Dr.-Ing. Marc Rußwurm

Earth Science | Time Series | Meta-Learning

Abstract

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2021 – today Postdoctral Researcher at EPFL-ECEO

2018 – 2022 Ph.D. Research at Chair of Remote Sensing Technology at TU Munich

2011 – 2018 Geodesy and Geoinformation Studies at TU Munich (B.Sc; M.Sc.)

1991 born in Germany

web marcrusswurm.com

Twitter twitter.com/MarcCoru

Google Scholar scholar.google.com/citations?user=MfGMG9wAAAAJ

Experience

Sept 2021 **Postdoctoral Researcher**

École Polytechnique Fédérale de Lausanne (EPFL)

Environmental Computational Sc. and Earth Observation Laboratory (ECEO):
Research: Machine Learning and Earth Observation; Domain Shift and Transfer Learning. Self-supervised representation learning on globally distributed data.

Jan–Mar '20 **Visiting Researcher Palo Alto, USA**

Stanford University (Visit)

Lobell Lab and Sustainability and AI Lab
Few-Shot Meta Learning for the Remote Sensing context. Research received *Best Paper Award* at Earthvision 2020 worshop at CVPR

May '19 **Short Visit OATML Oxford, UK**

Oxford Applied Machine Learning Group (Visit)

Visit (one-week). Participation in ESA project:
Multi-image super-resolution on Satellite Data. Presentation about Machine Learning and Earth Observation.

Oct '18–Feb '19 **Visiting Researcher Vannes, France**

IRISA Institute (Visit)

Environment Observation with Complex Imagery:
Research stay. Early classifification of time series. Multi-objective optimization (optimize accuracy and earliness).

2018 - 2021 **Research Associate and Ph.D. Candidate**

Technical University of Munich

Chair of Remote Sensing Technology:
Research fields: Multi-temporal Earth observation, machine learning and computer vision. Methodical work related to methods of natural language processing and applied to vegetation monitoring for Earth observation.

July–Aug 2018 **Participant—Frontier Developments Lab**

University of Oxford & European Space Agency

Kellogg College in Oxford, UK & ESRIN Φ-lab, Frascati near Rome, Italy.
Deep multi-resolution satellite data-fusion for disaster relief. The Frontier Developments Lab is an research and commercial accelerator composed of teams with machine learning and Earth observation background.

2015–2018 **Student Research Assistant**

Technical University of Munich

Chair of Remote Sensing Technology:
Tutor 3rd MSc. Semester: Image Understanding III.

Education

2018 – Feb 2022 Technical University of Munich

Dr.-Ing. (Ph.D.)

Chair of Remote Sensing Technology:
Thesis: *Data-driven Feature Learning with Discriminative Models for Satellite Time Series* Ph.D. defense (23rd of Februrary 2022)

2015–June 2018 Technical University of Munich

Master of Science

Geodesy and Geoinformation (M.Sc): Machine Learning, Computer Vision, Deep Learning, Earth Observation, Remote Sensing, Photogrammetry.
Thesis: *Multi-temporal Land Cover Classification with Recurrent-Convolutional Neural Networks*
Cooperation: *Bavarian Ministry of Food, Agriculture and Forestry (StMELF).*

2011–2015 Technical University of Munich

Bachelor of Science

Geodesy and Geoinformation (B.Sc): Photogrammetry, Remote Sensing, Surveying, Cartography, Geo-informatics, Gravity Science, GNSS Science, and Land Management.
Thesis: *Tri-ocular Image Rectfification and Photogrammetric Reconstruction*

Selected Publications

Google Scholar

scholar.google.com/citations?user=MfGMG9wAAAAJ

2022; in review

Rußwurm M., Wang S., Kellenberger B., Roscher R. & Tuia D. (2022; submitted). Meta-learning to address diverse Earth observation problems across resolutions. In review at Nature Communications.

Rußwurm M., Courty N., Emonet R., Lefèvre S., Tuia D & Tavenard R. (2022; submitted). ELECTS: End-to-End Learned Early Classification of Time Series. In review at ISPRS Journal of Remote Sensing.

top five publications

1 — 2021

Mifdal, J., Longépé, N., **Rußwurm**, M. (2021). Towards Detecting Floating Objects on a Global Scale with Learned Spatial Features using Sentinel 2. ISPRS Ann. Photogramm. Remote Sens. Spatial Inf. Sci., V-3-2021, 285–293, 2021, 169:421 – 435. (link)

2 — 2020

Rußwurm, M. & Körner, M. (2020). Self-attention for Raw Optical Satellite Time Series Classification. ISPRS Journal of Photogrammetry and Remote Sensing, 169:421 – 435. (link)

3 — 2020

Rußwurm, M., Wang, S., Körner, M. & Lobell, D. (2020). Meta-learning for Few-shot Land Cover Classification. In 2020 IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW), pages 788–796. EarthVision 2020 Best Paper Award. (link)

4 — 2019

Rudner, T. G. J., **Rußwurm**, M., Fil, J., Pelich, R., Bischke, B., Kopačková, V., & Biliński, P. (2019). Multi3Net: Segmenting Flooded Buildings via Fusion of Multiresolution, Multisensor, and Multitemporal Satellite Imagery. Proceedings of the AAAI Conference on Artificial Intelligence, 33(01), 702-709. (link)

5 — 2017

Rußwurm, M. & Körner, M. (2017) Temporal Vegetation Modelling using Long Short-Term Memory Networks for Crop Identification from Medium-Resolution Multi-Spectral Satellite Images, *In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) Workshops*. Earthvision 2017 Best Paper Award (link)

Outreach Activities

Working Group Member (2022-2025)

International Society of Photogrammetry and Remote Sensing (ISPRS). Working Group Member TCII/WG5: Temporal Geospatial Data Understanding

Working Group Member (2022-2024)

International Association for Pattern Recognition (IAPR). Thematic Committee

TC-7: Remote Sensing and Mapping

Thematic Session Organizer (2022) — ISPRS Congress 2022. Organization of the Thematic Session Deep Learning for Satellite Image Time Series Classification with Prof. Pelletier

Scientific Involvement

Peer Review (papers) — Transactions on Geoscience and Remote Sensing (TGRS); Elsevier Remote Sensing of Environment (RSE); Geoscience and Remote Sensing Letters (GRSL); Expert Systems With Applications (ESWS); Frontiers in Artificial Intelligence: Special Section: AI in Food, Agriculture and Water;

Peer Review (grants) — Belgean Earth Observation: STEREO IV-call (2022); Climate Change AI Grants (2021)

Program Committees — EarthVision Workshop at CVPR (since 2021)

MAChine Learning for EArth ObservatioN (MACLEAN) workshop at ECML/PKDD (since 2019)

Awards

June 2020 — Best paper - Earthvision Workshop at Computer Vision and Pattern Recognition Workshop (2020) (link)

Oct. 2017 — Best presentation - NVIDIA Deep Learning Workshop at Leibnitz Supercomputing Center (LRZ)

July 2017 — Best paper - Earthvision Workshop at Computer Vision and Pattern Recognition Workshop (2017) (link)

Sept. 2016 — Best presentation - Polish-National Remote Sensing Conference (link)

Research Grants

2023-2024 (in submission) — Swiss Data Science Center (SDSC) proposal: AI for Detecting Ocean Plastic Pollution with Tracking (ADOPT) with partner organization The OceanCleanup potential total funding 300k CHF

Stipends and Mobility Grants

March 2020 — DAAD-IFI Stipend for Research Stay at Lobell Lab, Stanford University

June. 2019 — Travel Grants ICML Workshops on *AI for Social Good* and *Time Series*

May. 2019 — Google Education Credits - 5k$ in Google Credits for Crop Type Mapping

June 2017 — Travel grant - of International Society for Photogrammetry and Remote Sensing (ISPRS) (link)

Teaching Activities

Exercise Lead (2022) — Image processing for Earth observation at EPFL given by Prof. Devis Tuia. Focused on Deep Learning for Remote Sensing applications for Computer Science and Environmental Science Students. Three main exercises titled *Introduction to Pytorch with Logistic Regression*, *Convolutional Neural Networks for Satellite Image Classification*, *Model Training, Optimization, and Regularization*. Further exercises on classic machine learning given by Dr. Vargas.

Invited Guest Lecture (2022) — Guest Lecture at University of Bonn. Geodesy and Geoinformation at Phenorob Cluster of Excellence with Prof. Ribana Roscher. Lecture titled *Interpretable Machine Learning Examples in Marine Debris Detection and Crop Type Mapping*

Tutorial Lead (2022) — ISPRS Congress 2022. ISPRS Congress 2022: Deep Learning for Satellite Time Series (Tutorial Session with Prof. Charlotte Pelletier)

advised students Dilge Gül (2022-2023; ongoing Master Thesis); Sushen Venkatesa (2022; ongoing Semester Project); Laura Pasero (2022; Master Thesis); Arthur Chevalley (2022; Semester Project); Corinna Frank (2022; Master Thesis); Max Zollner (2020; Semester Project); Malte von Bloh (2020; Master Thesis); Jennifer Kriese (2019; Semester Project);

mentored students Houtan Ghaffari (2019-2021). Now Ph.D. Student at Ghent University WAVES Lab. Mentoring towards finding a Ph.D. position.

Invited Talks and Presentations

2023 (upcoming) co-invited talk with Devis Tuia at the Winter Conference on Applications of Computer Vision (WACV), Workshop on Maritime Computer Vision (MaCVi). January 3rd 2023.

2022 University of Linköping, Sweden. Computer Vision Lab of Prof. Michael Felsberg. Learning from Earth Observation Tasks. June 30th 2022.

2021 Data-Driven Vegetation Modeling and Understanding Representation Shift at Lasig Seminar Deep Learning for Earth Sciences organized by Dr. Loic Landrieu, IGN France. November 11th 2021 (virtual).

Early Classification for Agricultural Monitoring at ANR Seminar organized by Prof. Romain Tavenard, Univ Rennes 2. July 8th 2021 (virtual).

2020 BreizhCrops: A Satellite Time Series Crop Type Dataset at MADICS MACLEAN workshop at the European Conference for Machine Learning (ECML) organized by Prof. Lefévre and Prof. Ienco July 7th 2020 (virtual).

2019 Attention Models for Satellite Time Series Classification. German Aerospace Center (DLR). Institute of Remote Sensing Technology organized by Prof. Bamler. December 2nd 2019.

Learning Vegetation Models from Satellite Data. IGN Paris invited by Dr. Loic Landrieu. July 10th 2019

Early Classification for Agricultural Monitoring. IRISA-Obelix Lab. Green Seminar. University of South Brittany invited by Prof. Sebastien Lefévre, July 12th 2019

Early Classification for Agricultural Monitoring. IRISA-Obelix Lab. Green Seminar. University of South Brittany invited by Prof. Sebastien Lefévre, July 12th 2019

Earth Observation and Machine Learning: From Language Model to Earth Model. Visit OATML Laboratory of Prof. Yarin Gal University of Oxford. May 3rd 2019.