Abel Lawrence Peirson

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Education

Stanford University — *Ph.D in Physics* *2017 - Jan 2023*
Thesis: High Energy Polarization Statistics and Geometry.
GPA: 4.0 (in required coursework).

University of Oxford — *MPhys in Physics* *2013 - 2017*
First Class Honours with Distinction – top 10% of graduating class.
College: Christ Church

Fellowships, Honors & Awards

Stanford Data Science Scholar ($100k+) — Stanford, USA *2021*
Future Investigator in NASA Earth and Space Science and Technology ($160k+) — Stanford, USA *2019*
Roach Prize for the most outstanding undergraduate across the sciences — Oxford, UK *2017*
Hooke Prize for the most outstanding member of Christ Church in the sciences — Oxford, UK *2017*
Oxford International Strategy Scholarship — Oxford, UK *2016*
Christ Church Academic Scholarship — Oxford, UK *2014-2017*

Selected Research

Kavli Institute for Particle Astrophysics and Cosmology — Stanford University, CA *Oct 2017 - Present*
*with **Prof. Roger Romani***
- Set current state of the art in X-ray polarization recovery by developing novel computer vision techniques.
- Improved NASA IXPE polarization sensitivity by $> 30\%$ (Code adopted as official data analysis pipeline).
- Created fast quadratic program + nested sampling approach to fit gravitational microlenses.

Wu Tsai Neurosciences Institute — Stanford University, CA *Mar 2018 - Jun 2018*
*with **Prof. Shaul Druckmann***
- Developed biologically inspired recurrent neural network to reproduce path integration in the drosophilia fly brain.

NeuroAI Lab — Stanford University, CA *Dec 2017 - Mar 2018*
*with **Prof. Dan Yamins***
- Found transfer-learning certain affine transformations of images does not improve accuracies in object classification, using RotNet and ImageNet datasets.

CLIC Test Facility — CERN, Switzerland *June - Aug 2016*
*with **Prof. Philip Burrows***
- Used beam dispersion to improve CTF3's quadrupole scan and reduce uncertainty in beam energy spread.
- Designed and implemented new fitting program to enhance beam analysis pipeline.

Selected Experience

G-Research — London, UK *June - Sep 2021*
Quantitative Researcher
- Quantitative research intern working on forecasting capital markets.

Peirson & Freedman — Stanford, CA *Aug 2018 - Present*
Co-founder
- Conceived and designed iOS app ***Dank Learning*** that uses neural networks to generate memes.

Peer-Reviewed Publications

[9] ***A Deep Ensemble Approach to X-ray Polarimetry***
A.L.Peirson, R.W.Romani *Neurips ML4PS workshop*, 2021

[8] ***New Tests of Millilensing in the Blazar PKS 1413+135***
A.L.Peirson, I.Liodakis, A.C.S.Readhead et al. *ApJ*, 2021 (under review)

[7] ***Towards Optimal Signal Extraction for Imaging X-ray Polarimetry***
A.L.Peirson, R.W.Romani. *ApJ*, 920, 40, 2021

[6] ***The Relativistic Jet Orientation and Host Galaxy of the Peculiar Blazar PKS 1413+135***
A.C.S.Readhead et al. *ApJ*, 907, 61, 2020

[5] ***Deep Ensemble Analysis for Imaging X-ray Polarimetry***
A.L.Peirson, R.W.Romani, H.L.Marshall, J.F.Steiner, L.Baldini. *NIMA*, 986, 2020

[4] ***The Polarization Behavior of Relativistic Synchrotron Self-Compton Jets*** [Code]
A.L.Peirson, R.W.Romani. *ApJ*, 885, 1, 2019

[3] ***Prospects for Detecting X-ray Polarization in Blazar Jets***
I.Liodakis, **A.L.Peirson**, R.W.Romani. *ApJ*, 880, 1, 2019

[2] ***The Polarization Behavior of Relativistic Synchrotron Jets***
A.L.Peirson, R.W.Romani. *ApJ*, 864, 2, 2018

[1] ***Transverse Beam Phase-Space Measurement Experience at CTF3***
D.Gamba, L.Martin, **A.L.Peirson Serratosa** et al. *IPAC2017*, 2017

Whitepapers & Other Publications

[3] ***Neural Network Analysis of X-ray Polarimeter Data***
A.L.Peirson, *The Handbook of X-ray and Gamma Ray Astrophysics*, *Springer Nature*, 2022

[2] ***The X-ray Polarization Probe Mission Concept***
K.Jahoda et al. *Decadal Survey on Astronomy and Astrophysics*, 1907.10190, 2020

[1] ***Dank Learning: Generating Memes Using Deep Neural Networks*** [Code][Techcrunch]
A.L.Peirson, E.M.Tolunay, 1806.04510, 2018

Selected Invited Talks

Optimal Signal Extraction for IXPE and an Application to Blazars, *Naval Research Laboratory Colloquium*, 2021

Towards Optimal Signal Extraction for IXPE, *Third Science Collaboration Meeting (SCM03)*, 2021

The Polarization Behavior of Synchrotron Self-Compton Emission in Blazars, *Understanding the Multiwavelength Blazar Variability - Workshop, Stanford*, 2019

Panel Discussion: AI in Design, **Used Future, Symposium by Current Obsession**, Pratt Institute NY, 2018

***Episode 68*, The NVIDIA AI Podcast**, 2018

Open Source Software (★466+)

SSCpol: Polarized relativistic jet simulation in C with Python wrapper. [Code][Paper]
Dank Learning: 'Show and Tell' image captioning for meme generation in Tensorflow. [Code][Paper][Webpage]
Software skills (extensive): Python — C/C++ — Scala — PyTorch — Tensorflow

Relevant Coursework

- ***APPHYS293*** (Theoretical Neuroscience)
- ***CS379C*** (Computational Models of the Neocortex)
- ***CS238*** (Decision Making Under Uncertainty)
- ***STATS207*** (Time Series)
- ***CS224N*** (Natural Language Processing)
- ***CS230*** (Deep Learning)
- ***EE364a*** (Convex Optimization)
- ***EE364b*** (Convex Optimization II)
- ***PHYS266*** (Statistical Methods in Physics)
- ***CS106b*** (Programming Abstractions)
- ***CS361*** (Engineering Design Optimization)
- ***EE263*** (Linear Dynamical Systems)