curriculum vitæ of

Nischal Mainali

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Education

2021 – present **Ph.D.** in Theoretical Neuroscience (w/ Prof. Yoram Burak) — Hebrew University of Jerusalem

2020 – 2021 **Master** of Applied Cybernetics (High Distinction) — Australian National University

2015 – 2019 **B.S.** in Mathematics (magna cum laude) — New York University Abu Dhabi
Minor in Economics & Computer Science

Research

Oct. 2021 – present **Theoretical Neuroscience** — Hebrew University of Jerusalem
I study manifold capcity and untangling as a way to understand learning in artificial and biological neural network with Prof. Haim Sompolinsky with a particular interest in graph representation by Neural Networks. I also work on developing a theoretical account of place and grid cells formation and function in mammalian cortex with Prof. Yoram Burak.

Jul. 2020 – Dec. 2020 **Smart Water Infrastructures** — Australian National University
I worked in a team to design and develop a prototype of a smart tap that modulates water volume via a computer vision enabled sensor. We presented the work at *Hydrology & Water Resources Symposium 2021*.

May. 2019 – Aug. 2019 **Cryptoanalysis** — NYUAD Center for Cyber Security
I participated in a summer research project on cryptoanalysis of post quantum encryption systems submitted to the NIST competition. I analysed an algebraic surface encryption system and suggested ways to strengthen the algorithms against quantum attacks.

Aug. 2018 – May. 2019 **Undergraduate Thesis in Algebraic Topology** — NYUAD Mathematics
I automated the calculation of characterstic classes of topological manifolds such as Chern, Pontryajin, and Wu classes, their relations and the associated polynomials with Prof. Hisham Sati. *Paper in preparation*.

May. 2018 – Aug. 2019 **Generative Model for Fluids** — Technical University of Munich
I participated in a summer research project on deep Learning methods for Reynolds-averaged Fluid simulation for Airfoils with Prof.Nils Thuerey. I was involved in design of normalization procedure and custom loss function, Data generation, and Coding the model. *Preprint here.*

Jan. 2018 – May. 2018 **Classification of Moral Reasoning** — NYU Center for Data Science
We trained a ML algorithm on applied ethics papers corpora for classification of moral reasoning employed in legal text with Prof. Elliott Ash and Prof. Daniel Chen. We used the model to analyse US Circuit Court judge rulings since 1891 and find a phase shift from deontological to consequentialist reasoning. Paper published in *Computational Legal Studies*.

Teaching

Teaching Assistant **ELSC, Hebrew University of Jerusalem**
Taught recitation class, and designed homework and exams for graduate level Information Theory and Learning course taught by Prof. Haim Sompolinsky.

Teaching Assistant **Courant Institute of Mathematical Sciences, NYU**
Held office hours for undergrad courses in Calculus, Linear Algebra, & Probability.

Work

March. 2021 – Jun. 2021 | Consultant | Place Intelligence

I wrote a report on urban design and analytics for disaster impact management with Place Intelligence. I also designed a predicitve framework that can be used to forecast and control for the impacts of disasters such as bush fires.

Oct. 2020 – Mar. 2021 | ML for Consevation Researcher | Microsoft / DPIE

I worked on a joint Project between Microdoft and Department of Planning, Industry and Energy, NSW. We designed an ML model to sift through automatically captured camera trap data to aid environment research and conservation work. I worked on designing an interface for using the model off the shelf.

Jul. 2020 – Dec. 2020 | Smart City Consultant | 3A Institute

We analysed and provided recommendation to Quenbeyan smart city project. It involved analysing the decision making, governance, and engineering process and providing reccomendations around managing safety and sustainability using a more-than-human approach.

May. 2019 – Aug. 2019 | Research Student | NYU Environmental Fluid Dynamics Lab

I worked on a research project that collected data from the Ilulissat Icefjord in Greenland with Prof. David Holland. We were out in the ocean at the vicinity of the fjord to collect boundary data to simulate the melting of the fjord.

May. 2016 – Jul. 2016 | Research Student | CTED Ghana

I worked in a summer project where we researched market forces in rural Ghana with an aim to increase market access for farmers. I analysed various incomplete property data and extrapolated them to full set of data with aim to safeguard farmer's property rights.

Fellowships and Conferences

Jul. 2021 | Diverse Intelligence Summer Institute Fellow | Online/UCLA

Summer Fellowship awarded to early career researchers in the field of cognitive science.

Jul. 2021 | London Mathematical Laboratory Summer Fellow | Online/London

Summer Fellowship awarded to researchers studying mathematics of learning.

Jan. 2019 | Workshop on Applied Topology | Kyoto, Japan

Jul. 2018 | Confrence on Numerical Ranges | Munich, Germany

Nov. 2017 | HackHarvard | Boston, USA

Awards

2019 | Rhodes Scholarship National Finalist | UAE

2017 | NYU Global Leadership Scholar | Washington D.C.

2015 | National Topper in A level Further Mathematics | Nepal

Skills

Languages | Nepali, English, Hindi

Programming | Python (TensorFlow, PyTorch), Matlab, C++, LaTeX