Jonathan Cangelosi

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Education

May 2023 – Now **Rice University,** Houston, TX
Ph.D. Candidate in Computational and Applied Mathematics
Advisor: Dr. Matthias Heinkenschloss
Thesis: *An Adaptive Surrogate Model Refinement (ASMR) Framework for Simulation and Optimization of Dynamical Systems*
Expected completion date: May 2025.

Aug 2020 – May 2023 **Rice University,** Houston, TX
M.A. in Computational and Applied Mathematics, May 2023.
Advisor: Dr. Matthias Heinkenschloss
Thesis: *Trajectory Optimization of Hypersonic Vehicles via a Radau Pseudospectral Method*
Successfully defended December 2022.

Aug 2016 – Dec 2019 **Louisiana State University,** Baton Rouge, LA
B.S. in Mathematics (with Honors), December 2019.
B.S. in Computer Science (with Honors), December 2019.

Research Experience

Jul 2021 – Now **Research Assistant,** Department of Computational Applied Mathematics and Operations Research (CMOR), Rice University
Implemented pseudospectral optimal control software in Python. Derived rigorous sensitivity analysis results in a function space setting. Development of sensitivity-driven adaptive surrogate model refinement framework for trajectory simulation and optimization with expensive high-fidelity models in progress. Work directly contributed one preprint and several conference posters or presentations.

Dec 2021 – Now **Multidisciplinary University Research Initiative (MURI)**
Lead PI: Dr. Charbel Farhat, Stanford University
Project title: *A Robust Multi-Physics Design Analysis and Optimization Framework for Hypersonic Systems Grounded in Rigorous Model Reduction*
Funded by a grant from the Air Force Office of Scientific Research (AFOSR). Collaborated with multidisciplinary research teams from 4 universities. Work directly contributed one conference paper to AIAA SciTech Forum 2024, co-authored by Jacob Needels and Dr. Juan Jose Alonso, Stanford University.

Publications and Preprints

Nov 2024 **J. R. Cangelosi,** M. Heinkenschloss. *Sensitivity of ODE solutions and quantities of interest with respect to component functions in the dynamics.* `https://arxiv.org/abs/2411.09655`

Jan 2024 **J. R. Cangelosi,** M. Heinkenschloss, J. T. Needels, J. J. Alonso. *Simultaneous design and trajectory optimization for boosted hypersonic glide vehicles.* AIAA SciTech 2024 Forum. `https://arc.aiaa.org/doi/10.2514/6.2024-0375`

Presentations

Oct 2024 "Sensitivity-Driven Surrogate Model Refinement for Efficient Computation of Quantities of Interest in Dynamical Systems." Minisymposium presentation, SIAM-TXLA 2024, Baylor University.

Sep 2024 "An Adaptive Surrogate Model Refinement Framework for Simulation and Optimization of Dynamical Systems." Minisymposium presentation, MORe 2024, University of California, San Diego.

Aug 2024 "An Adaptive Surrogate Model Refinement Framework for Optimization of Dynamical Systems." Minisymposium presentation, MOPTA 2024, Lehigh University.

Jul 2024 "Surrogate Model Refinement for Simulation of Dynamical Systems." Poster presentation, NSF CompMath PI Meeting 2024, University of Washington.

Jan 2024 "Simultaneous Design and Trajectory Optimization for Boosted Hypersonic Glide Vehicles." Technical paper presentation, AIAA SciTech 2024, Orlando, FL.

Nov 2023 "Adaptive Gaussian Process Modeling for Trajectory Simulation with Model Inexactness." Minisymposium presentation, SIAM-TXLA 2023, University of Louisiana at Lafayette.

Nov 2022 "Trajectory Optimization of Hypersonic Vehicles via a Radau Pseudospectral Method." Poster presentation, SIAM-TXLA 2022, University of Houston.

Teaching

Spring 2023, Spring 2024 **Teaching Assistant,** CMOR, Rice University

Held weekly recitation sessions and office hours for Differential Equations in Science and Engineering (CMOR 304), plus occasional guest lectures.

Spring 2024 **Kernel Methods Reading Group Facilitator,** CMOR, Rice University

Gave lectures and demonstrations on kernel methods from theoretical and practical perspectives for interested undergraduate and graduate students.

Aug 2017 – Dec 2019 **Lead Tutor,** Center for Academic Success, Louisiana State University

Tutored students in calculus, differential equations, linear algebra, discrete mathematics, real analysis, optimization, intro-level programming, data structures, algorithm analysis, and intro-level physics.

Service

Summer 2024 **Research Training Group (RTG) Summer Internship Volunteer,** Rice University

Created Jupyter notebooks to teach high school students about discretizing and solving numerical optimization problems in Python using software such as scipy and Pyomo.

Summer 2024 **RTG Summer Math Days Volunteer,** Rice University

Gave a presentation to high school students discussing how mathematicians reason about infinity, which is foundational to college-level mathematics.

Aug 2023 – May 2024 **Graduate seminar organizer,** Rice University

Invited speakers and arranged weekly research talks for graduate students in the department.

Aug 2020 – May 2023 **Grader,** Rice University

Differential Equations for Science and Engineering, Computational Science I, Numerical Analysis I and II.

Fall 2021 **Math Nights volunteer,** Rice Association for Women in Mathematics (AWM) Chapter, Rice University

Assisted undergraduate students in applied mathematics courses such as calculus, matrix analysis, and numerical methods for PDEs.

Certificates

Graduate Certificate in Teaching and Learning, Center for Teaching Excellence, Rice University

Accredited 2-year certificate program in the scholarship of teaching and learning.

Expected completion date: May 2025.

Technical Skills

Proficient in Python and C++. Some familiarity with OpenMP and MPI.