Roman Ibrahimov

CONTACT INFORMATION

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EDUCATION AND PROFESSIONAL DEVELOPMENT

University of California, Berkeley, CA, USA *Aug 2023-May 2025*
M.S., Mechanical Engineering, CGPA: 3.7/4.0
Advisor: Prof. Mark Müeller

Purdue University, West Lafayette, IN, USA *Jan 2021-May 2023*
M.S., Aeronautics and Astronautics, CGPA: 3.89/4.0
Advisors: Prof. Shirley Dyke and Prof. David Cappelleri

- **IEEE RAS Summer School on Multi-Robot Systems**, CTU, Prague, Czechia, *1-5 Aug 2022*
  Multi-UAV control, perception, localization, and planning

- **DroneCamp**, University of California, ANR, Monterey, California, USA, *27 June - 1 July, 2022*
  UAV hardware & sensors, mission planning, flight skills, safety & regulations

Skoltech (in collaboration with **MIT**), Moscow, Russia *Sep 2018-May 2020*
M.S. with Distinction, Space and Engineering Systems, CGPA: 3.9/4.0
Advisor: Prof. Dzimitry Tsetserukou

ADA University, Baku, Azerbaijan *Sep 2013-May 2018*
B.S. Summa Cum Laude, IT and Systems Engineering, CGPA: 3.90/4.0

- **ITMO University**, St. Petersburg, Russia, *Spring 2017*
  Exchange Student, Control Systems and Robotics, CGPA: 4.0/4.0

- **Middle East Technical University**, Ankara, Turkey, *Spring 2016*
  Exchange Student, Electrical and Electronics Engineering, CGPA: 3.80/4.0

RESEARCH INTERESTS

Planning & Control; Robot design; Wearable Devices; Human-Robot Interaction; Cyber-Physical Systems; Haptics;

PUBLICATIONS

R. Ibrahimov, Teaya Yang, and Mark W. Müeller, "Kalman Filter-Based Drift Detection and Mitigation of Visual-Inertial Odometry in UAVs," *American Control Conference (ACC)*, 2025.

Teaya Yang, **R. Ibrahimov**, and Mark W. Müeller, "Towards Safe and Efficient Through-the-Canopy Autonomous Fruit Counting with UAVs," *IEEE International Conference on Robotics and Automation (ICRA)*, 2025.

A. Behjat, **R. Ibrahimov**, A. Lenjani, A. Barket, K. Martinus, A. Maghareh, D. Whitaker, I. Bilionis, and S. Dyke, "A Computational Framework for the Evaluation of Resilience in Deep Space Habitat Systems," *ASME 2022 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*, St. Louis, Missouri, USA, Aug. 14-17, 2022.

E. Tsykunov, A. Fedoseev, E. Dorzhieva, R. Agishev, **R. Ibrahimov**, D. Vasquez, L. Labazanova, and D. Tsetserukou, "DroneStick: Flying Joystick as a Novel Type of Interface," *ACM SIGGRAPH Asia 2021 Emerging Technologies*, Virtual, Dec. 14-17, 2021.

E. Karmanova, V. Serpiva, S. Perminov, **R. Ibrahimov**, A. Fedoseev, and D. Tsetserukou, "SwarmPlay: A Swarm of Nano-Quadcopters Playing Tic-tac-toe Board Game against a Human," *ACM SIGGRAPH 2021 Emerging Technologies*, Virtual, Aug. 9-13, 2021.

R. Ibrahimov, N. Zherdev, and D. Tsetserukou, "DroneLight: Drone Draws in the Air using Long Exposure Light Painting and ML," *29th IEEE International Conference on Robot & Human Interactive Communication (IEEE RO-MAN 2020)*, Naples, Italy, Aug. 31-Sept. 4, 2020.

E. Tsykunov, R. Agishev, **R. Ibrahimov**, T. Moriyama, L. Labazanova, H. Kajimoto, and D. Tsetserukou "Swarm-Cloak: Landing of Two Micro-Quadrotors on Human Hands Using Wearable Tactile Interface Driven by Light Intensity," *2020 IEEE Haptics Symposium*, Washington DC, USA, March 28-31, 2020.

R. Ibrahimov, E.Tsykunov, V. Shirokun, A. Somov, and D. Tsetserukou, "DronePick: Object Picking and Delivery Teleoperation with a Drone Controlled by a Tactile Wearable," *28th IEEE International Conference on Robot & Human Interactive Communication (IEEE RO-MAN 2019)*, New Delhi, India, 2019.

E. Tsykunov*, **R. Ibrahimov***, D. Vasquez, D. Tsetserukou, "SlingDrone: System for Navigation and Interaction with the Environment Using a Single Drone and VR," *25th ACM Symposium on Virtual Reality Software and Technology (VRST 2019)*, Sydney, Australia, 2019.
*- authors contributed equally to the paper.

E. Tsykunov, R. Agishev, **R. Ibrahimov**, L. Labazanova, T. Moriyama, H. Kajimoto, D. Tsetserukou, "SwarmCloak: Landing of a Swarm of Nano-Quadrotors on Human Arms," *Int. Conf. on Computer Graphics and Interactive Technologies (ACM SIGGRAPH Asia 2019), Emerging Technologies,* Brisbane, Australia, 2019.

E.Tsykunov, R. Agishev, **R. Ibrahimov**, L. Labazanova, A. Tleugazy, and D. Tsetserukou, "SwarmTouch: Guiding Swarm of Nano-Quadrotors with Impedance Control using Wearable Tactile Interface," *IEEE Transactions on Haptics*, 2019.

G. Yashin, D. Trinitatova, R. Agishev, **R. Ibrahimov**, and D. Tsetserukou, "AeroVR: Virtual Reality Teleoperation System for the UAV Robotic Manipulator," *19th IEEE International Conference on Advanced Robotics (ICAR 2019)*, Belo Horizonte, Brazil, 2019.

PROJECT EXPERIENCE

Contact-Rich Robotic Manipulation for Construction, Princeton University   *July 2025-present*
- *Developing a contact-rich manipulation framework for automated assembly tasks using a UR20 robot*
- *Collected user demonstrations via kinesthetic teaching and generating large-scale synthetic data in Isaac Sim*
- *Built a synchronized multi-modal dataset pipeline combining pose, force, and simulation logs for training and evaluation*

Autonomous Drone Inspection of Caltrans Bridges, UC Berkeley   *Aug 2023-May 2025*
- *Implemented visual-inertial odometry with OpenVINS, integrating IMU and stereo camera*
- *Configured and tested hardware, including RealSense D455 for depth imaging, Qualcomm RB5 for onboard computing and Pixracer R15 for flight control*
- *Managed system communication via the Robot Operating System (ROS)*

An inspection robot for Duke Energy Power Lines, Purdue University   *May 2022-Aug 2023*
- *Implemented Model Predictive Control (MPC) for trajectory tracking along power lines*
- *Developed line detection algorithms using OpenCV for enhanced visual recognition*
- *Modeled and simulated robot dynamics*
- *Configured and tested Argo rover for optimal field deployment and reliability*

Resilient Extraterrestrial Habitats, NASA RETH Institute, Purdue University   *May 2021-Aug 2023*
- *Designed a control-theoretic autonomy framework to support resilient design and operation*
- *Built automated active learning framework with robots and humans-in-the-loop*
- *Developed methods for detection and diagnosis of anticipated and unanticipated faults*
- *Contributed to establishing SmartHabs with autonomous abilities to sense, anticipate and respond*

Bio-inspired nano-quadcopter for map building, Purdue University   *Sep 2021-May 2022*
- *Developed an API on FreeRTOS to read sensor reading on the quadcopter*
- *Transmitted sensor data to the ROS base station via radio communication*
- *Collected and processed point cloud data to construct detailed environmental maps*
- *Applied machine learning techniques to predict the map of the environment*

Human-Drone Interaction through a Tactile Wearable, Skoltech   *Oct 2018-May 2020*
- *Implemented human-drone communication using impedance control and vibrotactile feedback*
- *Designed a tactile wearable equipped with eccentric rotating mass (ERM) motors for intuitive interaction*
- *Created a Virtual Reality (VR) application in C# to support teleoperation and aerial manipulation tasks*
- *Developed remote object manipulation techniques using drones*

Balloon Satellite for Testing Solar Cells in High Altitude, Skoltech   *Sep 2018-Jan 2019*
- *Applied Model-based Systems Engineering principles to ensure mission success*
- *Constructed a CubeSat featuring an onboard controller, solar cells, storage devices, and GPS tracking*
- *Gathered and analyzed current, voltage, and temperature (CVT) data from solar cell tests*
- *Retrieved payload with no damage after landing from 35km maximum altitude*

Gas Leak Detecting Mobile Robot for NICA Collider, JINR   *Summer 2018*
- *Designed autonomous navigation system around elliptical collider*
- *Built a mobile robot with an on-board temperature camera*
- *Developed Computer Vision (CV) algorithm based on Python for detection nitrogen gas leak from the collider*
- *Came up with computer-based user interface for remote monitoring*

WORK EXPERIENCE

Research Associate, Princeton University, NJ, USA   *Jul 2025–present*
- *Develop and evaluate robotic manipulation strategies for contact-rich construction tasks using UR20 manipulators.*
- *Collect and analyze multimodal datasets from kinesthetic demonstrations and synthetic simulation environments.*

- Implement ROS 2 control frameworks integrating force/torque feedback for precise alignment and insertion.
- Collaborate with faculty and graduate students on experimental design, system integration, and publication efforts.

Graduate Student Instructor, UC Berkeley, CA, USA   *Jan 2025-May 2025*
- ENGIN07 Computer Programming for Scientists and Engineers
- Led coding labs and exercises, supporting course delivery.
- Conducted hands-on sessions to apply concepts in programming tasks.
- Held office hours to answer questions and assist with assignments.
- Designed and graded coding assignments, providing feedback on student work.

Graduate Research Assistant, UC Berkeley, CA, USA   *Aug 2023-May 2025*
- Design and test control algorithms for UAV stability and obstacle avoidance in complex environments.
- Optimize data processing workflows, enhancing efficiency and accuracy for real-time inspection feedback.
- Collaborate with interdisciplinary teams to troubleshoot hardware and software challenges.
- Presented research findings within lab meetings and contribute to technical publications on UAV autonomy.

Graduate Research Assistant, NASA RETH Institute, IN, USA   *May 2021-Aug 2023*
- Developed real-time fault detection algorithms and situational awareness systems to enhance safety and reliability in extreme environments.
- Designed and configured hardware systems, including specialized sensors, actuators, and computational units, to support autonomous operation in space habitats.
- Conducted simulations and tests to validate habitat resilience against environmental and operational disruptions.
- Collaborated with interdisciplinary teams to integrate control-theoretic approaches into habitat design, advancing NASA's SmartHab initiative with enhanced autonomous capabilities.

Teaching Assistant, Purdue University   *Jan 2021-May 2022*
- CNIT 155 Introduction to Software Development Concepts (in Python)
- Supported course delivery by leading coding labs and exercises, guiding students in foundational Python programming and problem-solving.
- Conducted hands-on lab sessions, helping students implement concepts through coding exercises and real-world applications.
- Held office hours to address individual student questions, clarify complex topics, and provide assignment assistance.
- Created and evaluated coding assignments, offering constructive feedback to enhance students' programming skills and understanding of software development principles.

Intern, *Universal Robots, Moscow, Russia*   *Summer 2019*
- Assisted in research and development for Human-Robot Collaboration (HRC) applications involving quadcopters to enhance interaction and safety.
- Participated in designing and testing control strategies to improve quadcopter responsiveness and collaboration capabilities.
- Supported hardware configuration and troubleshooting to ensure seamless integration of HRC functionalities.
- Documented findings and presented insights to the team, contributing to advancements in HRC applications.

Intern, *Azercosmos OJSCo, Baku, Azerbaijan*   *Summer 2017*
- Supported the Ground Control Department in monitoring and maintaining satellite communication systems.
- Assisted with network configuration and troubleshooting to ensure stable connectivity and optimal system performance.
- Gained experience in analyzing and managing data flow within ground control networks.
- Documented operational procedures and reported on system performance, contributing to improved workflow efficiency.

HONORS AND AWARDS

American Control Conference Full Travel Grant $2000	*April 2025*
Purdue University Poster Symposium Best Poster Award $750	*April 2022*
Skolkovo Foundation Full Graduate Scholarship	*2018-2020*
ACM SIGGRAPH Asia Best Demonstration Award	*November 2019*
Skolkovo Presidential Scholarship	*November 2019*
Skolkovo Presidential Travel Award, $5000	*November 2019*
Skolkovo Presidential Travel Award, $4500	*November 2019*
President's List of Honor, ADA University	*2014-2017*

Erasmus+ Exchange Scholarship, METU *Spring 2016*

FameLab World Finalist, *Cheltenham, the UK* *June 2015*

1st place, Microsoft ImagineCup Competition, *Baku, Azerbaijan* *May 2015*

4th place, International Rudolf Ortvay Competition in Physics, *Hungary* *Dec 2014*

MENTORING
EXPERIENCE

UC Berkeley:
- *Jannik Matthias Heinen, MEng in Mechanical Engineering (upcoming PhD student in TUM, Germany)*
- *Milan Rosic, MEng in Aerospace Engineering (safety engineer at Lucid Motors)*
- *Yuxuan Peng, MEng in Mechanical Engineering*
- *Ruonan Yang, MEng in Mechanical Engineering*

Purdue University:
- *Anderson Xu, BS in Aero/Astro (PhD student at Purdue University)*
- *Benjamin Krugman, BS in Mechanical Engineering*

REVIEWER FOR
CONFERENCE
AND JOURNALS

IEEE Robotics and Automation Letters (RA-L) 2024, RA-L 2023, RA-L 2022, IEEE International Conference on Robotics and Automation (ICRA) 2024, ICRA 2023, ICRA 2021, ICRA 2020; ACM Conference on Human Factors in Computing Systems (CHI) 2020; Virtual Reality & Intelligent Hardware Journal 2020;

TECHNICAL
SKILLS

Programming: *C/C++, Java, Python, MATLAB/Simulink, LabVIEW, LaTeX*

Robotics: *Robot Operating System (ROS), ROS2, Gazebo, NVIDIA Isaac Sim, RViz, Unity*

MCUs: *Qualcomm RB5, myRIO, Arduino, Libelium*

Mechanical: *CAD (SolidWorks), 3D Printing, soldering, laser/plasma cutting*