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Ivan I. Yakovkin

PhD (Physics & astronomy)

Education

Department of Theoretical Physics, Faculty of Physics, Taras Shevchenko National University of Kyiv:

- Bachelor with honors (2019)
- Master with honors (2021)
- PhD (Physics and astronomy, 2025)

Research Interests

Faculty of Physics, Taras Shevchenko National University of Kyiv

Liquid crystals, plasmonics, optics, computational physics:

- Orientational transitions in nematic liquid crystals
- Flexoelectric effect, photoorientation, easy axis gliding
- Q-tensor simulation of defects in liquid crystals
- Tuning plasmonic resonances with liquid crystals

Astronomical Observatory, Taras Shevchenko National University of Kyiv

Solar physics, optics, computational physics:

- Magnetic fields and other conditions in solar flares and sunspots
- Non-LTE simulation of polarized radiative transfer
- Inversion of Stokes parameters
- Custom software for automated spectrum processing and analysis
- Noise detection in spectra using machine learning

Achievements

- 2022 – Best poster award at the 7th International Symposium on Dielectric Materials and Applications ISyDMA'7
- 2023 – Scientific Excellence Award (Taras Shevchenko National University of Kyiv)
- 25 articles in refereed journals, participation in more than 30 conferences

Scientific computing

Numeric simulations of IVPs, BVPs, integral equations, Monte Carlo, etc

- Languages: COMSOL, python, Maple, Wolfram Mathematica, Matlab, Fortran, C++, Delphi

Detection and removal of spectrum contamination using convolutional neural networks

- Languages: python [pytorch, numpy]
- Techniques: custom modules with explicit backward gradient propagation

CAS-assisted analytical derivations

- Languages: Maple, Mathematica, python [sympy]

Setting up environments

- Environments: Windows, linux [Manjaro, wsl2, RHEL]
- Remote development: ssh, RDP, remote python debugging

Selected products

- [Virtual Photometer](#)* – precise digitalization and preprocessing of spectral data captured on photoplates (Delphi)

- [Profile Manipulator](#)* – expedited processing, analysis, and visualization of spectral line profiles (Delphi)

*Actively used for spectrum processing at the Horizontal Solar Telescope of the Astronomical Observatory, Taras Shevchenko National University of Kyiv

Commercial experience

Machine learning in finance

- Implementation of variational autoencoder models for predicting interest rates
- Languages: python [pytorch, numpy, scipy, pandas, pandera, numexpr, plotly]

Software engineering in wholesale credit risk

- Implementation of foundational and credit loss models for CCAR stress testing and CECL provisioning
- Languages: python [numpy, scipy, pandas, pandera, numexpr, pytorch, pyarrow]

Selected publications

- Yakovkin I.N., **Yakovkin I.I.**, Petrova N.V. DFT and Monte Carlo study of the W(001) surface reconstruction. *European Physical Journal B [Q2]*, 90 (125), 2017
- **Yakovkin I.I.**, Veronig A.M., Lozitsky V.G. Magnetic field measurements in a limb solar flare by hydrogen, helium and ionized calcium lines. *Advances in Space Research [Q2]*, 68 (3), 2021
- **Yakovkin I.I.**, Lesiuk A.I., Ledney M.F., Reshetnyak V.Yu. Director orientational instability in a planar flexoelectric nematic cell with easy axis gliding. *Journal of Molecular Liquids [Q1]*, 363 (6), 2022
- **Yakovkin I.I.**, Lozitsky V.G. Signatures of superstrong magnetic fields in a limb solar flare from observations of the Hα line. *Advances in Space Research [Q2]*, 69 (12), 2022
- **Yakovkin I.I.**, Lozitsky V.G. Search for superstrong magnetic fields in active processes on the Sun using spectro-polarimetry within 15 angstroms around the D3 line. *Monthly Notices of the Royal Astronomical Society [Q1]*, 523 (40), p. 5812 – 5822, 2023
- **Yakovkin I.I.**, Reshetnyak V.Yu. Liquid crystal-enabled tunability of Yagi-Uda antenna resonant properties. *Journal of Optical Microsystems [Q2]*, 3 (4), 041203, 2023
- **Yakovkin I.I.**, Reshetnyak V.Yu. Controlling plasmon resonance of gold and silver nanoparticle arrays with help of liquid crystal. *Photonics [Q2]*, 10 (10), 1088, 2023
- **Yakovkin I.I.**, Reshetnyak V.Yu., Bunning T.J., Evans D.R. Tunable THz absorbers based on LC-tuned Yagi–Uda antennas. *Liquid crystals [Q2]*, 1 – 11, 2024
- **Yakovkin I.I.**, Ledney M.F., Reshetnyak V.Yu., Pakamoryte I., Hands P.J.W. Modeling of laser generation in a Fabry-Perot-Tamm structure with a nematic liquid crystal layer. *Journal of Applied Physics [Q2]* 135 (21), 2024
- Lozitska N.I., **Yakovkin I.I.**, Lozitsky V.G. Unique spectral manifestations around the D3 line observed in the region close to the seismic source of a large solar flare. *Monthly Notices of the Royal Astronomical Society Letters [Q1]*, 528 (1), 2024
- **Yakovkin I.I.**, Lozitska N.I., Lozitsky V.G. Altitude Heterogeneity of Magnetic Fields and Doppler Velocities in the Area of Seismic Source of a Strong Solar Flare from Data in Helium, Sodium, and Nickel Lines. *Universe [Q1]*, 10(6), 2024
- Lozitsky V.G, **Yakovkin I.I.**, Lozitska N.I. Comparison of magnetic fields and Doppler velocities in an X-class solar flare as measured by D1, D2, D3, Hα, and NiI 5892.9 lines. *Advances in Space Research [Q1]*, 75 (1), 2025
- **Yakovkin I.I.**, Bartenev A.O., Petrova N.V. Machine Learning in Application to Automatic Noise Processing of Solar Spectrograms. *Journal of Physical Studies [Q3]*, 29(1), 2025
- **Yakovkin I.I.**, Ledney M.F. Voltage-controlled surface plasmon in a flexoelectric nematic liquid crystal cell. *Liquid Crystals [Q2]*, 2025