David Yaylali, PhD

Aerospace Engineering and Theoretical Physics

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Date of Birth: May 2, 1983

US Citizen

Summary

Expertise in spacecraft dynamics and control systems, trajectory simulation and optimization, and launch systems and mission design; dedicated to advancing the space industry.

Education

Dec 2018 — M.S. Aerospace Engineering (GPA: 4.0) — University of Arizona, Tucson, AZ
Thesis: *Fractional Control of Multivehicle Systems and Relative Orbits*
Relevant Courses: Advanced Control Theory, Advanced Astrodynamics, Guidance for Aerospace Systems, Spacecraft Attitude Dynamics, Spacecraft Optimal Estimation.

May 2014 — Ph.D. Physics (GPA: 3.9) — University of Hawaii, Honolulu, HI
Thesis: *Beyond Vanilla Dark Matter*

May 2005 — B.A. Physics — Reed College, Portland, OR
Thesis: *Conserved Properties of the Korteweg-de Vries Equation*

Positions Held

2017–2019 — Graduate Research Assistant
Department of Aerospace and Mechanical Engineering, University of Arizona

Summer 2018 — Visiting Researcher
Air Force Research Lab, Space Vehicles Directorate, Kirtland AFB
- Developed fractional control strategies for relative-orbit trajectories.

2017–2018 — Graduate Teaching Assistant
Department of Aerospace and Mechanical Engineering, University of Arizona
- Courses: Introduction to Control Theory, MATLAB, Celestial Mechanics.

2014–2017 — Postdoctoral Researcher in Physics
Joint position: University of Maryland and University of Arizona

2007–2014 — Graduate Teaching and Research Assistant
Department of Physics, University of Hawaii

2005–2007 — X-Ray Fluorescence (XRF) Applications Engineer
Oxford Instruments Measurement Systems, Elk Grove Village, IL
- Developed and performed XRF analyses of atomic composition and electroplating thickness; assisted the sales team and instructed customers on instrument operation.

Selected Technical Skills

- Expertise with Unix, MATLAB, STK, Mathematica, Bash, Python, C++, HTML/CSS/JS, Fortran.
- Extensive experience in simulation of both controlled and uncontrolled orbital and launch trajectories.
- Built controller optimization algorithms in MATLAB for spacecraft orbital maneuvers.
- Experienced with orbit determination methods, including the use of Kalman filtering.
- Performed simulations of vehicle attitude control using various attitude representations; also experienced with combined position/attitude dynamics.
- Developed Monte Carlo code in Python and C++ to simulate particle interactions and decay-chain kinematics at the Large Hadron Collider.

Professional References

- Dr. Eric Butcher — ebutcher@email.arizona.edu; (520) 621-0478
  Professor of Aerospace and Mechanical Engineering, University of Arizona, Tucson, AZ
- Dr. Aaron Rosengren — ajrosengren@email.arizona.edu; (520) 621-6088
  Assistant Professor of Aerospace and Mechanical Engineering, University of Arizona, Tucson, AZ
- Dr. Andrew Sinclair — andrew.sinclair.2@us.af.mil; (505) 846-0197
  Senior Aerospace Engineer, AFRL Space Vehicles Directorate, Kirtland AFB, Albuquerque, NM

Honors and Awards

- Air Force Research Lab, 2018 Summer Faculty Fellowship Program
  - Research fellowship awardee — Space Vehicles Directorate
- Theodore H. Troller Memorial Scholarship in Aerospace Engineering
- Achievement Rewards for College Scientists (ARCS) recipient, Honolulu Chapter
  - Robert and Doris Pulley Award in Physics

Selected Publications

1. D. Yaylali, E. Butcher, and A. Sinclair, "Fractional Control in Linearized Relative-Orbit Dynamics," *Proceedings of the 29th AAS/AIAA Space Flight Mechanics Meeting*, Ka'anapali, HI, 2019.
2. D. Yaylali, E. Butcher, and A. Dibiri, "Fractional PID Consensus Control Protocols for Second-Order Multiagent Systems," *Proceedings of the AIAA GNC Conference*, San Diego, CA, 2019.

(Author lists for the following papers are typically listed in alphabetical order by convention.)

3. S. In, J. Kumar, C. Rott, and D. Yaylali, "Neutrino Topology Reconstruction at DUNE and Applications to Searches for Dark Matter Annihilation in the Sun," Submitted to JCAP [arXiv:1903.04175].
4. K. R. Dienes, S. Su, B. Thomas, and D. Yaylali, "From Jet Cascades to Jet Avalanches: Extended Decay Chains and Multi-Jet Collider Signatures" *In preparation.*
5. C. Rott, S. In, J. Kumar, and D. Yaylali, "New Dark Matter Search Strategies at DUNE," *Proceedings of the 15th Conference on Topics in Astroparticle and Underground Physics*, Sudbury, Ontario, 2017. [arXiv:1710.03822].
6. K. R. Dienes, J. Kumar, B. Thomas, and D. Yaylali, "Off-diagonal dark-matter phenomenology: Exploring enhanced complementarity relations in nonminimal dark sectors," Phys. Rev. D **96**, 115009 (2017) [arXiv:1708.09698].
7. C. Rott, S. In, J. Kumar, and D. Yaylali, "Dark Matter Searches for Monoenergetic Neutrinos Arising from Stopped Meson Decay in the Sun," JCAP **1511**, 039 (2015) [arXiv:1510.00170].
8. J. Kumar, D. Marfatia, and D. Yaylali, "Vector dark matter at the LHC," Phys. Rev. D **92**, 095027 (2015) [arXiv:1508.04466].
9. K. R. Dienes, J. Kumar, B. Thomas, and D. Yaylali, "Dark-Matter Decay as a Complementary Probe of Multicomponent Dark Sectors," Phys. Rev. Lett. **114**, 051301 (2015) [arXiv:1406.4868].
10. K. R. Dienes, J. Kumar, B. Thomas, and D. Yaylali, "Overcoming Velocity Suppression in Dark-Matter Direct-Detection," Phys. Rev. D **90**, 015012 (2014) [arXiv:1312.7772].
11. J. Kumar, A. Rajaraman, and D. Yaylali, "Spin Determination for Fermiophobic Bosons," Phys. Rev. D **86**, 115019 (2012) [arXiv:1209.5432].
12. J. Bramante, R.S. Hundi, J. Kumar, A. Rajaraman, and D. Yaylali, "Collider Searches for Fermiophobic Gauge Bosons," Phys. Rev. D **84**, 115018 (2011) [arXiv:1106.3819].