Rafid Bendimerad

Ph.D. candidate - Mechanical & Aerospace Engineering, Cornell University
Double minor in Computer Science and Astronomy

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🌐 https://scholar.google.com/citations?user=rbdJ6EMAAAAJ&hl=en&oi=ao
in https://www.linkedin.com/in/rafid-bendimerd/

Education

2020 – present 📑 **Ph.D in Mechanical & Aerospace Engineering, Cornell University, USA.**
Advisor: Prof. Elaine Petro, ASTRA Lab.
Key Research Projects:
1- Mission analysis and optimization of in-space refueling strategies. Funding: AFOSR.
2- Discovery of new propellants for electrospray propulsion based on their molecular descriptors using machine learning. Funding: AFOSR.
3- Multiscale characterization of electrospray thruster plumes: from nanoscale (using Molecular Dynamics simulations) to millimeter scale (using N-body simulations). Funding: NASA.
- **Relevant courses**: Introduction to Machine Learning, Advanced Machine Learning, Advanced Artificial Intelligence, Data Mining and Machine Learning in Astronomy, AI for science, Planetary Atmospheres, Spaceflight Mechanics, Advanced Astrodynamics, Plasmas for propulsion, etc.

2018 – 2019 📑 **M.Sc. in Fluid Mechanics, École Polytechnique, France.**
- Graduation Project: Impact of the water's depth on the wave drag for symmetric and non-symmetric bodies – Application to rowing, canoe and kayak boats –.
- **Relevant courses**: Turbulence, Magnetohydrodynamics, Hydrodynamic Instabilities, CFD, etc.

2013 – 2018 📑 **B.Sc. in Mechanical Engineering, École Nationale Polytechnique, Algeria.**
- Distinction: Valedictorian.
- Graduation Project: Study of the impact of the cooling system on the performance of a combined-cycle power plant: Comparison study between water cooling and air cooling.

Publications

Journal Articles

1   **Bendimerad, R.**, & Petro, E. (2025). Propellant discovery for electrospray thrusters using machine learning. *Journal of Electric Propulsion*. Under review.

2   **Bendimerad, R.**, Savransky, D., & Petro, E. (2025). Optimization of refueling strategies for space missions. *Journal of Spacecraft and Rockets*. Under review.

3   **Bendimerad, R.**, Tahsin, A. T. M., Yonas, A., Colucci, C., & Petro, E. M. (2024). Investigating the chemical stability of electrospray plumes during particle collisions. *Journal of Propulsion and Power, 40*(2), 247–256. 🔗 doi:10.2514/1.B39118

4   **Bendimerad, R.**, & Petro, E. (2022). Molecular dynamics studies of ionic liquid-surface interactions for electrospray thrusters. *Journal of Electric Propulsion, 1*(1), 27. 🔗 doi:10.1007/s44205-022-00032-9

5   de Maleprade, H., **Bendimerad, R.**, Clanet, C., & Quéré, D. (2021). Droplet hurdles race. *Applied Physics Letters (2021)*. 🔗 doi:10.1063/5.0043908

6   Benham, G. P., **Bendimerad, R.**, Benzaquen, M., & Clanet, C. (2020). Hysteretic wave drag in shallow water. *Phys. Rev. Fluids, 5*, 064803. 🔗 doi:10.1103/PhysRevFluids.5.064803

Conference Proceedings

1. **Bendimerad, R.**, Savransky, D., & Petro, E. M. (2025). Optimization of refueling strategies for space missions. In *Aiaa scitech 2025 forum* (p. 0380).

2. **Bendimerad, R.**, & Petro, E. (2024). Propellant discovery for electrospray thrusters using machine learning. In *38th IEPC, Toulouse, France*.

3. Johnson, A. B., Padres, A., Hughes, R., Buonagura, C., Chapman, Z., Kubas, A., … **Bendimerad, R.** et al. (2024). A smallsat mission study for starlite: Superluminous tomographic atmospheric reconstruction with laser-beacons for imaging terrestrial exoplanets. In *Space telescopes and instrumentation 2024: Optical, infrared, and millimeter wave* (Vol. 13092, pp. 1050–1066). SPIE.

4. Shaik, S. Z., **Bendimerad, R.**, Tahsin, A. T. M., Smith, A., Lozano, P., & Petro, E. (2024). Characterization of propellant-surface collision byproducts using md simulations and rga measurements. In *AIAA SciTech 2024 Forum* (p. 1541).

5. Tahsin, A. T. M., **Bendimerad, R.**, Smith, A., Thill, S., & Petro, E. (2024). Cross-sections for charge exchange and other collisional processes in electrospray plumes. In *AIAA SciTech 2024 Forum* (p. 1540).

6. **Bendimerad, R.**, Tahsin, A. T. M., Yonas, A., Colucci, C., & Petro, E. (2023). Investigating the chemical stability of electrospray plumes during particle collisions. In *AIAA SciTech 2023 Forum* (p. 1406). 🔗 doi:10.2514/6.2023-1406

7. **Bendimerad, R.**, & Petro, E. (2022). Molecular dynamics studies of ionic liquid-surface interactions for electrospray thrusters. In *37th IEPC, Boston, Massachusetts, USA*.

8. Gallud, X., **Bendimerad, R.**, Hampl, S. K., Petro, E. M., & Lozano, P. C. (2022). Modeling and characterization of electrospray propellant-surface interactions. In *IEEE Aerospace Conference.* 🔗 doi:10.1109/AERO53065.2022.9843583

Skills

Coding	🔖	C, C++, Python, Matlab, Bash, SQL, Latex, Git.
Software	🔖	LAMMPS, Ovito, Ansys Fluent, Solidworks, Inkscape.

Teaching & Mentoring

Fall 2024	🔖	Teaching Assistant: Propulsion of Spacecraft.
Fall 2023	🔖	Teaching Assistant: Introduction to Mechanical Engineering.
Summers 2022-2024	🔖	Mentoring undergraduate students in *Engineering Learning Initiatives* (ELI), *Research Experiences for Undergraduates* (REU), and *Future Leaders in Aerospace and Mechanical Engineering* (FLAME) programs.

Award

2022	🔖	**Africa Fund Fellowship**, (full tuition + stipend + health insurance), Cornell University.

Certifications

2025   **Remote Sensing Image Acquisition, Analysis and Applications**, The University of New South Wales (`coursera.org`).

2023   **Cornell SmallSat Mission Design School**: 5-week intensive summer program focused on designing a space mission aligned with NASA's Decadal Survey science priorities.

     Certified Peer Reviewer Course, Elsevier Researcher Academy.

     Data-driven Astronomy, The University of Sydney (`coursera.org`).

2020   **The Special Theory of Relativity**, Stanford University (`coursera.org`).

     Python Specialization, University of Michigan (`coursera.org`).

     Using Python for Research, Harvard University (`edx.org`).

Languages

English: Fluent (*TOEFL iBT:* 111) / **Arabic**: Native / **French**: Fluent (*TCF:* 99.5%).

Extracurricular activities

- Science communication: I share my research work and tutorials on my YouTube channel.
- Active member of the *"Polytechnic Algiers Community"* association: I help organizing scientific events and online podcasts.