Ilan Price

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Education

PhD in Applied Mathematics | **University of Oxford** | *Start: Oct 2018, Expected grad: Sep 2023*
- **Focus:** sparse, low-dimensional, and/or efficient deep neural networks. **Advisor:** Prof. Jared Tanner
- **Teaching and Student Supervision:**
    - Teaching Assistant and/or Tutor for Oxford Maths 4th year and MSc courses: "Theories of Deep Learning" (2019, 2020, 2021); "Continuous Optimisation" (2020); "Random Matrix Theory" (2021).
    - Tutor for two courses at the Gene Golub SIAM Summer School 2021: "Perspectives on the theoretical understanding of deep networks", and "Large-scale Optimization for Deep Learning"
    - Co-supervisor for Oxford Maths MSc thesis on few-shot learning.

MSc in Mathematical Modelling and Scientific Computing | **University of Oxford** | *2016 - 2017*
- Awarded with Distinction, ranked 4$^{\text{th}}$ in cohort
- Dissertation: Gaussian Processes for Flight Ticket Demand Unconstraining.

Bachelor of Science | **Applied Mathematics & Philosophy** | **University of Cape Town** | *2011 - 2013*
- Distinction (first-class pass) in all courses | 4 Course Medals (top in course)

Selected Publications

ICASSP'23   **Price, I**, Tanner, J (2022). Improved Projection Learning for Lower Dimensional Feature Maps.

AISTATS'22   **Price, I**, Rasp, S (2022). Increasing the accuracy and resolution of precipitation forecasts using deep generative models. *The 25th International Conference on Artificial Intelligence and Statistics*

ICML'21   **Price, I**, Tanner J (2021). Dense for the Price of Sparse: Improved Performance of Sparsely Initialized Networks via a Subspace Offset. *The 38th International Conference on Machine Learning.*

ICMLA'21   **Price, I**, Tanner, J, (2021). Trajectory growth lower bounds for random sparse deep ReLU networks. *The 20th IEEE International Conference on Machine Learning and Applications.*

WOAH'20   **Price, I**, Gifford-Moore, J, Fleming, J, Roichman, M, Thain, N, Dixon, L, Sorensen, J (2020). Six Attributes of Unhealthy Conversation. *Proceedings of the 4th Workshop on Online Abuse and Harms.*

EJOR'19   **Price, I**, Jaroslav, F, Daniel, H (2019). Gaussian processes for unconstraining demand. *European Journal of Operational Research* 275.2: 621-634.

Selected Scholarships and Awards

- Alan Turing Institute PhD studentship (2018) | A studentship awarded by the Alan Turing Institute in London for PhD study in partnership with the institute | *Details here*
- Emirates Studentship (2018) | PhD funding award by the Mathematical Institute, University of Oxford
- Oxford-Weidenfeld and Hoffman Leadership Scholarship (2016) | A scholarship for future leaders from across the world to study at Oxford in parallel with a year-long leadership programme | *Details here*
- Skye Foundation Scholarship (2016) | Selected from a nationwide pool of candidates nominated by faculty deans from across South Africa, awarded based on academic merit | *Details here*
- Scholarships from University of Cape Town: Science Faculty Scholarship (2013); Twamley December Scholarship (2012); Humanities Entrance Scholarship, Twamley Undergraduate Scholarship (2011).

Selected Research and Engineering Experience

Research Intern | Google Brain | *Oct 2022 - Mar 2023*
- Hosted by Ruoxi Wang. Work focused on model efficiency in Deep Learning.

Research Scientist Intern | DeepMind | *May-Oct 2022*
- Hosted by Marta Garnelo in the Deep Learning team. Work currently confidential.

Machine Learning Research Intern | ClimateAI | *June-Oct 2021*
- Developed a GAN to correct and downscale (super-resolve) precipitation forecasts. The model approaches the performance of an operational regional high-resolution numerical weather model at a tiny fraction of the cost and time.
- Placed 1st in the company's internal tensor-completion Kaggle competition.

Alan Turing Institute Data Study Group | *April 2021*

- Built a podcast recommendation system in collaboration with inter-disciplinary team.
- Applied text- and data-preprocessing, LDA topic models, and pretrained BERT models to obtain podcast and user embeddings for clustering and nearest-neighbour recommendations.
- Implemented and evaluated Neural Collaborative Filtering on historical user-listen data.

Independent Projects | *2020*

- Conceptualised and coded (in Julia) an agent based Covid-19 simulation model, with a focus on novel modelling of contact tracing, quarantine, and isolation.
- Built a virtual version of 'Hanabi', a multiplayer cooperative online game. Code in Python.

Machine Learning Engineer | Rhodes Artificial Intelligence Lab (RAIL) | *Feb-Aug 2017, Oct 2017 - Oct 2019*

- Applying machine learning for social good (pro-bono work, part-time).
  - Project 1) Uncovered archetypal user behaviour for an online learning platform by applying clustering and topic modeling techniques to data from 3100 students.
  - Project 2) (Project leader) Crowdsourced a new dataset of 44K comments annotated for subtly toxic attributes, and established baseline classification results with BERT. Partnered with Google Jigsaw.

Research Assistant | Oxford-Emirates Data Science Lab, University of Oxford | *Sep 2017 - Jul 2018*

- Mathematical modelling and data analytics for revenue management and service personalisation (full-time).
- Developed an algorithm for online multiple hypothesis testing with live data.

Selected Talks and Academic Presentations

- Oral at ICASSP 2023, "Improved Projection Learning for Lower Dimensional Feature Maps" (Jun 2023)
- Presentation at ML Collective (DLCT): "Dense for the Price of Sparse: Training Extremely Sparse Networks from Scratch with Random Sparse Support" (Oct 2021)
- Invited Lecture at Gene Golub SIAM Summer School on Theory and Practice of Deep Learning, "Sparsity in Deep Learning" (Jul 2021)
- Spotlight at ICML 2021, "Dense for the Price of Sparse: Improved Performance of Sparsely Initialized Networks via a Subspace Offset" (Jul 2021)
- Poster presentation at LMS-Bath symposium on the Mathematics of Machine Learning, "Trajectory growth lower bounds for random sparse deep ReLU networks" (Aug 2020). [video]
- Guest presentation at African Institute for Mathematical Sciences: "Neural network expressivity and adversarial vulnerability" (Apr 2019)

Selected Leadership Experience

Co-Director | Rhodes Artificial Intelligence Lab (RAIL) | *July 2018 - Sep 2019*

- Co-led a society of Oxford graduate students which undertakes (pro-bono) projects and public events focused on machine learning for social good (see rhodeslab.com).
- Sourced, scoped, and managed 4 projects with different partners; organised technical and 'literacy' training in machine learning for a combined 60+ people.

COO (*2015*), **National Head** (elected) (*2014*) | Habonim Dror SA (HDSA) Foundation, HDSA

- Was elected to lead HDSA, a countrywide, educational youth movement for South African Jewish youth with an annual turnover of approx. R10 million.
- Took the initiative to establish an endowment fund, and raised more than R2.5 million.
- Managed Habonim's 44 hectare campsite as a business to supplement the revenue of the NPO.
- Managed large scale projects including a summer camp involving 800-1000 people, lasting one month. Other responsibilities included strategic positioning and crisis management.