Muhammad Yousuf Tufail

Applied Mathematician and Data Scientist

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Personal Statement

I am an applied mathematician with a deep interest in mathematical and statistical modelling. My skills include image registration, conformal geometry, numerical computation, machine learning, data mining, web scraping, bootstrapping, hypothesis testing (ex: A/B test), relational databases, predictive analytics, and deep learning with strong programming skills in Matlab, Python, SQL, LaTeX, R and Excel.

Career History

January 2020–Present	**Assistant Professor**, *Department of Mathematics*, NED University of Engineering and Technology, Karachi, Pakistan.
November 2017 – December 2019	**Data Scientist/Programmer**, Self Employed, Palmerston North, New Zealand.
July 2006–March 2012	**Lecturer**, *Department of Mathematics*, NED University of Engineering and Technology, Karachi, Pakistan.
January 2005–June 2006	**Lecturer**, *Department of Mathematics*, University of Karachi, Karachi, Pakistan.

Education

Academic Qualifications

2012–2017	**PhD Mathematics**, Massey University, Palmerston North, New Zealand.
2004–2005	**MSc Mathematics**, University of Karachi, Karachi, Pakistan.
2001–2003	**BSc (Hons) Mathematics**, University of Karachi, Karachi, Pakistan.

Certification

2018–2019	**Python programmer**, DataCamp, https://www.datacamp.com/.
2018–2019	**Data manipulation**, DataCamp, https://www.datacamp.com/.
2018–2019	**Importing & Cleaning data**, DataCamp, https://www.datacamp.com/.
2018–2019	**Statistical Thinking in python**, DataCamp, https://www.datacamp.com/.
2018–2019	**Relational databases**, DataCamp, https://www.datacamp.com/.
2019	**Supervised learning**, DataCamp, https://www.datacamp.com/.
2019	**Unsupervised learning**, DataCamp, https://www.datacamp.com/.
2019	**Deep learning in python**, DataCamp, https://www.datacamp.com/.

Conferences and Publications

- 2020 **S. R. Marsland, R. I. McLachlan and M. Y. Tufail. Conformal image registration based on constrained optimisation**, *accepted to ANZIAM Journal*.

- 2016 **Mathematics of Shapes and Applications (4 - 31 July)**, *Institute for Mathematical Sciences, National University of Singapore*, Singapore.

- 2016 **ANZIAM2016 Conference (7 - 11 February)**, *QT Hotel Canberra*, Canberra, Australia.

- 2015 **Mathematics-in-Industry NZ (MINZ) (29 June - 03 July)**, *Atrium Building, Massey University, Albany*, Auckland, New Zealand.

- 2014 **Foxton Fizz: Workshop on Geometry and Numerics (11 - 14 February)**, *Foxton*, Palmerston North, New Zealand.

- 2013 **NZMASP2013 (11 - 14 November)**, *University of Canterbury Cass field station*, Christchurch, New Zealand.

- 2013 **Geometric Mechanics and Shape (13 - 19 January)**, *Ohope Beach*, Whakatane, New Zealand.

- 2012 **NZMS Colloquium (4 - 6 December)**, *AgHort building, Massey University*, Palmerston North, New Zealand.

- 2012 **Winterschule in Numerical Differential Equations (7 - 8 May)**, *Business Studies Central, Massey University*, Palmerston North, New Zealand.

- 2008 **Modeling and simulation of summer monsoon rainfall for Northern Hilly Area of Pakistan**, *2008 IEEE International Multitopic Conference*.

Leading real data set projects

Analysing police activity

It is a data set of traffic stop by police officers. Data set was taken from Stanford open policing project `https://openpolicing.stanford.edu`. Finding are as below:

- About two-thirds of female traffic stops are for speeding, whereas stops of males are more balanced among the six categories of violation. About 95 % of stops for speeding result in a ticket and the numbers are similar for males and females.

- For all types of violations, the search rate is higher for males than for females.

- The frisk rate is higher for males than for females and the rate of drug-related stops nearly doubled over the course of 10 years

- The arrest rate increases as the weather gets worse, and that trend persists across many of the violation types.

Life expectancy around the world

I have investigated the probabilities of life expectancy in countries around the world. The data set was obtained from `https://docs.google.com/spreadsheets/d/1dgOdlUEq6_V55OHZCxz5BG_OuoghJTeA6f83br5peNs/pub?range=A1:D70&gid=1&output=html#`. Finding is as under.

- It looks like overall, life expectancy has steadily increased since 1900.

Relation between illiteracy and fertility

The women population data was collected from the link `https://www.datacamp.com/courses/statistical-thinking-in-python-part-2`.

- My analysis found that illiterate female has more children than the number of birth given by literate women.

Real estate data set, a machine learning algorithm

The data is collected from Airbnb site, a marketplace for short term rentals. The link is: `http://insideairbnb.com/get-the-data.html`. I have used k-nearest neighbors algorithm to built a python based program. This program helps to find the suitable cost of living space. Two data sets: Amsterdam and Washington, DC were considered.

GDP growth rate between USA and China

This data contains the information of Gross Domestic Product (GDP) and it was taken from `https://www.datacamp.com/courses/merging-dataframes-with-pandas`. Finding is:

- 10 year GDP growth of China has been higher than the US since the 2000s

Medals counts

The Olympic medals data set (more than a century data points) is collected from `https://www.theguardian.com/sport/datablog/2012/jun/25/olympic-medal-winner-list-data`. The findings about this data are as below:

- The Olympic competitions between 1952 and 1988 took place during the height of the Cold War between the United States of America (USA) & the Union of Soviet Socialist Republics (USSR). I have found that the USSR is higher than the US on a medals table.

- On looking at the hosting countries from the last 5 Olympic editions and the fractional change of medals won by China the last 5 editions, I have found that China fared significantly better when China was the host country.

Notable Achievements

2012–2017 **Marsden Fund**, MASSEY UNIVERSITY, Palmerston North, New Zealand.
- On the basis of my excellent academic record, I was awarded a highly competitive PhD scholarship by the Massey University. This scholarship was awarded from the Royal Society of New Zealand Marsden Fund, Te Apārangi

2005 **Second Position (Rank)**, UNIVERSITY OF KARACHI, Karachi, Pakistan.
- I ranked second position in my MSc.