukhopadhyay (Georgia Tech)

- **OS VI.1:** Edge-Host Partitioning of Deep Neural Networks with Feature Space Encoding for Resource-Constrained Internet-of-Things Platforms  
Jong Hwan Ko (Georgia Tech); Taesik Na (Georgia Tech); Mohammad Amir (Georgia Tech); Saibal Mukhopadhyay (Georgia Tech)
- **OS VI.2:** WatchNet: Efficient and Sequential Network for People Detection in Video Surveillance Systems  
Michael Villamizar (Idiap Research Institute); Angel N Martinez Gonzalez (Idiap research institute; EPFL); Olivier Canevet (Idiap Research Institute); Jean-Marc Odobez (IDIAP/EPFL, Switzerland)
- **OS VI.3:** Orientation-Aware Regression for Oriented Bounding Box Estimation  
Ryusuke Nosaka (Intelligent Systems Laboratory, SECOM CO., LTD.); Hidenori Ujiie (Intelligent Systems Laboratory, SECOM CO., LTD.); Takaharu Kurokawa (Intelligent Systems Laboratory, SECOM CO., LTD.)
- **OS VI.4:** Real-time maritime situation awareness based on deep learning with dynamic anchors  
Vincent Marie (Aix Marseille Univ, Universite de Toulon, CNRS, LIS, UMR 7020); Ikhlef Bechar (Aix Marseille Univ, Universite de Toulon, CNRS, LIS, UMR 7020); Frederic Bouchara (University of Toulon)

## 4.20 Oral Session VII: Sensors and Security

**Time:** 3.30 - 5.10pm

**Date:** 30 Nov 2018 (Friday)

**Venue:** AUT WA 224

**Chair:** Edward Delp (Purdue University)

- **OS VII.1:** Deepfake Video Detection Using Recurrent Neural Networks  
David Guera (Purdue University); Edward Delp (Purdue University)
- **OS VII.2:** Counting People by Infrared Depth Sensors  
Carlos Orrite (University of Zaragoza); Daniel Vicente (University of Zaragoza)
- **OS VII.3:** Anomaly Detection in Crowds using multi sensory information  
Lucio Marcenaro (Universita degli Studi di Genoa, Genoa); Carlo Regazzoni (Universita degli Studi di Genoa, Genoa); Muhammad Irfan (University of Genova)
- **OS VII.4:** Ontology-based Masking Loss for Improved Generalization in Remote Sensing Semantic Retrieval  
Arne Schumann (Fraunhofer IOSB); Lars Sommer (Fraunhofer IOSB, Karlsruhe, Germany); Max Vogler (Fraunhofer IOSB)
- **OS VII.5:** Rotation-invariant Binary Representation of Sensor Pattern Noise for Source-Oriented Image and Video Clustering  
Xufeng Lin (Charles Sturt University); Chang-Tsun Li (Charles Sturt University)

## 4.21 Poster Session I

**Time:** 10.00 - 10.30 am

**Date:** 28 Nov 2018 (Wednesday)

**Venue:** AUT WG 201

**Chair:** Hongmou Zhang (DLR, Germany)

- PS I.1: GPS and IMU Require Visual Odometry for Elevation Accuracy  
Dirk Baumbach (DLR); Hongmou Zhang (DLR); Sergey Zuev (DLR); Jurgen Wohlfeil (DLR); Martin Knoche (NIC); Reinhard Klette (Auckland University of Technology)
- PS I.2: Comprehensive Evaluation of Deep Learning based Detection Methods for Vehicle Detection in Aerial Imagery  
Lars Sommer (Fraunhofer IOSB, Karlsruhe, Germany); Oliver Acatay (Fraunhofer IOSB, Karlsruhe, Germany ); Arne Schumann (Fraunhofer IOSB)
- PS I.3: A Fast and Accurate Forward Vehicle Start Alarm by Tracking Moving Edges Obtained from Dashboard Camera  
Kang Yi (Handong Global University); Kyeong Hoon Jung (Kookmin University)
- PS I.4: Use of a Confidence Map Towards Improved Multi-layer Stixel Segmentation  
Noor Haitham Saleem (AUT); Reinhard Klette (Auckland University of Technology); Fay Huang (National Ilan University)
- PS I.5: Content-Based Multi-Camera Video Alignment using Accelerometer Data  
Antonio C. Nazare (Federal University of Minas Gerais); Filipe de O. Costa (Fundacao CPqD Centro de Pesquisa e Desenvolvimento em Telecomunicacoes); William R Schwartz (Federal University of Minas Gerais)
- PS I.6: Image-based Sea/Land Map Generation from Radar Data  
Francesc Joan Riera (Aalborg University); Rasmus Engholm (Terma A/S); Lars Jochumsen (Terma A/S); Thomas B. Moeslund (Aalborg University)
- PS I.7: Implementation of Modulated Wideband Converter compressed sensing scheme based on COTS lowpass filter with amplitude and phase compensation for spectrum monitoring  
Lap Luat Nguyen (Universite de Bretagne Occidentale); Anthony Fiche (Universite de Bretagne Occidentale); Roland Gautier (Universite de Bretagne Occidentale); Charles Canaff (Universite de Bretagne Occidentale); Emanuel Radoi (Universite de Bretagne Occidentale); Gilles Burel (Universite de Bretagne Occidentale)
- PS I.8: Neural network control for active cameras using master-slave setup  
Renan Oliveira Reis (Federal University of Minas Gerais); William R Schwartz (Federal University of Minas Gerais); Igor Dias (Federal University of Minas Gerais)
- PS I.9: Face Identification for an in-vehicle Surveillance System Using Near Infrared Camera  
Minsong Ki (Yonsei University); Bora Cho (Yonsei University); Taejun Jeon (Yonsei University); Yeongwoo Choi (Sookmyung Women's University); Hyeran Byun (Yonsei University)
- OS IV.4: Real-Time Vehicle Re-Identification System Using Symmelets and HOMs  
Jun-Wei Hsieh (National Taiwan Ocean University)

## 4.22 Poster Session II

**Time:** 12.00 - 12.30 pm

**Date:** 28 Nov 2018 (Wednesday)

**Venue:** AUT WG 201

**Chair:** Stefan Hooper (Auckland University of Technology)

- OS I.1: Simultaneous event localization and recognition for surveillance video  
Yikang Li (Arizona State University); Tianshu Yu (Arizona State University); Baoxin Li (Arizona State University)
- OS I.2: Optical Flow Dataset and Benchmark for Visual Crowd Analysis  
Gregory Schroder (Technische Universität Berlin); Tobias Senst (TU Berlin); Erik Bochinski (TU Berlin); Thomas Sikora (TU Berlin)
- OS I.3: Fast but Not Deep: Efficient Crowd Abnormality Detection with Local Binary Tracklets  
Mahdyar Ravanbakhsh (University of Genova); Hossein Mousavi (Polytechnique Montreal); Moin Nabi (SAP); Lucio Marcenaro (Università degli Studi di Genova, Genoa); Carlo Regazzoni (Università degli Studi di Genova, Genoa)
- PS II.1: A Vision-based Transfer Learning Approach for Recognizing Behavioral Symptoms in People with Dementia  
Zachary Wharton (Edge Hill University); Erik Thomas (Edge Hill University); Bappaditya Debnath (Edge Hill University); Ardhendu Behera (Edge Hill University)
- PS II.2: Unknown Crowd Event Detection from Phase Based Statistics  
Alexia Briassouli (Maastricht university)
- PS II.3: Enhancing Visualisation of Anatomical Presentation and Education Using Marker-based Augmented Reality Technology on Web-based Platform  
Ingjie Wang (Auckland University of Technology); Minh Nguyen (AUT, NZ); Huy Le (Auckland University of Technology); Stefan Hooper (Auckland University of Technology)
- PS II.4: Scene-based Non-uniformity Correction using Complementary Fixed Pattern Noise Models  
Omer Faruk Adil (ASELSAN); Huseyin Seckin Demir (ASELSAN); Samet Almali (ASELSAN)
- PS II.5: Deep-Temporal LSTM for Daily Living Action Recognition  
Srijan Das (INRIA); Michal Koperski (INRIA); Francois Bremond (INRIA Sophia Antipolis, France); Gianpiero Francesca (Toyota-Europe)
- PS II.6: Residual Transfer Learning for Multiple Object Tracking  
Juan Diego Gonzales Zuniga (INRIA); NGUYEN THI LAN ANH (INRIA Sophia-Antipolis); Francois Bremond (INRIA Sophia Antipolis, France)

## 4.23 Poster Session III

**Time:** 10.00 - 10.30 am

**Date:** 29 Nov 2018 (Thursday)

**Venue:** AUT WG 201

**Chair:** Alexander Gatter (DLR, Germany)

- OS II.1: Wardrobe Model for Long Term Re-identification and Appearance Prediction  
Kyung Won Lee (SUNY at Buffalo); Nishant Sankaran (University at Buffalo); Srirangaraj Setlur (University at Buffalo, SUNY); Nils Napp (University at Buffalo); Venu Govindaraju (University at Buffalo, SUNY)
- OS II.2: Combining Local and Global Models for Robust Re-detection in Generic Object Tracking  
Goutam Bhat (Linköping University); Martin Danelljan (Linköping University); Fahad Shahbaz Khan (Linköping University); Michael Felsberg (Linköping)
- OS II.3: Cascade-Dispatched Classifier Ensemble and Regressor for Pedestrian Detection  
Remi Trichet (DCU); Francois Bremond (INRIA Sophia Antipolis, France)
- OS II.4: CAMEL Dataset for Visual and Thermal Infrared Multiple Object Detection and Tracking  
Evan T Gebhardt (Georgia Institute of Technology)
- **OS VI.3:** Orientation-Aware Regression for Oriented Bounding Box Estimation  
Ryusuke Nosaka (Intelligent Systems Laboratory, SECOM CO., LTD.); Hidenori Ujiie (Intelligent Systems Laboratory, SECOM CO., LTD.); Takaharu Kurokawa (Intelligent Systems Laboratory, SECOM CO., LTD.)
- PS III.1: Evaluating deep semantic segmentation networks for object detection in maritime surveillance  
Tom Cane (University of Reading); James Ferryman (Univ. Of Reading, UK)
- PS III.2: Pixel Offset Regression (POR) for Single-shot Instance Segmentation  
Yuezun Li (SUNY, albany); Xiao Bian (GE Global Research); Ming-Ching Chang (Albany University); Longyin Wen (JD Finance); Siwei Lyu (University at Albany)
- PS III.3: A Consensus Framework for Segmenting Video with Dynamic Textures  
Lazhar Khelifi (Montreal university); Max Mignotte (Universite de Montreal)
- PS III.4: Contactless Multiple Finger Segments based Identity Verification using Information Fusion from Higher Order Spectral Invariants  
Akmal Jahan Mohamed Abdul Cader (Queensland University of Technology, Australia); Jasmine Banks (QUT); Vinod Chandran (QUT); Kien Nguyen Thanh (Queensland University of Technology)
- PS III.5: Classifying self-cast shadow regions in aerial camera images  
Alexander Gatter (DLR, Germany)

#### 4.24 Poster Session IV

**Time:** 12.00 - 12.30 pm

**Date:** 29 Nov 2018 (Thursday)

**Venue:** AUT WG 201

**Chair:** Francois Bremond (INRIA Sophia Antipolis, France)

- OS III.1: A Generalized Optimization Framework for Score Aggregation in Person Re-identification Systems  
Arko Barman (University of Houston); Shishir Shah (University of Houston)
- OS III.2: Fast Simultaneous People Detection and Re-identification in a Single Shot Network  
Wiebe Van Ranst (KU Leuven); Toon Goedeme (KU Leuven - EAVISE)
- OS III.3: An Intent-Based Automated Traffic Light for Pedestrians  
Christian Ertler (Graz University of Technology); Horst Possegger (Graz University of Technology); Michael Opitz (Graz University of Technology); Horst Bischof (Graz University of Technology)
- OS VI.1:  
Edge-Host Partitioning of Deep Neural Networks with Feature Space Encoding for Resource-Constrained Internet-of-Things Platforms  
Jong Hwan Ko (Georgia Tech); Taesik Na (Georgia Tech); Mohammad Amir (Georgia Tech); Saibal Mukhopadhyay (Georgia Tech)
- PS IV.1: Detection of High-Risk Intoxicated Passengers in Video Surveillance  
Jae-Yeong Leez (Electronics and Telecommunications Research Institute); Sunglok Choi (ETRI); Jaeho Lim (ETRI)
- PS IV.2: Online Detection of Long-Term Daily Living Activities by Weakly Supervised Recognition of Sub-Activities  
Farhood Negin (INRIA sophia antipolis); Abhishek Goel (INRIA); Abdelrahman G. Abubakr (INRIA); Gianpiero Francesca (Toyota-Europe); Francois Bremond (INRIA Sophia Antipolis, France)
- PS IV.3: Deep Residual Learning for Analyzing Customer Satisfaction using Video Surveillance  
Nehemia Sugianto (Southern Cross University); Dian Tjondronegoro (Southern Cross University)
- PS IV.4: Late Fusion of Multiple Convolutional Layers for Pedestrian Detection  
Ujjwal Ujjwal (INRIA); Aziz Dziri (VEDECOM); Bertrand Leroy (VEDECOM); Francois Bremond (INRIA Sophia Antipolis, France)
- PS IV.5: Drone Detection Using Convolutional Neural Networks with Acoustic STFT Features  
Yoojeong Seo (Soongsil University); Beomhui Jang (Soongsil University); Sungbin Im (Soongsil University)
- PS IV.6: Local Computation with Adaptive Spatial Clustering for Multi-Size Motion Patch Proposals in WAMI  
Yijun Lin (University of Chinese Academy of Sciences); Fengge Wu (Institute of Software Chinese Academy of Sciences)

- PS IV.7: Adaptive Control of Camera Modality with Deep Neural Network-Based Feedback for Efficient Object Tracking  
Priyabrata Saha (Georgia Institute of Technology); Burhan A Mudassar (Georgia Institute of Technology); Saibal Mukhopadhyay (Georgia Institute of Technology)

#### 4.25 Poster Session V

**Time:** 10.00 - 10.30 pm

**Date:** 30 Nov 2018 (Friday)

**Venue:** AUT WG 201

**Chair:** Anthony Griffin (Auckland University of Technology, New Zealand)

- OS IV.1: Efficient Camera Tampering Detection with Automatic Parameter Calibration  
Alexey Sidnev (Intel); Marina Barinova (Intel); Sergei Nosov (Intel)
- OS IV.2: Image fusion and influence function for performance improvement of ATM vandalism action recognition  
Hanseok Ko (Korea University); Yun Jeongseop (Korea University)
- OS IV.3: Multispectral Matching using Conditional Generative Appearance Modeling  
Christoph Bodensteiner (Fraunhofer IOSB); Sebastian W Bullinger (Fraunhofer IOSB); Michael Arens (Fraunhofer IOSB)
- OS V.1: GPU-accelerated Height Map Estimation with Local Geometry Priors in Large Scenes  
Alireza Rezaei (Paris Sud University); Nicola Pellicano (Paris Sud University); Emanuel Aldea (University Paris Sud)
- OS V.2:  
Online Multi-Object Tracking with Historical Appearance Matching and Scene Adaptive Detection Filtering  
Young-Chul Yoon (Gwangju Institute of Science and Technology); Abhijeet Boragule (Gwangju Institute of Science and Technology); Young-min Song (Gwangju Institute of Science and Technology); Kwangjin Yoon (Gwangju Institute of Science and Technology); Moongu Jeon (Gwangju Institute of Science and Technology)
- OS V.3 Scene Adaptation for Semantic Segmentation using Adversarial Learning  
Daniele Di Mauro (University of Catania); Antonino Furnari (University of Catania); Giuseppe Patane (Park Smart S.r.l.); Sebastiano Battiato (Università di Catania); Giovanni Maria Farinella (University of Catania, Italy)
- OS VI.2: WatchNet: Efficient and Sequential Network for People Detection in Video Surveillance Systems  
Michael Villamizar (Idiap Research Institute); Angel N Martinez Gonzalez (Idiap research institute; EPFL); Olivier Canevet (Idiap Research Institute); Jean-Marc Odobez (IDIAP/EPFL, Switzerland)

- PS V.1:  
Detecting and Counting Sheep with a Convolutional Neural Network  
Farah Sarwar (Auckland University of University); Anthony Griffin (Auckland University of University)
- PS V.2: MORA: A Generative Approach to Extract Spatiotemporal Information Applied to Gesture Recognition  
Igor L Bastos (Universidade Federal de Minas Gerais); Victor Melo (UFMG); Gabriel Goncalves (Universidade Federal de Minas Gerais); William R Schwartz (Federal University of Minas Gerais)
- PS V.3: Adapting MobileNets for mobile based upper body pose estimation  
Bappaditya Debnath (Edge Hill University); Mary O'brien (Edge Hill University); Motonori Yamaguchi (Edge Hill University); Ardhendu Behera (Edge Hill University)
- PS V.4: Acoustic Scene Classification Using Joint Time Frequency Image-Based Feature Representations  
Shamsiah Abidin (The University of Western Australia); Roberto Togneri (The University of Western Australia); Ferdous Sohel (Murdoch University)

#### 4.26 Poster Session VI

**Time:** 12.00 - 12.30 pm

**Date:** 30 Nov 2018 (Friday)

**Venue:** AUT WG 201

**Chair:** Xufeng Lin (Charles Sturt University);

- OS VI.4: Real-time maritime situation awareness based on deep learning with dynamic anchors  
Vincent Marie (Aix Marseille Univ, Universite de Toulon, CNRS, LIS, UMR 7020); Ikhlef Bechar (Aix Marseille Univ, Universite de Toulon, CNRS, LIS, UMR 7020); Frederic Bouchara (University of Toulon)
- OS VII.1: Deepfake Video Detection Using Recurrent Neural Networks  
David Guera (Purdue University); Edward Delp (Purdue University)
- OS VII.2: Counting People by Infrared Depth Sensors  
Carlos Orrite (University of Zaragoza); Daniel Vicente (University of Zaragoza)
- OS VII.3: Anomaly Detection In Crowds Using Multi- sensory Information  
Lucio Marcenro (Universita degli Studi di Genoa, Genoa); Carlo Regazzoni (Universita degli Studi di Genoa, Genoa); Muhammad Irfan (University fo Genova)
- OS VII.4: Ontology-based Masking Loss for Improved Generalization in Remote Sensing Semantic Retrieval  
Arne Schumann (Fraunhofer IOSB); Lars Sommer (Fraunhofer IOSB, Karlsruhe, Germany); Max Vogler (Fraunhofer IOSB)



- OS VII.5: Rotation-invariant Binary Representation of Sensor Pattern Noise for Source-Oriented Image and Video Clustering  
Xufeng Lin (Charles Sturt University); Chang-Tsun Li (Charles Sturt University)
- PS VI.1: Latent Body-Pose guided DenseNet for Recognizing Driver's Fine-grained Secondary Activities  
Ardhendu Behera (Edge Hill University); Alexander H Keidel (Edge Hill University)
- PS VI.2: A Blockchain Implementation for the Cataloguing of CCTV Video Evidence  
Michael Kerr (ACIC); Ron van Schyndel (RMIT University); Fengling Han (RMIT University)
- PS VI.3: Encrypted Domain Skin Tone Detection For Pornographic Image Filtering  
Waheeb Yaqub (New York University Abu Dhabi); Manoranjan Mohanty (University of Auckland, New Zealand); Nasir Memon (New York University)
- PS VI.4: Multimodel Drunk Density Estimation for Safety Assessment  
Pratibha Kumari (IIT ROAPR); Mandhatya singh (IIT ROPAR); Mukesh Saini (IIT Ropar)
- PS VI.5: Context is King: Privacy Perceptions of Camera-based Surveillance  
Andrew Tzer-Yeu Chen (University of Auckland); Morteza Biglari-Abhari (University of Auckland); Kevin I-Kai Wang (University of Auckland, New Zealand)

## 5 Local Program Chair's Thanks

Thanks to all the authors who submitted their papers to AVSS18. This year, we received 183 submissions in total. After a first round of double-blind review, we (the program co-chairs) accepted 64 papers for further processing. After the following meta review, we selected 20 papers for oral presentations and 42 papers for poster presentations. This year, authors of oral presentations have been provided the chance to display a poster as well. We appreciate reviewers and meta-reviewers great contributions to this conference.

The Best-paper Award will be presented at the end of these 3-day conference presentations. We are thankful to the committee who recommended the Best-paper Award of this conference. We are grateful for the sponsorship by the *Journal of Imaging* for the Best-paper Award.

AVSS 2018 starts on the first day with tutorial sessions, workshops and challenges. During this issue of AVSS, we have 2 challenges, 6 workshops and 5 keynote speeches on multiple aspects, to manifest and assert the theme of this conference: digital surveillance and artificial intelligence (AI).

We thank the AUT Events team for providing their assistance and collaboration in due course during the preparation and registration of this conference. We thank the IEEE organization for their confidence when deciding to have this conference at Auckland, New Zealand.

Thank you all for your particular contributions and your interest in this conference. We see you at AVSS'19.



Dr. Wei Qi Yan, Program Co-Chair of AVSS 2018

**Short Biography:** Dr. Wei Qi Yan is an associate professor with the Auckland University of Technology (AUT); his expertise is in digital security, surveillance, privacy and forensics; he is leading the Computing Cybersecurity (CCS) Research Group at AUT. Dr. Yan is an Editor-in-Chief (EIC) of the International Journal of Digital Crime and Forensics (IJDCF); he was an exchange computer scientist between the Royal Society of New Zealand (RSNZ) and the Chinese Academy of Sciences (CAS), China; he is a member of the ACM and a senior member of the IEEE. Dr. Yan is a guest (adjunct) professor with PhD supervision of the Chinese Academy of Sciences, China.

## Index

### A

Abdelrahman Abubakr 45  
Abhijeet Boragule 40, 46  
Abhishek Goel 45  
Akmal Jahan Mohamed Abdul Cader 44  
Alexander Gatter 44  
Alexander H Keidel 48  
Alexander Hauptmann 13  
Alexey Sidnev 39, 46  
Alexia Briassouli 43  
Alireza Rezaei 40, 46  
Alperen Elihos 13  
Andreas Specker 16  
Andrew Tzer-Yeu Chen 48  
Angel N Martinez Gonzalez 40, 46  
Ankit Parag Shah 13  
Anne Wieckert 22  
Anniwaer Jiamali 27  
Anthony Fiche 42  
Anthony Griffin 47  
Antonino Furnari 40, 46  
Antonio C. Nazare 42  
Antonio Nazare 16  
Ardhendu Behera 43, 47, 48  
Arko Barman 39, 45  
Arne Schumann 14, 16, 41, 42, 47  
Ashray Doshi 22  
Aziz Dziri 45

### B

Baoxin Li 38, 43  
Bappaditya Debnath 43, 47  
Barbara Bollard-Breen 22  
Bensu Alkan 13  
Beomhui Jang 45  
Bertrand Leroy 45  
Bora Cho 42  
Burak Balci 13  
Burhan A Mudassar 46

### C

Carlo Regazzoni 38, 41, 43, 47  
Carlos Orrite 41, 47  
Chang-Tsun Li 41, 48  
Charles Canaff 42

Chen Xin 27  
Chen-Kuo Kiang 19  
Christian Ertler 39, 45  
Christoph Bodensteiner 39, 46  
Chuljin Cho 22  
Clinton Fookes 16

### D

Daniel Vicente 41, 47  
Daniele Di Mauro 40, 46  
Danni Ren 27  
David Guera 41, 47  
David K. Han 22  
Dawei Zhang 13  
Dian Tjondronegoro 45  
Dirk Barnewitz 22  
Dirk Baumbach 42  
Dominik Rueb 22  
Doo-Hyun Choi 13

### E

Edmund Lai 30  
Edward Delp 35, 41, 47  
Elena Mugellini 22  
Emanuel Aldea 40, 46  
Emanuel Radoi 42  
Emil Barbuta Cipcigan 16  
Erik Bochinski 13, 38, 43  
Erik Thomas 43  
Evan Gebhardt 19  
Evan Krieger 13  
Evan T Gebhardt 44  
Evan T. Gebhardt 38

### F

Fabrice Moscheni 22  
Fahad Shahbaz Khan 38, 44  
Farah Sarwar 47  
Farhood negin 45  
Fay Huang 42  
Fengge Wu 45  
Fengling Han 48  
Ferdous Sohel 47  
Filipe de O. Costa 42  
Filiz Bunyak 14

Francesc Joan Riera 42  
 Francois Bremond 19, 38, 43–45  
 Frederic Bouchara 40, 47

## G

Gabriel Goncalves 16, 47  
 Gee-Sern Hsu 22  
 Gianpiero Francesca 43, 45  
 Gilles Burel 42  
 Giovanni Maria Farinella 40, 46  
 Giuseppe Patane 40, 46  
 Goutam Bhat 38, 44  
 Gregory Schroder 38, 43  
 Guna Seetharaman 14  
 Guozi Sun 27, 28

## H

Hanseok Ko 22, 39, 46  
 Hidenori Ujiie 40, 44  
 Hiren Galiyawala 16  
 Hongmou Zhang 42  
 Hongxia Wang 27  
 Horst Bischof 39, 45  
 Horst Possegger 39, 45  
 Hossein Mousavi 38, 43  
 Huakang Li 27  
 Hugo Nunes 22  
 Huseyin Seckin Demir 43  
 Huy Le 43  
 Hyeran Byun 42

## I

Igor Dias 42  
 Igor L Bastos 47  
 Ikhlef Bechar 40, 47  
 Ingjie Wang 43  
 Ioannis Pitas 30

## J

Jae-Yeong Lee 45  
 Jaeho Lim 45  
 James Ferryman 44  
 Jang-Woon Baek 14  
 Jasmine Banks 44  
 Jean Baptiste Lamare 13  
 Jean Baptiste Ramond 22

Jean-Marc Odobez 22, 40, 46  
 Jia Lu 27  
 Jin Du 27  
 Joel Dumoulin 22  
 Jong Hwan Ko 40, 45  
 Jong Lee 14  
 Juan Diego Gonzales Zuniga 43  
 Jun-Wei Hsieh 13, 39, 42  
 Junyeop Lee 22  
 Jurgen Wohlfeil 42  
 Jürgen Beyer 14, 16

## K

Kang Yi 42  
 Kannappan Palaniappan 14  
 Kathrin Kienapfel 22  
 Keita Mikami 13  
 Kenil Shah 16  
 Kevin I-Kai Wang 48  
 Ki Young Moon 14  
 Kien Nguyen Thanh 44  
 Kil-Taek Lim 14  
 Kristof Van Beeck 22  
 Kwang-Ju Kim 13  
 Kwangjin Yoon 13, 40, 46  
 Kyeong Hoon Jung 42  
 Kyung Won Lee 38, 44

## L

Lap Luat Nguyen 42  
 Lars Jochumsen 42  
 Lars Sommer 14, 41, 42, 47  
 lazhar khelifi 44  
 Lei Zhu 27  
 Li Yu 28  
 Lichao Zhai 28  
 Lijun Yu 13  
 Liping Ding 27  
 Longyin Wen 44  
 Lucio Marcenaro 38, 41, 43, 47  
 Luiz Lima 16

## M

Mahdyar Ravanbakhsh 38, 43  
 Mandhatya Singh 48  
 Manoranjan Mohanty 48

Marilyn Wolf 19  
 Marina Barinova 39, 46  
 Mark Nixon 16  
 Mark S. Nixon 16  
 Martin Danelljan 38, 44  
 Martin Knoche 42  
 Mary O'brien 47  
 Matheus Diniz 16  
 Max Mignotte 44  
 Max Vogler 41, 47  
 Mehul S. Raval 16  
 Mengjie Zhang 36  
 Michael Arens 39, 46  
 Michael Erz 22  
 Michael Felsberg 38, 44  
 Michael Halstead 16  
 Michael Kerr 48  
 Michael Opitz 39, 45  
 Michael Villamizar 22, 40, 46  
 Michal Koperski 43  
 Ming-Ching Chang 44  
 Minh Nguyen 43  
 Minsong Ki 42  
 Mohammad Amir 40, 45  
 Moin Nabi 38, 43  
 Moongu Jeon 13, 40, 46  
 Morteza Biglari-Abhari 48  
 Motonori Yamaguchi 47  
 Muhammad Irfan 41, 47  
 Mukesh Saini 48

## N

Nasir Memon 48  
 Nehemia Sugianto 45  
 Nguyen Thi Lan Anh 43  
 Nicola Pellicano 40, 46  
 Niklas Deckers 22  
 Nikola Kasabov 32  
 Nils Napp 38, 44  
 Nishant Sankaran 38, 44  
 Noor Al-Shakarji 14  
 Noor Haitham Saleem 42

## O

Oliver Acatay 14, 42  
 Olivier Canevet 22, 40, 46  
 Omar Abou Khaled 22

Omer Faruk Adil 43

## P

Pratibha Kumari 48  
 Priyabrata Saha 46

## Q

Qian Zhang 27

## R

Ralf Reulke 22  
 Ramesh Jain 34  
 Rasmus Engholm 42  
 Reinhard Klette 22, 42  
 Remi Trichet 38, 44  
 Renan Oliveira Reis 42  
 Roberto Togneri 47  
 Roland Gautier 42  
 Ron van Schyndel 48  
 Ruxianguli Abudurexiti 27  
 Ryusuke Nosaka 40, 44

## S

Saibal Mukhopadhyay 40, 45, 46  
 Samet Almali 43  
 Sanae Muramatsu 13  
 Sani Mohammed Abdullahi 27  
 Sebastian W Bullinger 39, 46  
 Sebastiano Battiato 40, 46  
 Sergei Nosov 39, 46  
 Sergey Zuev 42  
 Shamsiah Abidin 47  
 Shi Xu 13  
 Shishir Shah 39, 45  
 Simon Denman 16  
 Siwei Lyu 44  
 Srijan Das 43  
 Srirangaraj Setlur 38, 44  
 Steffan Hooper 43  
 Sungbin Im 45  
 Sunglok Choi 45

## T

Taejun Jeon 42  
 Taesik Na 40, 45  
 Takaharu Kurokawa 40, 44

Takeharu Eda 13  
 Tanguy Ophoff 22  
 Theus Aspiras 13  
 Thomas B. Moeslund 42  
 Thomas Sikora 13, 38, 43  
 Tianshu Yu 38, 43  
 Tobias Senst 13, 38, 43  
 Tom Cane 44  
 Toon Goedeme 39, 45  
 TToon Goedeme 22  
 Tuan Nguyen Anh 13

## U

Ujjwal Ujjwal 45

## V

Vandit Gajjar 16  
 Venu Govindaraju 38, 44  
 Victor Melo 47  
 Vijayan Asari 13  
 Vincent Marie 40, 47  
 Vinod Chandran 44

## W

Waheeb Yaqub 48  
 Wei Qi Yan 27, 28  
 Wenjun Li 27  
 Wenti Jiang 27  
 Wiebe Van Ranst 39, 45  
 William R Schwartz 42, 47  
 William Schwartz 16

## X

Xiangqun Chen 13  
 Xiao Bian 44  
 Xue Zhang 28  
 Xuehua Liu 27  
 Xufeng Lin 41, 48

## Y

Yakov Diskin 13  
 Yasen Aizezi 27, 28  
 Yeongwoo Choi 42  
 Yijun Lin 45  
 Yikang Li 38, 43  
 YingLi Tian 16

Yoojeong Seo 45  
 Young-Chul Yoon 13, 40, 46  
 Young-min Song 13, 40, 46  
 Yu Gu 27  
 Yuezun Li 44  
 Yuhong Zu 22  
 Yuhua Feng 28  
 Yun Jeongseop 39, 46  
 Yunsu Chung 13  
 Yusuf Artan 13

## Z

Zachary Wharton 43  
 Zahra Moayed 22