

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. 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, \LaTeX , R and Excel.

Career History

- October 2025– Present **Associate Professor**, *Department of Mathematics*, NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, Karachi, Pakistan
- January 2020– October 2025 **Assistant Professor**, *Department of Mathematics*, NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, Karachi, Pakistan
- July 2006– January 2020 **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

- 2021 **Data Science with python**, DATA CAMP, <https://www.datacamp.com/>
- 2020 **Data Visualization, Matplotlib**, DATA CAMP, <https://www.datacamp.com/>
- 2020 **Data Visualization, Seaborn**, DATA CAMP, <https://www.datacamp.com/>
- 2020 **Data cleaning in Python**, DATA CAMP, <https://www.datacamp.com/>
- 2019 **Supervised learning**, DATA CAMP, <https://www.datacamp.com/>
- 2019 **Unsupervised learning**, DATA CAMP, <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

- 2025–present **NED approved PhD supervisor**, NEDUET, Karachi.
- 2021–2024 **HEC approved PhD supervisor**, HEC, Islamabad.
- 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.
- 2011 (Refused) **Cinvestav**, CINVESTAV, Mexico City, Mexico
I was awarded fully funded PhD scholarship to pursue my PhD in the Departamento de Matemáticas at Cinvestav.
- 2011 (Refused) **NED University Scholarship**, TU DELFT, Delft, Netherlands
I was awarded a PhD scholarship to pursue my PhD at TU Delft.
- 2011 (Refused) **University of East Anglia**, UNIVERSITY OF EAST ANGLIA, Norwich, England
I was awarded a 20% PhD scholarship to pursue my PhD at the University of East Anglia.
- 2005 **Second Position (Rank)**, UNIVERSITY OF KARACHI, Karachi, Pakistan
I ranked second position in my MSc.

Publications and Conferences

Published journal articles

IMAGE REGISTRATION

- 2025 **M. Y. Tufail and S. Gul. Conformal pattern in the growth of human skulls**, *Acta Biotheoretica*, vol: 73 (13), 2025, <https://doi.org/10.1007/s10441-025-09503-6> ISSN: 1572-8358, 0001-5342, JCR indexed journal.
- 2025 **M. Y. Tufail, S. Gul. Conformal image registration using the discretised Cauchy-Riemann equations**, *The ANZIAM Journal*, 2025, <https://doi.org/10.1017/S144618112500001X>, ISSN: 1446-1811, 1446-8735, JCR indexed Journal
- 2023 **M. Y. Tufail and S. Gul. Image registration using the rigid group**, *Scientific Inquiry and Review (SIR)*, pp: 71–86, vol: 7 (1), 2023, <https://doi.org/10.32350/sir.71.05>, ISSN: 2521-2435, 2521-2427, HEC recognised Journal

- 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, <https://doi.org/10.1017/S144618112000022X>, ISSN: 1446-1811,1446-8735, JCR indexed Journal

CLIMATOLOGY AND DATA SCIENCE

- 2025 **M. Y. Tufail, S. Gul. Comprehensive comparison between artificial intelligence and multiple regression: prediction of Palmerston North's temperature**, *Discover Sustainability*, pp:1–22, vol: 6 (1), 2025, <https://doi.org/10.1007/s43621-024-00745-x>, ISSN: 2662-9984, JCR indexed Journal
- 2025 **M. Y. Tufail, S. Gul, S. Ali, S. S. S. Zia, S. A. Ali. The Influence of characteristics of the Azores High on surface climate: A case study for Peninsular Spain**, *Journal of Environmental Engineering and Science*, pp: 49–57, vol: 20 (1), 2025, <https://doi.org/10.1680/jenes.24.00035>, ISSN: 1496-256X,1496-2551, JCR indexed journal
- 2024 **M. Y. Tufail and S. Gul. Artificial intelligence and statistical regression for the prediction of temperature over Sukkur region**, *International Journal of Artificial Intelligence & Mathematical Sciences*, pp: 50–61, vol: 3 (2), 2024, <https://doi.org/10.58921/ijaims.v3i2.125>, ISSN: 2958-0153, 2958-5228, HEC recognised Journal
- 2024 **M. Y. Tufail, S. Gul, L. Jaben, S. Rasheed and S. Zia. A multiregressed COA-SAM model for predicting seasonal streamflow variability: A case study over Murray River Basin**, *Global NEST Journal*, PP: 1–9, vol: 26 (3), 2024, <https://doi.org/10.30955/gnj.005329>, ISSN: 1790-7632, JCR indexed Journal
- 2022 **M. Y. Tufail and S. Gul. Statistical analysis for the traffic police activity: Nashville, Tennessee, USA**, *KIET Journal of Computing and Information Sciences (KJCIS)*, pp: 67–84, vol: 5 (3), 2022, <https://doi.org/10.51153/kjcis.v5i2.135>, ISSN: 2616-9592, 2710-5075, HEC recognised Journal
- 2008 **M Y Tufail, S. U. Rehman, B. A. Usmani. Modeling and simulation of summer monsoon rainfall for Northern Hilly Area of Pakistan**, *Proceedings of IEEE*, pp: 480–484, 2008, <https://doi.org/10.1109/INMIC.2008.4777786>

- 2025 **M. Y. Tufail, S. Gul. GUI of complex plane on Excel spreadsheets**, *Revista Mexicana de Física E*, pp: 1–3, vol: 22 (1), 2025, <https://doi.org/10.31349/RevMexFisE.22.010208>, ISSN: 2683-2216, ISI, Scopus indexed journal

- 2024 **S. Gul, M. Y. Tufail. GUI for conic sections: parabola, ellipse and hyperbola**, *Revista Mexicana de Física E*, pp: 1–5, vol: 21 (1), 2024, <https://doi.org/10.31349/RevMexFisE.21.010203>, ISSN: 2683-2216, ISI, Scopus indexed journal, ISI, Scopus indexed journal

Accepted articles

- 2025 **A. Razzak, M. Y. Tufail, A. Tahir, M. Adeel. Simulation of wind speed distribution through spreadsheets**, *Accepted for vol: 21(2) in Jurnal Pendidikan Fisika Indonesia*, ISSN: 1693-1246, 2355-3812, JCR indexed Journal

- 2025 **M. Y. Tufail, S. Gul, S. A. A. Hashmi. Interactive MatLab GUI for exploring extreme values in bivariate functions**, *Accepted for vol: 23 (1) in Revista Mexicana de Física E*, ISSN: 2683-2216, ISI, Scopus indexed journal

Submitted journal articles

- 2024 **S. Marsland, R. I. McLachlan and M. Y. Tufail. Unconstrained optimisation for conformal diffeomorphic image registration**, *submitted to Bulletin of the Korean Mathematical Society*, ISSN: 1015-8634, 2234-3016, JCR indexed Journal, First review has been submitted

- 2025 **M. Y. Tufail, S. Gul. Harmonic constraint for conformal image registration**, *submitted to Journal of Mathematical Imaging and Vision*, 2025, ISSN: 1573-7683, 0924-9907, JCR indexed Journal

- 2025 **M. Y. Tufail and S. Gul. An optimisation over the Möbius group for optimal solution in image registration.**, *Submitted to Punjab University Journal of Mathematics*, ISSN: 1016-2526, JCR indexed Journal.

- 2025 **M. Y. Tufail, S. Gul. Fuzzy Probabilistic Learning for Thyroid Hormonal Imbalance Detection**, *submitted to Bio-Medical Materials and Engineering*, 2025, ISSN: 0959-2989, JCR indexed Journal

- 2024 M. Y. Tufail, S. Gul. **Prediction for the precipitation (rainfall) of Sukkur region using artificial neural network, multiple regression and supervised machine learning**, submitted to *Mindanao Journal of Science and Technology*, ISSN: 2244-0410, 2449-3686, JCR indexed Journal

Conferences

- 2023 **Research Colloquia 2023 (29 - 30 May)**, Department of Mathematical Sciences, Institute of Business Administration, Pakistan
- 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

Supervision

1. PhD supervision:

- *Mathematical exploration of climate variability over South Asian countries using generalized linear model.*

Capacity: Main.

Candidate: Muhammad Haris Ur Rehman Horani.

Outcome: in progress (approved by ASRB)

2. MS-Supervision:

- *Comparing Artificial intelligence and Fuzzy learning for the prediction of Cardio vascular disease.*

Capacity: Main.

Candidate: Ms Maham Fahim.

Outcome: In Progress

- *Brain stroke prediction: An artificial intelligence based risk assessment model.*

Capacity: Co-supervisor.

Candidate: Hafiz Syed Muhammad Kashif.

Outcome: In Progress

- *Spatial and temporal analysis of rainfall.*

Capacity: Main.

Candidate: Muhammad Hunain Anwar.

Outcome: Completed

- *Solution to a functional differential equations arising in the cell growth model.*

Capacity: Main.

Candidate: Iqra Nawaz.

Outcome: Completed

- *A Study on Analytic Solution to a functional differential equation arising in a cell growth model.*

Capacity: Co-supervisor.

Candidate: Bushra Rais.

Outcome: Completed

- *Comparison of rigid registration with different optimisation techniques.*

Capacity: Main.

Candidate: Aizaz Hussain.

Outcome: Completed

- *Comparison of rigid registration with different objective functions.*

Capacity: Main.

Candidate: Farzana Yasmeen.

Outcome: completed

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_V550HZCxx5BG_

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.

Taught Courses

During my teaching career I have been involved as a course coordinator in variety of courses such as:

- **Calculus**
- **Linear Algebra**
- **Ordinary differential equations**
- **Introduction to transformations (Fourier and Laplace)**
- **Higher order and partial differential equations (Heat, Wave and Laplacian equations)**
- **Graph Theory**
- **Introduction to Basic Statistics and Probability**
- **Discrete and Continuous probability distributions (such as Binomial, Poisson, Hypergeometric, Geometric, Gamma, Exponential and Normal distributions)**
- **Estimation, Hypothesis and ANOVA**

- **Abstract Algebra**
- **Galois Theory**
- **Essential Software**, PYTHON *based course*
- **Scientific computing**, MATLAB *based course*
- **Discrete Mathematics**