Curriculum Vitae

Katia I. Matcheva

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Academic and Research Positions

2013–present: Associate Professor, Department of Physics, University of Florida, Gainesville FL, USA.

2005–2013: Assistant Professor, Department of Physics, University of Florida, Gainesville FL, USA.

2002–2004: Research Associate, Center for Radiophysics and Space Research, Cornell University, Ithaca, NY, USA.

2001–2002: Marie Curie Fellow, Laboratory for Space Research and Instrumentation in Astrophysics, Observatory of Paris - Meudon, FRANCE.

1995–2000: Research Assistant, Department of Earth and Planetary Sciences, The Johns Hopkins University, Baltimore, MD, USA.

1994–1995: Teaching Assistant, Department of Earth and Planetary Sciences, The Johns Hopkins University, Baltimore, MD, USA.

Education

Ph.D. in Earth and Planetary Sciences - Planetary Atmospheres,
research adviser: Prof. Darrell F. Strobel,
The Johns Hopkins University, Baltimore, MD, 28 August 2000.
Duration of studies: 1996-2000.
Thesis title: *Gravity Waves in the Upper Atmosphere of Jupiter.*

M.A. in Earth and Planetary Sciences - Planetary Atmospheres,
The Johns Hopkins University, Baltimore, MD, 22 May 1996.
Duration of studies: 1994-1996.

M.S. in Physics Engineering with highest honors,
research adviser: Prof. K. Ivanov,
Plovdiv University, Bulgaria, 24 June 1993.
Duration of studies: 1992-1993.
Thesis title: *Mathematical Interpretation of the Wave Functions in Long-Range Spherically Symmetric Potentials.*

B.A. double major in Physics and Physics Education,
Plovdiv University, Bulgaria, 24 June 1992.
Duration of studies: 1988-1992.

Academic Honors and Awards

2023	Faculty Teacher of the Year award, Department of Physics, University of Florida.
2023	Department Nomination for the UF College of Liberal Arts and Sciences IDEA (Inclusion, Diversity, and Equity Alliance) "Collaboration Award" for organizing cross-campus activities to commemorate the UN International Day (Feb. 11) of Women and Girls in Science since 2017.
2023	Winning team in the Ariel Machine Learning Data Challenge at the European Conference on Machine Learning ECML-PKDD, Torino, Italy.
2022	First place team in the Ariel Machine Learning Data Challenge at the NeurIPS conference, New Orleans, LA.
2001	Marie Curie Individual Postdoctoral Fellowship.
2000	CEDAR 2000 Outstanding Poster Award.
1994-95	Gilman Graduate School Fellowship at the Johns Hopkins University.
1993	An honor award from the Bulgarian Ministry of Education for straight 'A' grades at Plovdiv University 1988-93.
1988-93	University Scholarship for academic achievements, Plovdiv University.
1988	First Prize in the Bulgarian National High School Physics Competition (paper presentation).
1988	Silver Medal from the Bulgarian Ministry of Education for academic achievements at G. Kirkov High School 1983-88.
1987	First place in a Regional Physics Competition (physics problem solving).
1986	Second place in a Regional Physics Competition (physics problem solving).

Synergistic Activities

• Member of the Machine Learning working group of the Ariel Consortium (2023-present).
• Mentor for the Google Summer of Code (GSOC) Machine Learning For Science (ML4SCI) program (summer 2023).
• Panel member, NASA grant proposal reviews for:
- Planetary Atmospheres (2005, 2006, 2007, 2008);
- Cassini Data Analysis Program (2010, 2011, 2015).
- Outer Planets Research Program (2014).
- Maven Data Analysis and Participating Scientist Program (2013).
- Solar System Workings (2014, 2016).
- New Frontiers Program (2017).
• External reviewer for NASA grant proposal programs (2009, 2012).
• Member of the American Physical Society, APS.
• Member of the American Astronomical Society - Division of Planetary Sciences, DPS.
• Member of the American Geophysical Union, AGU.
• Member of the Committee on Space Research, COSPAR.
• Reviewer for major astrophysics journals:
- Icarus, Planetary and Space Physics, Journal of Geophysical Research, Geophysical Research Letters, Astrophysical Journal.

Supervision of students and research associates

- Eyup Unlu (2022-present) — PhD student, projected graduation date 2025.

- Roy Forestano (2022-present) — PhD student, projected graduation date 2025.

- Alexander Roman (2021-23) — PhD student, co-advised with Prof. Matchev, May 2023.
  Thesis title: Leveraging Interpretable Machine Learning with Application to Particle Physics and Exoplanets.
  Current position: adjunct professor, New College of Florida.

- Darsa Donelan (2012-2016) — PhD student, graduated in Fall 2016.
  Thesis title: Atmospheric Gravity Waves in Titan's Atmosphere.
  Current position: continuing senior assistant professor, Gustavus Adolphus College, Saint Peter, MN.

- Brian Hare (2013-2016) — PhD student, co-advised with Prof. Uman
  Thesis title: Relationship of Terrestrial Gamma Ray Flashes and Cosmic Ray Air Showers to Natural and Triggered Lightning.
  Current position: junior scientist, ASTRON, Netherlands Institute for Radio Astronomy, Netherlands.

- Hsinjung Lin (2009-2012) — PhD student, graduated in Fall 2012.
  Thesis title: Latitudinal and Seasonal Variations in the Haze/Cloud Structure of Jupiter and Saturn Using the Cassini/CIRS Observations.
  Current position: industry.

- Daniel Barrow (2006-2011) — PhD student, graduated in the Spring of 2011.
  Thesis title: Atmospheric Gravity Waves in the Stratosphere of Mars and the Ionospheres of Jupiter and Saturn.
  Current position: industry.

- Nicolas Iro (2005-2007) — Postdoctoral researcher, 2005-2007.
  Position after UF: NASA Goddard Space Flight Center.
  Current position: research scientist, German Aerospace Center (DLR), Germany.

- Triana Almayda (2009-2010) — Physics & Astronomy undergraduate student, graduated in the Spring of 2011.
  Research topic: The Structure of Jupiter's Great Red Spot from the Cassini/CIRS Observations.
  Current position: Director of Teaching Observatory, University of Florida, Gainesville, FL.

Teaching Experience

Course numbers 6000 and above indicate a graduate-level course.

Fall 2023	Lecturing "Machine Learning for Exoplanets", ARES III School for PhD students and post-doctoral researchers, Biarritz, France, enrolled students: **30**;
Aug. 2023	"Deep Learning Symmetries from First Principles" Lecture at the "Data, Numbers and Geometry" workshop, London, UK. (available video on YouTube)
Spring 2023	Lecturing "Advanced Topics in Theoretical Physics: Planetary Atmospheres" PHY7097, Department of Physics, University of Florida, enrolled students: **6**;
Fall 2022	Lecturing "Enriched Physics 1 with Calculus" PHY2060, Department of Physics, University of Florida, enrolled students: **28**;
Spring 2022	Lecturing "Enriched Physics 1 with Calculus" PHY2060, Department of Physics, University of Florida, enrolled students: **38**;
Spring 2022	Discussions "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **120**;
Fall 2021	Lecturing "Enriched Physics 1 with Calculus" PHY2060, Department of Physics, University of Florida, enrolled students: **20**;
Spring 2021	Lecturing "Enriched Physics 1 with Calculus" PHY2060, Department of Physics, University of Florida, enrolled students: **35**;
Fall 2020	Lecturing "Enriched Physics 1 with Calculus" PHY2060, Department of Physics, University of Florida, enrolled students: **20**;
Spring 2020	Lecturing "Mechanics 1" PHY3221, Department of Physics, University of Florida, enrolled students: **29**;
Fall 2019	Lecturing "Enriched Physics 1 with Calculus" PHY2060, Department of Physics, University of Florida, enrolled students: **36**;
Spring 2019	Lecturing "Electromagnetism 1" PHY3323, Department of Physics, University of Florida, enrolled students: **42**;
Fall 2018	Lecturing "Enriched Physics 1 with Calculus" PHY2060, Department of Physics, University of Florida, enrolled students: **23**;
Spring 2018	Lecturing "Electromagnetism 1" PHY3323, Department of Physics, University of Florida, enrolled students: **35**;
Fall 2017	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **587**;
Spring 2017	Lecturing "Electromagnetism 1" PHY3323, Department of Physics, University of Florida, enrolled students: **44**;
Fall 2016	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **507**;
Spring 2016	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **705**;
Fall 2015	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **523**;
Spring 2015	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **655**;
Fall 2014	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **513**;

Spring 2014	Lecturing "Introduction to Weather" MET1010, Department of Physics, University of Florida, enrolled students: **27**;
Fall 2013	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **650**;
Spring 2013	Lecturing "Introduction to Weather" MET1010, Department of Physics, University of Florida, enrolled students: **35**;
Fall 2012	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **589**;
Spring 2012	Lecturing "Introduction to Weather" MET1010, Department of Physics, University of Florida, enrolled students: **35**;
Fall 2011	Lecturing "Introduction to Weather" MET1010, Department of Physics, University of Florida, enrolled students: **38**;
Spring 2011	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **621**;
Fall 2010	Lecturing "Introduction to Weather" MET1010, Department of Physics, University of Florida, enrolled students: **94**;
Spring 2010	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **604**;
Fall 2009	Lecturing "Introduction to Weather" MET1010, Department of Physics, University of Florida, enrolled students: **94**;
Spring 2009	Lecturing "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **590**;
Fall 2008	Lecturing "Electromagnetism 1" PHY3323, Department of Physics, University of Florida, enrolled students: **14**;
Spring 2008	Discussions "Physics 1 with Calculus" PHY2048, Department of Physics, University of Florida, enrolled students: **36**;
Fall 2007	Lecturing "Electromagnetism 1" PHY3323, Department of Physics, University of Florida, enrolled students: **22**;
Spring 2006	Lecturing "Introduction to Weather" MET1010, Department of Physics, University of Florida, enrolled students: **141**;
Fall 2005	Lecturing "Introduction to Weather" MET1010, Department of Physics, University of Florida, enrolled students: **89**;
Fall 1995	Teaching assistant for course 270.108 "The Oceans", Department of Earth and Planetary Sciences, Johns Hopkins University;
Fall 1994	Completed a course 370.601 "Communication Strategies in the American Classroom", Johns Hopkins University.
Summer 1993	Obtained certification as a high school teacher, Plovdiv University, Bulgaria.
Spring 1993	Three months of experience as a high school physics teacher at the English Language High School, Plovdiv, Bulgaria.

Outreach, Inclusion, and Mentoring Activities

- **Lead organizer** of a week-long series of campus-wide events in celebration of the UN *"International Day of Women in Science"* (February 11, 2017-2021). The events include: public talks, invited seminars, science days for children, museum exhibits and activities, career panels for undergraduate and graduate students, public nights at the UF observatory, reach-out events at local markets and popular venues. A representative schedule of events can be found at https://www.phys.ufl.edu/wp/index.php/2020/01/30/un-international-women-girls-science-day-celebration-february-2020/.

- **Lead organizer** of the Female Physics Forum (FPF) in the Physics Department (2005-2015): I am a founding member of FPF at UF since its initiation in the Spring of 2005. Members of the FPF work with female undergraduate students, graduate students and postdoctoral researchers to promote advancement of women in the field of physics. Activities include: meetings with women scientists; mentoring program; dedicated office hours; FPF newsletter; social events; FPF website (http://www.phys.ufl.edu/fpforum/); recruiting female students; participating in workshops for women.

- **Mentoring minority students.** As an advisor for physics undergraduate students I have mentored and guided a number of students from underrepresented groups who successfully graduated from our program and went on to pursue graduate degrees in physics.

- **Work with local high schools**
  - "High School Physics club" Establishing and mentoring a summer physics club at Buchholz high school (2020). During the pandemic I started a pilot program for club based physics activities at the Buchholz high school. The club focused on solving unique and challenging physics problems in preparation for national physics competitions like F=ma and the Physics Olympiad. F=ma is the national competition that selects the US team for the International Physics Olympiad. The goal is to provide support and opportunity to high school students to excel in the STEM subjects. That year Buchholz high school had 8 students qualify for the second round of the F=ma physics competition, which was the second highest number of qualifiers of any high school in the country.
  - Physics curriculum development: In the summer of 2021 I developed the organizational structure, the logistics, and the curriculum for a UF Physics class to be offered at Buchholz high school as part of the UF Dual enrollment program. This is envisioned as a survey course with a curriculum based on the current research developed in the UF physics department. It is organized in several self-contained modules and each module is being taught by a UF postdoctoral researcher/scientist, in accordance to their expertise. The proposed course offers the following benefits: (1) creating strong educational/research connections with the local high schools; (2) providing teaching opportunities for UF Postdoctoral Researchers as they build their professional/teaching skills.

- **Public talks at schools and local communities:**
  - *"Solar system exploration"*, an outreach educational talk at "Caring and Sharing" 5th grade science club in collaboration with the Astronomy Department, Jan. 24, 2017.
  - *"Stories in the Night Sky"*, a series of 6 public outreach talks for 3rd-5th grade students at Talbot Elementary School on solar system exploration, February, 2016.
  - *"There is no Place Like Space"*, a presentation for 4th-5th grade students at Talbot Elementary School on solar system exploration, February, 2015.
  - *"The magic of the night sky"*, a planetarium presentation with Prof. Vicki Sarajedini at the W. S. Talbot Elementary School for 1st and 2nd grade enrichment students, April 23, 2011.
  - *"Life in the Universe"*, a talk and a pannel discussion in a public forum organized by the SPS and the Undergraduate Astrophysics Society at UF (Apr. 2, 2010).
  - *"Guided tour through the solar system"*, a talk at the Oak Hammock retirement center, as part of a program that promotes learning in retirement communities.
- **Physics demos and events open to the general public:**
  - *"Carolyn Beatrice Parker"*, an exhibit of 5th grade students artwork celebrating the life of Carolyn B. Parker in collaboration with C. B. Parker elementary school. The exhibit was displayed in the Physics department and on-line (2021). Carolyn B. Parker, born and raised in Gainesville, FL, was the first African-American woman to obtain a Masters degree in Physics.
  - *"Sounds Are in the Air"*, a physics demonstrations event for 4th-5th grade students at Talbot Elementary School together with the department SPS students, February, 2014.
  - *"Introduce a Girl to Engineering"*, an outreach event with physics demonstrations and lab experiments. March 19, 2013.
  - *"Blasts In The Lab"*, a physics demonstrations event for 3rd-5th grade students at Talbot Elementary School together with the department SPS students, Nov. 15, 2012.
  - *"Just Do It!"*, a presentation of physics experiments for 6th grade middle school girls from Alachua County (March 15, 2012).

Service to the Department, the College and the University

• Member of the Department Bylaws Committee (2023-present);
• Member of the Department Computing Committee (2023-present);
• Member of the UF review committee for the UF Research Opportunity Seed Fund (ROSF) (2022-present);
• Member of the Committee on Inclusion, Diversity, and Equity (IDEA) in the UF Physics Department (2022-2023);
• Member of the Peer Evaluation of Teaching Committee (2021-2023);
• Member of CLAS IE3 Leadership Team (2019-2021);
• Lead organizer of the UN International Day for Women and Girls in Science on UF campus: we offer weeklong events featuring female scientists in different science fields across campus, invited guest speakers, outreach events, exhibits, and children activities in the week of Feb. 11. (2017-2021);
• Member of the Committee on Review of the Status of the Prelim Exam (2020-2021);
• Member of the Large Lecture Courses committee in the Physics Department (2009-present);
• Coordinator for the Physics Undergraduate program at UF (2016-2019);
• Chair of the undergraduate curriculum committee in the Physics Department (2016-2019);
• Chair of the undergraduate advising committee in the Physics Department (2016-2019);
• Member of the Physics Department Advisory Committee (2016-2019);
• Member of the Department Colloquium committee (2006-2007; 2008-2016);
• Member of the undergraduate advising committee in the Physics Department (2007-present);
• Member of the Department undergraduate curriculum committee (2007-present);
• Member of the Department graduate preliminary exam committee (2006, 2008, 2011, 2017, 2022);
• Served as a marshal at several college-wide commencement ceremonies;
• Department recording secretary for faculty meetings (2006-2007);
• Member of more than 20 Doctoral Degree Committees;
• Member of several junior faculty search committees in the Physics Department and in the Astronomy Department;
• Member of the College Nomination Committee 2009-2011;
• Mentor/research adviser for the Physics Department REU program (Research Experience for Undergraduate students);
• Lead organizer of the Department "Meet the Faculty" poster event (2010, 2011).

Undergraduate Coordinator Responsibilities (2016-2019)

From 2016 to 2019 I was appointed as the Coordinator for the Physics Undergraduate program at UF, which is one of the three senior administrative positions in the Physics Department (together with department chair and graduate coordinator). My responsibilities included:

• One-on-one meetings with physics undergraduate students to review class schedules and graduation plans each semester.
• Regular office hours two days a week, by appointment and walk-ins.
• Providing guidance and helping with finding research opportunities in the department.
• Review of Degree applications and certificates for BS, BA, minors and double majors in Physics every semester.
• Disseminating information about academic deadlines and requirements, research opportunities, educational opportunities, studies abroad, scholarships, internships, career resources through an e-mail list and an online electronic "Newsletter" with the latest announcements.
• Guidance for graduate school requirements and application process.
• Meeting with incoming freshmen and transfer students each semester, including the summer.
• Managing the submission, the review process, and the presentation of the Senior Undergraduate Thesis Projects.
• Reviewing the UF Catalogue Description for the requirements of the Physics Major (BS, BA and minor).
• Organizing the Department Reception for the physics graduates.
• Creating content about the Physics Undergraduate Program on the Physics Department webpage and keeping it up-to-date.
• Acting as a moderator between students and faculty for conflict resolution.
• Meeting with prospective students/parents in person for an overview of the physics program and department (about 10 meetings with family/students per year).
• Attending monthly college-wide meetings for undergraduate coordinators.
• Generating and submitting to the College reports for the "Learning Outcomes" of the core physics classes as an indicator for the quality of the program by administering tests in four classes "Classical Mechanics 1", "Quantum Mechanics 1" "Thermal Physics" and "Electromagnetism 1".
• Serving as a contact point for faculty for questions about UF regulations regarding undergraduate students (exams, grades, policies, make up exams, incomplete grades, special circumstances).
• Generating reports to AIP about the Physics Program at UF.
• Providing variety of information about the Physics Undergraduate Program upon request to the College and the Department Chair.
• Managing the enrollment of the physics department classes:
- Forecasting demand and planning new course offerings for Physics undergraduate majors for Fall, Spring and Summer.
- Monitoring class size and number of sections offered for large service courses.
- Monitoring the prerequisites for physics classes and granting wavers for registration.
- Moderating the enrollment in the Honors Physics Classes (department controlled).
- Resolving issues with the registration of students in the physics classes both for physics and

other majors University wide.
- Communicating and coordinating with other Departments in the University regarding class enrollment and demands.
- Registering students for advanced physics labs 1 and 2 (PHY4802L and PHY4803L); Undergraduate Research (PHY4911); Individual studies (PHY4905).
• Reviewing requests for substitutions of UF physics classes with physics classes taken at different Florida colleges, out-of-state or foreign institutions.
• Reviewing Study Abroad programs for physics majors for course equivalencies at UF.
• Writing letters of recommendations for physics students applying for study abroad, scholarships, internships, REU.
• Attending on-line and in-person training sessions on UF student policies and the Student Information System. Trouble-shooting the new COMPAS system for student information, audit, and course registration.
• Coordinating the attendance of Undergraduate Physics students at the annual Conference of Undergraduate Women in Physics.
• Organizing presentations of the UF Career Center representatives for our Physics students about "What to Expect and How to Prepare for a Career Fair".
• Working with the UF Career Center to design a Search Widget for Physics related Internships and Job opportunities to be used by Physics undergraduates.
• Organizing an "Open House" event for high school students and physics teachers visiting the Physics Department for a program overview with the participation of different Physics labs.
• Reviewing and revising the prerequisites/co-requisites for all Physics Courses listed in the UF catalogue that were implemented in the Student–Information-System COMPAS.
• Attending the Employers Fair "Employers Connections" at UF to market the skills of students with a Physics Degree.
• Organizing Graduation Parties for Physics undergraduate and graduate students.

Externally Funded Projects:

- Title: *Atmospheric Gravity Waves in Saturn's Ionosphere.*
  Funding Agency: NASA Planetary Atmospheres Program
  Effective Dates: 01/01/2013-12/31/2015
  Total Funding: $ 213,704
  Role: PI

- Title: *The distribution of clouds and haze in the atmospheres of Saturn and Jupiter from the Cassini CIRS Observations.*
  Funding Agency: NASA Cassini Data Analysis Program
  Effective Dates: 05/13/2008-05/12/2011
  Total Funding: $100,454
  Role: PI

- Title: *The impact of atmospheric waves on the ionospheric structure and the H_3^+ emission of Jupiter and Saturn.*
  Funding Agency: NASA Planetary Atmospheres Program
  Effective Dates: 01/23/2007 - 07/22/2010
  Total Funding: $266,678
  Role: PI

- Title: *REU Site: Materials Physics at the University of Florida*
  Funding Agency: NSF
  Effective Dates: 2009-2012
  Total Funding: $360,000
  Role: Co-Investigator

- Title: *Integrated Multi-Target Remote-Sensing*
  Funding Agency: DoD Army Research Lab
  Effective Dates: 02/01/2009-1/31/2011
  Total Funding: $1,722,000
  Role: Co-Investigator

LIST OF PUBLICATIONS AND PRESENTATIONS

Current and former members of Dr. Matcheva's group are identified with * for students and † for postdoctoral researchers. The number of citations, reads and downloads were extracted from the publishing journal (if available) or the ADS Abstracts Service https://ui.adsabs.harvard.edu/ as of December 28 2023.

I. Refereed publications

1. Forestano*, R. T, K. T. Matchev, K. Matcheva, E. B. Unlu*, *Searching for Novel Chemistry in Exoplanetary Atmospheres using Machine Learning for Anomaly Detection*, **Astrophysical Journal**, v. 958, number 2, Nov. 2023.
   doi:10.3847/1538-4357/ad0047
   arXiv:2308.07604 [astro-ph.EP]
   citations: 0, reads: 110, downloads: 84.

2. Matchev, K., K. Matcheva, S. Verner, P. Ramond, *Seeking Truth and Beauty in Flavor Physics with Machine Learning*, accepted in the workshop **"AI for Scientific Discovery: From Theory to Practice"**, NeurIPS conference, December 2023.
   arXiv:2311.00087 [hep-ph]
   citations: 0, reads: 5, downloads: 3.

3. Forestano*, R. T., K. T. Matchev, K. Matcheva, A. Roman*, E. B. Unlu*, and S. Verner, *Identifying the Group-Theoretic Structure of Machine-Learned Symmetries*, **Physics Letters B**, v. 847, article id 138306, 2023.
   doi:10.1016/j.physletb.2023.138306
   arXiv:2309.07860 [hep-ph].
   citations: 1, reads: 14, downloads: 5.

4. Unlu*, E. B, R. T. Forestano*, K. T. Matchev, K. Matcheva, *Reproducing Bayesian Posterior Distributions for Exoplanet Atmospheric Parameter Retrievals with a Machine Learning Surrogate Model*, accepted to the European Conference on Machine Learning (ECML), **Springer Computer Science proceedings**, September 2023.
   arXiv:2310.10521 [astro-ph.EP]
   citations: 1, reads: 32, downloads: 15.

5. Cara, M. C., S. Gleyzer, K. T. Matchev, K. Matcheva, R. T. Forestano*, E. B. Unlu*, K. Kong, Z. Dong, T. Magorsch, G. Dahale, R. Zhang, C. Cheng, *Quantum Vision Transformers for Quark-Gluon Classification*, submitted to the workshop **"Machine Learning for the Physical Sciences"**, NeurIPS conference, Sep. 2023.
   citations: NA, reads: NA, downloads: NA.

6. Forestano*, R. T., M. Cara, G. Dahale, Z. Dong, S. Gleyzer, D. Justice, K. Kong, T. Magorsch, K. T. Matchev, K. Matcheva, E. B. Unlu*, *A Comparison Between Invariant and Equivariant Classical and Quantum Graph Neural Networks*, submitted to the workshop **"AI for Scientific Discovery: From Theory to Practice"**, NeurIPS conference, Sep. 2023.
   arXiv:2311.18672 [quant-ph]
   citations: 0, reads: 2, downloads: 1.

7. Dong, Z., M. Cara, G. Dahale, R. T. Forestano*, S. Gleyzer, D. Justice, K. Kong, T. Magorsch, K. T. Matchev, K. Matcheva, E. B. Unlu*, *Z2×Z2 Equivariant Quantum Neural Networks: Benchmarking against Classical Neural Networks*, submitted to the workshop **"Machine Learning for the Physical Sciences"**, NeurIPS conference, Sep. 2023.
arXiv:2311.18744 [quant-ph]
citations: 0, reads: 1, downloads: 1.

8. Forestano*, R. T., K. T. Matchev, K. I. Matcheva, A. Roman*, E. Unlu*, S. Verner, *Accelerated Discovery of Machine-Learned Symmetries: Deriving the Exceptional Lie Groups G2, F4 and E6*, **Physics Letters B,** v. 847, article id 138266, 2023.
doi:10.1016/j.physletb.2023.138266
[arXiv.2307.04891 [hep-th]]
citations: 2, reads: 20, downloads: 6.

9. Yip K., Q. Changeat, I. Waldmann, E. Unlu*, R. Forestano*, A. Roman*, K. I. Matcheva, K. Matchev, S. Stefanov, O. Podsztavek, M. Morvan, N. Nikolaou, A. Al-Refaie, C. Jenner, C. Johnson, A. Tsiaras, B. Edwards, C. Oliveira, J. Thiyagalingam, P. Lagage, J. Cho, G. Tinetti, *Lessons Learned from Ariel Data Challenge 2022: Inferring Physical Properties of Exoplanets From Next-Generation Telescopes*, **Proceedings of Machine Learning Research**, volume 220, 1–17, 2023.
https://proceedings.mlr.press/v220/yip23a.html
citations: NA, reads: NA, downloads: NA.

10. Forestano*, R. T., K. T. Matchev, K. I. Matcheva, A. Roman*, E. Unlu*, S. Verner, *Discovering Sparse Representations of Lie Groups with Machine Learning*, **Physics Letters B,** Volume 844, article id. 138086, Sept. 2023.
doi:10.1016/j.physletb.2023.138086
arXiv:2302.05383v1 [hep-ph]
citations: 5, reads: 30, downloads: 7.

11. Roman*, A., R. T. Forestano*, K. T. Matchev, K. I. Matcheva, E. Unlu*, *Oracle-Preserving Latent Flows*, **Symmetry**, volume 15, issue 7, p. 1352, 2023.
doi:10.3390/sym15071352
arXiv:2302.00806v1 [cs.LG]
citations: 5, reads: 30, downloads: 12.

12. Forestano*, Roy T., K. T. Matchev, K. I. Matcheva, A. Roman*, E. Unlu*, S. Verner, *Deep Learning Symmetries and Their Lie Groups, Algebras, and Subalgebras from First Principles.* **Machine Learning: Science and Technology**, volume 4, Issue 2, 2023.
doi:10.1088/2632-2153/acd989
arXiv:2301.05638v1 [hep-ph]
citations: 8, reads: 55, downloads: 1049.

13. Dong, Z., K. Kong, K. T. Matchev, and K. I. Matcheva, *Is the Machine Smarter than the Theorist: Deriving Formulas for Particle Kinematics with Symbolic Regression*, **Physical Review D**, volume 107, Issue 5, 10.1103/PhysRevD.107.055018, 2023.
doi:10.1103/PhysRevD.107.055018.

arXiv:2211.08420v1 [hep-ph]
citations: 5, reads: 28, downloads: 9.

14. Matchev, K., K. I. Matcheva, A. Roman*, *Transverse Vector Decomposition Method for Analytical Inversion of Exoplanet Transit Spectra.* **Astrophysical Journal**, volume 939, issue 2, pp. 15, 2022.
doi:10.3847/1538-4357/ac82f3
arXiv:2203.06299v1 [astro-ph.EP].
citations: 3, reads: 92, downloads: 294.

15. Matchev, K., K. I. Matcheva, A. Roman*, *Unsupervised Machine Learning for Exploratory Data Analysis of Exoplanet Transmission Spectra.* **The Planetary Science Journal**, volume 3, Issue 9, pp. 12, 2022.
doi:10.3847/PSJ/ac880b.
arXiv:2201.02696v1 [astro-ph.EP]
citations: 6, reads: 181, downloads: 1053.

16. Matchev, K., K. I. Matcheva, A. Roman*, *Analytical Modeling of Exoplanet Transit Spectroscopy with Dimensional Analysis and Symbolic Regression.* **Astrophysical Journal**, volume 930, n. 1, pp. 13, 2022.
doi:10.3847/1538-4357/ac610c.
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18. Matcheva, K.I. and D. Barrow*, *Small-Scale Variability in Saturn's Lower Ionosphere.* **Icarus, v. 221**, Issue 2, p. 525-543, 2012.
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19. Barrow, D.*, K. I. Matcheva, and P. Drossart, *Prospects for Observing Atmospheric Gravity Waves in Jupiter's Thermosphere Using H_3^+ Emission.* **Icarus, v. 219**, Issue 1, p. 77-85, 2012.
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21. Harrington, J., R. French, and K. I. Matcheva, *The 1998 November 14 Occultation of GSC 0622-00345 by Saturn: II. Stratospheric Thermal Profile, Power Spectrum, and Gravity Waves.* **The Astrophysical Journal, v. 716**, Issue 1, p. 404-416 , 2010.

doi:10.1088/0004-637X/716/1/404
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22. Matcheva, K. I., B. Conrath, P. Gierasch, and F. M. Flasar, *The cloud structure of the Jovian atmosphere as seen by the Cassini/CIRS experiment.* **Icarus, v. 179**, Issue 2, p. 432-448, 2005.
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23. Raynaud E., K. I. Matcheva, P. Drossart, F. Roques, and B. Sicardy, *A Re-analysis of the 1971 Beta Scorpii Occultation by Jupiter: Study of Temperature Fluctuations and Detection of Wave Activity.* **Icarus, v. 168**, n 2, p. 324-335, 2004.
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25. Matcheva, K. I., D. F. Strobel and F. M. Flasar, *Interaction of Gravity Waves with Ionospheric Plasma: Implications for Jupiter's Ionosphere.* **Icarus, v. 152**, n. 2, 347-365, 2001.
doi:10.1006/icar.2001.6631
citations: 35, reads: 171, downloads: 72.

26. Matcheva, K. I., *Gravity Waves in the Upper Atmosphere of Jupiter.* **Ph. D. Thesis**, Johns Hopkins University, August 2000.
Thesis (PhD). THE JOHNS HOPKINS UNIVERSITY, Source DAI-B 61/10, p. 5372, Apr 2001, 137 pages
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27. Matcheva, K. I. and D. F. Strobel, *Heating of Jupiter's Thermosphere by Dissipation of Gravity Waves Due to Molecular Viscosity and Heat Conduction.* **Icarus, v. 140**, n. 2, 410-423, 1999.
doi:10.1006/icar.1999.6151
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28. Matcheva, K. I., *Mathematical Interpretation of the Wave Functions in Long-Range Spherically Symmetric Potentials.* **M. S. Thesis**, Plovdiv University, June 1993.
citations: NA, reads: NA, downloads: NA.

II. Contributed and invited conference presentations

Oct. 22-28, 2023	*Searching for Novel Chemistry in Exoplanetary Atmospheres using Machine Learning for Anomaly Detection,* Presentation at the Ariel Consortium meeting, Budapest, Hungary.
Oct. 5-10, 2023	*Anomaly Detection Techniques for Unusual Chemistry in Exoplanet Atmospheres,* Presentation at AAS Division of Planetary Sciences meeting, Huston, TX.
Aug. 24-25, 2023	*Deep Learning Symmetries from First Principles* Presentation at the Data, Numbers and Geometry workshop, London, UK.
June 6-9, 2023	*Decoding Exoplanetary Atmospheres: Leveraging Transmission Spectroscopy, Big Data and Machine Learning,* Presentation at the Ariel Consortium meeting, Gran Canaria, Spain.
Dec. 10-16, 2022	*Application of Symbolic Regression and Dimensionality Reduction to Forward Models of Radiative Transfer in Planetary Atmospheres* Presentation at the American Geophysical Union (AGU) meeting, Chicago, IL.
Oct. 2-7, 2022	*New Semi-Analytical Method for Inversion of Exoplanet Transmission Spectra,* Presentation at the 54 annual meeting of DPS of AAS, London, Canada.
May 12-18, 2022	*Using Machine Learning to Search for Chemical Biomarkers in the Atmospheres of Extrasolar System Planets*, Presentation at the AGU AbSciCon conference, Atlanta, GA.
May 1-6, 2022	*Dimensionality Reduction Techniques for Exoplanet Transit Spectroscopy.* Presentation at the AAS Exoplantes IV conference, Las Vegas, NV.
March 1-2, 2016	*Small-Scale Variability in Saturn's Lower Ionosphere.* Presentation at ASTROWIN workshop, UF.
Apr. 24-25, 2015	*The Role of Remote-Sensing Technics in the Exploration of Solar System Planets.* Presentation at the annual meeting of the Center for Remote Sensing (CRS), Gainesville, Florida.
Nov. 5-12, 2015	*The Effect of Large-Scale Tropospheric Storms on the Ionospheres of Giant Planets.* Presention at the 47th annual meeting of the Division of Planetary Sciences, National Harbor, MD.
Nov. 4-11, 2014	*Wave-Driven Compositional Effects in the Upper Atmospheres of Giant Planets.* Presented at the 46th annual DPS meeting of AAS, Tucson, AZ.
Oct. 11-17, 2013	*Atmospheric Gravity Waves in Titan's Troposphere and Stratosphere.* Presented at the 45th annual DPS meeting of AAS, Denver, CO.
June 19-22, 2013	*Wavelet Analysis of Cassini's Radio Occultations of Saturn.* Presentation at the "Aeronomy of Giant Planets" workshop at the International Space Sciences Institute, Bern, Switzerland.
Oct. 16-23, 2012	*The Effect of Atmospheric Gravity Waves on the Thermal Structure of Saturn's Upper Atmosphere.* Presented at the 44th annual DPS meeting of AAS, Reno, NV.
Oct. 16-23, 2012	*The Zonal Mean Structure of Clouds and Haze on Saturn from Cassini/CIRS Observations.*

	Presented at the 44th annual DPS meeting of AAS, Reno, NV.
Sept. 23-28, 2012	*The Wavelet analysis of Saturn's electron density profiles from the Cassini radio occultations.* Presented at the European Planetary Science Congress, Madrid, Spain.
Dec. 7-12, 2011	*Small-Scale Variability in Saturn's Lower Ionosphere.* Presented at the AGU (American Geophysical Union) meeting, San Francisco, CA.
Oct. 3-8, 2010	*Propagation of Gravity Waves in Saturn's Stratosphere and Upper Troposphere.* Presented at the 42nd annual DPS meeting of the AAU, Pasadena, CA.
Oct. 3-8, 2010	*Prospects for Observing Waves in Jupiter's Thermosphere using H_3^+ Emission.* Poster presented with D. Barrow* at the 42nd DPS meeting of AAS, Pasadena, CA.
Oct. 3-8, 2010	*The Doppler Spectro Imager (DSI/ECHOES) for EJSM/JGO: A Dedicated Instrument for Jovian Internal Structure And Atmospheric Study.* Poster presented with Schmider, Francois-Xavier and the DSI/ECHOES Team at the 42nd DPS meeting of AAS, Pasadena, CA.
Dec. 17, 2009	*High Resolution IR Spectrometry and Detection of Atmospheric Gravity Waves in the Upper Atmosphere of Jupiter.* Presented at the AGU meeting, San Francisco, CA.
Oct. 4-9, 2009	*Haze And Cloud Structure In Saturn's Southern Hemisphere From The Cassini/CIRS Observations*, Presented at 41st DPS meeting of the AAS, Fajardo, Puerto Rico.
Oct. 4-9, 2009	*Dynamical Effects Of Atmospheric Gravity Waves On The Ionosphere Of Jupiter*, Poster with D. Barrow* at the 41st DPS meeting of the AAS, Fajardo, PR.
Oct. 24, 2008	*Clouds and Haze on Jupiter and Saturn*, Presented at UF-UCF star and planets formation workshop, Daytona, FL.
Oct. 9-15, 2008	*Wave Driven Variations in the Distribution of Ions in the Ionosphere of Jupiter.* Presented at the 40th DPS meeting of the AAS, Cornell University, Ithaca, NY.
Nov. 6-7, 2007	*Dynamically Driven Small-Scale Variations in the Distribution of H_3^+ Ions in the Jovian Non-Auroral Ionosphere.* Presented at the Planetary Atmospheres Workshop held in Greenbelt, MD.
Oct. 7-14, 2007	*Cassini/CIRS Observations of Saturn at 7.18 μm.* Presented at the 39th DPS meeting of the AAS, Orlando.
Oct. 7-14, 2007	*Spectral Properties of Gravity Waves in Mars' Lower Atmosphere Using Mars Global Surveyor Radio Occultation Measurements.* Presented at the 39th DPS meeting of the AAS, Orlando, FL.
Oct. 7-14, 2007	*Atmospheric Gravity Waves in the Upper Atmosphere of Saturn.* Presented at the 39th DPS meeting of the AAS, Orlando, FL.
Feb. 19, 2007	*Gravity Waves in Planetary Atmospheres.* Presented at the "Mesospheric Sounding of Planetary Atmospheres" workshop at the Observatory of Paris-Meudon, France.
Sep. 4-8, 2005	*The Atmosphere of Jupiter from Voyager's and Cassini's Infrared Observations.*

Presented at the 37th DPS meeting of the AAS, Cambridge, UK.

Sep. 9-13, 2005 *The Cloud Structure of the Jovian Atmosphere as Seen by the Cassini/CIRS Experiment – Prospects for Saturn.*
Presented at the Cassini/CIRS team meeting, Oxford, UK.

Nov. 7, 2004: *The Clouds on Jupiter - the Cassini/CIRS Perspective.*
Paper presented at the 36th DPS meeting of AAS, Louisville, CT.

July 18, 2004: *The Clouds on Jupiter from the Cassini/CIRS Perspective, Prospects for Saturn.*
Poster presentation at the biannual meeting of the Committee of Space Research (COSPAR), Paris, France.

Oct. 8, 2002: *Probing the Dynamics of a Planetary Atmosphere by Analyzing Small Scale Temperature Variations.*
Paper presented at the 34th DPS meting of AAS, Birmingham, AL.

Oct. 3, 2002: *Gravity Waves in Planetary Atmospheres.*
Paper presentation at the workshop of Marie Curie Fellows: Research and Training in Physics and Technology, Geneva, Switzerland.

June 18, 2002: *In Search of Extraterrestrial Atmospheric Waves.*
Paper presentation at the Euro-conference: Jupiter after Galileo and Cassini, Lisbon, Portugal.

Dec. 14, 2001: *Gravity Wave-Driven Fluctuations in the H_3^+ Emission of Jupiter.*
Poster presentation at the American Geophysical Union meeting, San Francisco, CA.

Nov. 29, 2001: *Gravity Wave-Driven Fluctuations in the H_3^+ Emission of Jupiter.*
Paper presented at the 33rd DPS meeting of AAS, New Orleans, LA.

Nov. 28, 2001: *Scale-Time and Correlation Analysis of Lightcurves From the HIP 9369 Occultation by the Northern Polar Region of Jupiter.*
Poster presented with E. Raynaud at the 33rd DPS meeting, New Orleans, LA.

Oct. 26, 2000: *Gravity Wave Signatures in Jupiter's Ionosphere.*
Poster presented at the 32nd DPS meeting of AAS, Pasadena, CA.

June 25, 2000: *Gravity Wave Signatures in Jupiter's Ionosphere.*
Poster presented at the annual CEDAR workshop, Boulder, CO.

Oct. 10, 1998: *Heating of Jupiter's Thermosphere by Dissipation of Gravity Waves Due to Molecular Viscosity and Heat Conduction.*
Paper presented at the 30th DPS meeting of AAS, Madison, WI.

III. Invited Talks, Seminars, and Colloquia

Oct. 20, 2023 *Exploration of Exoplanets in the Era of "Big Data" and AI.*
Invited colloquium talk,
Institute for Astrophysics (IAP), Paris, France.

Mar. 28, 2023 *Exoplanets Exploration in the Era of "Big Data" and AI.*
Invited seminar talk,

University College London, London, UK.

Oct. 4, 2019 *Waves in Planetary Atmospheres.*
Invited plenary talk at the EPS Symposium in Honor of Prof. Darrell Strobel, Johns Hopkins University, Baltimore, MD.

May 24, 2012 *Gravity Waves and Atmospheric Coupling*
Invited talk at the DI-ECHOES workshop, La Cruses, NM.

Jan. 11, 2011: *The Female Physics Forum at the University of Florida*
Invited talk at the "Women in Physics" panel at the American Association of Physics Teachers, Jacksonville, FL.

June 21, 2010: *New Developments in Modeling Gravity Waves in Saturn Ionosphere*
Invited talk at the International Space Science Institute, Bern, Switzerland.

Apr. 8, 2010: *Jupiter and Saturn: unveiling the secrets of a planet*
Invited colloquium talk at Florida State University, Tallahassee, FL.

Feb. 15, 2010: *Gravity Waves and Atmospheric Coupling*
Invited talk at the DSI (Doppler Spectro Imager) Science Meeting, Nice Observatory, Nice,France.

Jan. 28, 2010: *Weather on Other Planets*
Invited talk at the Southwestern Chapter of the American Meteorology Society. Tampa, FL.

Oct. 23, 2009: *Saturn Aeronomy*
Seminar talk at the Department of Physics at UF, Gainesville, FL.

Sep. 22, 2009: *Gravity Waves in Saturn Ionosphere*
Invited talk at the ISSI (International Space Science Institute) workshop "Saturn Aeronomy", Bern, Switzerland.

Mar. 27, 2009: *Jupiter and Saturn - Unveiling the Secrets of a Planet*
Colloquium talk at the Department of Physics at the University of Central Florida, Orlando, FL.

March 5, 2009: *Gravity Waves in Planetary Atmospheres*
Invited seminar presented at Boston University, Boston, MA.

Nov. 7, 2008: *Exploring the Solar System*
Colloquium presented at the University of South Florida, Tampa, FL.

Dec. 4, 2008: *The Giant Planets: so strange, yet so familiar*
Invited colloquium talk at the Department of Physics at UF, Gainesville, FL.

Aug. 29, 2007: *The Planets of our Solar System and Beyond*
Invited talk at the Florida Space Research Colloquium, Gainesville, FL.

Jan. 25, 2006: *A Guided Tour Through the Solar System*
Invited public lecture at Oak Hammock Retirement Center Gainesville, FL.

Sep. 28, 2005: *Learning from Giants: Exploring Jupiter and Saturn*
Colloquium talk at the Astronomy Department of UF, Gainesville , FL.

June 25, 2005: *Exploring the Outer Solar System*
Invited Colloquium talk in Plovdiv University, Plovdiv, Bulgaria.

Feb. 2, 2005: *The Giant Planets – Up Close and Personal*
Colloquium presented at the University of California at Irvine, Irvine, CA.

Jan. 27, 2005: *Jupiter and Saturn - Learning From the Giants*
Invited talk at the Department of Astronomy, Cornell University, Ithaca, NY.

Feb. 28, 2003: *Gravity Waves in Planetary Atmospheres*

Invited talk at the Department of Physics, UF, Gainesville, FL.

Dec. 5, 2000: *The Impact of Gravity Waves on Jupiter's Ionosphere*
Invited talk at Laboratoire de Météorologie Dynamique, Paris, France.

Oct. 25, 2000: *Gravity Waves in Jupiter's Upper Atmosphere.*
Invited talk at the Department of Atmospheric, Oceanic, and Planetary Physics, Oxford University, Oxford, UK.

Feb. 19, 1999: *The Energy Crisis in Jupiter's Thermosphere.*
Invited talk at the Space Telescope Science Institute (STSci), Baltimore, MD.

IV. Recent Highlights in the Popular Press

My AI-related research has been featured in the following articles in the popular media:

- *"5 Papers to Read on Dimensionality Reduction Method in 2022"*
  by Monodeep Mukherjee (April 12, 2022).
  https://medium.com

- *"A Simpler Way to Analyze Spectra"*
  by By Kerry Hensley (July 15, 2022).
  https://aasnova.org

- *"With the James Webb telescope, Florida scientists delve into the deepest questions of the cosmos"*
  by Eric Hamilton (August 16, 2022).
  https://news.ufl.edu

- *"Delving into the Cosmos with the James Webb Space Telescope".*
  by Eric Hamilton (Fall 2022).
  Explore Magazine

- *"The Most Compelling Places to Search for Life Will Look Like "Anomalies"".*
  by Matt Williams (August 22, 2023)
  https://www.universetoday.com