

ROBERT PĚNIČKA

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PROFILE

I am currently an assistant professor in the Multi-robot Systems group at the Faculty of Electrical Engineering (FEE), Czech Technical University in Prague (CTU), where I focus on collision-free motion planning and multi-goal path planning for aerial robots. I am the principal investigator of a GACR Junior Star project (GM23-06162M) and the CTU lead investigator of a TACR TREND project (FW12010288), both focused on agile and resilient autonomy for UAV systems. Previously (2020-2022), I was a postdoctoral researcher in the Robotics and Perception Group (RPG) led by Prof. Davide Scaramuzza at the University of Zurich, where I worked on motion planning for autonomous drone racing. I completed my Ph.D. in 2020 on the topic of Data Collection Planning For Aerial Vehicles, supervised by Doc. Martin Saska and co-supervised by Prof. Jan Faigl. I am the author of more than 20 journal articles and over 20 conference papers, currently having h-index 25 in google scholar and 19 in Web of Science. I have participated in numerous research projects and international competitions, including receiving multiple awards at MBZIRC 2017 and 2020, and autonomous drone racing competition 2025. Additionally, several of my publications received excellent evaluations in the Czech national research assessment M2017+, recognizing their high quality and international impact.

WORK EXPERIENCE

Czech Technical University in Prague, Faculty of Electrical engineering <i>postdoctoral researcher</i> in high-level and trajectory planning for drones	2022 – present
University of Zurich, Robotics and Perception Group <i>postdoctoral researcher</i> in motion planning for drone (UAV) racing	2020 – 2022
Czech Technical University in Prague, Faculty of Electrical engineering <i>PhD student and Research fellow</i> with focus on UAV multi-goal path and motion planning	2016 – 2020
Florida Institute for Human and Machine Cognition <i>Research fellow</i> working on mobile robot startup for interactive learning environment	2014
Czech Technical University in Prague, Faculty of Transportation Sciences <i>Computer Networks Administrator</i> database design, network administration, virtualization	2011 – 2016

EDUCATION

Czech Technical University in Prague, Faculty of Electrical engineering PhD degree in Artificial Intelligence and Biocybernetics Under the supervision of Dr. Martin Saska and co-supervision of prof. Jan Faigl	2016 – 2020
Czech Technical University in Prague, Faculty of Electrical engineering Master degree in Cybernetics and Robotics (summa cum laude)	2013 – 2016
Czech Technical University in Prague, Faculty of Electrical engineering Bachelor degree in Cybernetics and Robotics (summa cum laude)	2010 – 2013

PROJECTS PI AND PARTICIPATION

TACR TREND FW12010288 principal investigator on CTU side (non-lead participant)	2025 - present
GACR Junior Start GM23-06162M principal investigator of project TOPFLIGHT	2023 – present
OP JAK ROBOPROX - Robotics and advanced industrial production	2023 – present
GACR GA22-24425S Sampling-based motion planning in narrow passages	2022 – 2022
Horizon 2020 grant No. 871479 (AERIAL-CORE)	2020 – present
NCCR Robotics through the Swiss National Science Foundation	2020 – 2022
European Research Council grant No. 864042 (AGILEFLIGHT)	2020 – 2022
GACR GA20-10280S Reliable sensing-driven compact groups of micro aerial robots with adaptive shapes	2020 – 2022
GACR GJ19-22555Y Sampling-based planning of actions and motions using approximate solutions	2019 – 2021
GACR GA19-20238S, Multi-robot persistent monitoring of dynamic environments	2018 – 2020
GACR GJ17-16900Y, Stabilization and control of teams of relatively-localized micro aerial vehicles in high obstacle density areas	2017 – 2019
Mobility 7AMB17DE026 (project with IWF at TU-Berlin, Berlin, Germany)	2017 – 2018
Mobility 7AMB17DE025 (project with IAR/IPR at KIT, Karlsruhe, Germany)	2017 – 2018
GACR GP13-18316P, Self-Organizing Maps for multi-goal path planning tasks	2016 – 2017
Mobility 7AMB16FR017 (project with RIS at CNRS-LAAS, Toulouse, France)	2016 – 2017
Symbiotic Evolutionary Robot Organisms, EU FP7 project No. 216342	2012 – 2013

AWARDS

Autonomous drone racing competition 2025 (A2RL & DCL)	Forth in grand challenge and third in drag race
M17+ 2022 evaluation	Excellent evaluation of my paper ‘Physical Orienteering Problem for ...’
M17+ 2021 evaluation	Excellent international level evaluation of my paper ‘Dubins Orienteering Problem’
MBZIRC 2020	1st prize in the Grand challenge
MBZIRC 2020	1st prize in the 2st challenge
MBZIRC 2020	2nd prize in the 1st challenge
ETFA 2019	Best Paper Award
Travelling Salesman Challenge 2.0	Winner of TSP Challenge organized by kiwi.com
Department of Cybernetics, FEE-CTU	Best lab lecturer of department in 2018
MBZIRC 2017	1st prize in the 3rd challenge
MBZIRC 2017	2nd prize in the 1st challenge
MBZIRC 2017	3rd prize in the Grand challenge

RESEARCH STAYS ABROAD

Robotics and Perception Group, University of Zurich <i>postdoctoral researcher in motion planning for drone racing</i>	2020-2022
GRASP Laboratory at University of Pennsylvania <i>short research stay during cooperation on MBZIRC 2020</i>	2018
RIS at LAAS-CRNS Toulouse <i>short research stay through joint mobility project</i>	2016
IAR/IPR at KIT Karlsruhe <i>short research stay during work on Master thesis</i>	2015
Florida Institute for Human and Machine Cognition <i>half year internship working on development of robotic learning environment</i>	2014
Machine Learning & Robotics Lab, University Stuttgart <i>short research stay during work on Bachelor thesis for EU project Replicator</i>	2013

STUDENT MENTORING

PhD students (ongoing):

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|----------------------|--|
| • Swati Dantu | Learning-based agile flight |
| • Parakh Manoj Gupta | Model-based |
| • Matej Novosad | Trajectory planning and high-level planning for drones |
| • Ondřej Procházka | Planning and control for flight in environments with obstacles |

Master students (past):

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|--------------------|---|
| • Rawan Abusadeh | Evaluation of Imitation Learning with Reinforcement Learning-Based Fine-Tuning for Different Control Tasks |
| • Denys Datsko | Perception-Aware Nonlinear Model Predictive Control for Autonomous Drone Racing |
| • Matej Novosad | Path Planning with Different Homotopy Classes in Environment with Obstacles |
| • Kryštof Teissing | Replanning of Collision-Free Trajectories for Unmanned Aerial Vehicle |
| • David Mašek | Learning Autonomous Quadrotor Flight in Environments with Obstacles |
| • Michal Němec | Planning for team of robots in cooperative wall building task [pdf] |
| • Alexander Dubeň | Motion planning with Hermite splines for Unmanned Aerial Vehicle in information gathering task (2018) [pdf] |

Bachelor students (past):

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|-------------------|--|
| • Vít Knobloch | Learning High-Speed Flight of Unmanned Aerial Vehicle in Cluttered Environments |
| • Karel Poncar | Reinforcement Learning for Swarm Control of Unmanned Aerial Vehicles |
| • Jan Hřebec | Nonlinear Predictive Control of Unmanned Aerial Vehicle in Environments with Obstacles |
| • Jan Hrnčíř | Drone simulator integration in Unreal Engine 5 |
| • Jaroslav Janoš | Inspection Planning for Firefighting with Unmanned Aerial Vehicle [pdf] |
| • Arseniy Tkachev | Multi-Goal Path Planning for Spray Writing with Unmanned Aerial Vehicle [pdf] |
| • David Zahrádka | Motion planning for team of Unmanned Aerial Vehicles with flight time constraint and Dubins vehicle model (2018) [pdf] |

TEACHING

- **Multi-robot Aerial Systems** Course about multi-robot systems, specifically focused on aerial vehicles (2022 – present)
- **Solving Problems and other Games** Lab teacher of course for first year bachelor students to learn Python programming basics through solving games (2016 – 2020)
- **Autonomous robotics** Lab teacher of course for first year master students to learn principles of robotics and Robot Operating System (2020 – 2024)
- **IEEE RAS Summer School on Multi-Robot Systems** Lab teacher during the summer school organized by the MRS group at CTU (2019 – present)

COMMUNITY ACTIVITIES

Program Committee and Conference Services

- Program committee International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2024
- Program committee at European Conference on Mobile Robots (ECMR) 2023
- Program committee at European Conference on Mobile Robots (ECMR) 2021
- Program committee at European Conference on Mobile Robots (ECMR) 2019
- Session chair of "Motion and Path Planning II" at IROS 2019, Macau

Reviewer for Conferences and Journals

- European Journal of Operational Research (2020 - present)
- Robotics and Autonomous Systems (2020 - present)
- IFAC World Congress (2020)
- Defence Technology Elsevier (2019)
- European Conference on Mobile Robots (2019 - present)
- Conference on Field and Service Robotics (2019)
- Heliyon (2019)
- International Conference on Advanced Robotics (2019 - present)
- Journal of Intelligent & Robotic Systems (2017 - present)
- Frontiers of Information Technology & Electronic Engineering (2019)
- International Conference on Robotics and Automation ICRA (2018 - present)
- PLoS ONE (2018)
- International Conference on Intelligent Robots and Systems IROS (2017 - present)
- International Symposium on Multi-robot and Multi-agent Systems (2017)
- Autonomous Robots (2016 - present)

PERSONAL SKILLS

Programming	C, C++, Python, Java, PHP, PLSQL, VHDL
PCB designing	OrCAD, Eagle
Software & Tools	Robot Operating System, Latex, Matlab, MS Office
Server administration	VMware, Oracle databases, DNS, DHCP, VPN, IMAP, SMTP, Apache
Languages	great conversational English, basic knowledge of the German language