Arif Solmaz, PhD

Assistant Professor | Computational Physicist | Scientific ML & Astrophysics

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PROFILE

Computational physicist and astrophysicist specializing in interdisciplinary data science applications. My research bridges astronomy and applied machine learning, focusing on extracting meaningful insights from complex observational data through advanced statistical methods. I lead projects in exoplanet characterization using space telescope data (TESS, JWST) and develop AI-driven solutions for scientific classification problems. My work emphasizes Bayesian inference, time-series analysis, international collaboration, and reproducible research practices. With extensive English-medium teaching experience, I deliver courses integrating computational physics, machine learning, and scientific programming.

RESEARCH EXCELLENCE & INNOVATION

- **Interdisciplinary Leadership**: Successfully bridging astrophysics, machine learning, and applied sciences through funded research projects including prestigious TÜBİTAK and EU programs
- **Data Science & AI Applications**: Advanced proficiency in Bayesian inference, MCMC methods, time-series analysis, and deep learning for scientific classification tasks
- **International Collaboration**: Active contributor to multi-national research teams including ExoClock Project (100+ observers, 50+ countries), Europlanet ML Working Group, and multi-site stellar occultation campaigns
- **Research Impact**: Publications in high-impact international journals (Astronomy & Astrophysics, MNRAS, ApJS) with focus on methodological innovation and large-scale collaborations
- **Grant Success**: Principal Investigator on multiple national research projects; Project Coordinator for EU-funded international education initiative

CORE EXPERTISE

- **Time-Series Analysis**: Bayesian parameter estimation, MCMC sampling, Gaussian Processes; uncertainty quantification for astronomical observations with systematic noise
- **Exoplanet Science**: Transit photometry and timing analysis; stellar activity characterization; integration of ground-based and space telescope data (TESS, JWST)
- **Machine Learning Applications**: Deep learning for image classification, transfer learning, model validation; applications in astronomy and materials science
- **Scientific Computing**: Python-based research pipelines for data acquisition, reduction, modeling, and publication-quality visualization; emphasis on reproducible workflows
- **Observational Astronomy**: CCD imaging systems, photometric calibration, telescope operations; multi-site observing campaign coordination

TECHNICAL SKILLS

- **Programming Languages**: Python (expert), C, Bash; Git/GitHub version control; Linux research environments
- **Scientific Computing**: NumPy, SciPy, Pandas, Matplotlib; Astropy ecosystem (Astropy, Photutils, Lightkurve)
- **Statistical Methods**: Bayesian modeling, MCMC (emcee, PyMC), time-series modeling (celerite), Gaussian processes

- **Machine Learning**: Scikit-learn, TensorFlow/Keras; CNNs for image classification; transfer learning techniques
- **Research Tools**: LaTeX scientific writing, Jupyter notebooks, reproducible computational environments
- **Languages**: Turkish (native), English (advanced: YÖKDİL 87.5/100, 2022)

EDUCATION

PhD in Physics *Jan 2023*
Çukurova University, Institute of Science Adana, Turkey

- Dissertation: *Effects of Starspot Occultations on Exoplanet Transit Mid-time Measurements*
- Developed novel methods for handling systematic errors in astronomical time-series data caused by stellar surface features
- Advisors: Prof. Dr. Aysun Akyüz & Prof. Dr. Özgür Baştürk (Ankara University)

MSc in Space Sciences and Technologies *Oct 2010*
Çanakkale Onsekiz Mart University, Institute of Science Çanakkale, Turkey

- Thesis: *Extrasolar Planetary Systems: a status review*
- Comprehensive review of exoplanet detection methods and characterization techniques
- Advisor: Prof. Dr. Mehmet Emin Özel

BSc in Physics *Jan 2008*
Çanakkale Onsekiz Mart University, Faculty of Arts and Sciences Çanakkale, Turkey

- Undergraduate thesis: *Large Telescopes and Observing Sites*
- Advisor: Prof. Dr. Faruk Soydugan

ACADEMIC APPOINTMENTS

Assistant Professor *May 2024 – Present*
Istanbul Health and Technology University (İSTÜN)
Faculty of Engineering & Natural Sciences, Department of Mechatronics Engineering Istanbul, Turkey

- Teaching programming, robotics, and machine learning courses in English and Turkish
- Developing curriculum integrating computational physics, data science, and engineering applications
- Leading research projects in astrophysics and applied machine learning
- Supervising undergraduate research projects and thesis work

Lecturer *Sep 2015 – Jun 2023*
Çağ University, Faculty of Arts and Sciences
Mersin, Turkey

- Delivered quantitative and computational courses including Statistics, Computer Programming
- Developed digital learning materials and blended teaching approaches
- Supervised student projects emphasizing data analysis and computational thinking

Research Assistant *Feb 2011 – Sep 2015*
Çağ University, Faculty of Arts and Sciences Mersin, Turkey

- Supported teaching and research activities with emphasis on computational methods
- Assisted in course development and student mentoring

RESEARCH LEADERSHIP & FUNDED PROJECTS

As Principal Investigator / Project Coordinator:

- **Machine Learning-Based Microscopic Wood Species Identification System: An Image-Based Literature-Supported Approach** — TÜBİTAK-1002 (National Scientific Research Support Program). *Ongoing.*
  Developing deep learning models for automated wood species classification from microscopic images; applications in forestry and materials science.
- **MILAGE: Technology Use in Mathematics Education** — EU Funded Project (Erasmus+ Programme). *Sep 2015 – Sep 2018.*
  International collaboration on digital tools and gamification in mathematics learning; coordinated multi-country partnership.
- **Geometric Modeling and Analysis of Exoplanet Transit Observations** — Scientific Research Project, Higher Education Institutions. *Sep 2019 – Present.*
  Advanced Bayesian methods for parameter estimation from space telescope data; robust handling of stellar activity systematics.
- **Turkey Meteor Monitoring Systems and Network (Continuation Project)** — Scientific Research Project, Higher Education Institutions. *Sep 2019 – Present.*
  Establishing automated detection systems and coordinating national observation network infrastructure.
- **Light Pollution Measurement Studies** — Scientific Research Project, Higher Education Institutions. *Sep 2019 – Present.*
  Systematic monitoring and assessment of light pollution levels; developing measurement protocols and public awareness programs.

As Research Fellow / Team Member:

- **Turkey Meteor Monitoring Systems and Network: Creation of National Impact Craters and Meteorites Database** — TÜBİTAK-1001 (Scientific and Technological Research Projects). *Jan 2014 – Jul 2017.*
  National network infrastructure and comprehensive database development.
- **Multi-faceted Analyses of Binary and Multiple Star Systems to Determine Star Formation Region Properties** — TÜBİTAK-1010 EVRENA (International Research Fellowship Programme). *2010 – 2013.*
  Observational and theoretical studies of stellar populations in star-forming regions.
- **Çukurova University UZAYMER Observatory: New CCD Project** — Funded Research Project, Çukurova University. *Jul – Sep 2020.*
- **Doğa Dostu Matematik** — TÜBİTAK Science Communication Project (Instructor). *Jul 2018 – Feb 2019.*
- **Science Outreach Projects** — Multiple TÜBİTAK science popularization projects (Instructor). *Various periods 2018–2021.*

SELECTED PUBLICATIONS

Representative publications demonstrating research impact and international collaboration. Complete list available at arifsolmaz.github.io

High-Impact Peer-Reviewed Publications:

- A high geometric albedo and small size for the Haumea cluster member (24835) 1995 SM55 determined from a stellar occultation and photometric observations
  Astronomy & Astrophysics, 703, A147, 2025 · Multi-site international observing campaign
- Testing the performance of cross-correlation techniques to search for molecular features in JWST NIRSpec G395H observations of transiting exoplanets
  Monthly Notices of the Royal Astronomical Society, 543, 3456, 2025 · Advanced data analysis methodology
- ExoClock Project IV: A homogeneous catalogue of 620 updated exoplanet ephemerides
  arXiv preprint, arXiv:2511.14407, 2025 · Large-scale international collaboration (100+ authors)

- ExoClock Project III: 450 New Exoplanet Ephemerides from Ground and Space Observations
  The Astrophysical Journal Supplement Series, 265, 4, 2023 · Contributing author (60+ coauthors)
- Leke Örtülmelerinin Ötegezegen Geçiş Ortası Zaman Ölçümlerine Etkisi (Effects of Starspot Occultations on Exoplanet Transit Mid-Time Measurements)
  Turkish Journal of Astronomy and Astrophysics, 4, 147, 2023 · PhD dissertation summary
- Physical properties of the trans-Neptunian object (38628) Huya from a multi-chord stellar occultation
  Astronomy & Astrophysics, 664, A130, 2022 · International coordinated observations
- BO Ari Light Curve Analysis using Ground-Based and TESS Data
  New Astronomy, 86, 101571, 2021 · Ground-space data integration
- The First Light Curve Solutions and Period Study of BQ Ari
  Astronomy Letters, 47, 402, 2021

Conference Proceedings & Community Contributions:

- Artificial Intelligence in Planetary Science and Astronomy: Applications and Research Potential
  EPSC-DPS Joint Meeting 2025, EPSC-DPS2025-1467 · Invited presentation
- Europlanet Machine Learning Working Group: a year of progress
  EPSC-DPS Joint Meeting 2025, EPSC-DPS2025-1815 · Working group coordination
- Breaking Free of the Classroom: Implementing Digital Media to Enhance Students' Involvement in Learning Mathematics
  ICERI2016 Proceedings, 2016 · Educational innovation

INTERNATIONAL COLLABORATION & ACADEMIC SERVICE

- **ExoClock Collaboration**: Contributing member coordinating ground-based observations and ephemeris refinement for transiting exoplanets; part of international network spanning 100+ observers across 50+ countries
- **Europlanet Machine Learning Working Group**: Active participant fostering AI/ML applications in planetary science; presenting research findings and coordinating community efforts
- **Multi-Site Stellar Occultation Campaigns**: Coordinating international observations for physical characterization of trans-Neptunian objects; managing data analysis and collaborative publications
- **Peer Review Service**: Reviewer for international astronomy and planetary science journals
- **Scientific Community Engagement**: Regular presenter at international conferences (EPSC-DPS, ICERI); active participant in astronomical research networks

TEACHING EXPERIENCE

Current Teaching (2024–2025 Academic Year):

- Computer Programming I (English & Turkish) — Introduction to programming, algorithms, Python fundamentals
- Computer Programming II (English & Turkish) — Advanced programming concepts, data structures
- Object-Oriented Programming (English & Turkish) — OOP principles, design patterns, software engineering
- Robotics (Turkish) — Control systems, sensor integration, autonomous systems
- Machine Learning (Turkish) — Supervised/unsupervised learning, neural networks, practical applications

Previous Teaching Experience:

- Statistics — Descriptive and inferential methods, applied statistical computing, data visualization
- Quantitative Methods — Mathematical foundations for data analysis and modeling

- Programming Courses — Multiple levels from introductory to advanced topics

Teaching Philosophy & Innovations:

- Developed project-based learning modules integrating real-world datasets and problems
- Emphasis on reproducible research practices and version control (Git/GitHub)
- Created computational physics and astronomy data analysis course materials
- Supervised undergraduate research projects in data science and astronomy applications
- Extensive experience in English-medium instruction across technical disciplines

LEADERSHIP & ADMINISTRATIVE SERVICE

- **Coordinator, Scientific Research Projects Coordination Unit (BAP)**
  Çağ University Rectorate *2020–2021*
  Managed university research project administration, budget oversight, and reporting
- **Executive Board Member**
  Çağ University Space Observation Application and Research Center (UZAYMER) *2012–2023*
  Contributed to strategic planning and research direction for university observatory

SCIENCE OUTREACH & PUBLIC ENGAGEMENT

- **Science Outreach Network Turkey Contact Point**
  European Southern Observatory (ESO) *2010–2022*
  Coordinated science communication activities and educational resource distribution
- **Turkey Representative**
  Universe Awareness (UNAWE) International Program *2011–2015*
  Led astronomy education programs for underprivileged children
- **Science Communication Projects**
  Multiple TÜBİTAK-funded public engagement initiatives *2018–2021*
  Developed and delivered astronomy and mathematics outreach programs

PROFESSIONAL MEMBERSHIPS

- **International Astronomical Union (IAU)** — Member *2024 – Present*
- **European Astronomical Society (EAS)** — Member *2021 – Present*
- **Turkish Astronomical Society (TAD)** — Member *2009 – Present*
- **European Association for Astronomy Education (EAAE)** — Board Member *2009 – Present*
- **American Association of Variable Star Observers (AAVSO)** — Member *2008 – 2020*
- **Astronomy Without Borders (AWB)** — Advisor *2009 – 2015*
- **International Dark-Sky Association (IDA)** — Advisor *2009 – 2020*
- **NASA Museum Alliance** — Member *2008 – 2020*

Complete publication list, research code, and teaching materials available at arifsolmaz.github.io
References available upon request