Benjamin William Look Margolis

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Education

University of California, Davis **Davis, CA**
PhD, Mechanical and Aerospace Engineering *2016–2020*
Dissertation: Model and Algorithm Development in Applications of Model Predictive Control
Advisor: Rida T. Farouki

Santa Clara University **Santa Clara, CA**
MS, Applied Mathematics *2014–2016*
Advisor: Mohammad A. Ayoubi

Harvey Mudd College **Claremont, CA**
BS, Engineering *2006–2010*

Work Experience

NASA Ames Research Center **Moffett Field, CA**
Aerospace Engineer (GS-13) *February 2022–present*

NASA Ames Research Center **Moffett Field, CA**
Research Aerospace Engineer (GS-12) *September 2020–February 2022*

NASA Ames Research Center **Moffett Field, CA**
Aerospace Engineer Trainee (GS-11) *July 2018–September 2020*

NASA Ames Research Center **Moffett Field, CA**
Interim Research Associate (Science and Technology Corporation) *May 2018–July 2018*

- Invented novel aerodynamic control system that leverages vehicle instability for increased manueverability, which was the subject of 5 conference papers, 1 journal paper, and 1 patent
- Developed a novel trajectory sensitivity method "SGM" which was described in a peer-reviewed journal paper and used in orbital trajectory design efforts, results published in 3 conference papers and analysis delivered to commercial partners
- Led the development of a novel aircraft synthesis tool which has been used for four conference papers and analysis delivered to commercial and agency partners
- Wrote winning software architecture proposal for 2-year, >1 million dollar, multi-center tool development project leveraging SGM and previously developed software to perform analysis and design of aerospace vehicle trajectories under uncertainty
- Served as a subject matter expert within the agency on engineering software tool development and numerical methods with application to trajectory and system design by advising on a variety of early stage project development sessions, technical workshops, and standards development working groups.

UC Davis **Davis, CA**
Doctoral Researcher *September 2016–June 2020*

- Contributed to design and implementation of software framework to facilitate data collection

and analysis for human-subject experiments.
- Released two open-source scientific Python packages with mathematically consistent API.
- Implemented real-time model predictive control system for CNC machine to perform inverse dynamics compensation.
- Compared three nonlinear tracking control methods for aerospace application in simulation study.
- Taught 6 sections of EME 50: Manufacturing Processes Lab as Teaching Assistant, demonstrating operation of manufacturing processes, overseeing safety during student work hours, teaching and grading geometric design and tolerance principles.

Santa Clara University **Santa Clara, CA**
Graduate Researcher *September 2014–September 2016*

- Designed optimal and nonlinear control systems applied to a theoretical aerospace maneuver.
- Analytically and numerically evaluated control systems.
- Designed and implemented numerical simulation software to perform study.
- Mentored younger students in both technical and professional development.

EyEngineering **Ojai, CA**
Chief Engineer *January 2012–September 2016*

- Invented patented laser device for treatment of metabolic retinal diseases.
- Wrote technical documentation and memorandum for patent application and business development materials.
- Oversaw and reviewed technical work and reports from vendors.

Six Pearls Designs **Pomona, CA**
Sole Proprietor *January 2012–September 2016*

- Designed and developed web application and performed engineering design and analysis.
- Worked within legacy systems, adapting to unfamiliar technologies and code bases to improve performance.
- Used modern web development tools including front-end development with jQuery, AJAX, less.js, and knockout.js and back-end development with PHP, WordPress, Django, and Wagtail.
- Contributed to open source software project, Wagtail.

Trinity Automation **Norco, CA**
Software/Controls Engineer *June 2011–January 2012*

- Designed, documented, and implemented electrical and control systems for robotic and programmable logic controller (PLC) automation systems.
- Developed and implemented PLC programs and HMI interfaces, including touch screens and graphics.
- Assisted with mechanical design and fabrication of custom machines and robotic arm end-effector tools.
- Directly interfaced with customers and led project kick-off meetings, milestone reviews, installation, and run-off.

Vertical Management Systems **Pasadena, CA**
Junior Developer *December 2010–June 2011*

- Developed new features for financial software using C#, Visual Basic, and MS SQL database systems.
- Solved technical issues for clients by identifying root cause and developing solutions.

The Pilot Group **Monrovia, CA**
Staff Engineer *June 2010–October 2010*

- Designed and fabricated manufacturing cell of product line for client as project manager.
- Directly interfaced with customers and led milestone reviews.

Rhizome Systems **Claremont, CA**
Embedded Systems Engineer *October 2007–December 2009*

- Developed energy management devices with team of four students and one professor.
- Developed embedded system using MicroChip PIC 18F microcontroller for real-time electrical power measurement device.
- Installed power measurement system in eight dorms for energy conservation competition.

Oregon Medical Laser Center **Portland, OR**
Summer Intern *January 2009–September 2009*

- Continued Spring 2009 student capstone project by characterizing the properties of the advanced hemostatic device.
- Prepared prototypes for acute animal trials and developed efficient manufacturing procedure.
- Wrote and delivered presentation on research results to the research team.

BSST LLC **Irwindale, CA**
R&D Instrumentation Development Intern *June 2008–August 2009*

- Programmed automated scanning measurement system, including graphical interface using LabVIEW.
- Designed mechanical system for scanning measurement instrument.
- Managed fabrication via local vendors.

Honors and Awards

NASA
Software of the Year Co-Winner *July 2025*
For Condor, a mathematical modeling framework for engineers with a deadline

NASA Ames Research Center
Ames Honor Award *November 2024*
Exceptional Technical Contribution – Engineer

NASA Ames Research Center
Director's Management Group Achievement Award *August 2024*
For the successful delivery of data models for aircraft performance to the national airspace digital twin project

NASA Ames Research Center
Ames Honor Award *November 2019*
Exceptional Technical Contribution – Student

NASA Ames Research Center
Director's Management Group Achievement Award *November 2019*
For the successful delivery of unique Guidance, Navigation, and Control solutions for precision landing of deployable entry vehicles

NASA/International Aeronautical Congress
Student Travel Award *October 2019*

IPPW Student Organizing Committee
Student Travel Award *July 2019*

University of California, Davis
Malcolm R. Stacey Fellowship *July 2017*

Santa Clara University
Graduation with Distinction *September 2016*

Santa Clara University
James W. Reed Graduate Engineering Scholarship *December 2014*

National Science Foundation
Graduate Research Fellowship *April 2014*

Harvey Mudd College
Graduation with Distinction *May 2010*

Harvey Mudd College
Graduation with honors from the Department of the Humanities, Social Sciences, and Arts *May 2010*

Harvey Mudd College
Dean's List *Spring 2007 – Fall 2009*

Harvey Mudd College
Strauss Internship for Social Understanding *June 2007*

Certificates

The Carpentries
Instructor Training *May 2019*
The Carpentries is an organization that teaches foundational coding and data science skills to researchers worldwide.

UC Davis Professors for the Future
Certificate of Completion *March 2018*
Inclusive Mentorship Seminar Series

UC Davis Center for Educational Effectiveness
Certificate of Completion *July 2017*
Demonstrated Excellence: "Scholarly Teaching Strategies to Maximize Student Learning"

Fanuc Robotics
Certificate of Completion *July 2011*
HandlingTool Operation and Programming (J2P0310)

Journal Articles

[1] Luttrull JK, Chang DB, **Margolis BWL**, Dorin G, Luttrull DK. "Laser re-sensitization of medically unresponsive neovascular age-related macular degeneration: efficacy and implications."

Retina, October 2014.

[2] Luttrull JK, **Margolis BWL**. "Functionally guided retinal protective therapy for dry age-related and inherited retinal degenerations. A pilot study." *IOVS*, November 2015.

[3] **Margolis BWL**. "SimuPy: A Python framework for modeling and simulating dynamical systems." *Journal of Open Source Software*, September 2017.

[4] Lyons KR, **Margolis BWL**. "AxoPy: A Python Library for Implementing Human-Computer Interface Experiments." *Journal of Open Source Software*, February 2019.

[5] **Margolis BWL**, Lyons KR. "ndsplines: A Python Library for Tensor-Product B-Splines of Arbitrary Dimension." *Journal of Open Source Software*, September 2019.

[6] **Margolis BWL**, Ayoubi MA, Joshi SS. "Nonlinear Model Predictive Control of Reentry Vehicles Based on Takagi-Sugeno Fuzzy Models." *Journal of Astronautical Sciences*, March 2020.

[7] **Margolis BWL**, Farouki RT. "Inverse dynamics toolpath compensation for CNC machines based on model predictive control." *The International Journal of Advanced Manufacturing Technology*, July 2020.

[8] Okolo WA, **Margolis BWL**, D'Souza SN, Yount BC, Barton JD, Johnson BJ. "Development and Evaluation of Control Architectures for a Mechanically Deployed Entry Vehicle." *Journal of Spacecraft and Rockets*, March 2022.

[9] **Margolis BWL**, Lyons KR. "Simupy Flight Vehicle Toolbox" *Journal of Open Source Software*, July 2022.

[10] **Margolis BWL**. "Another Geometric Interpretation of Cramer's Rule." *Mathematics Magazine*, July 2023.

[11] **Margolis BWL**. "A Sweeping Gradient Method for Ordinary Differential Equations with Events." *Journal of Optimization Theory and Applications*, October 2023.

[12] Folk S, Melton J, **Margolis BWL**, Yim M, Kumar V. "Learning Local Urban Wind Flow Fields from Range Sensing." *IEEE Robotics and Automation Letters*, June 2024.

Conference Manuscripts

[1] **Margolis BWL**, Ayoubi MA. "Model Predictive Control of Planetary Aerocapture Using Takagi-Sugeno Fuzzy Model." *26th AAS/AIAA Space Flight Mechanics Meeting*, February 2016.

[2] **Margolis BWL**, Ayoubi MA. "Comparative Study of Tracking Controllers Applied to Martian Aerocapture." *AAS/AIAA Astrodynamics Specialist Conference*, Columbia River Gorge, Stevenson, WA, August 2017.

[3] D'Souza SN, Okolo WA, Nikaido BE, Yount B, Tran J, **Margolis BWL**, Smith BP, Cassell AM, Johnson BJ, Hibbard KE, Barton JD, Hays Z. "Developing an Entry Guidance and Control Design Capability using Flaps for the Lifting Nano-ADEPT." *AIAA Aviation 2019 Forum*, June 2019.

[4] **Margolis BWL**, Okolo WA, Nikaido BE, Barton JD, D'Souza SN. "Control and Simulation of a Deployable Entry Vehicle with Aerodynamic Control Surfaces." *AAS/AIAA Astrodynamics Specialist Conference*, Portland ME, August 2019.

[5] **Margolis BWL**, Okolo WA, D'Souza SN. "Control Design & Sensitivity Analysis for a Deployable Entry Vehicle with Aerodynamic Control Surfaces." *70th International Aeronautics Congress*, Washington, D.C., October 2019.

[6] Okolo WA, **Margolis BWL**, Barton JD, D'Souza SN. "Pterodactyl: Development and Comparison of Control Architectures for a Mechanically Deployed Entry Vehicle." *AIAA SciTech Forum 2020*, Orlando FL, January 2020.

[7] Alunni A, D'Souza SN, Yount B, Okolo W, Nikaido B, **Margolis BWL**, Johnson B, Hibbard K, Barton J, Lopez G, Hays. "Pterodactyl: Trade Study for an Integrated Control System Design of a Mechanically Deployed Entry Vehicle." *AIAA SciTech Forum 2020*, Orlando FL, January 2020.

[8] **Margolis BWL**, Okolo WA, D'Souza SN, Johnson BJ. "Pterodactyl: Guidance and Control of a Symmetric Deployable Entry Vehicle using an Aerodynamic Control System." *AIAA SciTech Forum 2021*, Virtual, January 2021.

[9] D'Souza SN, Alunni A, Yount B, Okolo WA, **Margolis BWL**, Johnson BJ, et. al. "Pterodactyl: System Analysis of an Asymmetric and Symmetric Deployable Entry Vehicle for Precision Targeting Using Flaps." *AIAA SciTech Forum 2021*, Virtual, January 2021.

[10] Lyons, KR., **Margolis BWL**, et. al. "Advancement of the General Aviation Synthesis Program Using Python to Enable Optimization-Based Hybrid-Propulsion Aircraft Design." *AIAA AVIATION Forum*, June 2023.

[11] Recine C, Pham DDV, Bowles JV, Lyons KR, **Margolis BWL**, Garcia JA. "Analysis and Optimization of Baseline Single Aisle Aircraft for Future Electrified Powertrain Flight Demonstration Comparisons." *AIAA AVIATION Forum*, June 2023.

[12] **Margolis BWL**, et. al. "General Aviation Synthesis Program Advancements with Symbolic Computations, Optimization, and Decoupled Numerical Methods" *AIAA AVIATION Forum*, July 2024.

[13] **Margolis BWL**, Woffinden D. "Robust Trajectory Optimization Techniques Using a Sweeping Gradient Method and Linear Covariance Analysis." *AAS/AIAA Astrodynamics Specialist Conference*, August 2024.

[14] **Margolis BWL**, Woffinden D. "Co-Optimization of Navigation System Requirements and Trajectory Design Using a Sweeping Gradient Method and Linear Covariance Analysis." *AAS/AIAA Astrodynamics Specialist Conference*, August 2024.

[15] Bashir ZT, McKown Q, D'Souza SN, **Margolis BWL**, Johnson BJ. "Pterodactyl: Coupled 6-DOF Integration of Guidance and Control Algorithms in Genesis." *AIAA SciTech Forum*, January 2025.

[16] Listgarten NS, Pham DDV, Natividad CAD, **Margolis BWL**, Lyons KR Garcia JA, Bowles JV. "Parallel Hybrid Turboprop Performance Modeling and Optimization" *AIAA SciTech Forum*, January 2025.

[17] Woffinden D, **Margolis BWL**, Robinson S. "Performance Impacts to the NASA Artemis II Trajectory Correction Burn Placement" *AAS Guidance, Navigation and Control Conference*, February 2025.

[18] Folk S, Melton J, **Margolis BWL**, Yim M, Kumar V. "Towards Safe and Energy-Efficient Real-Time Motion Planning in Windy Urban Environments." *IEEE International Conference on Robotics and Automation*, May 2025.

[19] Zelinski S, Recine C, Natividad CAD, Pham DDV, **Margolis BWL**, Listgarten NS, Phillips J. "Assessing National Airspace System Impact of Transonic Truss-Braced Wing Aircraft" *AIAA Aviation Forum*, July 2025.

[20] Pham DDV, Natividad CAD, **Margolis BWL**, Listgarten NS, Jansen RH. "Parametric Modeling and Mission Optimization for the Hybrid Electric Turboprop Commercial Freighter (HETCOF) Concept" *AIAA SciTech Forum*, January 2026.

[21] **Margolis BWL**, Joseph J, Kinney DJ. "Outer Mold Line Design of a Blended-Wing-Body using Gradient-Based Optimization of a Vortex-Lattice Model" *AIAA SciTech Forum*, January 2026.

[22] **Margolis BWL**, Lyons KR, Nativdad CAD, Listgarten NS. "A Component-Assembly Architecture for Conceptual Aircraft Design" *AIAA SciTech Forum*, January 2026.

[23] **Margolis BWL**, Lyons KR, Garcia JA, Felder JL, Jones SM, Lavelle TM, Wang XJ. "Useful Derivatives for Numerical Propulsion System Simulation Models" *AIAA SciTech Forum*, January 2026.

[24] **Margolis BWL**, Lyons KR, York CE, Woffinden D, Bhatt S, Steffes SR, Tarpley ML. "A Systems Approach to Modeling Uncertain ODE Systems" *AIAA SciTech Forum*, January 2026.

Patents

[1] Gregory KW, Baranowski LL, Kalyanpur A, Vine S, Blackwell G, **Margolis B**, Dell S. "Hemorrhage control devices and methods." United States Patent No. #8,828,050.

[2] Luttrull JK, **Margolis B**, Chang DB. "Process for restoring responsiveness to medication in tissue of living organisms." United States Patent No. #9,168,174.

[3] Luttrull JK, **Margolis B**. "System and process for retina phototherapy." United States Patent No. #9,381,115.

[4] Luttrull JK, **Margolis B**, Chang DB. "Subthreshold micropulse laser prophylactic treatment for chronic progressive retinal diseases." United States Patent No. #9,381,116.

[5] Luttrull JK, **Margolis B**, Chang DB. "Pulsating electromagnetic and ultrasound therapy for stimulating targeted heat shock proteins and facilitating protein repair." United States Patent No. #9,427,602.

[6] Luttrull JK, **Margolis B**, Chang DB. "System and process for neuroprotective therapy for glaucoma." United States Patent No. #9,962,291.

[7] Luttrull JK, **Margolis B**. "Apparatus for retina phototherapy." United States Patent No. #10,076,671.

[8] Luttrull JK, Chang DB, **Margolis B**. "System and process for treatment of myopia." United States Patent No. #10,278,863.

[9] Luttrull JK, **Margolis B**, Chang DB. "System for performing retina photostimulation." United States Patent No. #10,285,859.

[10] Luttrull JK, **Margolis B**, Chang DB. "System for neuroprotective therapy for glaucoma." United States Patent No. #10,299,961.

[11] Luttrull JK, Chang DB, **Margolis B**. "Method for heat treating biological tissues using pulsed energy sources." United States Patent No. #10,531,908.

[12] Luttrull JK, Chang DB, **Margolis B**. "Process and system for utilizing energy to treat biological tissue." United States Patent No. #10,596,389.

[13] Luttrull JK, Chang DB, **Margolis B**. "System and process for prevention of myopia." United States Patent No. #10,709,608.

[14] Luttrull JK, Chang DB, **Margolis B**. "Process utilizing pulsed energy to heat treat biological tissue." United States Patent No. #10,874,873.

[15] Luttrull JK, Chang DB, **Margolis B**. "Process for providing protective therapy for biological tissues or fluids." United States Patent No. #10,953,241.

[16] Luttrull JK, Chang DB, **Margolis B**. "Process utilizing pulsed energy to heat treat biological tissue." United States Patent No. #11,033,749.

[17] Luttrull JK, Chang DB, **Margolis B**. "System and process of utilizing energy for treating biological tissue." United States Patent No. #11,077,318.

[18] D'Souza SN, Okolo WO, **Margolis B**, et. al. "Aerospace Vehicle Entry Flightpath Control." United States Patent No. #11,772,828.

[19] **Margolis B**, Garcia JA, "Method and System for Enhancing Vehicle Performance and Design Using Parametric Modeling and Gradient-Based Control Integration." United States Patent Application No. 18/907,440

NASA Technical Memo

[1] "Expansion of Check-Cases for 6DOF Simulation," *October 2024*. NASA/TM−20240013031 // NESC-RP-23-01853

NASA New Technology Reports - Lead Innovator

[1] "A novel aircraft bank control system design concept exploiting the dihedral effect," *July 2019*. ARC-18469-1

[2] "SimuPy Flight Vehicle Toolkit," *August 2020*. ARC-18618-1

[3] "A method for flight vehicle design that considers physical and guidance, navigation, and control systems," *July 2022*. ARC-18856-1

[4] "A novel wind field estimation method using small Unmanned Aerial Vehicles as remote sensor," *August 2022*. ARC-18873-1

[5] "Condor," *November 2023*. ARC-18996-1

[6] "Sweepyng: An implementation of a sweeping gradient method for ordinary differential equations with events in Python," *January 2024*. ARC-19018-1

[7] "Gascon," *January 2024*. ARC-19018-1

NASA New Technology Reports - Contributing Innovator

[1] "RCS Hardware for DEV Entry Flightpath Control," *September 2019.* ARC-18498-1

[2] "Mass Movement Hardware for DEV Entry Flightpath Control," *September 2019.* ARC-18499-1

[3] "Flap Hardware for DEV Entry Flightpath Control," *September 2019.* ARC-18496-1

Open Source Software Projects - Lead Developer

[1] SimuPy: A framework for modeling and simulating dynamical systems

[2] ndsplines: Multi-dimensional B-splines

[3] SimuPy Flight Vehicle Toolkit: an efficient simulation framework for flight vehicles in Python.

[4] Condor: a framework for mathematical modeling of engineering systems in Python, for engineers with a deadline.

[5] Sweepyng: a canonical implementation of the sweeping gradient method for computing gradients through ODEs with events (to be released)

[6] Condor Flight Simulation Tool: a semantic flight vehicle modeling toolkit (open-source release process initiated)

[7] Gascon: the general aviation synthesis program in condor (open-source release process initiated)

[8] SIGMA: swift integrated GNC mission analysis

Open Source Software Projects - Contributor

[1] Wagtail: a Django content management system

[2] AxoPy: A Python Library for Implementing Human-Computer Interface Experiments

Academic Service

Journal of Open Source Software
Reviewer

Optimization and Engineering
Reviewer

Journal of Spacecraft and Rockets
Reviewer

UC Davis Poolbuster's Vanpool
President *January 2017 – June 2018*

Deep and Reinforcement Learning Journal Club
UC Davis Mechanical and Aerospace Engineering
Organizer *June 2017 – March 2018*

Early Career Advisory Group, NASA Ames Research Center
Interim Co-Chair *October 2020 – May 2021*

NASA Standard for Models and Simulations (NASA-STD-7009) Revision B
Working Group Member *January 2021 – July 2022*

Skills

Scientific Computing: Python, SciPy, NumPy, pandas, matplotlib, Jupyter, CVXPY, CVXOPT, Cython, code generation, scikit-learn, Keras, TensorFlow, MATLAB, Mathematica, API design

Electronics and embedded systems: microcontroller (Microchip PIC, Atmel AVR, Parallax Propeller, Arduino, Raspberry Pi) and FPGA (verilog); analog, digital, and mixed circuit design, analysis, prototyping; motor controllers (H-Bridge usage for DC motors, stepper motors, variable frequency drive/VFD for AC motors)

Mechanical design and fabrication: mill, lathe, welding, CNC, CAD (SolidWorks, AutoCAD), CAM (GibbsCAM, MasterCAM, ESPRIT), geometric design and tolerancing/GD&T, sketching

Industrial automation: programmable logic controllers/PLC ladder logic (Rockwell, Automationdirection), robotic systems (Fanuc, ABB), LabVIEW

Web development: PHP, WordPress, HTML, CSS, JavaScript, jQuery, AJAX, less.js, knockout.js, Django, Wagtail, basic devops

Control system synthesis and analysis: PID controllers, linear quadratic regulator/LQR, Kalman filter, robust control, model predictive control/MPC, statistics, optimization, estimation, digital signal processing, analog signal processing

Applied Mathematics: numerical linear algebra, optimization algorithms, distributed computing, solution of ordinary differential equations

Interests

Strength training, martial arts, board games