MIROSLAV PURKRABEK

Computer Vision & Machine Learning Researcher

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SELECTED PUBLICATIONS

For the full list (9 publications), see my website – **MiraPurkrabek.github.io**

BBoxMaskPose v2: Expanding Mutual Conditioning into 3D
Purkrabek, Kolomiiets, Matas;   GitHub ⭐ 150+   **in review**
Better 2D predictions act as reliable prompts for 3D reconstruction, demonstrating that accurate 2D conditioning is a prerequisite for multi-person 3D pose. BMPv2 sets new state of the art in both standard and crowded 2D benchmarks, becoming the first method to surpass 50 AP on OCHuman. As a result, 3D pose estimation in crowds approaches the reliability of the 2D pose predictions.

Detection, Pose Estimation and Segmentation for Multiple Bodies: Closing the Virtuous Circle
Purkrabek, Matas;   GitHub ⭐ 150+, online demo   **ICCV 2025**
Three small specialized models, each conditioned by the others, form a self-improving loop. It beats human-centric foundation models (AP 41.3 → 49.2) and sets a new SOTA on OCHuman in instance segmentation and pose estimation.

ProbPose: A Probabilistic Approach to 2D Human Pose Estimation
Purkrabek, Matas;   GitHub ⭐ 45+, Pip package ⬇ 350+, iPad demo   **CVPR 2025**
Introduces a probabilistic modeling approach that handles partially visible individuals better and reduces false positive predictions. Using out-of-image keypoints is necessary for more reliable modeling of the underlying distribution and robust evaluation.

BLANKET: Anonymizing Faces in Infant Video Recordings
Hadera, Cech, Purkrabek, Hoffmann;   **ICDL 2025 oral**

Improving 2D Human Pose Estimation in Rare Camera Views with Synthetic Data
Purkrabek, Matas;   GitHub ⭐ 50+, Best Poster 🏆   **Face and Gestures 2024**

RESEARCH EXPERIENCE

Research Visit
Real Virtual Humans, University of Tübingen
📅 December 2025 – March 2026   📍 Tübingen, DEU
- Visiting prof. Pons-Moll to deepen my knowledge about 3D avatars

Researcher
Visual Recognition Group, Czech Technical University in Prague
📅 February 2019 – Ongoing   📍 Prague, CZE
- Specialized in analyzing the human body, including Pose Estimation, 3D Shape, and UV Map estimation, along with detection and segmentation
- Co-supervising more junior colleagues in writing their first papers
- Managing the annotation process for our team of annotators
- Supervised by prof. Jiri Matas

Research Intern
Visual Cognitive Systems lab, University of Ljubljana
📅 October 2018 – March 2019   📍 Ljubljana, SVN
- Initial experience in computer vision research during my Erasmus stay
- Supervised by prof. Matej Kristan

INDUSTRY EXPERIENCE

Software Developer
Porsche Engineering Services
📅 March 2020 – July 2022   📍 Prague, CZE
- Production code for Porsche's supercharger, 1 000+ units worldwide
- Production code for Porsche Macan's control unit, 100 000+ cars worldwide

IN ONE SENTENCE

I enjoy connecting basic research with real-world applications.

RESEARCH FOCUS

Human 2D & 3D Pose   Robustness
UV Map   3D Scene Understanding
Person Detection and Segmentation

TECHNICAL SKILLS

Python
- Deep learning papers
- Training models (eg. PMPose-h) for 10+ days on 8 GPUs using SLURM
- Porsche automated testing (daily runs)

C / C++
- Production code for Porche Macan
- Plug-n-charge feature for Porsche charger
- University course autonomous robot

FRAMEWORKS

PyTorch   OpenCV   SLURM   Git
SMPL   CUDA   Blender   MMCV

AWARDS

Outstanding Reviewer
CVPR 2025

Best Poster Award
FG 2024

Award for Excellent Results
Czech Ministry of Interior

EDUCATION

Ph.D. in Computer Science
Computer Vision, AI
Czech Technical University in Prague
topic: Robust Human Pose Estimation
supervisor: prof. Jiri Matas
📅 Feb 2023 – Ongoing (exp. 2026/27)

M.S. in Computer Science
AI, Computer Vision, Cyber Security
Czech Technical University in Prague
topic: Multi-object Multi-view Tracking
supervisor: prof. Jiri Matas
📅 Oct 2020 – June 2022

Erasmus – University of Ljubljana, SVN

PROJECTS

Set of Forensic Analytical Tools for Image and Video Processing for Criminal Police Service

The project, a collaborative effort with VUT (Brno University of Technology), involves creating a suite of advanced forensic tools for the Czech Republic Police, funded by the Ministry of Interior. These tools focus on the automatic processing of images and videos, specifically using human poses to enhance the efficiency and accuracy of criminal investigations.
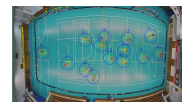
Results:
- Automated system for sensitive content detection. The system is now deployed and used by Czech Police.
- Prize of the Ministry of the Interior for excellent results 🏆
- CVPR'25 and ICCV'25 papers

Advanced Video Analysis for Floorball Player Tracking

This project extends my long-standing interest in sports analysis, a journey that began with my bachelor thesis and evolved through my master's work. The aim is to harness video analysis to gain insight into player movements and team dynamics, enhancing coaching strategies and game understanding.

Results:
- Automated system to download and save camera recordings from our sports hall. The system is available to 20+ users 24/7 and has downloaded more than 300 matches.
- Server app with web interface for immediate situation analysis during matches. The app process video in real-time and offers intuitive UI for both desktop and mobile users.

PoseAnnotator

A lightweight, local alternative to CVAT and LabelStudio. Originally developed to create the RePoGen dataset, we have since used it for multiple datasets. This easy-to-use Python tool features a simple GUI for annotating 2D human poses in images. Ideal for researchers and developers, PoseAnnotator simplifies the data labeling process for human pose estimation projects. Our research group already used it not only for annotating pose but also for other structured keypoints like facial landmarks.

Results:
- OpenSource Python package for human pose annotation – GitHub
- Used for annotating datasets published at CVPR/ICCV

Modeling Infant Sensorimotor Development

The project led by Matej Hoffman focuses on the behavior of infants to gain a deeper understanding of human development. My contribution to this project involves the precise estimation of 2D poses of babies in videos, a crucial aspect that helps in analyzing and interpreting infant movements and interactions. This work is part of a larger effort to model human behavior, particularly in the early stages of life, providing valuable insights for various applications.

Results:
- ICDL'25 paper
- Private data for BBoxMaskPose evaluation

Detection, Identification and Monitoring of Animals by Advanced Computer Vision Methods

The project led by Lukas Picek from University of West Bohemia focuses on the identification of wild animals (especially lynxes) in camera trap images. My contribution to this project involves the estimation of 2D poses of animals, which improves identification accuracy as each animal has a different texture on each side. The project is part of a larger effort to protect the environment using computer vision and AI.