Md Al Masum Bhuiyan

Assistant Professor
Dept. of Mathematics & Statistics
Austin Peay State University, TN

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Summary

- Taught statistics and mathematics based classes at undergraduate and graduate levels.
- Experienced with high dimensional and high frequency data analysis for five years.
- Collaborated with a group of scholars and applied for research grants;
- Published high-quality peer reviewed journal papers.
- Presented interaction visualization results in the national/international conferences.

Skills

- **Statistical concepts:** Regression, Probabilities, Time Series Analysis, and Applied statistics, **Machine Learning:** Logistic Regression, Random Forest, Decision Trees, Isolation Forest, Gradient Descent, Support Vector Machine, Principal Component Analysis, Convolutional Neural Network, **Stochastic models:** Stochastic Process, Stochastic Volatility, Stochastic Differential Equation, Fast Fourier Transform.

- **Programming abilities:** Python, R, SAS, MINITAB, MATLAB

Appointments

- **Austin Peay State University** Clarksville, TN
  Assistant Professor - Dept. of Mathematics and Statistics *Fall 2020 - present*
  - Fall 2020: Taught MATH 5260 - Stochastic Process; MATH 4240 - Probability; MATH 1530 - Elements of Statistics
  - Spring 2021: STAT 5290 - Predictive Analytics; MATH 5800 - Differential Equation and Stochastic Analysis; MATH 1530 - Elements of Statistics

- **El Paso Community College** El Paso, TX
  Adjunct Faculty - Mathematics *Fall 2019 - Summer 2020*
  - Taught Introductory Algebra, Mathematics for Business and Social Sciences, and Pre-calculus classes.

Education

- **University of Texas at El Paso** *August 2015 - May 2020*
  Doctor of Philosophy in Computational Science; GPA: 4.00
  Research area: Applied Statistics and Data Science
  Dissertation title: Predicting stochastic volatility for extreme fluctuations in high frequency time series.

- **University of Texas at El Paso** *August 2013-July 2015*
  Master of Science in Mathematical Science; GPA: 3.69
  Thesis title: Associativity forcing commutativity in left nil rings

- **University of Dhaka** *2009-2011*
  Master of Science in Applied Mathematics; GPA: 3.56

- **University of Dhaka** *2005-2009*
  Bachelor of Science in Mathematics; GPA: 3.27

Achievements

- Big Data Analytics Certificate, UTEP, 2020.

- SAS Certified Base Programmer, SAS Institute Corporation, 2018.

- Scholarships awarded as selected researcher in time series analysis, UTEP, 2018, 2019.

Academic Projects

- **Statistical Data Mining** *Fall 2018 - Spring 2020*
  Classification (by R and Python)
  Analyzed the datasets from UCI Machine Learning repository.
  - Implemented "Principal Component Regression" on optical recognition of handwritten digits dataset.
  - Applied Artificial Neural Network, Logistic Regression and Support Vector Machine on climate model simulation crashes data, public health data and atmospheric data.
  - Enhanced the performance and accuracy by L1 & L2 regularizations.
  - Analyzed anomaly detection of high tech part data using various algorithms.
  - Implemented parametric & nonparametric nonlinear regression on several datasets.

- **Time Series Analysis** *Spring 2017 - Spring 2020*
  Financial and Geophysical data analysis (by R)
  Analyzed high frequency stock market data, natural earthquakes data and mining explosions data.
  - Analyzed Lehman Brothers Collapse, Flash Crash Events and their effects using various classification techniques.
  - Market analysis using principal component regression.
  - Implemented stochastic volatility, Fourier transform on high frequency stock market data and geophysical data.
  - Implemented power spectrum to discriminate similar signals from earthquake and mining explosion sources.
  - **My innovative idea:** Applied Ornstein-Uhlenbeck process to simulate the special case of high frequency stock market returns.
  - Applied stochastic volatility to the simulated returns.
  - Achieved the higher accuracy of estimated time-varying parameters.

Personal Project

- **Kaggle Data Analytics Competitions** *January, 2020*
  1. Bengali.AI Handwritten Grapheme Classification
  Analyzed 13,000 different graphemes of Bengali alphabets with 200840 training dataset (parquet image files).
  - Applied convolutional neural network with Keras and TensorFlow.
  - Implemented a number of serial non-linear layers as encoder as well as corresponding set of decoders that work as pixelwise classifiers.
  - Enhanced the performance and accuracy by various algorithms like "data augmentation", "resizing", "dropout".

Publications

- Reza, S., **, Bhuiyan, M.A.M**, Tasnim, N. (2021), A Convolution Neural Network with Encoder-Decoder Applied to the Study of Bengali Hand-written Grapheme Classification, *Big Data and Information Analytics (AIMS)*, 06, 41-55.

- Varela, M.P.; **Bhuiyan, M.A.M**; Tweneboah, O.K..; Asante, P.; Mariani, M.C. (2021), Solving Third Order Ordinary Differential Equations by using Ricatti Equations, *2021 Hawaii University International Conferences*.

- **Bhuiyan, M.A.M**, Suhail M., Islam, R. Tasnim, N. (2021), Volatility Estimation of COVID-19 Daily Rates Using Kalman Filtering Technique, *Elsevier: Results in Physics*, 26, 104291.

- **Bhuiyan, M.A.M**, Mahmud S., Sarmin N. Elahee, S. (2020) A Study on Statistical Data Mining Algorithms for the Prediction of Ground Level Ozone Concentration in the El Paso-Juarez Area, *Aerosol Science Engineering*, DOI: 10.1007/s41810-020-00074-2.

- **Bhuiyan, M.A.M**, (2020) Predicting Stochastic Volatility For Extreme Fluctuations In High Frequency Time Series, *Open Access Theses Dissertations*, 2934.

- Mariani, M., Asante P.K., **Bhuiyan, M.A.M**, Tweneboah, O., Varela, M.P., Jaroszewicz, S., Tweneboah, O., (2020), Long-Range Correlations and Characterization of Financial and Volcanic Time Series., *Mathematics(MDPI)*, 8(3), 441.

- Mariani, M., **Bhuiyan, M.A.M**, Tweneboah, O., Tweneboah, O., Huizar, H.G. (2020), Long memory effects and forecasting of earthquake and volcano seismic data, *Elsevier-Physica A*, 125049.

- Mahmud, S., **Bhuiyan, M.A.M**, Sarmin, N., Elahee, S. (2020), Study of wind speed and relative humidity using stochastic technique in a semi-arid climate region, *AIMS Environmental Science*, 7, 156-173.

- Mariani, M., **Bhuiyan, M.A.M**, Tweneboah, O., Varela, M.P., Florescu, I. (2019) Analysis of stock market data by using Dynamic Fourier and Wavelets techniques, *Physica A- Statistical Mechanics and its Applications*, 537, 122785.

- Mariani, M., **Bhuiyan, M.A.M**, Tweneboah, O., (2019) Supervised machine learning models applied to disease diagnosis and prognosis, *AIMS Public health*, 6(4), 405-423.

- Beccar, M.P., **Bhuiyan, M.A.M**, Mariani, M.C., Tweneboah, O. (2019) Analytic Methods for Solving Higher Order Ordinary Differential Equations, *Mathematics (MDPI)*, 7(9), 826.

- Mariani, M., **Bhuiyan, M.A.M**, Tweneboah, O. (2019) Statistical data mining algorithms for the prognosis of diabetes and autism, *9th Annual STEM conference*, Hawaii.

- Beccar, M.P., **Bhuiyan, M.A.M**, Mariani, M.C., Tweneboah, O. (2019) Analytic Solutions for Third Order Ordinary Differential Equations, *9th Annual STEM conference*, Hawaii.

- Mariani, M., **Bhuiyan, M.A.M**, Tweneboah, O., Huizar, H.G., Florescu I. (2018) Volatility models applied to geophysics and high frequency financial market data, *Physica A- Statistical Mechanics and its Applications*, 503 (2018), 304-321

- Mariani, M., **Bhuiyan, M.A.M**, Tweneboah, O. (2018) Estimating stochastic volatility by using Ornstein-Uhlenbeck type models, *Physica A- Statistical Mechanics and its Applications*, 491, 167-176.

- Maria, M., Hector, H.G., **Bhuiyan, M.A.M**, Tweneboah, O. (2017) Using dynamic fourier analysis to discriminate between seismic signals from natural earthquakes and mining explosions, *AIMS Geosciences*, 3(3), 438-449.

- Mariani, M., **Bhuiyan, M.A.M**, Tweneboah, O. (2017) Forecasting the volatility of geophysical time series with stochastic volatility models, *International Journal of Mathematical, Computational, Physical, Electrical Engineering*.

- **Bhuiyan, M.A.M** (2015) Associativity forcing commutativity in left nil rings, *ProQuest*, UTEP.

REVIEWER

- Mathematics (MDPI).

- Hindawi: Mathematical Problems in Engineering.

- Journal of Exposure Science and Environmental Epidemiology.

- Journal of Applied Mathematics, Statistics and Informatics.

Conference and presentations

- Title: Analysis of High Frequecy Financial Data Using Dynamic Fourier Models, *AMS Spring Central/Western Meeting*, Sept 12-13, 2020.

- Title: Statistical data mining algorithms for the prognosis of diabetes and autism, *9th Annual STEM conference*, Hawaii, June 2019.

- Title: Analytic Solutions for Third Order Ordinary Differential Equations, *9th Annual STEM conference*, Hawaii, June 2019.
- Title: Analysis of High Frequency Financial Data Using Dynamic Fourier Models, *8th Annual Conference on High-Frequency Finance and Analytics*, New jersey, June 27-29, 2019.
- Title: The Application of Stochastic Differential Equation to modeling high frequency financial data and other seismic data, *AMS Spring Central/Western Meeting*, Hawaii, March 22-24, 2019.
- Title: Estimation of Stochastic Volatility in High Frequency Financial Data Using Long Memory Effects, *4th Int. Conference on Big Data and Information Analytics*, Houston, December 17-19, 2018.
- Title: Volatility Forecasting of Financial Time Series By Using Ornstein-Uhlenbeck Type Models, *Cincinnati Symposium On probability Theory and Applications*, Ohio, November 10-11, 2018.
- Title: Application of Stochastic Differential Equation by using Ornstein-Uhlenbeck Process, *The 1st Annual Meeting of SIAM Texas-Louisiana Section*, Louisiana, October 5-7, 2018.
- Title: The Estimation of Long-Memory Spectrum in High Frequency Financial Data, *The* 38^{th} *International Symposium on Forecasting*, Colorado, June 17 - 21, 2018.
- Title:Volatility Forecasting of Financial Data by using Ornstein-Uhlenbeck Type Models, *The* 32^{nd} *New England Statistics Symposium*, Massachusetts, April 13 - 14, 2018.
- Title: Application of Stochastic Differential Equation by using Ornstein Uhlenbeck Process, *Texas Differential Equations Conference*, San Antonio, March 24, 2018.
- Title: Analysis of Geophysical Time Series by using Dynamic Fourier Techniques, *The 21st Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences*, Texas, November 4, 2017.
- Title: Analysis of Geophysical Time Series by using Dynamic Fourier Techniques, *The 21st Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences*, Texas, November 4, 2017.
- Volatility Forecasting of Financial Time Series by using Ornstein-Uhlenbeck Type Models, *The 21st Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences*, Texas, November 4, 2017.
- Title: Forecasting the Volatility of Geophysical Time Series with Stochastic Volatility Models, *19th International Conference on Statistics, Mathematics & Econometrics*, New York, October 5-6, 2017.
- Title: A Statistical Analysis of Time Series Forecasting with Volatility Models, *2017 International Conference in Business, economics, Humanities, Statistics*, Washington DC., May 19, 2017.
- Title: A Comprehensive Analysis of Time Series Forecasting with Volatility Models, *The 20th Joint NMSU/UTEP Workshop on Mathematics, Computer Science, and Computational Sciences*, New Mexico, April 8, 2017.
- Title: Volatility Forecasting of Financial and Geophysical Time Series using GARCH and Stochastic Volatility Model, *7th Annual Stevens Conference on High Frequency Finance and Analytics*, Stevens Institute of Technology, New-Jersey, November 3-5, 2016.
- Title: Discrimination of Seismic Signals Arising in Earthquakes and Mining Explosions using Dynamical Fourier Analysis, *The 17th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences*, Texas, November 7, 2015.
- Title: Associativity Forcing Commutativity in Left-Nil Rings, *The 2nd Annual Dynamica Expo Conference*,Texas, November 14 - 15, 2014.

Honors & Awards

- UTEP College of Science Dean's Office Research Award, 2020, 2019, 2018, 2017.
- Served as a chair of a session in the Hawaii STEM Conference, 2019, Hawaii
- Received the Allien and Paul C. Davidson scholarship, UTEP, Fall 2019.
- Served as a judge of Secondary Science Fair at the Ysleta Independent School District, January 26, 2019, El Paso, Texas.
- Served as a judge of Science Fair at the Young Women's STEAM Academy, Jan 11, 2019, El Paso, Texas.
- Served as a judge of students poster presentation in BUILDing SCHOLARS Symposium, Sept 29, 2018, El Paso, Texas.
- Received the Frank B. Cotton Trust Scholarship from UTEP, Fall 2018.
- Received the Research grant from Dept. of Mathematical Sciences, UTEP, Summer 2017 & 2018.
- Received the Scholar Award in the category of outstanding performance for presentation-Washington DC., May 19, 2017.
- Awarded the Runner-Up in Basic Science Category for poster presentation - El Paso Convention Center, El Paso, Texas, November 14 & 15, 2014.

Grants

- Google Data Centers Grants Fund: TF2011-096256 - APSU Makerspace Program (AMP), $10000, December 2020.
- Research grant, Dept. of Mathematical Sciences, UTEP, $14000, 2019-2020.
- Texas Public Education Grant Award, $3000, 2019.
- Research grant, Dept. of Mathematical Sciences, UTEP, $6800, 2018-2019.
- Research grant, Dept. of Mathematical Sciences, UTEP, $4000, 2017-2018.
- Travel Grant from Dept. of Mathematical Sciences, Program of Computational Sciences Dodson Fund, UTEP, Fall 2018.
- Travel Grant from National Science Foundation, the Charles Phelps Taft Research Center, University of Cincinnati, $600, Fall 2018.
- Travel Grant from National Science Foundation, Louisiana State University, $900, Fall 2018.
- Mathematical Sciences Dodson Travel Grant, UTEP, March, 2018.
- CPS Dodson Travel Grant, UTEP, October, 2017.
- CPS Dodson Travel Grant, Department of Mathematical Science Travel Grant, UTEP, May, 2017.
- Travel Grant - Department of Mathematical Science, UTEP, April, 2017.
- Mathematical Science Dodson Travel Grant, November, 2016.
- Travel Grant, Bangladesh - Sweden Trust Fund, Economic Relations Division of the Ministry of Finance, Bangladesh, 2014.

MEMBERSHIP

- CPSSA (Computational Science Students Association - UTEP
  - Executive Treasure position of CPSSA.
- SIAM (Society for Industrial and Applied Mathematics).
- AMS (American Mathematical Society).
- Bangladesh Mathematician Club

Collaborators

- Austin Peay State University - Dr. Ramanjit Sahi, Dr. Saeid Samadi-Dana, Mr. Michael Wilson, Dr. Doug Catellier, Dr. Mason Cordell, Dr. Alex Zhang.
- University of Texas at El Paso - Dr. Maria C. Mariani, Dr. Beccar Varela, Dr. Suhail Mahmud, Mr. Syed Mohsin Reza.
- Texas Tech University - Mr. Ram Joshi
- Rampao College of New jersey - Dr. Osei K. Tweneboah
- Daffodil University, BD - Ms. Nishat Tasnim, Mr. Romiull Islam