Yevhenii "Jack" Kovryzhenko

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• https://yevheniikovryzhenko.github.io/Portfolio/

Education

Auburn University

Doctor of Philosophy in Aerospace Engineering, GPA: 4.00/4.00 Masters of Science in Aerospace Engineering (Thesis), GPA: 4.00/4.00 Bachelor of Science in Aerospace Engineering, GPA: 3.47/4.00

Short Summary of Technical Skills

Technical Fields: UAV, UAS, guidance, navigation, control, data-driven control, vehicle and systems design, embedded systems, motion planning, flight dynamics, space mechanics, state estimation, optimal control, calculus of variations, direct and indirect approach to optimal control.

Computer Languages: C&C++ (proficient), Python (beginner), Julia (beginner).

Human Languages: English (fluent), Russian (native), Ukrainian (native), German (beginner).

Software/Frameworks: MATLAB/SIMULINK, Visual Studio, SOLIDWORKS, Qt (C++), PX4, MAVLINK, Linux, GitHub, Pointwise, Ansys Fluent, NPSS, Open Rocket, Flight Stream.

Lab skills: Optitrack Motion Capture, 3D printing, LaTeX, laser cutting, HPC, soldering, basic circuitry, complex system assembly, hardware wiring/setup.

Engineering Experience

Graduate Research Assistant

ACE LAB, Department of Aerospace Engineering, Auburn University

- Developed and experimentally validated novel real-time motion planning techniques based on Finite Fourier series and minimum-snap trajectories for UAVs. Hardware deployments using MATLAB/SIMULINK and PX4.
- Developed and tested various linear and non-linear control systems and strategies in MATLAB/SIMULINK and PX4 environments: TECS, EMF, LQR, PID, and data-driven control (quadcopters and tilt-wing aircraft).
- Embedded system development in C/C++: Control system implementation for multirotor VTOL aircraft. Full autopilot development in Unix-based RTOS (NuttX-PX4 and RTLinux) and general-purpose Linux distros (Ubuntu and Debian): CAN-based servo drivers, GPS drivers, radio communication protocols (MAVLINK), user interface and remote control pipeline development and integration, guidance and control system algorithms implementation, etc.
- Hardware design and testing: CAD design Solidworks, extensive use of 3D manufacturing (plastics, composites), general electrical system-level design, electrical hardware assembly, soldering, configuration, and testing.

Undergraduate Researcher

ACE LAB, Department of Aerospace Engineering, Auburn University

- Developed quadcopter 6DoF simulations in MATLAB/SIMULINK and written custom flight code for Beaglebone Blue board. The autopilot was written in C and C++ for RTLinux OS.
- Developed constrained minimum-snap motion planning algorithms using FFS and deployed to hardware.
- Carried out all hands-on work, including, configuration, sensor calibration, control system gain tuning; and data acquisition for thrust, torque, and motor speed.
- Written communication software, all in C, and resolved in-lab WiFi interference.
- Worked on control system integration and testing using Raspberry Pi 4, Navio-2, and Ardupilot pipeline.

3D Printing Technician

RBD Library Makerspace Lab, I&RC, Auburn University

- Responsible for the setup, operation, and maintenance of laboratory equipment. I was also teaching new employees 3D printing, soldering, laser cutter operation, 3D scanning, and how to operate other equipment.
- Configured remote 3D-printing to mitigate limitations imposed by quarantine.

May 2021 – Current

January 2020 – April 2021

Auburn, Alabama

May 2021 - May 2026 May 2021 - August 2023 August 2017 - May 2021

May 2020 – April 2021

Projects, Leadership, and Extracurricular Activities

President

Vertical Flight Society at Auburn University

• I am Responsible for organizing and planning events, inviting speakers, and hosting presentations. I also mentored a team of undergraduate students participating in the VFS Design competition.

Controls, Systems and Hardware Integration Engineer

Air Force Agility Prime Project, Phase II

- Designed and developed 3D printable tilt-wing aircraft for hardware and software integration.
- Integrated and tested of LQI-, TECS- and EMF- based control systems for a tilt-wing eVTOL UAV.
- Developed software pipelines (C++ bridge for PX4 and MATLAB/SIMULINK) for HITL testing and ground station-to-vehicle communication (MAVLINK via Serial/UDP).
- Written drivers for lidar and CAN motor expansion board. Added support for servo and ESC control via CAN from PX4.

AU-LU Team member

GTOC 11 Competition

• Developed a beam search algorithm to explore feasible impulsive trajectories within a set of 84000 asteroids. • The team placed 17th out of 25 teams who submitted a valid solution with 94 registered teams.

Controls and Systems Engineer, C/C++

Air Force Agility Prime Project, Phase I

• 6-channel flight control law development, hardware integration, and testing for the vectored thrust airship.

Team Leader (Controls, C/C++, Aerodynamics, CAD)

Embedded Systems Team

- 2018-2019: designed, 3D-printed, and tested air-brake design for sounding rocket apogee control. The team placed 5th out of 46 in our category and 10th place overall out of 103 teams at Spaceport America Cup 2019.
- 2019-2020: was in charge of the mechanical and structural design of the new altitude control module, manufacturing, and testing. Carried out a CFD test campaign on a new air brake design. This was the first successful externally mounted air-brake design for AU.
- 2020-2021: designed and developed a completely new Rocket Control System (RCS) module. Supervised hardware and firmware development. As a result, this was the first successfully flight-tested and fully functional rocket control system for AURA.

Teaching Experience

Graduate Teaching Assistant

Department of Aerospace Engineering, Auburn University

- Held weekly mentoring sessions for AERO structures and flight dynamics classes; taught structures lab.
- Assisted with the grading of class material (homework, lab reports, projects, and exams), performed all 3D printing-related work: completing 3D printing requests for labs and projects, teaching students basics of 3D printer operation.

Peer Tutor

Study Partners, Auburn University

- Held scheduled 1hr long tutoring sessions with Auburn University students for a diverse range of subjects, including Engineering Physics I and II, all math subjects starting with Pre-calculus and up to Calculus III, Differential Equations, and Linear Algebra.
- Awarded Tutor of the Semester (Summer, 2019).

Subject Tutor Mentor – Physics

Study Partners, Auburn University

- Led training cohorts for student tutors. Held recruitment meetings and evaluated potential tutor candidates. Assisted other tutors and desk workers (floor managers). Conducted regular observations and performance evaluations of other tutors. Assisted Study Partners management team during general meetings, event planning, etc.
- Awarded Lead Tutor of the Semester (Spring, 2019).

August 2021 – September 2021

Auburn, AL and Wewahitchka, FL

August 2018 - April 2021

Auburn University Rocketry Association (AURA)

August 2021 – May 2022

June 2018 – February 16, 2020

January 2019 - February 16, 2020

Auburn. AL

17 October 2021 - 7 November 2021

September 2022 – August 2024

30 September 2021 – Current

Department of Aerospace Engineering, Auburn University

ACE LAB, Department of Aerospace Engineering, Auburn University

Awards

Charles E. Gavin III Doctoral Fellowship	Fall 2021 - Fall 2024
Second place overall, awarded $750 \mid 10$ th annual Graduate Engineering Research Showcase	October 2022
Outstanding International Student Award International Student Organization	April 2021
Undergraduate Research Fellowship	June 2020 - May 2021
NSF National Robotics Initiative PI Scholarship Science Conference	February 2020
Tutor of the Semester Study Partners	August 2019
Lead Tutor of the Semester Study Partners	May 2019

Peer-Reviewed Journal Publications

Kovryzhenko, Y., Li, N., and Taheri, E., "Robust Data-Driven Control of Quadrotors: From Theory to Practice," Control Engineering Practice, 2025. Under review, submitted: 12/23/2024

Kovryzhenko, Y., and Taheri, E., "Utilizing the Finite Fourier Series to Generate Quadrotor Trajectories Through Multiple Waypoints," *Drones*, Vol. 9, No. 1, 2025, p. 77. doi:10.3390/drones9010077

Kovryzhenko, Y., Li, N., and Taheri, E., "A Control System Design and Implementation for Autonomous Quadrotors with Real-Time Re-Planning Capability," *Robotics*, Vol. 13, No. 9, 2024a, p. 136. doi:10.3390/robotics13090136

Kovryzhenko, Y., and Taheri, E., "Vectorized Trigonometric Regularization for Singular Control Problems with Multiple State Path Constraints," *The Journal of the Astronautical Sciences*, Vol. 71, No. 1, 2023, p. 1. doi:10.1007/s40295-023-00424-5

Conference Presentations and Publications

Kovryzhenko, Y., Li, N., and Taheri, E., "Implementation of a Data-Driven Control Method for Unmanned Aerial Vehicles," American Institute of Aeronautics and Astronautics, 2024b. doi:10.2514/6.2024-3658

Comer, A., Chakraborty, I., Kovryzhenko, Y., Taheri, E., Bhandari, R., Kunwar, B., and Putra, S., "Flight Testing of Explicit Model-Following Trajectory Control System for Lift-Plus-Cruise and Tilt-Wing Configurations," VFS 80 Forum, Montreal, Canada, 2024. doi:10.4050/F-0080-2024-1306

Kovryzhenko, Y., Nurre, N. P., and Taheri, E., "Generalized Vectorized Trigonometric Regularization for Solving Optimal Control Problems with Complex Solution Structures," *AIAA SciTech Forum*, American Institute of Aeronautics and Astronautics, Orlando, FL, 2024c. doi:10.2514/6.2024-2208

Kovryzhenko, Y., Saloglu, K., and Taheri, E., "Vectorized Trigonometric Regularization for Optimal Control Problems with Singular Arcs," *AAS/AIAA Astrodynamics Specialist Conference*, Charlotte, North Carolina, August 7-11, 2022, p. 21. URL https://s3.amazonaws.com/amz.xcdsystem.com/ A464D031-C624-C138-7D0E208E29BC4EDD_abstract_File22414/FinalPaperPDF_323_0902115924.pdf

Kovryzhenko, Y., and Taheri, E., "Comparison of minimum-snap and finite fourier series methods for multi-copter motion planning," *AIAA SCITECH 2022 Forum*, American Institute of Aeronautics and Astronautics, San Diego, CA & Virtual, 2022. doi:10.2514/6.2022-1085

Undergraduate and Graduate Degree Publications

Kovryzhenko, Y., "Application of the finite fourier series for smooth motion planning of quadrotors," Master's thesis, Auburn University, Jul. 2023. URL https://etd.auburn.edu//handle/10415/8797

Kovryzhenko, Y., and Taheri, E., "Development of Cascaded Control and Path-Planning Algorithms for Autonomous Aerial Vehicles," *Auburn University Journal of Undergraduate Scholarship*, 2021, p. 4. URL https://bpb-us-e2.wpmucdn.com/wordpress.auburn.edu/dist/a/151/files/2022/01/ FINAL-2021-22-AUJUS-Issue-Working-File.pdf

News Articles and Media Highlights

McAdory, J., "Aerospace professors play key role in designing, testing prototype aircraft," *Auburn University* College of Engineering, 2023. URL

https://eng.auburn.edu/news/2022/10/aerospace-professors-help-development-of-concept-aircraft

McAdory, J., "Aerospace students challenged to resolve space trajectory issue," Auburn University College of Engineering, 2022a. URL https:

//eng.auburn.edu/news/2022/02/aerospace-students-excel-at-recent-global-trajectory-optimization-competition

McAdory, J., "Aerospace professors partner with U.S. Air Force Agility Prime Program," *Auburn University* College of Engineering, 2022b. URL

https://eng.auburn.edu/news/2022/01/aerospace-professors-partner-with-air-force-agility-prime-program

McAdory, J., "Auburn rocketry team takes 12th out of 76 teams at prestigious Spaceport America Cup," Auburn University College of Engineering, 2021. URL

https://eng.auburn.edu/news/2021/07/auburn-rocket-team-fifth-nationally-in-texas-competition