

# ILAN PRICE

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## EDUCATION

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**PhD in Mathematics of Deep Learning** | University of Oxford | *Start: Oct 2018, Expected grad: Sep 2022*

- **Research:** low-dimensional and sparse neural networks, mathematical theory for deep learning: expressivity, subspace-training, loss landscapes. Supervisor: Professor 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); “Continuous Optimisation” (2020); “Random Matrix Theory” (2021).
  - Tutor for two courses at the Gene Golub Summer School 2021: “Perspectives on the theoretical understanding of deep networks”, and “Large-scale Optimization for Deep Learning”
  - Co-supervisor for MSc thesis on few-shot learning.
- **Winter/Summer Schools:**
  - [Low-Rank Models \(2020\)](#)
  - Reinforcement Learning Summer School at the Alan Turing Institute (2021)
  - [Oxford Machine Learning Summer School \(2021\)](#)

**MSc in Mathematical Modelling and Scientific Computing** | University of Oxford | *2016 - 2017*

- Awarded with Distinction, 4<sup>th</sup> top in cohort overall
- Dissertation (Grade: 82%): Gaussian Processes for Flight Ticket Demand Unconstraining.
- Selected Course Content: Continuous Optimisation | Numerical Linear Algebra | Scientific Computing in MATLAB, Python and C++ | ODEs and PDEs | Mathematical Modelling

**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)

## PUBLICATIONS

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UnderReview **Price, I**, Rasp, S (2021). Increasing the accuracy and resolution of precipitation forecasts using deep generative models. *Under review*. Preprint [here](#). Code [here](#).

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*. Paper [here](#). Code [here](#).

ICMLA’21 **Price, I**, Tanner, J, (2021). Trajectory growth lower bounds for random sparse deep ReLU networks. *Accepted to 20th IEEE International Conference on Machine Learning and Applications*. Paper [here](#)

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 Fourth Workshop on Online Abuse and Harms* (pp. 114-124).

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

SAMJ’17 Hodes, R., **Price, I**, Bungane, N, Toska, E, & Cluver, L. (2017). How front-line healthcare workers respond to stock-outs of essential medicines in the Eastern Cape Province of South Africa. *South African Medical Journal*, 107(9), 738-740.

## SELECTED SCHOLARSHIPS AND AWARDS

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- 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 TECHNICAL EXPERIENCE

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### 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 model at a tiny fraction of the cost and time.
- Won the company's internal tensor-completion Kaggle competition.

### Alan Turing Institute Data Study Group | *April 2021*

- Two-week hackathon-style event. Challenge: build a podcast recommendation system for a podcast app.
- 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. A collaboration with Alphabet's Jigsaw.

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

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

### Programming languages/packages:

- Python (2017 - 2021), Tensorflow (2018 - 2020), Pytorch (2020 - 2021), Matlab (2012 - 2013, 2016 - 2017), Julia (2020)

## TALKS AND ACADEMIC PRESENTATIONS

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- Presentation at ML Collective (DLCT): "Dense for the Price of Sparse: Training Extremely Sparse Networks from Scratch with Random Sparse Support" (Oct 2021)
- Invited Panelist: Uniq+ Oxford, "AI across disciplines" (Aug 2021)
- Invited Lecture: Gene Golub Summer School on Theory and Practice of Deep Learning, "Sparsity in Deep Learning" (Jul 2021)
- Spotlight presentation: ICML 2021, "Dense for the Price of Sparse: Improved Performance of Sparsely Initialized Networks via a Subspace Offset" (Jul 2021)
- Seminar presentation: Numerical Analysis Group Internal Seminar, University of Oxford: "Dense for the Price of Sparse: Initialising deep nets with efficient sparse affine transforms" (Feb 2021)
- Paper presentation: Fourth Workshop on Online Abuse and Harms, "The Unhealthy Comments Corpus: Six attributes of unhealthy conversation" (Nov 2020)
- Poster presentation: LMS-Bath symposium on the Mathematics of Machine Learning, "Trajectory growth lower bounds for random sparse deep ReLU networks" (Aug 2020). [Video](#).
- Guest presentation: African Institute for Mathematical Sciences: "Neural network expressivity and adversarial vulnerability" (Apr 2019)
- Lecture: Open event at Rhodes House, Oxford: "A non-technical introduction to machine learning" (Oct 2018). [Presentation](#).

## SELECTED LEADERSHIP EXPERIENCE

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**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](https://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

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