

# Yousuf Tufail

APPLIED MATHEMATICIAN, DATA SCIENTIST

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## Personal Statement

I am an applied mathematician with a deep interest in mathematical and statistical modelling. My area of PhD was image registration using conformal diffeomorphisms. I have developed two alternative algorithms for the construction of conformal diffeomorphisms. These algorithms were implemented on grey scale 2-D images. The thesis can be accessed at the Massey University research repository at <https://mro.massey.ac.nz/handle/10179/12459>. My additional skills include 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, SAS files, STATA files, L<sup>A</sup>T<sub>E</sub>X, 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 in Mathematics**, MASSEY UNIVERSITY, Palmerston North, New Zealand  
Image registration under conformal diffeomorphisms  
<https://mro.massey.ac.nz/handle/10179/12459>
- 2004–2005 **MSc in Mathematics**, UNIVERSITY OF KARACHI, Karachi, Pakistan
- 2001–2003 **BSc (Hons) in Mathematics**, UNIVERSITY OF KARACHI, Karachi, Pakistan

### Certification

- 2020 **Data Visualization, Matplotlib**, DATACAMP, <https://www.datacamp.com/>
- 2020 **Data Visualization, Seaborn**, DATACAMP, <https://www.datacamp.com/>
- 2020 **Data cleaning in Python**, 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**, DATA CAMP, <https://www.datacamp.com/>
- 2018–2019 **Python programmer**, DATA CAMP, <https://www.datacamp.com/>
- 2018–2019 **Data manipulation**, DATA CAMP, <https://www.datacamp.com/>
- 2018–2019 **Importing & Cleaning data**, DATA CAMP, <https://www.datacamp.com/>
- 2018–2019 **Statistical Thinking in python**, DATA CAMP, <https://www.datacamp.com/>
- 2018–2019 **Relational databases**, DATA CAMP, <https://www.datacamp.com/>

### 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.

## Leading real data set projects

### Analyzing police activity

It is a data set of traffic stop by police officers in Rhode Island, USA. 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/1dg0d1UEq6\\_V550HZCxz5BG\\_0uoghJTeA6f83br5peNs/pub?range=A1:D70&gid=1&output=html#](https://docs.google.com/spreadsheets/d/1dg0d1UEq6_V550HZCxz5BG_0uoghJTeA6f83br5peNs/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.

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## Conferences and Publications

- 2021 **S. Marsland, R. I. McLachlan and M. Y. Tufail. Conformal image registration based on constrained optimization**, *The ANZIAM Journal*, pp: 235–255, vol: 62 (3), 2021. doi:10.1017/S144618112000022X ISSN: 1446-1811,1446-8735, JCR index
- 2020 **M. Y. Tufail, R. I. McLachlan and S. Marsland. Unconstrained optimisation for conformal diffeomorphic image registration**, *Submitted to The ANZIAM Journal*, ISSN: 1446-1811,1446-8735, JCR index
- 2021 **M. Y. Tufail and S. Gul. D’Arcy Thompson and two dimensional Möbius image registration**, *Submitted to Journal of Mathematical Imaging and Vision*, ISSN: 0924-9907,1573-7683, JCR index
- 2021 **M. Y. Tufail and S. Gul. Two dimensional image registration using the rigid group**, *Submitted to Indian Journal of Pure and Applied Mathematics*, ISSN: 0019-5588,0975-7465, JCR index
- 2021 **M. Y. Tufail and S. Gul. Statistical Analysis for the Traffic Police Activity: Nashville, Tennessee, USA**, *Submitted to Policing and Society*, ISSN: 1043-9463, JCR index
- 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

## ■ Languages

- **Urdu**, NATIVE
- **Punjabi**, REGIONAL
- **English**, PROFESSIONAL

## ■ References

Will be furnished on request.