David Yaylali

Aerospace Engineering and Theoretical Physics

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Date of Birth: May 2, 1983

US Citizen

Activity and Research Interests

Spacecraft guidance and control systems; Earth-orbiting and interplanetary mission design.

Education

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

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

May 2005 — B.A. Physics — Thesis Adviser: Nick Wheeler
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 orbits.

2014–2017 — Postdoctoral Researcher
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
- Performed XRF analyses of atomic composition and electroplating thickness.

Selected Technical Skills

- Operating Systems: Linux, Windows, macOS.
- Languages: MATLAB, Mathematica, Python, C++, HTML/CSS/JS, Fortran.
  - Designed and simulated multiagent control strategies for relative orbits in MATLAB.
  - Built controller optimization algorithms in MATLAB for spacecraft orbital maneuvers.
  - Developed Monte Carlo code in Python and C++ to simulate particle interactions and decay-chain kinematics at the Large Hadron Collider.
- Typsetting/Presentation: LaTeX, Microsoft Suite, Inkscape, Matplotlib, gnuplot.

Honors and Awards

June 2018	Air Force Research Lab, Summer Faculty Fellowship Program ○ Research fellowship awardee — Space Vehicles Directorate
August 2017	Theodore H. Troller Memorial Scholarship in Aerospace Engineering
May 2011	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 Guidance, Navigation, and Control 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," *In preparation.*

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, "Directional Searches at DUNE for Sub-GeV Monoenergetic Neutrinos Arising from Dark Matter Annihilation in the Sun," JCAP **1701**, no. 01, 016 (2017) [arXiv:1609.04876].

8. 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].

9. J. Kumar, D. Marfatia, and D. Yaylali, "Vector dark matter at the LHC," Phys. Rev. D **92**, 095027 (2015) [arXiv:1508.04466].

10. 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].

11. 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].

12. J. Kumar, A. Rajaraman, and D. Yaylali, "Spin Determination for Fermiophobic Bosons," Phys. Rev. D **86**, 115019 (2012) [arXiv:1209.5432].

13. 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].