



BRANDON PANOS

Ph.D. in Machine Learning and Physics

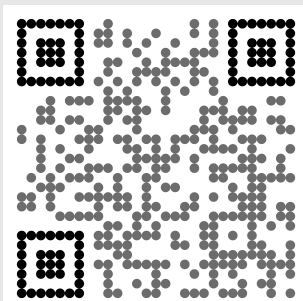
- +41 76 483 06 17
- brandonlpanos@gmail.com
- github repo
- linkedin profile
- personal website
- B-permit married to Swiss
- Age 34 years
- Zürich

Skills

- Generative modelling
- Sequence modelling
- Explainable AI
- Information Theory
- Reinforcement Learning
- Mathematics
- Physics
- Problem solving
- Advisor and co-supervisor
- English
- German

Coding

- Python:** NumPy, SciPy, Pandas
- ML Libraries:** TensorFlow, PyTorch, sklearn, JAX
- IDL:** SSW, IRIS, SDO, MAP
- Misc:** Latex, C, Wolfram-pha, Fortran 95



Education

- 2021 - now **Postdoc Machine Learning / Physics** University of Bern
Specialization: Explainable AI and multivariate sequence modeling.
Advisor: Lucia Kleint.
- 2017 - 2021 **Ph.D. Computer Science / Physics (summa cum laude)** University of Geneva
Specialization: Flare Prediction using ML.
Advisors: Lucia Kleint, Slava Voloshynovskiy, Samuel Krucker.
- 2015 - 2017 **M.Sc. Theoretical Physics** University of Witwatersrand
Specialization: Condensed Matter Field Theory.
Advisors: Izak Snyman.
- 2014 - 2015 **Honours. Theoretical Physics** University of Johannesburg
Specialization: Pion Curvature Radiation.
Advisors: Soebur Razzaque.
- 2011- 2014 **B.Sc. Physics / Mathematics** University of Johannesburg
Specialization: Group Theory, Quantum Mechanics.

Research (first author)

- Solving radiative transfer using multi-agent deep reinforcement learning (in prep)**
Accelerating the fundamental numerical operations responsible for simulating the interaction between radiation and matter using reinforcement learning.
- Locating the boundaries of flare prediction with transformers (submitted)**
Used a hybrid transformer architecture with autoregressive denoising to prove that sequence data for the task of flare prediction contributes only a small fraction to the model's overall TSS.
- Identifying pre-flare spectral features using explainable AI. 2023, A&A, 671, A73**
Used explainable AI to derive physical explanations for high classification scores obtained by convolutional networks on spectrograms (a type of audio signal that encodes the physics of the solar atmosphere). Found early warning signals for solar flares.
- Exploring mutual information between IRIS spectral lines. I. 2021, ApJ, 912, 121**
Used a VAE to dynamically filter data based on reconstruction error, before calculating all non-linear dependencies within the data using a Mutual Information Neural Estimator. The Sun's atmospheric layers communicate most efficiently over regions of enhanced energy deposition.
- Exploring mutual information between IRIS spectral lines. II. 2021, ApJ, 915, 77**
Used clustering techniques and self-organizing maps to solve the traveling salesman problem in order to derive conditional probabilities between spectral lines from NASA's IRIS satellite
- Real-time flare prediction based on spectra, 2020, ApJ, 891, 17**
First-time proof that spectral data can be used to predict solar flares in combination with dimensionality reduction techniques (PCA, t-SNE) and neural networks.
- Identifying typical MgII flare spectra using machine learning, 2018, ApJ, 861, 62**
Used unsupervised clustering techniques to successfully analyze millions of spectra from multiple observations, discovering similar physics across different observations.

Research (co-author)

- Automatic detection of coronal rain using CycleGAN (in prep)**
- A comparison of active region upflow and core properties, 2021, A&A, 651, A112**
- Information bottleneck in extremely distributed systems, 2020, Entropy, 11, 22**
- DCT-tensor-net for solar flares detection on IRIS data, 2018, EUVIP**
- Occurrence and statistics of IRIS bursts, 2022, A&A, 657, A132**

Awards

- Twice principal investigator (PI) for coordinated observation campaigns (2022).
- Successful candidate for the solar spectropolarimetry school held in Colorado (2018)
- MSc scholarship from the national institute for theoretical physics (NiTHEP) (2015-2016)
- National research foundation grant holder bursary for honours (2014)

Other

- Contributing Author**, HeliomL book (2019)
- Interview with Le Temps newspaper for CycleGAN application**, (2023)
- Invited speaker**, Machine Learning and IRIS data, Hinode/IRIS meeting (2021)
- Invited speaker**, Machine Learning, 2nd Eddy Cross-Disciplinary Symposium (2021)
- Languages:** English (native), German (basic), Afrikaans (basic)
- Hobbies:** Chess, reading Sci-Fi, philosophy, psychology, surfing