Bilal Ahmed Usmani

Assistant Professor
Department of Biomedical Engineering
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Work Experience

Assistant Professor, Department of Biomedical Eng. (BMD)	**Apr 2010-to Date**

NED University of Engineering & Technology
Courses Taught: Biostatistics, Numerical Methods for Engineers, Modelling of Physiological Systems, Finite Element Method and Modelling of Physiological Systems.

Lecturer, Department of Mathematics and BMD	**Jan 2008-Mar 2010**

NED University of Engineering & Technology
Courses Taught: Calculus, Linear Algebra. Human pattern recognition, learning and neural networks sections in Systems Biology course.

Lecturer, Department of Computing & Mathematical Sciences	**Jan 2006-Dec 2007**

Dadabhoy Institute of Higher Education, Main Campus,
Courses Taught: Calculus, Linear Algebra and Statistics.

Others

Consultant, Epidemiological and Biostatistics section, CHS, AKU	**Jan 2020-to Date**

Provide modelling assistance to the research studies in infectious diseases that incorporate population mixing methods and transmission mechanisms. Review and advice on Epidemiology and Biostatistics theses. Development of extramural research proposals and mentoring junior faculty.

Visiting Faculty, IBA	**Jan 2017-to Date**

Taught Differential Equations, Business Statistics and Mathematical Statistics and Linear Algebra to MBA and MS Economics programmes

Visiting Faculty, SZABIST	**Jan 2016-May 2016**

Taught Advance Research Methods and Techniques to Postgraduates of Social Sciences and Education & Learning streams

TA and Demonstrator, University of Glasgow	**Jan 2012-Sep 2015**

TA in multiple courses and labs to undergraduate and postgraduate students having diverse educational backgrounds at the School of Mathematics & Statistics and Institute of Biodiversity, Animal Health & Comparative Medicine (IBAHCM). The courses include Understanding your data, Financial Mathematics, Topics in Applied Mathematics and Key Research Skills

Visiting Faculty, Federal Urdu University of Arts, Sciences and Technology	**Apr 2005-Dec 2005**

Taught Calculus and Mathematical Methods to Undergraduate students

Qualification

PhD. in Epidemiology	**2011 - 2016**

IBAHCM, University of Glasgow, Glasgow, Scotland, UK
Title: Investigating disease persistence in host vector system: Dengue as a case study
My work is related to developing deterministic and stochastic models to reveal the persistence dynamics of dengue (measured as CCS) for the endemic situation of the disease.

M.Phil. in Mathematics	**2005 – 2009**

University of Karachi
My M.Phil. surrounds developing statistical and AI models for forecasting rainfall in North-Eastern part of Pakistan. Courses include Fluid Dynamics, Advanced Differential Equations and Numerical Analysis

M.Sc. Mathematics (Pure)	**2003 –2004**

University of Karachi
Courses include Real and Complex Analysis, Numerical Analysis, Mathematical Methods and Algebra

B.Sc. (Hons)	**2001 – 2003**

University of Karachi
My Majors were Mathematics, Physics and Chemistry

Research Interests

- Infectious Disease Modelling
- Network and Metapopulation Analysis
- Spatiotemporal Analysis
- Modelling Public Health interventions
- Population Ecology and Epidemiology
- Artificial Intelligence
- Climatology
- Image Processing

Administrative Positions at NEDUET

- Member of Board of Studies at NEDUET
- Member of Board of Faculty at NEDUET
- Member of Objective Based Education (OBE) Design Team at NEDUET
- Assigned responsibilities of Class advisor, Student councillor and Factotum on multiple occasions.

Invited Talks and Workshops Conducted

- **Provincial Level Consultations for the Development of Investment Plans for Polio Super High-Risk Union Councils (SHRUCs)**

Oct 2020. (i) Movenpick Karachi, (ii) Serena Hotel and Provincial EOC, Quetta

- **Covid-19 Modelling in Sindh - Relationship Between Epidemic Spread & Control Measures.**

Sep 2020. Institution of Engineers Pakistan, Karachi Centre & NED University of Engineering & Technology

- **Mathematical Modelling in Infectious Diseases - SIR/SEIR Approach**

Aug 2020. Basics of Infectious Disease & Environmental Epidemiology Course Team, Aga Khan University

- **ToT Lead Facilitator: Development of Investment Case on Integrated Health, Nutrition, Child Protection & WASH Services for 40 SHRUCs in 3 Provinces (Sindh, KP & Baluchistan) of Pakistan**

Jul 2020. Department of CHS, Aga Khan University

- **Guest Session Speaker: Predictive Modelling for Controlling & Managing COVID'19 - SEIR & Other Models**

Jun 2020. A Public Health Approach to Tackling the Novel Virus Course Team, Aga Khan University

- **State of the Art Lecture Speaker: Assessment of the Awareness & Preparedness of Community Against the Novel Coronavirus 2019**

Apr 2020 Department of Medicine, Virtual Grand Rounds, Aga Khan University

Professional Memberships and Honours

- Vector Population Biology and Disease Dynamics Group, University of Glasgow
- Boyd Orr Centre of Population Biology, University of Glasgow
- Edinburg Mathematical Society (EMS)
- British Atmospheric and Data Centre (BADC)
- Country Customizer for EQUIST software analysis by UNICEF
- Editor: World Scientific Journal Series; The Journal of Biological Systems
- Editor: Frontier Series Journal; Frontiers Global Women's Health
- Interviews aired on Dunia News and GTV for Dengue epidemic preparedness and control
- Writer of the Health News columns in different Newspapers
- Nominated by Economics Affairs Division (EAD) to represent Pakistan for the training course on "Ending HIV-Related Stigma in Health Facilities to Fast-Track 90-90-90 Targets" to be held from 22nd June to 3rd July 2020 at Thailand. (The course was cancelled due to COVID-19 situation.)

References

1. Professor Daniel Haydon

Director of Institute/Professor of Population Ecology and Epidemiology
(Institute of Biodiversity Animal Health & Comparative Medicine)
Associate (School of Life Sciences). Contact: +44 (0) 1413305843
Email: Daniel.Haydon@glasgow.ac.uk

2. Dr Ali Raza Jafri

Professor and Chairperson, Department of Biomedical Engineering, LEJ Campus, NEDUET
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List of Publications

1. **Bilal Ahmed Usmani**, Mustafain Ali Khan, Muhammad Abul Hasan, Amna Rehana Siddiqui, Sameen Siddiqui, Aaron G. Lim and Saad Ahmed Qazi, "*The impact of disease control measures on the spread of COVID-19 in the province of Sindh, Pakistan*". Submitted in PLoS ONE. (PONE-D-20-37128)

2. Marwan A. A. Hamid, Walid Alhaidari, Waseemullah, Najeed Ahmed Khan, **Bilal Ahmed Usmani**, Syed. M. Wasim Raza, Dynamic Changes of Multiple Sclerosis Lesions on T2-FLAIR MRI using Digital Image Processing International Journal of Advanced Computer Science and Applications (IJACSA), Vol. 11, No. 2, 2020.

3. Fatima Zaidi, Ubaida Fatima, **Bilal Ahmed Usmani,** Ali Raza Jafri "*Comprehending nodes essentiality through centrality measures in biological networks*", International Journal of Computer Science & network Security, IJCSNS 19 (9), 65, 2019.

4. Amna Sethi, **Bilal Ahmed *Usmani,*** Mustafain Ali, Syeda Wajiha Naqvi "*The Role of Human Migration On Transmission of Infectious Diseases: Measles as a Case Study*", submitted in International Journal of Biological Systems, 2019 (Manuscript ID: WSPC-JBS-D-19-00045, Current status: under review)

5. **Bilal Ahmed *Usmani,*** Binish Danis*h* "*A framework for Stability Analysis in Common Epidemiological Models*", submitted in International Journal of Biomathematics, 2019 (Manuscript ID: IJB-19-00101, Current status: under review)

6. **Bilal Ahmed Usmani,** Saqib-Ur-Rehman , Abdul Khan, Kamran Khan, Syed Hussain, Syeda Zia, Tanveer Siddiqui, and Syed Ullah. 2019. "*Wavelet Analysis of Winter Rainfall Variability over Victoria*". Current Journal of Applied Science and Technology 33 (5), 1-9. https://doi.org/10.9734/cjast/2019/v33i530097.

7. **Bilal Ahmed Usmani**, Saqib-Ur-Rehman, Syed Adnan Hussain, Kamran Khan and Atia Elahi "*Regional Precipitation Variability Associated with Zonal Movement of Indian Ocean High Pressure System*", in Asia-Pacific Journal of Atmospheric Sciences, pp 1-10.

8. **Usmani, B.A.**, S.-U.-R., Khan, A., Khan, K., Hussain, S., Zia, S., & Siddiqui, T. (2019). The Impact of Subtropical Indian Ocean Anticyclone over Tasmania Precipitation in *Current Journal of Applied Science and Technology*, 33(5), 1-10. https://doi.org/10.9734/cjast/2019/v33i530100

9. Tajwar Sultana, Abdul Rehman Abbasi, **Bilal Ahmed Usmani**, Sadeem Khan, Wajeeha Ahmed, Naima Qaseem and Sidra, "*Towards Development of Real-Time Handwritten Urdu Character to Speech Conversion System for Visually Impaired*" International Journal of Advanced Computer Science and Applications (IJACSA), 7(12), 2016. http://dx.doi.org/10.14569/IJACSA.2016.071204

10. **Usmani B. A.** "*Forecasting Rainfall over North-Eastern Region of Pakistan: A Comparison between Linear and Neural Network Models*", in International Conference on Environmental Science and Engineering, Singapore,2009

11. Danial N., Noor R., **Usmani B. A.**, and Zaidi S. J. H., "*A Dynamical System and Neural Network Perspective of Karachi Stock Exchange Returns*", in Communications in Computer and Information Science (CCIS), Springer-Verlag, vol. 20, pp. 88-96, December 2008. [www.springerlink.com/index/h67uj718h4402344.pdf]

12. Zaidi S. J. H., Danial S. N., and **Usmani B. A**., "*Modelling Interfailure Time Series using Neural Networks*". 12th IEEE International Multitopic Conference, (INMIC '08), Karachi, Pakistan, pp. 409-411, December 23-24, 2008.

13. Tufail Y. M., Rehman S., and **Usmani B. A**., "*Modelling and Simulation of Summer Monsoon Rainfall for Northern Hilly Area of Pakistan*". 12th IEEE International Multitopic Conference, (INMIC '08), Karachi, Pakistan, pp. 480-484, December 23-24,2008. [http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?isnumber=4777689&arnumber=4777786&count=119&index=96]

14. **Usmani B. A**., "*Rainfall Modelling using Artificial Neural Networks: In Context of North-Eastern part of Pakistan*", Abstract in Proceedings of 35th All Pakistan Science Conference (APSC 35th), pp. 1, December 22-23, 2008.

15. Hasan T, Ambreen N., **Usmani B. A.**, Zaidi S. J. H. and Danial N. "*The Impact of Stock Markets on Economic Growth: A Case-Study of the Evolution of Karachi Stock Exchange as a Factor of Pakistan's Economic Development*", in International Conference on Statistical Sciences (ICSS '07), Lahore, November 7-8, 2007

16. Danial N., Noor R., **Usmani B. A**. and Zaidi S. J. H.," *On the Dimensional Estimate of Rounding-Errors of a typical Computing Process*". in Proceedings of 11th IEEE-International Multi- Topic Conference (INMIC '07), Lahore, pp.1-7, December 27-29, 2007. [http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=4557679

Selected Projects Supervised (Related to Epidemiology)

1. COVID-19 modelling for province of Sindh in relation to control measures (co-supervised)
2. The comparison of testing and spread of COVID-19 in different provinces of Pakistan (co-supervised)
3. Mathematical Modelling of Tuberculosis Spread in Pakistan.
4. An Analysis of the Spatial Patterns of Dengue Using Seroprevalence Data from Different Parts of Pakistan.
5. Investigating HIV Co-Infection Dynamics in TB Patients: A Mathematical Analysis.
6. Spatiotemporal Modelling of Hepatitis C in Sindh.
7. Impact of Migration on Disease Spread Using a Modelling Approach.
8. Exploring Influenza Dynamics in Connected Populations.
9. Network Modelling and Centrality Measures for Epidemics.

Ph.D. Project under supervision

Spatiotemporal Modelling of Infectious Disease Dynamics in Host Systems

This study aims at developing novel methodology for infectious disease management and control. It investigates the spatiotemporal dynamics of Tuberculosis in Pakistan through compartmental models. The application of such models includes managing health systems, revealing the mechanism and determinants of underlying transmission, exploring characteristics of TB outbreaks, and evaluating strategies to find the best control programs.

Research Grants

S.No.	Title	Agency	Year	Amount
1.	Spatiotemporal Modelling of Infectious Disease Dynamics in Host Systems. Human TB as a case study	NEDUET (for a PhD supervision)	2018	0.8 Million PKR
2.	Visit to the Department of Population Health Sciences, Bristol Medical School, University of Bristol, UK.	UK Travel Grant (PAK-UK Education Gateway)	2019	2000 GBP
3.	Technical assistance for the development of Investment Case on Integrated Health, Nutrition, Child protection and WASH services for 40 polio super high-risk Union Councils (SHRUCs) in three provinces (Sindh, KP and Baluchistan) of Pakistan.	UNICEF (Co-PI), EQUIST Country Customizer	2020	150,000 USD
4.	COVID-19 GIS based Intelligent Decision Support System	World Bank, (Co-PI),	2020	6.4 million PKR

Collaborations

S.No.	Organization	Details	Date
1.	University of Bristol, UK	Collaboration with Dr. Aaron Lim from Bristol Medical School	February 2019- To date
2.	National Tuberculosis Program (NTP), Pakistan	Collaboration related to HIV-TB co-infection project.	June 2018- To date
3.	Aga Khan University, Karachi	Collaboration on different projects with Department of Community Health Sciences and Department of Paediatrics and Child Health	December 2018- To date