

2021 digital edition - XXIVth ISPRS Congress Preliminary Programme (June 1, 2021)

Monday 5 July Scientific Track

08:00 - 08:50: Spatial Analysis

Chairpersons: Mahmoud Delavar and Wu Hao

- MO.1.1: #374 *A framework to manage uncertainty in the computation of waste collection routes after a flood.* **Arnaud Le Guilcher**, Sofiane Martel, Mickaël Brasebin, Yann Méneroux.
- MO.1.2: #404 *Remote sensing analysis of the changes in vegetated coastland: the case of Southeastern Europe.* **Kuenda Laze**.
- MO.1.3: #313 *On the visualization of positional precision.* **Jochen Meidow**.
- MO.1.4: #487 *An improved temperature spatial interpolation method for spaceborne lidar atmospheric correction.* **Mei Zhou**, Kuangyu Li, Miaomiao Pan, Jiuying Chen, Chuanrong Li, Linsheng Chen.

09:00 - 09:50: Advanced applications for Smart Cities

Chairpersons: Giorgio Agugiaro and Margarita Kokla

- MO.2.1: #282 *Volume comparison of automatically reconstructed multi-LoD building models for urban planning applications.* **Truc Quynh Doan**, Camilo León Sánchez, Ravi Peters, Giorgio Agugiaro, Jantien Stoter.
- MO.2.2: #797 *Development of 3D cadastre in New South Wales through e-PLAN logement.* Taha Masri, **Dev Raj Paudyal**.
- MO.2.3: #238 *Accuracy investigation on image-based change detection for BIM compliant indoor models.* Theresa Meyer, Ansgar Brunn, Uwe Stilla.
- MO.2.4: #395 *Augmented reality asset tracking using hololens.* Jihai Fan, Kourosh Khoshelham.

10:00 - 10:50: Thematic Information Extraction

Chairperson: Xinlian Liang

- MO.3.1: #279 *Towards fine-grained road maps extraction using sentinel-2 imagery.* **Christian Ayala**, Carlos Aranda, Mikel Galar.
- MO.3.2: #620 *Towards Detecting Floating Objects on a Global Scale with Learned Spatial Features using Sentinel-2.* **Jamila Mifdal**, Nicolas Longépé, Marc Rußwurm.
- MO.3.3: #596 *Germany's first cloud-based web service for land monitoring using Copernicus Sentinel-2 data.* **Patrick Werner Knoefel**, David Herrmann, Marcus Sindram, Michael Hovenbitzer.
- MO.3.4: #767 *Estimating carbon and greenhouse gas emissions in remote regions of Canada.* **Ima Ituen**, Baoxin Hu.

11:00 - 11:50: Microwave Remote Sensing

Chairperson: *Batuhan Osmanoglu*

- MO.4.1: #444 *Using generative adversarial networks for extraction of InSAR signals from large-scale Sentinel-1 interferograms by improving tropospheric noise correction.* **Binayak Ghosh**, Mahmud Hagshenas Haghghi, Mahdi Motagh, Setareh Maghsudi.
- MO.4.2: #635 *UAV-based Lidar high-resolution snow depth mapping in the Swiss Alps: Comparing flat and steep forests.* **Kalliopi Koutantou**, Giulia Mazzotti, Philip Brunner.
- MO.4.3: #628 *Exploring cloud-based platforms for rapid InSAR time series analysis.* **Andreas Piter**, Magdalena Vassileva, Mahmud Hagshenas Haghghi, Mahdi Motagh.
- MO.4.4 : #340 *Investigation of Sentinel-1 time series for sensitivity to fern vegetation in a european temperate forest.* **Marlin M. Mueller**, Clémence Dubois, Thomas Jagdhuber, Carsten Pathe, Christiane Schmillius.

12:00 - 12:30: Opening and award ceremony

12:30 - 13:30: Keynote Speaker #1

Emmanuel Flory (Airbus). *Pléiades Neo 30cm-resolution satellite constellation : enhanced data access and geospatial application*

13:30 - 15:00: Interactive poster session

Details coming soon. Full list of posters provided at the end of this document.

15:15 - 16:15: Keynote Speaker #2

Claudio Almeida (INPE, Brazil). *Vegetation monitoring in Brazilian biomes. Legacies, challenges and future perspectives.*

16:30 - 17:20: Sensor Calibration

Chairpersons: *Jan Skaloud, Francesco Nex*

- MO.5.1: #408 *Mounting calibration of a multi-view camera system on a UAV platform.* **Mehrnoush Mohammadi**, Arman Khani, Franz Rottensteiner, Ingo Neumann, Christian Heipke.
- MO.5.2: #642 *Adaptive weighting of image observations for self-calibration with fisheye images.* **Leticia Ferrari Castanheiro**, Antonio Maria Garcia Tommaselli, Mariana Batista Campos, Adilson Berveglieri.
- MO.5.3: #741 *A review of the one-parameter division undistortion model.* **Bastian Erdnuess.**
- MO.5.4: #551 *Sentinel-2 Surface Reflectance Products Generated By CNES And DLR: Methods, Validation And Applications.* **Olivier Hagolle**, Jérôme Colin, Sophie Coustance, Peter Kettig, Pablo d'Angelo, Stefan Auer, Georgia Doxani, Camille Desjardins.

17:30 - 18:20: Object Monitoring in Remote Sensing

Chairpersons: *Michael Schmitt, Rupert Müller*

- MO.6.1: #168 *Extraction of Cloud Heights from Sentinel-2 Multispectral Images.* **Thomas Krauß.**
- MO.6.2: #166 *Thermal anomaly detection based on saliency analysis from multimodal imaging sources.* **Artuom Sledz**, Christian Heipke.
- MO.6.3: #598 *Evaluating uniform manifold approximation and projection for dimension reduction and visualization of PolInSAR features.* **Sylvia Schmitz**, Uwe Weidner, Horst Hammer, Antje Thiele.

- MO.6.4: #419 *Convolutional neural networks for detecting bridge crossing events with ground-based interferometric radar data.* **Matthias Arnold**, Mareike Hoyer, Sina Keller.

18:30 - 19:20: Mobile Mapping

Chairpersons: Naser El-Sheimy, Stephan Nebiker

- MO.7.1: #373 *Fixed-wing micro UAV open data with digicam and raw INS/GNSS.* **Jan Skaloud**, Davide Antonio Cucci, Kenneth Joseph Paul.
- MO.7.2: #297 *RADLER - A Unicycle as a Low-cost Radial Laser Scanner.* **Dorit Borrmann**, Sven Jörissen, Andreas Nüchter.
- MO.7.3: #423 *3D Modeling and GIS analysis for aerodrome forest obstacle monitoring.* **Liudmila Mitsevich**, Natalia Zhukovskaya.
- MO.7.4: #667 *Curiosity-driven reinforcement learning agent for mapping unknown indoor environments.* **Nicolò Botteghi**, Rob Schulte, Beril Sirmacek, Mannes Poel, Christoph Brune.

Tuesday 6 July

Scientific Track

08:00 - 08:50: Data integration

Chairpersons: Zhizhong Kang, Arzu Cöltekin

- TU.1.1: #694 *Region adaptive adjustment strategy based on information entropy for remote sensing image segmentation.* Xiaoli Li, Jinsong Chen.
- TU.1.2: #100 *Classification and identification of artificial lakes based on national geographic-conditions data.* Zhiwu Zhou, Shengyuan Jing, Yinxi Gong, Hui Zhao.
- TU.1.3: #801 *Combining terrestrial scanned datasets with UAV point cloud for mining operations.* Megan Fotheringham, Dev Raj Paudyal.
- TU.1.4: #451 *A platform for multilayered documentation of cultural heritage.* **Marko Radanovic**, Kourosh Khoshelham, Clive Fraser.

09:00 - 09:50: Data processing and simulation

Chairpersons: Maria Brovelli and Martin Breunig

- TU.2.1: #259 *A two-level approach for the crowd-based collection of vehicles from 3D point clouds.* Volker Walter, Michael Koelle, David Collmar, Yongxiang Zhang.
- TU.2.2: #644 *Point cloud based 3D models for agent-based simulation in social distancing and evacuation.* **Shayan Nikoohemat**, Paula Godoy, Nienke Valkhoff, Marlies Wouters, Robert Voute, Ville Lehtola.
- TU.2.3: #242 *An experimental analysis of spatial indexing algorithms for real-time safety-critical map application.* Furkan Cetin, M.Oguzhan Kulekci.
- TU.2.4: #466 *Detection of the spatial variations of local populations from the viewpoint of urban structure analysis.* Kiichiro Kumagai, Yuki Kameda.

10:00 - 10:50: Surface Modelling

Chairpersons: Uwe Soergel, Kaichang Di

- TU.3.1: #214 *Segmentation of buildings based on high resolution persistent scatterer point clouds.* **Philipp Schneider**, Uwe Soergel.
- TU.3.2: #686 *Further adventures in Mars DTM quality: Smoothing errors, sharpening details.* **Randolph L. Kirk**, David P. Mayer, Bonnie L. Redding, Donna M. Galuszka, Robin L. Ferguson, Trent M. Hare, Klaus Gwinner.

- TU.3.3: #630 *3D multi-resolution mapping of Mars using CASP-GO on HRSC, CRISM, CTX and HiRISE*. **Jan-Peter Muller**, Yu Tao, Alfiah Ritzky Diana Putri, Susan Conway.
- TU.3.4: #266 *Evaluating an Automated Object-Oriented Method to Delineate Drumlins from both Terrestrial and Submarine Digital Elevation Models*. **Kakoli Saha**, Katrien J. J. Van Landeghem.

11:00 - 11:50: Hyperspectral Image Processing and Data Fusion

Chairperson: *Eija Honkavaara*

- TU.4.1: #799 *Piecewise anomaly detection using minimal learning machine for hyperspectral images*. **Anna-Maria Raita-Hakola**, Ilkka Pölonen.
- TU.4.2: #530 *Detection of methane plumes in hyperspectral images from Sentinel-5p by coupling anomaly detection and pattern recognition*. **Elyes Ouerghi**, Thibaud Ehret, Carlo de Franchis, Gabriele Facciolo, Thomas Lauvaux, Enric Meinhardt, Jean-Michel Morel.
- TU.4.3: #539 *Analysis and detection of wildfires by using PRISMA hyperspectral imagery*. **Dario Spiller**, Luigi Ansalone, Stefania Amici, Alessandro Piscini, Pierre Philippe Mathieu.
- TU.4.4: #401 *Marrying deep learning and data fusion for accurate semantic labeling of sentinel-2 images*. **Guillemette Fonteix**, Michael Swaine, Maxime Leras, Yuliya Tarabalka, Sébastien Tripodi, Frédéric Trastour, Anne Giraud, Lionel Laurore, Justin Hyland.

12:30 - 13:30: Keynote Speaker #3

Kiran Kumar (ISRO, India). *Collection of scientific data of the Moon with the Chandrayaan satellites*.

13:30 - 15:00: Interactive poster session

Details coming soon. Full list of posters provided at the end of this document.

15:15 - 16:15: Keynote Speaker #4

Marc Pollefeys (ETH Zürich & Microsoft, Switzerland). *Computer Vision for Mixed Reality with Hololens2*.

16:30 - 17:20: 3D Change Detection

Chairperson: *Belén Riveiro*

- TU.5.1: #206 *Automatic point cloud segmentation for the detection of alterations on historical buildings through an unsupervised and clustering-based machine learning approach*. **Antonella Musicco**, Rosella Alessia Galantucci, Silvana Bruno, Cesare Verdoscia, Fabio Fatiguso.
- TU.5.2: #518 *Influence of spatial and temporal resolution on time series-based coastal surface change analysis using hourly terrestrial laser scans*. **Katharina Anders**, Lukas Winiwarter, Hubert Mara, Roderik Lindenbergh, Sander E. Vos, Bernhard Höfle.
- TU.5.3: #645 *Automated and permanent long-range terrestrial laser scanning in a high mountain environment: setup and first results from error identification*. **Annelies Voordendag**, Brigitta Goger, Christoph Klug, Rainer Prinz, Martin Rutzinger, Georg Kaser.
- TU.5.4: #307 *Change detection of time-series 3d point clouds using robust principal component analysis*. **Takashi Fuse**, Toshiki Yamano.

17:30 - 18:20: 3D Instance Detection

Chairperson: *Michael Ying Yang*

- TU.6.1: #499 *Fast Weakly Supervised Detection of Railway-Related Infrastructures in LiDAR Acquisitions*. **Stéphane Guinard**, Jean-Philippe Riant, Jean-Christophe Michelin, Sofia Costa D'Aguiar.
- TU.6.2: #735 *A Framework for Generic Spatial Search in 3D Point Clouds*. **Johannes Otepka**, Gottfried Mandlbürger, Wilfried Karel, Bruno Wöhrer, Camillo Ressel, Norbert Pfeifer.
- TU.6.3: #542 *Roadside tree extraction and diameter estimation with MMS LiDAR by using point-cloud image*. **Genki Takahashi**, Hiroshi Masuda.
- TU.6.4: #322 *Segmentation of traffic signs from poles with mathematical morphology applied to point clouds*. **Jesús Balado**, Mario Soilán, Lucía Díaz-Vilariño, Peter van Oosterom.

18:30 - 19:20: 3D Semantic Segmentation

Chairperson: Norbert Haala

- TU.7.1: #790 *Weakly supervised pseudo-label assisted learning for 3D point cloud semantic segmentation*. **Puzuo Wang**, Wei Yao.
- TU.7.2: #298 *Towards Mesh-Based Deep Learning for Semantic Segmentation in Photogrammetry*. **Manuel Knott**, Rick Groenendijk.
- TU.7.3: #188 *Which 3D data representation does the crowd like best? Crowd-based active learning for coupled semantic segmentation of point clouds and textured meshes*. **Michael Kölle**, Dominik Laupheimer, Volker Walter, Norbert Haala, Uwe Soergel.
- TU.7.4: #111 *Tesserae3D: A benchmark for tesserae semantic segmentation in 3D point clouds*. **Abderrazzaq Kharroubi**, Line Van Wersh, Roland Billen, Florent Poux.

Wednesday 7 July

Scientific Track

08:00 - 08:50: Education and Outreach

Chairpersons: Senthil Kumar, Sheryl Rose Reyes

- WE.1.1: #633 *Creative strategies in navigating the new normal: advancing the contributions of the ISPRS Student Consortium as an international organization*. **Sheryl Rose Reyes**, Charmaine Cruz, Mustafa Ustuner, Sona Guliyeva, Charles Jjuuko.
- WE.1.2: #424 *A webgis framework for semi-automated geodatabase updating assisted by deep learning*. **Recep Can**, Sultan Kocaman, Ali Ozgun Ok.
- WE.1.3: #152 *Regression analysis of errors of SAR-based DEMs and controlling factors*. **Yen-Yi Wu**, Hsuan Ren.
- WE.1.4: #538 *Towards gender equality in education and career in the Earth observation and GI sector*. **Barbara Riedler**, Nathalie Stéphenne, Estefanía Aguilar-Moreno, Marie Jagaille, Aida Monfort-Muriach, Grazia Fiore, Natassa Antoniou.

09:00 - 09:50: Landuse and Landcover Change Detection

Chairpersons: Ammatzia Peled, Yongnian Zeng

- WE.2.1: #547 *Adversarial discriminative domain adaptation for deforestation detection*. **Javier Noa Turnes**, Pedro Juan Soto Vega, Gilson Alexandre Ostwald Pedro Costa, Dennis Wittich, Raul Queiroz Feitosa, Franz Rottensteiner.
- WE.2.2: #356 *Contribution index of land cover and land surface temperature changes in upper hill Nairobi, Kenya*. **Patricia Wanjiku Mwangi**, Faith Njoki Karanja, Peter Kariuki Kamau, Sammy Letema.

- WE.2.3: #393 *Investigations on feature similarity and the impact of training data for land cover classification*. **Mirjana Voelsen**, Daliana Lobo Torres, Raul Queiroz Feitosa, Franz Rottensteiner, Christian Heipke.
- WE.2.4: #365 *Graph Neural Network Based Multi-feature Fusion for Building Change Detection*. **Wei Yuan**, Xiuxiao Yuan, Zipei Fan, Zhiling Guo, Xiaodan Shi, Jianya Gong, Ryosuke Shibasaki.

10:00 - 10:50: Application of Remote Sensing Data

Chairpersons: Mitsunori Yoshimura, Fazlay S. Faruque

- WE.3.1: #112 *Estimation of Land Surface Albedo from GCOM-C/SGLI Surface Reflectance*. **Junichi Susaki**, Hiroaki Sato, Amane Kuriki, Koji Kajiwara, Yoshiaki Honda.
- WE.3.2: #380 *Estimation of optimal crown coverage and canopy shape for shadow estimation on tropical moist broadleaf forest*. **Takumi Fujiwara**, Wataru Takeuchi.
- WE.3.3: #325 *Automated building segmentation and damage assessment from satellite images for disaster relief*. **Xiangtian Yuan**, Seyed Majid Azimi, Corentin Henry, Veronika Gstaiger, Marco Codastefano, Michael Manalili, Stefano Cairo, Sirio Modugno, Marc Wieland, Anne Schneibel, Nina Merkle.
- WE.3.4: #726 *Evaluating the impact of LaSRC and Sen2cor atmospheric correction algorithms on Landsat-8/OLI and Sentinel-2/MSI data over AERONET stations in Brazilian territory*. **Rennan de Freitas Bezerra Marujo**, José Guilherme Fronza, Anderson Reis Soares, Gilberto Ribeiro de Queiroz, Karine Reis Ferreira.

11:00 - 11:50: Best Paper session

Chairperson: Christian Heipke

- WE.4.1: #462 *Robust estimation in robot vision and photogrammetry: A general model and its applications*. **Jiayuan Li**, Yongjun Zhang, Qingwu Hu
- WE.4.2: #717 *Towards efficient indoor/outdoor registration using planar polygons*. **Rahima Djahel**, Bruno Vallet, Pascal Monasse
- WE.4.3: #572 *Water quality retrieval and algal bloom detection using high-resolution CubeSat imagery*. **Milad Niroumand-Jadidi**, Francesca Bovolo
- WE.4.4: #653 *Joint estimation of road roughness from crowd-sourced bicycle acceleration measurements*. **Oskar Wage**, Monika Sester
- WE.4.5: #118 *Knowledge and skills related to active optical sensors in the body of knowledge for earth observation and geoinformation (EO4GEO BoK)*. **Clémence Dubois**, Boris Jutzi, Marc Olijslagers, Carsten Pathe, Christiane Schmullius, Martyna Anna Stelmaszczuk-Górska, Danny Vandenbroucke, Martin Weinmann.

12:30 - 13:30: Keynote Speaker #5

Chenghu Zhou (CAS, China). *Contribution of geospatial technology against COVID-19*.

13:30 - 15:00: Interactive poster session

Details coming soon. Full list of posters provided at the end of this document.

15:15 - 16:15: Keynote Speaker #6

Christoph Stiller (Univ. Karlsruhe & KIT, Germany). *Automated driving with and without maps*.

16:30 - 17:20: 2D Segmentation and Classification

Chairperson: Ribana Roscher

- WE.5.1: #178 *Bidirectional Multi-Scale Attention Networks for Semantic Segmentation of Oblique UAV Imagery*. **Ye Lyu**, George Vosselman, Gui-Song Xia, Michael Ying Yang.
- WE.5.2: #271 *Semi-supervised segmentation of concrete aggregate using consensus regularisation and prior guidance*. **Max Coenen**, Tobias Schack, Dries Beyer, Christian Heipke, Michael Haist.
- WE.5.3: #153 *Remote sensing image classification with the SEN12MS dataset*. **Michael Schmitt**, Yu-Lun Wu.
- WE.5.4: #142 *Detecting Cracks and Spalling Automatically in Extreme Events by End-to-end Deep Learning Frameworks*. **Yongsheng Bai**, Halil Sezen, Alper Yilmaz.

17:30 - 18:20: 3D Registration

Chairperson: Franz Rottensteiner

- WE.6.1: #776 *Maximum Consensus Localization using LiDAR Sensors*. **Jeldrik Axmann**, Claus Brenner.
- WE.6.2: #174 *Influence of co-alignment procedures on the co-registration accuracy of multi-epoch SfM points clouds*. Mirko Saponaro, Alessandra Capolupo, **Giacomo Caporusso**, Eufemia Tarantino.
- WE.6.3: #337 *Photogrammetry and computed tomography point cloud registration using virtual control points*. **Kun Zhan**, Dieter Fritsch, Joerg F Wagner. (*asking for earlier session*)
- WE.6.4: #733 *Registration optimization of mobile handheld scanner point clouds with static scans*. **Victor Alteirac**, H el ene Macher, Tania Landes.

18:30 - 19:20: Stereo Matching

Chairperson: Ewelina Rupnik

- WE.7.1: #263 *Mixed probability models for aleatoric uncertainty estimation in the context of dense stereo matching*. **Zeyun Zhong**, Max Mehlretter.
- WE.7.2: #151 *Real-time depth map estimation from infrared stereo images of RGB-D cameras*. Jiageng Zhong, **Ming Li**, Xuan Liao, Jiangying Qin, Hanqi Zhang, Qi Guo. (*asking for earlier session*)
- WE.7.3: #333 *3D Surface Reconstruction From Multi-Date Satellite Images*. **Bullinger, Sebastian**, Christoph Bodensteiner, Michael Arens.
- WE.7.4: #426 *A new stereo dense matching benchmark dataset for deep learning*. **Teng Wu**, Bruno Vallet, Marc Pierrot-Deseilligny, Ewelina Rupnik.

Thursday 8 July

Thematic Sessions

08:00 - 08:50: Digital Twins

Chairpersons: Arzu  oltekin (FHNW), Sidonie Christophe (LASTIG)

- TH.1.1: #149 *Mapping of 3D eye-tracking in urban outdoor environments*. **Andreas Kollert**, Martin Rutzinger, Magnus Bremer, Katja Kaufmann, Tabea Bork-H uffer.
- TH.1.2: #382 *Creating 3D indoor first responder situation awareness in real-time through a head-mounted AR device*. **Bart-Peter Smit**, Robert Vo ute, Edward Verbree.
- TH.1.3: #671 *Embodied digital twins for environmental applications*. Pejman Sajjadi, Jiayan Zhao, Jan Oliver Wallgrun, Jiawei Huang, Mahda Bagher, **Alexander Klippel**.

- TH.1.4: #578 *Hybrid GIS-BIM approach for the Torino Digital-Twin: the implementation of a 3D city geodatabase for floor-level urban analysis.* **Giulia Sammartano**, Marco Avena, Marco Cappellazzo, Antonia Spanò.

09:00 - 09:50: Unconventional applications for geospatial deep learning

Chairpersons: *Matthieu Molinier (VTT), Devis Tuia (EPFL)*

- TH.2.1: #306 *Deep learning for vessel detection and identification from spaceborne optical imagery.* **Giona Matasci**, Jonathan Plante, Kevin Kasa, Payam Mousavi, Andrew Stewart, Andrew Macdonald, Anne Webster, Jennifer Busler.
- TH.2.2: #512 *Deep no learning approach for unsupervised change detection in hyperspectral images.* **Saha, Sudipan**; Kondmann, Lukas; Zhu, Xiao Xiang.
- TH.2.3: #649 *JUngle-Net: using explainable machine learning to gain new insights into the appearance of wilderness in satellite imagery.* **Timo Tjaden Stomberg**, Immanuel Weber, Michael Schmitt, Ribana Roscher.
- TH.2.4: #708 *End-to-end physics-informed representation learning from and for satellite ocean remote sensing data.* **Ronan Fablet**, Mohamed-Mahmoud Amar, Quentin Febvre, Maxime Beauchamp, Bertrand Chapron.

10:00 - 10:50: AI for Knowledge Discovery in Geosciences

Chairpersons: *Anca Popescu (ESA), Diego Fernandez-Prieto (ESA)*

- TH.3.1: #252 *AI4EO: Reasoning, Uncertainty, Ethics and Beyond.* **XiaoXiang Zhu**
- TH.3.2: #258 *Causal inference in Earth system sciences.* **Jakob Runge**
- TH.3.3: #316 *Explainable Deep Learning: Paradigms for Earth Observation.* **Mihai Datcu**
- TH.3.4: #317 *Asking questions to Sentinel images: a deep learning perspective.* **Devis Tuia**, Sylvain Lobry
- TH.3.5: #730 *Remote sensing, AI and innovative prediction methods for adapting cities to the impacts of the climate change.* **Beril Sirmacek**
- TH.3.6: #253 *Earth system data cubes: towards a multivariate understanding of regional to global land surface dynamics.* **Miguel Mahecha**, Fabian Gans, Gunnar Brandt, Markus Reichstein, Carsten Bruckmann

11:00 - 11:50: Towards resilient & ubiquitous navigation

Chairperson: *Charles Toth (OSU)*

- TH.4.1: #775 *Cubesat onboard algorithm for space debris motion determination by processing stereo images.* **Sergei Petrovich Simakov**, Igor Vitalevich Belokonov
- TH.4.2: #417 *Image-based orientation determination of mobile sensor platforms.* **Oliver Hasler**, Stephan Nebiker
- TH.4.3: #479 *Analysis of positioning deviation between Beidou and GPS based on National Reference Stations in China.* **Ming Chen**, Qinglan Zhang
- TH.4.4: #513 *Feasibility Verification of Virtual Reference Station Technology in Geological Hazard Monitoring.* **Qinglan Zhang**, Ming Chen, Junli Wu, Chaoqian Xu, Fan Wang
- TH.4.5: #745 *Assessment of car collaborative positioning with UWB and vision.* **Andrea Masiero**, Charles Toth, Jelena Gabela, Guenther Retscher
- TH.4.6: #146 *Dynamic routing for navigation in changing unknown maps using deep reinforcement learning.* **Yuci Han**, Alper Yimaz

12:00 - 15:00: Forum #1

15:15 - 16:15: Keynote Speaker #7

Sarah Gallagher (Univ. of Western Ontario and Canadian Space Agency, Canada).
Space-based Earth observations. Challenges and new opportunities.

16:30 - 17:20: ISPRS Scientific Initiatives & Education and Capacity Building Initiatives (I)

Chairperson: Songnian Li (Ryerson University)

- TH.5.1: *The ISPRS Benchmark Test on Indoor Modelling.* **Kourosh Khoshelham**, Ha Tran, Debaditya Acharya, Lucia Díaz Vilariño, Zhizhong Kang, Sagi Dalyot
- TH.5.2: *GeoBIM benchmark: reference study on software support for open standards of city and building models.* **Francesca Noardo**, Ken Arroyo Ogori, Filip Biljecki, Claire Ellul, Lars Harrie, Thomas Krijnen, Margarita Kokla, Jantien Stoter
- TH.5.3: *International Benchmarking of terrestrial Image-based Point Clouds for Forestry.* Markus Hollaus, **Martin Mokroš**, Yunsheng Wang

17:30 - 18:20: ISPRS Scientific Initiatives & Education and Capacity Building Initiatives (II)

Chairperson: Songnian Li (Ryerson University)

- TH.6.1: *Development of an Online Spectral Library for Pigments of Paintings.* **Shuqiang Lyu, Miaole Hou**, Ahmed Shaker Abdelrahman, Jeffrey Lee
- TH.6.2: *#411 UP4DREAM capacity building project: UAS based mapping in developing countries.* Alessio Calantropio, **Filiberto Chiabrando**, Jessica Comino, Andrea Lingua, Paolo Maschio, Tautvydas Juskauskas
- TH.6.3: *Development of educational content for the "D3MOBILE Metrology World League.* **Juan Pedro Ortiz-Sanz**, Mariluz Gil-Docampo, Teresa Rego-Sanmartín, Marcos Arza-García, Grazia Tucci, Erica Isabella Parisi, Valentina Bonora, Francesco Mugnai
- TH.6.4: *LightCam: Enlightening the camera obscura - Where photogrammetry, computer and robotic vision meet.* **Erica Nocerino**, Fabio Menna, Ronny Hänsch

18:30 - 19:20: Cultural Heritage

Chairpersons: Michael Younan (GSEC), Fulvio Rinaudo (Politecnico di Torino)

- TH.7.1: *Modelling the evolution of the archeological works developed in Qubbet El Hawa (Aswan, Egypt).* **Jose Luis Pérez-García**, Antonio T. Mozas-Calvache, Jose Miguel Gómez-López, Alejandro Jiménez-Serrano
- TH.7.2: *#707 Integrating topographic, photogrammetric and laser scanning techniques for a Scan-to-BIM process.* **Mauro Lo Brutto**, Emanuele Iuculano, Paolo Lo Giudice
- TH.7.3: *#732 HBIM modelling for an historical urban centre.* **Antonia Spanò**, Marco Avena, Giulia Sammartano, Elisabetta Colucci.
- TH.7.4: *#302 The reliability assessment of the TLS registration methods - the case study of the Royal Castle in Warsaw.* **Jakub Markiewicz**, Sławomir Łapiński, Agnieszka Bocheńska, Patryk Kot

Friday 9 July
ISPRS Geospatial Lecture Day 2021

8:30 - 11:00: Remote Sensing

Chairperson: Uwe Sörgel (University of Stuttgart)

8:30 – 9:30: Timo Balz (Wuhan University). *PS-InSAR for surface motion estimation*

9:30 – 10:30: Gottfried Mandlbauer (TU Wien). *State and Trends in Airborne LiDAR*

10:30 – 11:00: coffee break & discussion chats

11:00 Deep learning

Chairperson: Ribana Roscher (University of Bonn)

11:00 – 12:00: Loic Landrieu (IGN-ENSG). *Deep learning for 3D Point Cloud Analysis*

12:00 – 13:00: Charlotte Pelletier (UBS Vannes) & Marc Rußwurm (TUM). *Deep Learning for time series classification*

13:00 – 14:00: lunch break & discussion chats

14:00 Photogrammetry

Chairperson: Erica Nocerino (Aix Marseille Université)

14:00 – 15:00: Ewelina Rupnik (IGN-ENSG, Univ. Gustave Eiffel), Marc Pierrot-Deseilligny (IGN-ENSG, Univ. Gustave Eiffel), Yilin Zhou (Amadeus), Mehdi Daakir (CERN). *High-precision mapping with UAVs*

15:00 – 16:00: Davide Cucci (EPFL). *Dynamic networks*

16:00 – 16:30: coffee break & discussion chats

16:30 GIS & OGC

Chairperson: Margarita Kokla (National Technical University of Athens)

16:30 – 17:30: Serena Coetzee (University of Pretoria) & Maria Antonia Brovelli (Politecnico di Milano). *Geospatial Tools for Collaborative Humanitarian Mapping*

17:30 – 18:30: Peter Baumann (Jacobs University). *Federated Earth Datacubes: Concepts, Standards, Services*

Interactive oral sessions

Posters

We are currently designing the interactive oral session program.
The day each poster will be presented is not yet ready.

Annals

Technical Commission I: Sensor Systems

- **#135** *Drone-Based Container Crane Inspection: Concept, Challenges and Preliminary Results.* **Mehdi Maboudi**, Ahmed Alamouri, Vanessa De Arriba López, Mohammad Shafi Bajauri, Cosima Berger, Markus Gerke.
- **#236** *Individual tree extraction from uav lidar point clouds based on self-adaptive mean shift segmentation.* **Zhenyang Hui**, Na Li, Yuanping Xia, Penggen Cheng, Yating He.
- **#399** *Deep learning for automatic building damage assessment: application in post-disaster scenarios using UAV data.* **Alessio Calantropio**, Filiberto Chiabrando, Marco Codastefano, Elizabeth Bourke.
- **#432** *DeepLIO: Deep Lidar Inertial Sensor Fusion for Odometry Estimation.* **Arash Javanmard-Ghareshiran**, Dorota Iwaszczuk, Stefan Roth.
- **#618** *Terrestrial mobile mapping based on a microwave radar sensor. Application to the localization of mobile robots.* **Raphaël Rouveure**, Patrice Faure, Marie-Odile Monod.

Technical Commission II: Photogrammetry

- **#173** *A web-based platform for management and visualization of geometric documentation products of cultural heritage sites.* **Charalabos Ioannidis**, Ioannis Tallis, Ilias Pastos, Argyro-Maria Boutsis, Styliani Verykokou, Sofia Soile, Panagiotis Tokmakidis, Konstantinos Tokmakidis.

Technical Commission III: Remote Sensing

- **#102** *Monitoring of Time-Series Soil Moisture Based on Advanced DInSAR.* **Chia-Hsiang Yang**, Andreas Mütterthies.
- **#122** *Updating landslide inventory maps using high resolution digital orthophotos and Digital Surface and Elevation modeling: the case study of Brusque city, Santa Catarina State, Brazil.* **Liliana Sayuri Osako**.
- **#125** *A calculation method of ecosystem service value based on product of national geographic conditions monitoring in China.* **Tao Cheng**, Xinyan Zheng, Huixian Chen, Jin Liu, Xinyuan Gao, Weiwei Zhang.
- **#185** *Eelgrass Mapping with Sentinel-2 and UAV Data in Prince Edward Island (Canada).* **Eleanor Gallant**, Armand LaRocque, Brigitte Leblon, Angela Douglas.

- **#249** *A fully automated and fast approach for canopy cover estimation using high-resolution remote sensing imagery.* **M. Maimaitijiang**, V. Sagan, S. Bhadra, C. Nguyen, T.C. Mockler, N. Shakoor.
- **#352** *Positive and negative roughness according to local differences between DEM surface and 3D reference planes.* **Jean Francois Parrot**, Carolina Ramirez Nunez.
- **#397** *Advanced surface-reflected radiance correction for airborne hyperspectral image in the case of coastal red tide detection.* **Jee-Eun Min**, Seung-Kuk Lee, Joo-Hyung Ryu.
- **#418** *Forest cover mapping and Pinus species classification using very high-resolution satellite images and random forest.* **Laura Alonso**, Juan Picos, Julia Armesto.
- **#442** *Deep Bayesian active learning in high-resolution satellite images for change detection in urban and suburban areas.* **Lemonia Ragia**, Antigoni Panagiotopoulou.
- **#478** *A Comparison of Machine Learning Models for Soil Salinity Estimation Using Multi-Spectral Earth Observation Data.* **Arastou Zarei**, Mahdi Hasanlou, Masoud Mahdianpari.
- **#486** *Research on quality control method of land cover classification data oriented to national geographic condition monitoring.* **Wenjuan Mao**, Haitao Zhao, Wenchao Gao, Hongjing Tu, Yongmin Xu.
- **#489** *Estimation of Snow Depletion Curve for Gangotri Basin using Multi-Source Remote Sensing Data.* **Prateek Verma**, Sanjay Kumar Ghosh, RAAJ Ramsankaran.
- **#599** *Comparison of classification algorithms of images for the mapping of the land covering in Tasso Fragoso municipality, Brazil.* **Paulo Roberto Mendes Pereira**, Francisco Wendell Dias Costa, Édson Luis Bolfe, Lucrencio Silvestre Macarringe, Adielson Corrêa Botelho.
- **#605** *Toward a multi-source remote sensing wetland inventory of the us: preliminary results on wetland inventory of minnesota.* **Sarina Adeli**, Bahram Salehi, Masoud Mahdianpari, Lindi J. Quackenbush.
- **#638** *Multi-sensor Approach to Leaf Area Index Estimation Using Statistical Machine Learning Models: A Case on Mangrove Forests.* **Kayziel Martinez**, Diana Faith Burgos, Ariel Blanco, Severino Salmo III.
- **#656** *Use of landsat-8 oli imagery and local indigenous knowledge for eelgrass mapping in eeyou istchee.* **Kevin Clyne**, Brigitte Leblon, Armand LaRocque, Maycira Costa, Mélanie-Louise Leblanc, Ernie Rabbitskin, Marc Dunn.
- **#687** *A method of water depth inversion in coastal area considering temperature information.* **Yu Liu**, Xinyuan Gao, Guanghui Wang, Tao Zhang, Jie Wang.
- **#691** *Water quality monitoring over Finger Lakes region using Sentinel-2 imagery on Google Earth Engine cloud computing platform.* **Rabia Munsaf Khan**, Bahram Salehi, Masoud Mahdianpari, Fariba Mohammadimanesh.
- **#715** *A comparison of decision tree-based models for forest above-ground biomass estimation using a combination of airborne lidar and landsat data.* **Haifa Tamiminia**, Bahram Salehi, Masoud Mahdianpari, Colin M. Beier, Lucas Johnson, Daniel B. Phoenix.
- **#758** *Post-disaster assessment of mangrove forest recovery in Lawaan-Balangiga, Eastern Samar using NDVI Time Series Analysis.* **Keith Ann E. Cabello**, Mark Jonathan Q. Germentil, Ariel C. Blanco, Edgardo G. Macatulad, Severino G. Salmo III.
- **#771** *Monitoring and assessment of agri-urban land conversion using multi-sensor remote sensing and GIS techniques.* **Dominic Cabanlit Fargas Jr.**, Gilson Andre Morata Narciso, Ariel Conferido Blanco.
- **#810** *An unsupervised method based on fire index enhancement and GRNN for automated burned area mapping from single-period remote sensing imagery.* **Qi Zhang**, Yao Xiao.

Technical Commission IV: Spatial Information Science

- **#150** *Geometric enhancement of the openstreetmap road network.* **Fatima Zohra Belhouari**, Issam Boukerch, Kamel Siyoucef.

- **#420** *Plastic surgery for 3d city models: a pipeline for automatic geometry refinement and semantic enrichment.* **Olaf Wysocki**, Benedikt Schwab, Ludwig Hoegner, Thomas Heinrich Kolbe, Uwe Stilla.
- **#676** *Accessing and processing Brazilian earth observation data cubes with the Open Data Cube platform.* **Vitor Conrado Faria Gomes**, Felipe Menino Carlos, Gilberto Ribeiro Queiroz, Karine Reis Ferreira, Rafael Santos.
- **#701** *Earthquake prediction evaluation based on VLF data using a novel "intersection-union" method.* **Wrya Barghi**, Mahmoud Reza Delavar, Mahmoud Shahabadi, Mehdi Zare, Seyed Ahmad Eslaminezhad, Hadi Bayat.
- **#714** *2-Dimensional Geometric Analysis of a Simple Free Network.* **Bryan Sluis**, Charles Toth.
- **#742** *Effects of geospatial data sources on the identification and characterization of burnt areas in portugal.* **Cidália Costa Fonte**, Joaquim Patriarca, Diogo Duarte.
- **#787** *Suitable dem assessment study for data scarce cities towards urban extreme and nuisance flood mapping.* **Anjaneyulu Akkimi**, Sibashisa Dutta.

Thematic Sessions

AI for Knowledge Discovery in Geoscience

- **#128** *Image to Point Cloud Translation using Conditional Generative Adversarial Network for Airborne LiDAR data.* **Takayuki Shinohara**, Haoyi Xiu, Masashi Matsuoka.

Visualization of complex spatio-temporal data and phenomena on Earth

- **#287** *Practices, pitfalls and guidelines in visualising Lagrangian ocean analyses.* **Christian Kehl**, Reint P.B. Fischer, Erik Van Sebille.
- **#658** *Image-Based Reality-Capturing and 3d Modelling for The Creation of VR Cycling Simulations.* **Wissam Wahbeh**, Manuela Ammann, Stephan Nebiker, Michael Van Eggermond, Alexander Erath.

Archives

Technical Commission I: Sensor Systems

- **#133** *Towards more efficient UAS data acquisition: camera auto mount pivoting oblique survey.* **Igor Sales Da Gama Campos**.
- **#163** *On the classifier performance for simulation based debris detection in SAR imagery.* **Silvia Kuny**, Horst Hammer, Karsten Schulz.
- **#191** *RPAS based tracking of machinery used in asphalt paving process.* **Guido Martin Staub**, Henry Diverth Montecino, José Esteban Díaz, Mauricio Alejandro Pradena, Seirgei Miller, Marcos Alfonso Díaz.
- **#221** *Analysis and bias improvement of height modes based on satellite images.* **Karsten Jacobsen**, Ricardo Passini.
- **#234** *A Procedure for Identifying Invasive Wild Parsnip Plants based on Visible Bands from UAV Images.* **Jingyi Liu**, Mohammad Dalower Hossain, Dongmei Chen.
- **#283** *Cooperative localisation using image sensors in a dynamic traffic scenario.* **Philipp Trusheim**, Yajie Chen, Franz Rottensteiner, Christian Heipke.
- **#284** *Setup of a CORONA camera and image co-registration/calibration.* **Noah Kunz**, Peter Bochmann, Gerhard Kemper.

- **#293** *Improving the Internal Accuracy of UAV-Image Blocks using Local Low-Altitude Flights and Scale-Bars.* **Mehdi Maboudi**, Ahmed Elbillehy, Yahya Ghassoun, Markus Gerke.
- **#338** *Investigating the performance of a handheld mobile mapping system in different outdoor scenarios.* **Eleonora Maset**, Sara Cucchiaro, Federico Cazorzi, Fabio Crosilla, Andrea Fusiello, Alberto Beinat.
- **#377** *1D-Convolutional Autoencoder based hyperspectral data compression.* **Jannick Kuester**, Wolfgang Gross, Wolfgang Middelman.
- **#378** *Accuracy validation of tilted camera setups in open skies project and mapping applications.* **Mathias Motz, Dr. Gerhard Kemper**, Doru Ciobanu.
- **#409** *Open urban and forest datasets from a high-performance mobile mapping backpack – a contribution for advancing the creation of digital city twins.* **Stefan Blaser**, Jonas Meyer, Stephan Nebiker.
- **#430** *Mapping barley lodging with UAS multispectral imagery and machine learning.* **Odysseas Vlachopoulos**, Brigitte Leblon, Jinfei Wang, Ataollah Haddadi, Armand Larocque, Greg Patterson.
- **#433** *Object tracking control using a RPAS gimbal mechanism applied to industrial photogrammetry inspection.* **Daniel Juchem Regner**, José Dueñas Salazar, Pedro Vieira Buschinelli, Michael Machado, Diogo Oliveira, João Marcio Santos, Carla Alves Marinho, Tiago Da Costa Pinto.
- **#437** *Development of a low-cost, hand-held multi-sensor system for the monitoring of small water bodies.* **Robert Blaskow**, Ellen Schwalbe.
- **#438** *An efficient deep learning approach for ground point filtering in aerial laser scanning point clouds.* **Abdul Awal Md Nurunnabi**, Felix Norman Teferle, Jonathan Li, Roderik C. Lindenbergh, Addisu Hunegnaw.
- **#449** *Automatic integration of laser scanning and photogrammetric point clouds: from acquisition to co-registration.* **Tahmineh Partovi**, Marc Daehne, Mehdi Maboudi, Daniel Krueger, Markus Gerke.
- **#498** *The iPad Pro built-in LiDAR sensor: 3D rapid mapping tests and quality assessment.* **Alessandra Spreafico**, Filiberto Chiabrando, Lorenzo Teppati Losè, Fabio Giulio Tonolo.
- **#521** *Predicting the infrared UAV imagery over the coast.* **Antoine Collin**, Dorothee James, Antoine Mury, Mathilde Letard, Benoit Guillot.
- **#526** *An accurate real-time uav mapping solution for the generation of orthomosaics and surface models.* **Alexander Kern**, Phillipp Fanta-Jende, Philipp Glira, Felix Bruckmüller, Christoph Sulzbachner.
- **#534** *Analysis of geometric and orthogonal correction accuracy for cas-500 satellite images.* **Yoo Jin Lee**, Taejung Kim.
- **#537** *Automated reflectance target detection for automated vicarious radiometric correction of uav images.* **Seung Hwan Ban**, Tae Jung Kim.
- **#643** *Evaluating different water-land-boundary approximations to improve SAR-derived Digital Elevation Models.* **Bastian Schneider**, Sylvia Schmitz, Eva Wortmeyer, Antje Thiele, Patrick Havel, Holger Dirks.
- **#647** *Evaluation of 3D UAS flight path planning algorithms.* **Paul Debus**, Volker Rodehorst.
- **#718** *A capsule network approach to pavement crack detection using mobile laser scanning point clouds.* **Wenxuan Zhu, Weikai Tan, Lingfei Ma, Dedong Zhang, Jonathan Li, Michael A. Chapman.**
- **#747** *UAV UWB positioning close to building facades: a case study.* **Myrto Bouloukou**, Andrea Masiero, Antonio Vettore, Vassilis Gikas.
- **#759** *Random forest-based river plastic detection with a handheld multispectral camera.* **Irene Cortesi**, Andrea Masiero, Michaela De Giglio, Grazia Tucci, Marco Dubbini.
- **#761** *A case study of pedestrian positioning with UWB and UAV cameras.* **Andrea Masiero**, Paolo Dabove, Vincenzo Di Pietra, Marco Piragnolo, Antonio Vettore, Sara Cucchiaro, Alberto

Guarnieri, Paolo Tarolli, Charles Toth, Vassilis Gikas, Harris Perakis, Kai-Wei Chiang, Laura Ruotsalainen, Salil Goel, Jelena Gabela.

- **#823** *The What, Where & When! Multi-disciplinary Trend -Detection, -Analysis & -Forecasting From Aerial Film Archives.* Rolf Becker.

Technical Commission II: Photogrammetry

- **#121** *Interactive extraction of linear structures from LiDAR raw data for archaeomorphological structure prospection.* **Philippe Even**, Axelle Grzesznik, Anne Gebhardt, Thomas Chenal, Pierre Even, Phuc Ngo.
- **#124** *Comap: a synthetic dataset for collective multi-agent perception of autonomous driving.* **Yunshuang Yuan**, Monika Sester.
- **#136** *A novel approach to register multi-platform point clouds for rockfall monitoring.* **Dimitrios Bolkas**, Gabriel Walton, Ryan Kromer, Timothy Sichler, Weidner Luke.
- **#138** *Application of UAV oblique photography in real scene 3D modeling.* **Zhou Tihui**, Lv Linbing, Liu Jinhui, Wan Ji.
- **#143** *Mohe-net: monocular object height estimation network using deep learning and scene geometry.* **Jianli Wei**, Jinwei Jiang, Alper Yilmaz.
- **#169** *Larger receptive field based RGB visual relocalization method using convolutional network.* **Jiangying Qin**, Ming Li, Deren Li, Xuan Liao, Jiageng Zhong, Hanqi Zhang.
- **#181** *MRSSC: a benchmark dataset for multimodal remote sensing scene classification.* **Kang Liu**, Aodi Wu, Xue Wan, Shengyang Li.
- **#182** *Strict geometric calibration of an underwater laser triangulation system.* **Hannes Sardemann**, Christian Mulsow, Hans-Gerd Maas.
- **#186** *An efficient representation of 3D buildings: application to the evaluation of city models.* **Oussama Ennafii**, Arnaud Le Bris, Florent Lafarge, Clément Mallet.
- **#189** *Efficient tour planning for a measurement vehicle by combining Next Best View and Traveling Salesman.* **Joachim Gehring**, Marcus Hebel, Michael Arens, Uwe Stilla.
- **#194** *Mbs-net: a moving-camera background subtraction network for autonomous driving.* **Jianli Wei**, Jinwei Jiang, Alper Yilmaz.
- **#201** *3D point cloud data processing and infrastructure information models: methods and findings from SAFEWAY project.* **Mario Soilán**, Andrés Justo, Ana Sánchez-Rodríguez, Daniel Lamas, Belén Riveiro.
- **#204** *Water turbidity estimation from LiDAR bathymetry data by full-waveform analysis - comparison of two approaches.* **Katja Richter**, David Mader, Patrick Westfeld, Hans-Gerd Maas.
- **#207** *Ambiguity concept in stereo matching pipeline.* **Emmanuelle Sarrazin**, Myriam Cournet, Loïc Dumas, Véronique Defonte, Quentin Fardet, Yoann Steux, Natalia Jimenez Diaz, Emmanuel Dubois, David Youssefi, Fabrice Buffe.
- **#208** *Determination of parking space and its concurrent usage over time using semantically segmented mobile mapping data.* **Artem Leichter**, Udo Feuerhake, Monika Sester.
- **#210** *Identification of misclassified pixels in semantic segmentation with uncertainty evaluation.* **Lina Emilie Budde**, Dimitri Bulatov, Dorota Iwaszczuk.
- **#218** *Automatic object segmentation to support crisis management of large-scale events.* **Seyed Majid Azimi**, Ralph Kiefl, Veronika Gstaiger, Reza Bahmanyar, Nina Merkle, Corentin Henry, Dominik Rosenbaum, Franz Kurz.
- **#219** *CNN-based multi-scale hierarchical land use classification for the verification of geospatial databases.* **Chun Yang**, Franz Rottensteiner, Christian Heipke.
- **#223** *Citywide estimation of parking space using aerial imagery and OSM data fusion with deep learning and fine-grained annotation.* **Corentin Henry**, Jens Hellekes, Nina Merkle, Seyed Majid Azimi, Franz Kurz.

- **#228** *Evaluation of tunnel excavation combining terrestrial laser scanning point clouds and design models.* **Yuzhou Zhou**, Zhen Dong, Peiling Tong, Bisheng Yang.
- **#235** *Environmental challenges, technical solutions and standard operating procedures for data collection in photogrammetric studies toward a unified database of objects and features in underwater caves in Mexico.* **Julien Fortin**, Sam Meacham, Dominique Rissolo, Christophe Le Maillot, Fred Devos.
- **#248** *A case study of the application of hand-held mobile laser scanning in the planning of an Italian forest (Alpe di Catenaia, Tuscany).* **Serena Sofia**, Sebastiano Sferlazza, Alessandra Mariottini, Marco Niccolini, Tommaso Coppi, Marcello Miozzo, Tommaso La Mantia, Federico Maetzke.
- **#255** *Calibration and validation of the Intel T265 for visual localisation and tracking underwater.* **Tim Appelt**, Joschka Van Der Lucht, Michael Bleier, Andreas Nüchter.
- **#268** *A Monte Carlo simulation study on the dome effect.* **Riccardo Roncella**, Gianfranco Forlani, Fabrizio Diotri.
- **#270** *BIM on artificial intelligence for decision support in e-health.* **Bastian Plaß**, Claire Prudhomme, Jean-Jacques Ponciano.
- **#273** *Scale-awareness for more accurate object detection.* **Vasileios Tsironis**, Christos Stentoumis, Nikos Lekkas, Alex Nikopoulos.
- **#285** *3D Modelling using Aerial Oblique Images with close range UAV based data for single objects.* **Tomas Orlik**, Eatay Shechter, Gerhard Kemper.
- **#304** *3D and hyperspectral data integration for assessing material degradation in medieval masonry heritage buildings.* **Pol Kolokoussis**, Margarita Skamantzari, Sevasti Tapinaki, Vassilia Karathanassi, Andreas Georgopoulos.
- **#310** *A digital archive of Borobudur based on 3D point clouds.* **Masanori Kawato**, Liang Li, Kyoko Hasegawa, Motoaki Adachi, Hiroshi Yamaguchi, Fadjar Thufail, Sugeng Riyanto, Brahmantara Yk, Satoshi Tanaka.
- **#311** *Bundle adjustment with polynomial point-to-camera distance dependent corrections for underwater photogrammetry.* **Erica Nocerino**, Fabio Menna, Armin Gruen.
- **#314** *Automatic Modelling of 3D Trees using Aerial LIDAR Point Cloud Data and Deep Learning.* **Richard Gerrit Kippers**, Luke Moth, Sander Jacob Oude Elberink.
- **#319** *From survey to 3D modelling to digital fabrication. a workflow aimed at documenting and transmitting built heritage.* **Roberta Spallone**, Maria Concepción López González, Marco Vitali, Giulia Bertola, Fabrizio Natta, Francesca Ronco.
- **#320** *Semantic segmentation of Mobile Laser Scanning point clouds with Long Short-Term Memory networks: Preliminary results.* **Jesús Balado Frías**, Peter Van Oosterom, Lucía Díaz-Vilariño, Pedro Arias.
- **#321** *Environmental influences on the stability of a permanently installed laser scanner.* **Mieke Kuschnerus**, Daniel Schröder, Roderik Lindenbergh.
- **#326** *Evaluation of interior orientation modelling for cameras with aspheric lenses and image pre-processing with special emphasis to SfM reconstruction.* **Heidi Hastedt**, Thomas Luhmann, Heinz-Jürgen Przybilla, Rofallsi Robin.
- **#328** *Towards learning low-light indoor semantic segmentation with illumination-invariant features.* **Ning Zhang**, Francesco Nex, Norman Kerle, George Vosselman.
- **#332** *Real-time semantic SLAM with DCNN-based feature point detection, matching and dense point cloud aggregation.* **Boris Vishnyakov**, Ivan Sgibnev, Viktor Sheverdin, Andrey Sorokin, Pavel Masalov, Kirill Kazakhmedov, Sergey Arseev.
- **#334** *Learning multi-modal features for dense matching-based confidence estimation.* **Konstantin Heinrich**, Max Mehlretter.
- **#342** *Data fusion of historical photographs with modern 3D data for an archaeological excavation – concept and first results.* **Paul Kalinowski**, Frank Both, Thomas Luhmann, Ursula Warnke.

- **#343** *Random noise assessment in aerial and satellite images.* **Aleksandr Chibunichev**, Irina Anikeeva.
- **#344** *Automatic change detection of digital maps using aerial images and point clouds.* **Felix Dahle**, Ken Arroyo Ochori, Giorgio Agugiaro, Sven Briels.
- **#346** *Requirements for aerial images quality, obtained for mapping purposes.* **Aleksandr Chibunichev**, Irina Anikeeva.
- **#348** *3d least squares matching applied to micro-tomography data.* **Frank Liebold**, Renata Lorenzoni, Iurie Curosu, Fabien Léonard, Viktor Mechtcherine, Sidnei Paciornik, Hans-Gerd Maas.
- **#349** *3D reconstruction of ice shape using visible and thermal range imaging for aircraft icing study.* Vladimir A. Knyaz, Mikhail M. **Novikov**, Eugeny V Ippolitov.
- **#364** *A concept for the segmentation of individual urban trees from dense MLS point clouds.* **Philipp-Roman Hirt**, Ludwig Hoegner, Uwe Stilla.
- **#368** *Estimating surface flow velocities of rivers with thermal and rgb uav imagery.* **Anette Eltner**, David Mader, Noemi Szopos, Balint Nagy, Jens Grundmann, László Bertalan.
- **#372** *Indoor mapping of a complex cultural heritage scene using tls and hmls laser scanning.* **Valeria-Ersilia Oniga**, Ana-Ioana Breaban, Eliza-Iulia Alexe, Cosmin Vasii.
- **#391** *Multifunctional 3D model for the Farnese Theatre in Parma.* **Andrea Zerbi**, Sandra Mikolajewska.
- **#410** *Boat-based mobile laser scanning for shoreline monitoring of large lakes.* **Danilo Schneider**, Robert Blaskow.
- **#416** *Connecting geometry and semantics via Artificial Intelligence: from 3D classification of heritage data to H-BIM representations.* **Valeria Croce**, Marco Giorgio Bevilacqua, Gabriella Caroti, Andrea Piemonte.
- **#429** *Information acquisition on pedestrian movements in urban traffic with a mobile multi-sensor system.* **Björn Borgmann**, Marcus Hebel, Michael Arens, Uwe Stilla.
- **#435** *Semantic Segmentation of terrestrial LIDAR data using co-registered RGB data.* **Erick Sanchez Castillo**, David Griffiths, Jan Boehm.
- **#440** *Rpa positioning error influence on close range photogrammetry for industrial inspection.* **Michael Batista Machado**, Guilherme Canarin Marcellino, Jose Dueñas Salazar, Pedro Vieira Buschinelli, Daniel Juchem Regner, João Marcio Santos, Carla Alves Marinho, Tiago Da Costa Pinto.
- **#470** *Generating Synthetic 3D Point Segments for Improved Classification of Mobile Lidar Point Clouds.* **Sagar Chitnis**, Zexian Huang, Kourosh Khoshelham.
- **#474** *Towards free-viewpoint video capture in challenging environments for collaborative & immersive analysis.* **Anton Frolov**, Gareth Rendle, Adrian Kreskowski, Mariya Kaisheva, Bernd Froehlich, Volker Rodehorst.
- **#484** *Automatic detection and vectorization of roadway elements in point cloud and panoramic images from mobile mapping system.* **Étienne Barçon**, Arthur Picard.
- **#493** *Digital twin and 3d documentation of a theban tomb in deir el-medina (egypt) using a multi-lenses photogrammetric approach.* **Alessandro Mandelli**, Cédric Gobeil, Christian Greco, Corinna Rossi.
- **#514** *MAGO approach for semantic segmentation: the case study of UAVID benchmark dataset.* **Sara Gagliolo**, Domenico Sguerso.
- **#516** *Photogrammetric underwater and UAS surveys of archaeological sites: the case study of the Roman shipwreck of Torre Santa Sabina.* **Alessio Calantropio**, Filiberto Chiabrande, Rita Auriemma.
- **#531** *Exploiting multi-camera constraints within bundle block adjustment: an experimental comparison.* **Eleonora Maset**, Ewelina Rupnik, Marc Pierrot-Deseilligny, Fabio Remondino, Andrea Fusiello.
- **#532** *A portable opto-acoustic survey solution for mapping of underwater targets.* **Bertrand Chemisky**, Erica Nocerino, Fabio Menna, Mohamad Motasem Nawaf, Pierre Drap.

- **#540** *A comparison between 3D reconstruction using NeRF neural networks and mvs algorithms on cultural heritage images.* **Francesca Condorelli**, Fulvio Rinaudo, Francesco Salvatore, Stefano Tagliaventi.
- **#544** *Incremental map refinement of building information using LiDAR point clouds.* **Qianqian Zou**, Monika Sester.
- **#545** *Real-time dense 3d reconstruction from monocular video data captured by low-cost uavs.* **Max Hermann**, Boitumelo Ruf, Martin Weinmann.
- **#550** *Semantic segmentation for building façade 3D point cloud from 2D orthophoto images using transfer learning.* **Arnadi Murtiyoso**, Camille Lhenry, Tania Landes, Pierre Grussenmeyer, Emmanuel Alby.
- **#553** *First assessments into the use of commercial-grade solid state lidar for low cost heritage documentation.* **Arnadi Murtiyoso**, Pierre Grussenmeyer, Tania Landes, Hélène Macher.
- **#563** *Close-range photogrammetry method for SF6 Gas Insulated Line (GIL) deformation monitoring.* **Kamal Nur Fauzan**, Deni Suwardhi, Arnadi Murtiyoso, Irwan Gumilar, Teguh Purnama Sidiq.
- **#566** *Influence of illumination changes on image-based 3D surface reconstruction.* **Nazarena Bruno**, Anna Giacomini, Riccardo Roncella, Klaus Thoeni.
- **#570** *Road type classification of MLS point clouds using deep learning.* **Qian Bai**, Roderik Lindenbergh, Julien Vijverberg, Jeroen Guelen.
- **#579** *Unsupervised object-based clustering in support of supervised point-based 3D point cloud classification.* **Eleonora Grilli**, Florent Poux, Fabio Remondino.
- **#602** *Automatic segmentation of point clouds in the architecture environment.* **Rocío Romero - Jarén**, Jose Juan Arranz, Laura Navas-Sánchez, Emrah Erduran, Sandra Martínez-Cuevas, Belén Benito.
- **#610** *Review on photogrammetric surface inspection in automotive production.* **Max Erik Hödel**, Ludwig Hoegner, Uwe Stilla.
- **#615** *Quality evaluation of 3D building models based on low altitude imagery and airborne laser scanning point clouds.* **Grzegorz Gabara**, Piotr Sawicki.
- **#636** *Multi-temporal image co-registration of UAV blocks: a comparison of different approaches.* **Pietro Garieri**, Massimo Riboloni, Gianfranco Forlani, Riccardo Roncella.
- **#646** *Synthetic data generation pipeline for geometric deep learning in architecture.* **Stanislava Fedorova**, Alberto Tono, Meher Shashwat Nigam, Jiayao Zhang, Amirhossein Ahmadnia, Cecilia Maria Bolognesi, Dominik L. Michels.
- **#650** *Validation of a uav-derived point cloud by semantic classification and comparison with tls data.* **Marica Franzini**, Vittorio Casella, Paolo Marchese, Mattia Marini, Giovanna Della Porta, Fabrizio Felletti.
- **#652** *Large scale semantic segmentation of virtual environments to facilitate corrosion management.* **Robinson Luiz Garcia**, Patrick Nigri Happ, Raul Queiroz Feitosa.
- **#661** *Building outline extraction from aerial images and digital surface models with a frame field learning framework.* **Xiaoyu Sun**, Wufan Zhao, Raian V. **Maretto**, Claudio Persello.
- **#663** *Evaluating tie points distribution, multiplicity and number on the accuracy of uav photogrammetry blocks.* **Vahid Mousavi**, Masood Varshosaz, Fabio Remondino.
- **#664** *Evaluating surface mesh reconstruction of open scenes.* **Yanis Marchand**, Bruno Vallet, Laurent Caraffa.
- **#677** *Digital elevation models from stereo, video and multi-view imagery captured by small satellites.* **Pablo D'Angelo**, Peter Reinartz.
- **#678** *Orientation vs. orientation: image processing for studies of dental morphology.* **Armen Gaboutchian**, Vladimir Knyaz, Sergey Vasilyev, Dmitriy Korost, Artur Kudaev.
- **#681** *Exploring cross-city semantic segmentation of ALS point clouds.* **Yuxing Xie**, Konrad Schindler, Jiaojiao Tian, Xiao Xiang Zhu.

- **#682** *Monitoring terrain deformations caused by underground mining using UAV data.* **Grzegorz Józków**, Agata Walicka, Andrzej Borkowski.
- **#697** *3D Content Generation using Hybrid Aerial Sensor Data.* **Uwe Bacher**.
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- **#709** *Application of rail track geometry measuring trolleys for georeferencing of UAV images.* **Vladimir Vasil'Evich Shcherbakov**, Maksim Aleksandrovich Altyntsev, Marina Anatol'Evna Altyntseva.
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- **#482** *Concepts – locations – emotions: semantic analysis and visualization of climate change texts.* **Niki Anastopoulou**, Marinos Kavouras, Margarita Kokla, Eleni Tomai.
- **#492** *A full life data quality workflow research and project practic.* **Haitao Zhao**, Wenchao Gao.
- **#494** *Spatial-Temporal Changes Of Land Degradation Caused By Natural And Human Induced Factors: Case Study Of Bulgan Province In Central Mongolia.* **Sainbayar Dalantai**, Erdenesukh Sumiya, Yuhai Bao, Munkhdulam Otgonbayar, Urtnasan Mandah, Bayartungalag Batsaikhan, Boldbaatar Natsagdorj.
- **#496** *The Use AHP within GIS for destructed areas in Damascus, Syria.* **Mohamad Khalil**, J. Satish Kumar.
- **#500** *Spatial distribution, pollution, and health risk assessment of heavy metal in industrial area soils of ulaanbaatar, mongolia.* **Oyunbat Purevsuren**, Batkhishig Ochirbat, Bayartungalag Batsaikhan, Frank Lehmkuhl, Martin Knippertz, Veit Nottebaum.
- **#504** *The Setting up of a gis for the general population and housing census.* **Kamel Si Youcef**, Issam Boukerch, Imane Hocine, Aicha Benabdelkader.
- **#505** *Geovisualization of aerial photogrammetric flights for data quality assessment.* **Mehmet Buyukdemircioglu**, Sultan Kocaman.
- **#507** *Integration of urban spatial data management and visualization with enterprise applications using open-source software.* **Hamidreza Ostadabbas**, Helmut Merz, Heike Weippert.
- **#510** *Sidewalk detection and pavement characterisation in historic urban environments from point clouds: preliminary results.* **Daniele Treccani**, Lucía Díaz-Vilariño, Andrea Adami.
- **#522** *Spatio temporal data cube applied to AIS containerships trend analysis in the early year of the Belt and Road Initiative - From global to local scale.* **Emere Arco**, Andrea Ajmar, Fabio Cremaschini, Cristina Monaco.
- **#525** *Ontology-based data mapping to support planning in Historical urban centres.* **Elisabetta Colucci**, Margarita Kokla, Francesca Noardo.
- **#559** *Comparison and evaluation of spatial interpolation methods for monthly average air temperature of mongolia based on digital elevation model.* **Boldbaatar Natsagdorj**, Sainbayar Dalantai, Erdenesukh Sumiya, Yuhai Bao, Sainbuyan Bayarsaikhan, Bayartungalag Batsaikhan, Danzanchadav Ganbat.
- **#560** *Integration of data of the remote sensing, GIS, and gamma-spectrometric analysis to study soil material redistribution.* **Lyubov N Trofimetz**, Alexey A Kolesnikov, Evgeny A Panidi, Pavel M Kikin.
- **#568** *Using systems of parallel and distributed data processing to build hydrological models based on remote sensing data.* **Alexey A Kolesnikov**, Pavel M Kikin, Evgeny A Panidi, Anastasia G Rusina.
- **#588** *Abnormal crowdsourced data detection using remote sensing image features.* **Xiaoguang Zhou**, Guang Yu, Dongyang Hou, Dongsheng Wei.
- **#591** *An extension of CityJSON for the support of point clouds.* **Gilles-Antoine Nys**, Abderrazzaq Kharroubi, Florent Poux, Roland Billen.

- **#611** *From architectural survey to continuous monitoring: graph-based data management for cultural heritage conservation with Digital Twins.* **Marika Falcone**, Antonio Origlia, Massimiliano Campi, Sergio Di Martino.
- **#613** *Social network analysis of spatial human mobility behaviour in infectious disease interaction: an exploratory evidence of tuberculosis in malaysia.* **Ilham Abdul Jalil**, Abdul Rauf Abdul Rasam.
- **#629** *A collaborative platform for water quality monitoring: simile webgis.* **Juan Fernando Toro Herrera**, Daniela Carrion, Maria Antonia Brovelli.
- **#654** *Interactive videos as geospatial interfaces: A case study for regional promotion.* **Matej Zmitko**, Fabian Schwander, Doris Agotai, Arzu Çöltekin.
- **#684** *Building OPENDRIVE model from mobile mapping data.* **Mark Barsi**, Arpad Barsi.
- **#696** *Quality aspects of high-definition maps.* **Janos Mate Logo**, Nikol Krausz, Vivien Poto, Arpad Barsi.
- **#713** *Issues of geographic information systems and thematic mapping application to analysis of epidemiological situation in large cities.* **Ilya Kuznetsov**, Evgeny Panidi, Pavel Kikin, Alexey Kolesnikov, Vladislav Korovka, Vladimir Galkin.
- **#728** *The Digital Elevation Model Intercomparison eXperiment DEMIX, a community based approach at global DEM benchmarking.* **Peter Strobl**, Conrad Bielski, Peter Guth, Carlos Grohmann, Jan-Peter Muller, Carlos López-Vázquez, Dean B. Gesch, Giuseppe Amatulli, Serge Riazanoff, Claudia Carabajal.
- **#748** *Geospatial assessment of human-wildlife-environment interactions for spatial decision support.* **Marguerite Madden**, Malvern Karidozo, William Langbauer, Ferrell Osborn, Andrea Presotto, Roger Parry.
- **#781** *Determining the suitable location for the metallurgical and steel processing factory in Mongolia using GIS-based multi-criteria analysis methods.* **Zolzaya Adiya**, Battogtokh Dorjgotov, Sainbuyan Bayarsaikhan, Myagmartseren Purevtseren.
- **#821** *Collaborative air quality mapping of different metropolitan cities of India.* **Rakesh Dubey**, Shruti Bharadwaj, Md Iltaf Zafar, Susham Biswas.
- **#822** *Raster Data Based Automated Noise Data Integration for Noise Mapping Limiting Data Dependency.* **Shruti Bharadwaj**, Rakesh Dubey, Md Iltaf Zafar, Susham Biswas.

Technical Commission V: Education and Outreach

- **#274** *Research oriented remote sensing image processing software design in practical courses for senior undergraduates.* **Haopeng Zhang**, Danpei Zhao, Fengying Xie, Zhiguo Jiang.
- **#341** *Qualitative testing of an advanced terrestrial laser scanner simulator: users experience and feedback.* **Maria Chizhova**, Denys Gorkovchuk, Tatyana Kachkovskaya, Darius Popovas, Julia Gorkovchuk, Thomas Luhmann, Mona Hess.

Thematic Sessions

AI for Knowledge Discovery in Geoscience

- **#669** *Ai4geo : a data intelligence platform for 3d geospatial mapping.* **Pierre-Marie Brunet**, Pierre Lassalle, Simon Baillarin, Bruno Vallet, Arnaud Lebris, Gaele Romeyer, Guy Le Besnarais, Flora Weissgerber, Gilles Foulon, Vincent Gaudissart, Christophe Triquet, Michael Darques, Gwenaél Souille, Laurent Gabet, Cedrik Ferrero, Thanh-Long Huynh, Emeric Lavergne.

Image-to-Image translation in remote sensing

- **#706** *Evaluation of sar to optical image translation using conditional generative adversarial network for cloud removal in a crop dataset.* **Luiz Eduardo Christovam**, Milton Hirokazu Shimabukuro, Maria De Lourdes Bueno Trindade Galo, Eija Honkavaara.

LULC Change Detection and Updating

- **#524** *Study on the characteristics of beijing subsidence based on ps-insar/leveling/gnss and primary investigation of the relationship with fault zone.* **Xiao Qing Wang**, Peng Zhang, Yong Shang Wang, Zhan Yi Sun.
- **#546** *Deforestation detection in the Amazon rainforest with spatial and channel attention mechanisms.* **Pedro Tovar**, Mabel Ortega Adarme, Raul Feitosa.
- **#601** *Deforestation mapping using Sentinel-1 and object-based Random Forest classification on Google Earth Engine.* **Vasil Yordanov**, Maria Antonia Brovelli.
- **#753** *Socioeconomic drivers of land use intensification in Fiji Islands: a geographical approach.* David Lopez Cornelio.
- **#773** *Promising advances of amazonian monitoring systems throughout vanguard technology and scientific knowledge.* **Luciana Soler**, Daniel Silva, Cassiano Messias, Thiago Carvalho Lima, Juan Doblaz, Bruna Pechini, Jefferson Souza, Douglas Moraes, Claudio Almeida.
- **#783** *Evaluation of Semi-supervised learning for CNN-based Change Detection.* **Evangelos Bousias Alexakis**, Costas Armenakis.

CIPA

- **#141** *Triangulation and Time-of-flight Based 3D Digitisation Techniques of Cultural Heritage Structures.* **Cihan Altuntas**.
- **#216** *Decay classification using artificial intelligence.* **Elisabetta Caterina Giovannini**, Andrea Tomalini, Edoardo Pristeri, Letizia Bergamasco, Massimiliano Lo Turco.
- **#327** *Urban parametric perception. The case study of the historic centre of Perugia.* **Fabio Bianconi**, Marco Filippucci, Marco Seccaroni, Costanza Maria Aquinardi.
- **#527** *Landscape Analysis Techniques Applied to a Buddhist Carved Rock Sculpture.* **Giuseppe Salemi**, Emanuela Faresin, Luca Maria Olivieri.

Cultural Heritage

- **#183** *Point cloud exploitation for structural modelling and analysis: a reliable workflow.* **Alighiero Lucidi**, Ersilia Giordano, Francesco Clementi, Ramona Quattrini.
- **#264** *Modelling the evolution of the archaeological works developed in qubbet el hawa (aswan, egypt).* **Jose Luis Pérez-García**, Antonio T. Mozas-Calvache, Jose Miguel Gómez-López, Alejandro Jiménez-Serrano.
- **#594** *Development of panoramic virtual tours system based on low cost devices.* **Issam Boukerch**, Bachir Takarli, Kamal Saidi, Mokrane Kariche, Abd El Kader Mestapha Meguenni.
- **#621** *State-wide Calculation of Terrain-Visualisations and Automatic Map Generation for Archaeological Objects.* **Frank Thiemann**, Malte Schulze, Utz Böhner.
- **#625** *The memory of a 2nd WW camp: 3D modeling using the combination of hybrid technologies.* **Mathieu Koehl**, Yassine Seddik, Alexandre Calay, Juliette Brange, Michaël Landolt, Florian Basoge, Samuel Guillemin, Loic Lutz.

Deep learning for Satellite Image Time Series Analysis

- **#609** *Benchmarking of Convolutional Neural Network approaches for vegetation land cover mapping.* **Benjamin Carpentier**, Antoine Masse, Emeric Lavergne, Christophe Sannier.
- **#768** *Towards lifelong crop recognition using fully convolutional recurrent networks and sar image sequences.* **Jorge Andres Chamorro Martinez**, Raul Queiroz Feitosa, Patrick Nigri Happ, Jose David Bermudez Castro.

Digital Twins

- **#331** *Wood and generative algorithms for the comparison between models and reality.* **Fabio Bianconi**, Marco Filippucci, Giulia Pelliccia.
- **#813** *Root phenotyping from x-ray computed tomography: skeleton extraction.* **Monica Herrero-Huerta**, Valerian Meline, Anjali S. Iyer-Pascuzzi, Augusto M. Magalhães, Mitchell R. Tunistra, Yang Yang.

Disaster Management

- **#817** *Large-scale subsidence geohazard monitoring with Sentinel-1 SAR Interferometry in central Lishui (China).* **Tengteng Qu**, Zhiman Su, Hongzhen Yang, Xuguo Shi, Weiping Shao.

EuroSDR and NMCAs

- **#762** *Public-private cooperation models for efficient access to geospatial content.* **Simon Musäus**.

Processing of Multi-satellite and bistatic SAR constellation data

- **#517** *InSAR Collaborative Monitoring Mode and Multi-Mode Computing Services for Geohazards Identification in Open-Pit Mining Area.* **Jin Zhang**.

Unconventional applications for geo-spatial deep learning

- **#456** *Evaluating impressions based on gaze analysis and deep learning: A case study of attractiveness evaluation of streets in densely built-up wooden residential area.* **Takuya Oki**, Sayaka Kizawa.
- **#703** *3D urban change detection with point cloud siamese networks.* **Iris De Gélis**, Sébastien Lefèvre, Thomas Corpetti.

Invited papers

Thematic Sessions

Global Urban Observation and Information Initiative and the UN SDG 11

- **#158** *Remote sensing of cities: day and night.* **Qihao Weng**.
- **#167** *Examining changes in the impervious surfaces of urban functional zones and social-economic driving factors of Tianjin, China.* **Shisong Cao**, Yile Cai, Xi Wang, Mingyi Du.
- **#196** *Annual dynamics of impervious surfaces in China at 30m resolution derived from multisource satellite images over the past three decades.* **Yinyi Lin**, Hongsheng Zhang, Peifeng Ma.

- **#229** *Uncovering the spatiotemporal dynamics of sdc11.3.1 using Earth observation data: a case study of the Beijing-Tianjin-Hebei region, China.* **Meiling Zhou**, Linlin Lu, Huadong Guo, Shuangcheng Zhang, Muhammad Fahad Baqa.
- **#448** *Monitoring and characterizing long-term variability of urban thermal environment using time-series land cover and remote sensing data.* **George Z Xian**.
- **#463** *Development and reliability verification of building scale micro population data –case study in Tokyo and Bangkok-.* **Yuki Akiyama**, Hiroyuki Miyazaki, Sirinya Sirikanjanaanan, Kittisak Maneepong.
- **#464** *High-resolution global urban impervious surface mapping from Sentinel 1A/2 imagery In serve of sustainable development goals.* **Wenjie Du**, Zhongchang Sun, Huadong Guo.
- **#519** *Large-Scale 3D Characterization of Built-up Areas based on TanDEM-X Data.* **Thomas Esch**, Julian Zeidler, Mattia Marconcini, Elisabeth Brzoska, Daniela Palacios-Lopez, Annekatrin Metz-Marconcini, Achim Roth.
- **#580** *New advances in outlining the global settlement extent - the world settlement footprint 2019.* **Mattia Marconcini**, Annekatrin Metz-Marconcini, Thomas Esch, Noel Gorelick.
- **#754** *Development of an On-demand Building Mapping System using High-Resolution Satellite Images.* **Hiroyuki Miyazaki**, Satoshi Kaneko, Ryosuke Shibasaki.
- **#782** *A novel model for detecting the dynamics of the urban fringe in Harbin City, China.* **Yuan Wang**, Yilong Han, Lijie Pu, Bo Jiang.

Deep learning for Satellite Image Time Series Analysis

- **#114** *Crop classification under varying cloud cover with neural ordinary differential equations.* **Nando Metzger**, Mehmet Ozgur Turkoglu, Stefano D'Aronco, Jan Dirk Wegner, Konrad Schindler.

Deep Learning in Remote Sensing

- **#367** *Geospatial Machines Interacting With People.* **Devis Tuia**, Benjamin Kellenberger.

Unconventional applications for geospatial deep learning

- **#425** *Better generic objects counting when asking questions to images: a multitask approach for remote sensing visual question answering.* **Sylvain Lobry**, Diego Marcos, Benjamin Kellenberger, Devis Tuia.
- **#729** *CNN semantic segmentation to retrieve past land cover out of historical orthoimages and DSM.* **Arnaud Le Bris**, Clément Mallet, Sébastien Giordano.