Denys Rozumnyi

Curriculum Vitae

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Education

Sep 2019 – Present **ETH Zurich**, *PhD Student*, Supervisor: Marc Pollefeys, Computer Vision and Geometry Group.
Topics: 3D reconstruction of objects and scenes, object detection, tracking, 6D pose estimation, and deblurring. The central contribution of my PhD thesis is a general framework to solve all these tasks together. For that, I utilized neural rendering and test-time optimization, and I'm passionate about these two tools (alongside deep learning). I designed a pipeline [11,13,15] to minimize a loss on reconstructing the input image via differentiable rendering with suitable regularizers, which led to high-quality 3D reconstruction and plausible novel view synthesis (similar to NeRF and Gaussian Splatting). I extended this pipeline to improve unknown object tracking by 3D reconstruction on the go [16]. These methods are open-sourced [GitHub].

Jul 2017 – Jun 2019 **Czech Technical University in Prague**, *Master of Science (**with honours**)*, Specialisation: Computer Vision and Image Processing, Artificial Intelligence, Average grade: 1.10/1.00.

Oct 2018 – Mar 2019 **Technical University of Munich**, *Erasmus+ Student Exchange Programme*, Master of Science in Computer Science.

Sep 2014 – Jun 2017 **Czech Technical University in Prague**, *Bachelor of Science (**with honours**)*, Specialisation: Computer Science and Mathematics, Average grade: 1.08/1.00, 2nd best graduate of the year.

Sep 2016 – Jan 2017 **Swansea University, Wales, United Kingdom**, *Erasmus+ Student Exchange Programme*, *Bachelor of Science in Computer Science*.

Work experience

Oct 2023 – Mar 2024 **PhD Research Scientist Intern**, ***Meta Zurich***.
Topics: Worked on '*XR-MBT: Multi-modal Full Body Tracking for XR through Self-Supervision with Learned Depth Point Cloud Registration*' [20] – a generative diffusion-based approach for egocentric body tracking from upper body tracking signals and egocentric depth maps.

Oct 2022 – Jul 2023 **PhD Student Researcher**, ***Google Zurich***, Supervisors: Vittorio Ferrari, Stefan Popov.
Topics: Worked on '*Estimating Generic 3D Room Structures from 2D Annotations*' [17] – a novel method to produce generic 3D room layouts just from 2D segmentation, also released a new dataset [GitHub].

Mar 2018 – Present **Research Fellow**, ***CTU in Prague***, Visual Recognition Group, Supervisor: Jiri Matas.
Topics: On-going collaboration on visual object tracking [6,7,8,10,12,16]. One of my most successful projects was the first learning-based method for deblurring and shape recovery of fast moving objects [9]. I trained a novel deep-learning based model with novel loss functions tailored for this task. This method has a wide range of applications, *e.g.* to debunk UFO footage [news, GitHub].

Jul 2018 – Aug 2018 **Student Summer Research Fellowship**, ***ETH Zurich***.
Topics: Worked on '*Learned Semantic Multi-Sensor Depth Map Fusion*' [5] during this highly prestigious fellowship with an acceptance rate of around 1% (accepted 15 students out of 1400 applications worldwide). Supervisors: Marc Pollefeys, Martin Oswald.

Aug 2017 – Sep 2017 **Summer Internship**, ***Tampere University of Technology***, Tampere, Finland.
Topics: Worked on a real-time demo in C++ for fast moving objects detection [GitHub] based on my CVPR'17 paper [2]. Supervisors: Jiri Matas, Joni Kämäräinen.

Sep 2016 – Feb 2018 **Research Intern**, ***CTU in Prague***, Visual Recognition Group.
Topics: Worked on my Bachelor thesis supervised by Jiri Matas, which was published at CVPR'17 [2]. We were the first ones to notice and introduce fast moving objects in images/videos. I was the main driving force of this project, in which we defined the problem, created new datasets, proposed a baseline method, created new evaluation metrics, and introduced new applications and downstream tasks.

Awards

Feb 2021 **The Edwards Award**, 2nd place for the best master thesis in the Czech Republic.

Mar 2020 **First place in Werner von Siemens award for the best master thesis** in the Czech Republic. Highly selective, prestigious, and well-known award.

Sep 2019 **Best Paper Honorable Mention** at German Conference on Pattern Recognition 2019 [7]. [link].

Jan 2018 **Valeo scholarship** - two-year scholarship for exceptional master students at CTU sponsored by Valeo (multinational company for automotive driving).

Nov 2017 **Josef Hlávka's Award** (Cena Josefa Hlávky) – a highly prestigious award for best students and graduates in Czech Republic. Awarded by the oldest Czech foundation established in 1904. [link]

Aug 2017 **Dean's Award** for an exceptional bachelor thesis. Bachelor's degree with distinctions.

2014-2019 Merit scholarships for excellent study results.

Invited talks

20.03.2024 Meta Reality Labs – '*Multi-modal Full Body Tracking for XR*' in Zurich.

12.10.2023 Deep Layers Workshop – '*Tracking by 3D Model Estimation of Unknown Objects in Videos*' (program) in Brno.

10.06.2023 Google Research – '*Estimating Generic 3D Room Structures from 2D Annotations*' in Zurich.

14.12.2022 UTIA, Czech Academy of Sciences – '*Deblurring and 3D Reconstruction of Fast Moving Objects*'.

21.09.2022 Deep Layers Workshop – '*3D Reconstruction of Motion-blurred Objects*' (program) in Brno.

22.09.2019 Honest Guide in Prague – interview with **51K** views showcasing my research on YouTube.

10.05.2019 CTU in Prague – invited speaker, talk on '*Fast Moving Objects*', on YouTube.

07.07.2018 Eastern European Conference on Computer Vision (EECCV) – invited speaker, talk on '*Detection and Tracking of Fast Moving Objects*' (YouTube, program) in Odessa (Ukraine).

23.07.2017 CVPR in Hawaii – demo on fast moving objects.

Teaching

2019-2020 **Computer Vision**, Teaching Assistant.

2021 **Mixed Reality Lab**, Teaching Assistant.

2020-2023 **3D Vision**, Teaching Assistant.

2020-2023 **Deep Learning Seminar**, Teaching Assistant.

Supervising

Nov 2023 **Master thesis**, Rong Zou: Retrieval Robust to Object Motion Blur, in review [19].

May 2023 **Semester project**, Yiming Zhao: Recovering Blurry Human Body, accepted to ICCV 2023 [15].

Mar 2022 **Semester project**, Thakur Rajat: Predicting 3D Shape and Texture of Fast Moving Cars.

Sep 2021 **Master thesis**, Adrian Klaeger: Temporal Super-Resolution of Multiple Fast-Moving Objects.

Jun 2021 **Semester project**, Harish Rajagopal: Improving DeFMO With Learned Losses.

April 2021 **Bachelor thesis**, Julius Fricke: ADMM Algorithm Unrolling: Deblurring and Matting.

Reviewing

Conferences CVPR, ICCV, ECCV, NeurIPS, ICLR, ICML, 3DV, WACV.

Journals IJCV, PAMI.

Languages

Fluent **English, Czech**

Native **Ukrainian**
Intermediate **German**

Publications (Google Scholar)

[20] **D. Rozumnyi**, N. Rüegg, O. Sbai, F. Arcadu, Y. Chen, A. Sanakoyeu, M. Kumar Marram Reddy, C. Herold, R. Kips. *XR-MBT: Multi-modal Full Body Tracking for XR through Self-Supervision with Learned Depth Point Cloud Registration*. Submitted to ECCV 2024.

[19] R. Zou, M. Pollefeys, **D. Rozumnyi**. *Retrieval Robust to Object Motion Blur*. Submitted to ECCV 2024.

[18] R. Spetlik, **D. Rozumnyi**, J. Matas. *Single-Image Deblurring, Trajectory and Shape Recovery of Fast Moving Objects with Denoising Diffusion Probabilistic Models*. WACV 2024.

[17] **D. Rozumnyi**, S. Popov, K. Maninis, M. Nießner, V. Ferrari. *Estimating Generic 3D Room Structures from 2D Annotations*. NeurIPS 2023.

[16] **D. Rozumnyi**, J. Matas, M. Pollefeys, V. Ferrari, M. Oswald. *Tracking by 3D Model Estimation of Unknown Objects in Videos*. ICCV 2023.

[15] Y. Zhao, **D. Rozumnyi**, J. Song, O. Hilliges, M. Pollefeys, M. Oswald. *Human from Blur: Human Pose Tracking from Blurry Images*. ICCV 2023.

[14] D. Barath, **D. Rozumnyi**, I. Eichhardt, L. Hajder, J. Matas. *Progressive-X+: Clustering in the Consensus Space*. CVPR 2023. [Online].

[13] **D. Rozumnyi**, M. Oswald, V. Ferrari, M. Pollefeys. *Motion-from-Blur: 3D Shape and Motion Estimation of Motion-blurred Objects in Videos*. CVPR 2022. [Paper]

[12] **D. Rozumnyi**, J. Kotera, F. Šroubek, J. Matas. *Tracking by Deblatting*. IJCV 2021. [Paper]

[11] **D. Rozumnyi**, M. Oswald, V. Ferrari, M. Pollefeys. *Shape from Blur: Recovering Textured 3D Shape and Motion of Fast Moving Objects*. NeurIPS 2021. [Paper]

[10] **D. Rozumnyi**, J. Matas, F. Šroubek, M. Pollefeys, M. Oswald. *FMODetect: Robust Detection and Trajectory Estimation of Fast Moving Objects*. ICCV 2021. [Paper]

[9] **D. Rozumnyi**, M. Oswald, V. Ferrari, J. Matas, M. Pollefeys. *DeFMO: Deblurring and Shape Recovery of Fast Moving Objects*. CVPR 2021. [Paper]

[8] **D. Rozumnyi**, J. Kotera, F. Šroubek, J. Matas. *Sub-frame Appearance and 6D Pose Estimation of Fast Moving Objects*. CVPR 2020. [Paper]

[7] **D. Rozumnyi**, J. Kotera, F. Šroubek, J. Matas. *Non-Causal Tracking by Deblatting*. In 41th German Conference on Pattern Recognition (GCPR) 2019, Dortmund, Germany. Oral presentation, **Best Paper Honorable Mention**, announced here. [Paper]

[6] J. Kotera, **D. Rozumnyi**, F. Šroubek, J. Matas. *Intra-frame Object Tracking by Deblatting*. Visual Object Tracking (VOT) Workshop in conjunction with ICCV 2019. [Paper]

[5] **D. Rozumnyi**, I. Cherabier, M. Pollefeys, M. Oswald. *Learned Semantic Multi-Sensor Depth Map Fusion*. In 3D Reconstruction in the Wild (3DRW) Workshop in conjunction with International Conference on Computer Vision (ICCV) 2019, Seoul, South Korea. [Paper]

[4] **D. Rozumnyi**. *All-speed Long-term Tracker Exploiting Blur*. Master thesis, Czech Technical University in Prague, 2019. [Paper]

[3] **D. Rozumnyi**. *Tracking, Learning and Detection over a Large Range of Speeds*. Bachelor thesis, Czech Technical University in Prague, 2017. [Paper]

[2] **D. Rozumnyi**, J. Kotera, F. Šroubek, L. Novotný, J. Matas. *The World of Fast Moving Objects*. CVPR 2017, Honolulu, Hawaii. [Paper]

[1] J. Pritts, **D. Rozumnyi**, M. P. Kumar, O. Chum. *Coplanar Repeats by Energy Minimization*. BMVC 2016, York, UK. [Paper]