Ing. **Michal Neoral** Ph.D.

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Education

- **Czech Technical University in Prague** Doctoral degree – Ph.D. (Philosophiæ Doctor) *2018 – 2025*
  - Faculty of Electrical Engineering
  - Informatics / Artificial Intelligence and Biocybernetics
  - thesis topic: Dense Motion Estimation in a Monocular Video
- **Czech Technical University in Prague** Master's degree in engineering – Ing. (MSc equivalent) *2014 – 2017*
  - Faculty of Electrical Engineering
  - Open Informatics
  - specialization: Computer Vision and Image Processing
- **Czech Technical University in Prague** Bachelor's degree in engineering – Bc. (BSc equivalent) *2011 – 2014*
  - Faculty of Electrical Engineering
  - Cybernetics and Robotics
  - specialization: Robotics

Experience

- **Czech Technical University in Prague** Research Developer *Feb 2025 – present*
  - Faculty of Electrical Engineering, Center for Machine Perception
  - Detection, classification and fine-grained recognition: FunDive, Local CLS, CEDMO, AISee, Median
- **Czech Technical University in Prague** Research Scientist *Jul 2017 – Jan 2025*
  - Computer vision research for Toyota Motor Europe
  - Dense motion estimation in monocular video: optical flow with occlusion reasoning, discovery and segmentation of independently moving objects, long-term dense tracking
  - Basis of the doctoral dissertation and of four patent filings
- **Czech Technical University in Prague** University Teacher *Mar 2018 – present*
  - Lab teaching, detailed in the Teaching section below
- **Czech Technical University in Prague** Researcher and Developer *2012 – Feb 2017*
  - Part-time alongside the bachelor's and master's studies: CloPeMa, SyRoTek, Electrolux, Toyota

Teaching

- **Pattern Recognition and Machine Learning** Czech Technical University in Prague *2018 – present*
  - teaching
  - material preparation
  - development of automatic evaluation of student homeworks
- **Digital Photography Processing** Czech Technical University in Prague *2020 – 2022*
- **Computer Vision Methods** Czech Technical University in Prague *2018 – 2019*

Patents and Publications

C=Conference Paper, P=Patent, T=Thesis, O=Other

[C] Jonáš Šerých, **Michal Neoral**, and Jiří Matas. (2025). **MFTIQ: Multi-Flow Tracker with Independent Matching Quality Estimation**. In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision*, February 2025, Tucson, Arizona USA.

[C] **Michal Neoral**, Jonáš Šerých, and Jiří Matas. (2024). **MFT: Long-term Tracking of Every Pixel**. In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision*, pp. 6837–6847, January 2024, Waikoloa, Hawaii USA.

[C] **Michal Neoral**, Jan Šochman, and Jiří Matas. (2021). **Monocular Arbitrary Moving Object Discovery and Segmentation**. In *The 32nd British Machine Vision Conference*, November 2021, Online.

[C] **Michal Neoral**, Jan Šochman, and Jiří Matas. (2019). **Continual Occlusion and Optical Flow Estimation**. Computer Vision – ACCV 2018. Ed. by C.V. Jawahar et al. Cham: Springer International Publishing, 2019, pp. 159–174. ISBN: 978-3-030-20870-7.

[C] **Michal Neoral** and Jan Šochman. (2017). **Object Scene Flow with Temporal Consistency**. In *22nd Computer Vision Winter Workshop (CVWW)*. Pattern Recognition and Image Processing Group; TU Wien & PRIP Club; Vienna; Austria, February 2017, ISBN: 978-3-200-04969-7.

[O] Matej Kristan, Jiří Matas, Pavel Tokmakov, Alan Lukežič, Michael Felsberg, Luka Čehovin Zajc, Khanh-Tung Tran, Xuan-Son Vu, Johanna Björklund, **Michal Neoral**, Hyung Jin Chang, et al. (2025). **The Third Visual Object Tracking Segmentation VOTS2025 Challenge Results**. In *Proceedings of the IEEE/CVF International Conference on Computer Vision Workshops*, October 2025, Honolulu, Hawaii USA.

[O] Adam Schmidt, Mert Asim Karaoglu, Soham Sinha, Mingang Jang, Ho-Gun Ha, Kyungmin Jung, Kyeongmo Gu, Ihsan Ullah, Hyunki Lee, Jonáš Šerých, **Michal Neoral**, Jiří Matas, et al. (2025). **Point Tracking in Surgery – The 2024 Surgical Tattoos in Infrared (STIR) Challenge**. arXiv preprint arXiv:2503.24306.

[P] Nikolay Chumerin, **Michal Neoral**, Jan Šochman, and Jiří Matas (2023). **MONOCULAR-VISION-BASED DETECTION OF MOVING OBJECTS**. EP Patent EP4174770B1, filed Oct 28, 2021, and issued Nov 29, 2023. **Granted Patent**

[P] Nikolay Chumerin, Jonáš Šerých, **Michal Neoral**, and Jiří Matas. (2024). **A METHOD AND SYSTEM FOR TRACKING A PIXEL IN A VIDEO**. EP Patent EP4465239A1, filed May 16, 2023, and issued Nov 20, 2024. **Patent Application**

[P] Nikolay Chumerin, **Michal Neoral**, Jan Šochman, and Jiří Matas. (2023). **MONOCULAR-VISION-BASED DETECTION OF MOVING OBJECTS**. EP Patent EP4174770A1, filed Oct 28, 2021, and issued May 03, 2023. **Patent Application**

[P] Nikolay Chumerin, **Michal Neoral**, Jan Šochman, and Jiří Matas. (2020). **METHODS FOR OPTICAL FLOW ESTIMATION**. WO Patent WO2020088766A1, filed Oct 31, 2018, and issued May 07, 2020. **Patent Application**

[T] **Michal Neoral** (supervisor prof. Ing. Jiří Matas, Ph.D., co-supervisor Mgr. Jan Šochman, Ph.D.) (2025). **Dense Motion Estimation in a Monocular Video**. **Doctoral Dissertation**.

[T] **Michal Neoral** (supervisor Mgr. Jan Šochman, Ph.D.) (2017). **Object Scene Flow in Video Sequences**. **Master Thesis**, awarded with the Dean's Prize for outstanding master thesis.

[T] **Michal Neoral** (supervisor Ing. Pavel Krsek, Ph.D.) (2014). **Extraction of Features from Moving Garment**. **Bachelor Thesis**.

Projects and Internships

- **Project: FunDive** Open-set and closed-set fine-grained recognition of fungal species *2026 – present*
- **Project: Local CLS** Knowledge distillation for fine-grained image retrieval from frozen vision-language models *2026 – present*
- **Project: CEDMO** Automated analysis of billboard video recordings for media monitoring *2026*
- **Project: AISee** Video object detection and classification, incremental learning of user-defined classes *2025 – 2026*
- **Project: Median** Automatic recognition of template videos in cam-glasses recordings *2025 – 2026*
- **Project: Toyota Motor Europe** Computer vision research at the Toyota Research Lab, FEE CTU *2015 – 2025*
- **Project: Electrolux** Identification of objects inserted into home appliances *2015*
- **Project: SyRoTek** Systém pro Robotickou Tele-výuku, a robotic system for education *2014 – 2015*
- **Project: CloPeMa** Clothes Perception and Manipulation, feature extraction from a moving garment *2012 – 2014*
- **Toyota Motor Europe (TME), Brussels, Belgium.** Internship *February 2017 – June 2017*
  - Tools: C++, CUDA, Python, CAFFE2, TensorFlow
  - Developed and implementation of monocular depth estimation