Giorgos ('Yorgos') Mamakoukas

giorgosmamakoukas@u.northwestern.edu • (847) 868 - 2198 • gmamakoukas.com

SUMMARY

Mechanical Engineering/Robotics Ph.D. researcher, specializing in algorithm development, optimization methods, real-time nonlinear control, system modeling, dynamics, machine learning, and numerical methods. Extensive research, teaching, and leadership experience with a rigorous mathematical background, first-author publications in top-tier peer-reviewed journals and conferences in robotics and control and hands-on experiments with robotic fish. Enthusiastic team player with an interest in the nexus of science, research, and management/business.

Keywords: nonlinear optimization and control, machine learning, algorithm development, numerical methods

SKILLS AND INTERESTS

Programming Languages: MATLAB, Python, C, C++, Mathematica, LaTeX
Software and Toolbox: Git, Simulink, Onshape
Languages: Greek (native), English (fluent), German (advanced)
Interests: Team sports (former soccer varsity athlete), Hiking, Mentoring, Chess

EDUCATION

Northwestern University, The Graduate School, Evanston, IL
Ph.D. in Mechanical Engineering | GPA: 3.93/4.0 — Expected June 2020
Master of Science in Mechanical Engineering | GPA: 3.93/4.0 — July 2017
Honors/Awards: Brady Scholars, Graduate Leadership and Service, Walter P. Murphy Fellowship

Northwestern University Kellogg School of Management, Evanston, IL
Certificate in Management for Scientists and Engineers, Kellogg School of Management — Aug 2018

Grinnell College, Grinnell, IA
Bachelor of Arts in Physics (Honors) | GPA: 3.97/4.0 — May 2014
Honors/Awards: H. George Apostle Prize in Physics, Phi Beta Kappa Academic Award, George White Academic Scholarship

RESEARCH EXPERIENCE

Graduate Research Assistant, Interactive & Emergent Autonomy Lab, Northwestern University — Sept 2014 – Present

Machine Learning Algorithms for Prediction and Control (2 Publications)
- Created algorithm to ensure optimal and stable data-driven system identification and improve long-horizon accuracy
- Implemented and improved real-time data-driven control of robotic systems in simulation and experiments
- Developed novel simulations to assess the effectiveness and accuracy of predicting models

Data-Driven Control of Robotic Fish (3 Publications)
- Created technique to quantify and bound the model accuracy of data-driven models using Python & MATLAB
- Cleaned and analyzed data and performed error analysis to assess and improve model performance
- Employed algorithms on robotic fish for experimental tracking in disturbance using C++
- Led collaboration with Michigan State University to on-site troubleshoot and consult their experiments with robotic fish

Real-Time Optimal Control of Nonlinear Systems (7 Publications)
- Investigated and advanced nonlinear optimization and control algorithms
- Developed feedback algorithms using C++ software for guaranteed collision-free locomotion of robots

Independent Research on Magnetic Levitation, California Institute of Technology**, CA — June – Aug 2013
- Selected for competitive and prestigious program for magnetic isolation of gravitational wave detectors from seismic noise
- Reduced experimental setup phase from 10 weeks to 13 days by re-planning and prioritizing
- Created the solution that realized a seismic isolation technique for detecting gravitational waves

Independent Research on Alloy Crystallography, Grinnell College, IA — June – July 2012
- Pioneered experimentation with new $220k X-ray diffractometer to discover new crystals

- Discovered new crystals and analyzed their atomic structure

SELECTED LEADERSHIP AND SERVICE EXPERIENCE

Brady Scholar Fellow, Northwestern University   June 2016 – June 2019
- Led sixteen Northwestern students to secure funding and perform energy audits for affordable housing
- Managed three grants ($2k), training of 21 participants, and completion of 5 energy audits in Evanston apartments
- Conducted weekly meetings, coordinated tasks, and evaluated their progress

Presenter at Museum of Science and Industry Annual Robot Block Party   Apr 2015 – Apr 2019
- Presented and communicated complex robotics research projects to hundreds of adults and children

President of Mechanical Engineering Graduate Student Society, Northwestern University   Sept 2016 – Feb 2018
- Expanded the program by creating new positions and establishing annual social and career development events
- Streamlined communication and outreach processes by creating a website and a contact e-mail address

Supervisor of Teaching Assistants, Grinnell College   Aug 2013 – May 2014
- Promoted to an inaugural role to assess and guide all 10+ science TAs to improve teaching and communication skills
- Oversaw and filmed TAs for 5 hours/week during their teaching and advised them on their strengths and weaknesses

SELECTED MENTORSHIP AND TEACHING EXPERIENCE

Robotics Teaching Assistant, Northwestern University   Sept 2016 – Dec 2016
- Received 97.8% positive evaluation from 73 students

Physics and Math Mentor, Grinnell College   Aug 2011 – May 2014
- Identified and bridged knowledge gaps and motivated students both in 25+ student classes and in 1-on-1 tutoring

Modern Greek Instructor, Grinnell College   Aug 2011 – May 2012
- Collaborated with another student to design curriculum and teach a new credit-bearing college course
- Participated in seminars on effective communication styles and teaching methods

SELECTED PUBLICATIONS (5 of 12)

- **G. Mamakoukas,** M. Castano, X. Tan and T. D. Murphey, 'Online data-driven control of robotic systems using derivative-based Koopman operators', in *Transactions on Robotics.* Submitted 2020.
- **G. Mamakoukas**, M. Castano, X. Tan and T. D. Murphey, 'Local Koopman operators for data-driven control of robotic systems', in *Robotics: Science and Systems*, 2019.
- **G. Mamakoukas**, M. A. MacIver, and T. D. Murphey, 'Feedback synthesis for underactuated systems using sequential second-order needle variations', in *International Journal of Robotics Research,* 2018. **[Invited as best conference paper]**
- **G. Mamakoukas,** M. A. MacIver, and T. D. Murphey, 'Superlinear convergence using controls based on second-order needle variations', in *Conference on Decision and Control*, 2018.
- **G. Mamakoukas**, M. A. MacIver, and T. D. Murphey, 'Feedback synthesis for controllable underactuated systems using sequential second-order actions', in *Robotics: Science and Systems,* 2017.