Alexander Marchuk, PhD

Curriculum Vitae

Through my career I always was notoriously interested in building unobvious insights from data with machine learning and statistic, and now ready to go from academia research into IT and apply my skills of meticulous data analyser to help solve business needs.

CONTACT DETAILS

TG: @aamarchuk *E-mail:* a.a.marchuk@gmail.com *GitHub:* github.com/Amarchuk/

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SCIENTIFIC INTERESTS

Galaxies' structure, formation and evolution. Origin and properties of spiral arms in galaxies, pattern speed of spiral structure and bar, methods of corotation radii determination. Star formation properties of galaxies and their connection to the stability of gaseous and stellar discs. Gravitational instability in galaxies. Kinematical analysis of galaxy features, stellar velocity ellipsoid. Dust in galaxies. Properties of Boxy/Peanut/X-shaped bulges in galaxies. Surveys and catalogs of extragalactic objects.

Application of Machine Learning methods in Astrophysics.

WORK EXPERIENCE

2022 – current time

Lead Research Scientist, *Saint Petersburg State University, Department of Astrophysics*.

2020 – current time

Research Scientist, *Pulkovo Observatory of Russian Academy of Sciences*, Saint Petersburg, Russia.

2016 – 2022

Top Rated Freelancer on Upwork, *Upwork, Data Science and Data Analysis works*.

2013 – 2020

Research Fellow, *Saint Petersburg State University, Department of Astrophysics*, Saint Petersburg, Russia.

2013 – 2014

Python & Java Developer in JetBrains, *JetBrains company, Pycharm team*, Saint Petersburg, Russia.

TECHNICAL SKILLS

Python (Numpy, Scipy, Pandas, Matplotlib, Astropy, Plotly), Jupyter ecosystem, PyCharm & DataSpell IDEs, bash, git, TensorFlow, Matlab, Unix/Linux, touch Fortran/C++/Java/R/Julia, Apache Kafka, Airflow, Docker, scikit-learn, catboost, XGBoost, mlrun, Catalyst/backtrader projects.

Ph.D. & MASTER'S THESIS

Ph.D. Thesis: Dynamic status of gaseous discs in spiral galaxies according to two-fluid gravitational instability criterion
Advisor: Professor Natalja Ya. Sotnikova
Master's Thesis: Two-fluid instability and large-scale star formation in disk galaxies
Advisor: Professor Natalja Ya. Sotnikova

SELECTED PROJECTS

2015 – current time

Various weekend fun projects, that could be found on Github, including but not limited to:
Shakespeare lingvoarcheology; creation of isodistances map of Saint-Petersburg;
developing classifier of Systembolaget bottles; check Steam games sizes vs HDD capacity;
building the model for social media attention; analysis and infographics of urgent subway closing, etc.

2020 – 2021

Deep Learning search for galaxies, where I completely trained and applied the CNN model that search for galaxies with some peculiarities in their center, which increased the number of such objects known from several 100s to almost 2000, details in the paper in Monthly Notices of the Royal Astronomical Society.

2016 – 2020

Reinforcement Learning Trader, Upwork project where I implemented Q-learning approach for crypto trading. The full automatic ML-pipeline was built using PGPortfolio, various backtrading packages, Apache Kafka and mlrun tools. Models automatically update and trade with some small portfolios in Binance.

2014

Scientific Tools in Pycharm, I implemented some tools for better experience with PyCharm IDE, including Data View tool and some console-related improvements.

2013

Eclipse plugin for YouTrack, written from scratch by myself in JetBrains using Java.

2012 – 2013

GoodsReview, diploma project for NLP-based application for sentiment extraction from user reviews. I was a main researcher in the project with mentors from Yandex and HP Labs and build the ML classifier with decent results and wrote a research paper.

Languages: English, Russian

Interests: latest discoveries in Physics, Biology and Archeology, hiking and kayaking, electronic and classical music, pareidolia painting, urban tourism.

References available upon request.

APPENDIX **GRANT WORK**

2022 – current time

RSF-project, "Investigation of the spiral pattern properties of galaxies based on deep observational data", informal PI, *Pulkovo Observatory of Russian Academy of Sciences,* Saint Petersburg, Russia.

2020 – current time

RSF-project, "A study of the distribution and properties of dust in galaxies", Co-PI, *Pulkovo Observatory of Russian Academy of Sciences,* Saint Petersburg, Russia.

2019 - 2021

RFBR-project, "The nature of X-structures in edge-on galaxies", *Saint Petersburg State University,* Saint Petersburg, Russia.

2018 – 2020

RFBR-project, "Investigation of the spiral structure of disc galaxies based on the multi-wavelength (UV-IR) observations", *Saint Petersburg State University,* Saint Petersburg, Russia.

2014

RSF-project, “Distribution and motion of galaxies in the nearby Universe”, *Special Astrophysical Observatory RAS*, Nizhnij Arkhyz, Russia.

APPENDIX **LIST OF PAPERS**

First Author

- B/PS bulges in DESI Legacy edge-on galaxies - I. Sample building (2022)
- An analysis of methods for determining corotation radii in galaxies (2022)
- Fractal dimension of optical cirrus in Stripe82 (2021)
- Gravitational instability and star formation in NGC 628 (2018)
- Two-component gravitational instability in spiral galaxies (2018)
- Reconstructing the velocity dispersion profiles from the line-of-sight kinematic data in disc galaxies (2017)

Co-Author

- The distribution of dust in edge-on galaxies: I. The global structure (2022)
- The edge-on Galaxies in the Pan-STARRS survey (EGIPS) (2022)
- The properties of Galactic globular clusters from Gaia EDR3 and other data compared with theoretical isochrones (2022)
- Interstellar extinction at high Galactic latitudes across the whole dust layer in the Galaxy (2022)
- Dust discs in edge-on galaxies: case of NGC 4437 (2022)
- Studying the characteristics of spiral galaxies (2022)
- Catalog of edge-on galaxies using the Pan-STARRS1 survey data (2022)
- Investigation of Galactic cirri based on SDSS Stripe 82 images (2022)
- Isochrone fitting of Galactic globular clusters - III. NGC 288, NGC 362, and NGC 6218 (M12) (2021)
- Investigation of the parameters of spiral pattern in galaxies: the arm width (2020)
- A multiwavelength study of spiral structure in galaxies. I. General characteristics in the optical (2020)
- A coupling pair of dwarfs in Lynx (2013)
- Extracting product features from reviews with the use of internet statistics (2013)