Olusegun Michael Otunuga, PH.D.

Curriculum Vitae

Department of Mathematics
Augusta University
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Research Interests

1. Statistical Modeling and Analysis of Dynamical Systems
2. Stochastic Differential Equations, Analysis and Applications
3. Mathematical Modeling of Infectious Diseases and Computational Biology
4. Commodities Price Modeling and Valuation
5. Data Mining and Analytics

Education

- **Ph.D., Pure** & **Applied Mathematics**, University of South Florida - Tampa, Fl. July 2014.
- **M.A., Mathematics**, Marshall University, Huntington, WV. May 2009.
- **B.Sc., Mathematical Sciences**, First Class Honors
  Federal University of Agriculture, Abeokuta, Nigeria. September 2006.

Professional Experience

- **Assistant Professor**, Joint Appointment with Medical College of Georgia, Department of Population Health Sciences, Augusta University. January 2023 - Present.
- **Assistant Professor**, Department of Mathematics, Augusta University. August 2021 - Present.
- **Assistant Professor**, Marshall University. August 2014 - 2021.
- **Pi Mu Epsilon Advisor**, WV Beta Chapter, Marshall University. August 2015-Present.
- **Editorial Assistant**, Journal of Stochastic Analysis and Application. August 2012-2014.
- **Graduate Teaching and Research Assistant in Mathematics**. August 2009-July 2014.
  University of South Florida, USA.
- **Graduate Teaching Assistant in Mathematics**, Marshall University, USA. August 2007-May 2009.

Key Strength

1. **Data Mining and Analytics:** Ability to analyze complex, high dimensional data using innovative and/or existing statistical methods. Sample projects completed include statistical modeling and analysis of high dimensional COVID-19 data, stochastic modeling and analysis of Influenza data, mathematical modeling and analysis of large-scale financial and energy data.
2. **Statistical Invention:** Developed a patented innovative nonparametric approach for state and parameter estimation for dynamical systems.
3. **Team Work:** Collaborated with peers and faculty on industrial and academic projects including an ongoing research in connectomics (comprehensive modeling of neural connections in the brain) and AI Synergy with partners from West Virginia University. Participated in planning and organization of academic symposia and departmental seminars. Facilitated and collaborated with faculty on the development of new and improved course curriculum for several first year courses.

4. **Communication Skills:** Gave conference presentations internationally and locally. Taught several graduate and undergraduate courses.
5. **Computer and Software:** Experienced with statistical software (R, SPSS, SAS, Microsoft Excel), MATLAB, Mathematica, Python, Maple, VBA, Microsoft Office tools.

Research Duties

1. Conducting substantive research into complex problems, ideas, concepts or theories and applying appropriate methodologies
2. Developing a body of outstanding quality publications in well recognized peer reviewed outlets
3. Initiating and developing links with internal contacts and external contacts at other educational institutions, employers and professional organizations to actively foster collaboration
4. Presenting research and giving invited papers at national and international conferences
5. Acting as reviewer for academic journals
6. **Honors Prospectus Capstone Advisor**, Department of Mathematics, Augusta University, 2022-Present.

   Serving as the thesis prospectus adviser for honors undergraduate students: 2022-2023.

   "Mathematical modeling and analysis of the spread of infectious diseases: Case study Covid-19" (with Michael Ford) Spring 2022
7. **Honors Prospectus Capstone Reader**, Department of Mathematics, Augusta University, 2022-Present.

   Serving as the thesis prospectus reader for honors undergraduate students: 2022-2023.

   "Mathematical Modeling of Post-exposure Prophylaxis of SARS-CoV-2" (with Makayla Preston) Spring 2022
8. **Summer Scholars Program: CURS**, Department of Mathematics, Augusta University, Summer 2022.

   Advising an undergraduate students on Mathematical Biology: Summer 2022

   "Analysis of the transmission of multi-strains infectious diseases: Case study Covid-19" (with Alexandra Yu) Summer 2022
9. **Masters Thesis Supervision: Marshall University.**

   I supervised the Master's thesis of one of the graduate students in the department of Mathematics at Marshall University. This is in fulfilment of the requirements for the degree of Master of Arts in Mathematics.

   Title: Radial Basis Function Methods With Accelerated Newton Iteration For Nonlinear Boundary Value Problems

   Student: Ayodele Ashefon Spring-Summer 2019
10. **Chair, Oral Master's Program Comprehensive Exam Supervision: Marshall University.**

    I chaired the oral comprehensive exam of one of the graduate students in the department of Mathematics at Marshall University. This is in fulfilment of the requirements for the degree of Master of Arts in Mathematics.

    Student: Ayodele Ashefon Summer 2019
11. **Senior Capstone Research Advisor**, Department of Mathematics, Marshall University, 2015-Present.

    Served as the capstone adviser for senior undergraduate students: 2015-Present.

    i. "Dynamic Modeling and Forecasting of Energy Commodity Prices" (with Estep, R.) Spring 2015.

    ii. "Modeling the Spread of Infectious Diseases", (with Morisue, J.) Fall 2015.

    iii. "Estimating time varying parameters in a linear stochastic model for energy commodity spot price processes", (with Lockhart, T.) Spring 2017.

    iv. "New Innovative Numerical Integration Scheme using Radial Basis Function (RBF) method", (with Lim, B.)

My student won the Marshall University Undergraduate Creative Discovery and Research Scholar Awards (Summer 2018), with an award amount of $4,000 Spring 2018.

v. "Mathematical Analysis of Transmission of Infectious Diseases: Case study Influenza ", (with Powers, C.) Fall 2018.

vi. "Stationary Probability Distribution for a Stochastic SIS Model", (with Wallace, C.) Spring 2019.

vii. "Optimal Control of Infectious Disease using a SEITR Model", (with Hoops, K.) Spring 2020.

viii. "Modeling SARS-CoV-2 Transmission using SEIRS Model", (with Krznaric, J.)
My student won the WV NASA student fellowship grant for this research Fall 2020.

ix. "Evaluating the Black-Scholes option pricing model using hedging simulations", (incompleted) (with Patino, A.) Spring 2021.

Research Publications and United States Patent

▸ United States Patent

Title: Local Lagged Adapted Generalized Method of Moments Dynamic Process (with Ladde Gangaram and Ladde Nathan.)

U.S. Patent Number: 10719578

Issued: July 21, 2020

▸ Research Publications

1. Analysis and dynamics of measles with control strategies: a mathematical modeling approach. *International Journal of Dynamics and Control* (2023). https://doi.org/10.1007/s40435-022-01105-
2. Nowcasting of Short-Run Euro-Dollar Exchange Rate with Economic Fundamentals and Time-Varying Parameters. *Finance Research Letter, 52* (2023)
3. Stochastic modeling and forecasting of Covid-19 deaths: Analysis for the fifty states in the United States. *Acta Biotheoretica 70:25* (2022)
4. Analysis of multi-strain infection of vaccinated and recovered population through epidemic model: Application to COVID-19. *PLoS ONE, 17(7): e0271446* (2022)
5. Estimation of epidemiological parameters for COVID-19 cases using a stochastic SEIRS epidemic model with vital dynamics. *Results in Physics, vol 28, 104664* (2021)
6. Time-dependent probability distribution for number of infection in a stochastic SIS model: case study COVID-19. *Chaos, Solitons & Fractals*, **147**, (2021)
7. Time-dependent probability density function for general stochastic logistic population model with harvesting effort. *Physica A*, **573**, pp 1-33, (2021)
8. Two-Scale Network Dynamic Model for Energy Commodity Processes. *Journal of Energy*, **2020**, Article ID 2075258 pp 1-59, (2020)
9. Qualitative analysis of a stochastic SEITR epidemic model with multiple stages of infection and treatment. *Infectious Disease Modelling*, **5**:61-90 (2020)
10. Closed-form probability distribution of number of infections at a given time in a stochastic SIS epidemic model. *Heliyon*, **5**(9), (2019), https://doi.org/10.1016/j.heliyon.2019.e02499
11. Parameter identification for a stochastic SEIRS epidemic model: case study influenza. *Journal of Mathematical Biology*, (2019), **79(2)**: 705-729, https://doi.org/10.1007/s00285-019-01374-z
12. Local Lagged Adapted Generalized Method of Moments: An Innovative Estimation and Forecasting

Approach and its Applications. *Journal of Time Series Econometrics*, **11(1)**, (2019), https://doi.org/10.1515/jtse-2016-0024

13. Global stability for a $2n+1$ dimensional HIV/AIDS epidemic model with treatments. *Journal of Mathematical Biosciences*, **299**, (2018): 138-152 https://doi.org/10.1016/j.mbs.2018.03.013
14. Time varying parameter estimation scheme for a linear stochastic differential equation. *International Journal of Statistics and Probability*, **6(5)**, (2017), pp 84-100 ,doi: https://doi.org/10.5539/ijsp.v6n5p84
15. Global Stability of Nonlinear Stochastic SEI Epidemic Model. *International Journal of Stochastic Analysis*, (2017), vol 2017, Article ID 6313620, pp 1-7, doi:10.1155/2017/6313620.
16. Local Lagged Adapted Generalized Method of Moments and Applications, with Gangaram S. Ladde, Nathan Ladde. *Journal of Stochastic Analysis and Applications*, **35(1)**, (2016), pp 1-34
17. Second Order State and Covariance Estimation for Nonlinear Stochastic Systems. *Journal of Neural, Parallel and Scientific Computation*, **22**, (2014), pp 89-126
18. Stochastic Modeling of Energy Commodity Spot Price Processes with Delay in Volatility. *American International Journal of Contemporary Research*, **4(5)**, (2014), 1-20
19. Positive Solutions of Boundary Value Dynamic Equations. *American Review of Mathematics and Statistics*, **2(2)**, (2014), (**2**), 1-6.
20. Finding Positive Solutions of Boundary Value Dynamic Equations on Time Scale. *Theses, Dissertations and Capstones*, (2009), Paper 734
21. Stochastic Modeling and Applications of Energy Commodities Spot Price Processes, *Dissertations and Capstones*. Scholar Commons, (2014).
22. Global dynamics of a multi-dimensional HIV/AIDS and Tuberculosis co-infection epidemic model with treatments (under review)
23. Nonlinear Stochastic Dynamic Model For Malaria Transmission in Human and Mosquito Population, (under review)

Grant Activity

▸ **Funded**

Current Research: Augusta University

1. Grant # 1930341 (PI Name: Angela Spencer)

   Name of Funding Organization: National Science Foundation

   Amount Awarded: $\$905,444$

   Period of Grant Award: 01/2020-12/2024

   Title of Project: Promoting Opportunities and Pathways for Undergraduate Persistence in Science, Engineering, Technology, and Mathematics

   Role on Project (co-PI)

▸ **Not Funded**

1. NSF 22-054. RAISE: IHBEM Innovative media-informed stochastic modeling of disease transmission dynamics, **Olusegun Otunuga (PI)**, Eric Numfor (Co-PI), Ebenezer George (Co-PI), Kenneth Ward (Research Associate), Xinhua Yu (Research Associate), and Shelley White-Means (Research Associate), May 16, 2022.
2. NSF 22-503. LEAPS MPS: Stochastic modeling, analysis, and control of the spread of multi-strain infectious diseases: Case study COVID-19 and influenza, **Olusegun Otunuga (PI)**, January 2022.

Contributed Talks

1. **Joint Mathematical Meetings, American Mathematical Society,** John B. Hynes Veterans Memorial Convention Center, Boston Marriott Hotel, and Boston Sheraton Hotel, Boston, MA. *Mathematical modeling of vaccine breakthrough infection and rebound infection: analysis for the United States and the ten U.S. HHS regions.* January 4-7, 2023.
2. **Joint Mathematical Meetings, American Mathematical Society,** John B. Hynes Veterans Memorial Convention Center, Boston Marriott Hotel, and Boston Sheraton Hotel, Boston, MA. *Transition probability density function for the number of infections in a population satisfying a stochastic SIS epidemic model.* January 4-7, 2023.
3. **International Conference on Statistical Distributions and Applications (ICOSDA 2022)**, Huntington, WV. *Time-dependent probability density function for general stochastic logistic population model with harvesting effort.* Oct 13-15, 2022.
4. **Biology and Medicine Through Mathematics Conference (BAMM)**, Virginia Commonwealth University, Richmond, VA. *Multi-strain epidemic model with infected vaccinated and re-infected recovered population: application to COVID-19 pandemic.* May 18-20, 2022.
5. **Central Botswana Mathematics and Statistical Sciences Conference**, Zoom, Botswana. *Time-dependent Probability Distribution for Number of Infection in a Stochastic SIS Epidemic Model: Case Study COVID-19.* June 18, 2021.
6. **University of Memphis Mathematics Colloquium**, Memphis, TN. *Time Dependent Probability Density Function for Number of Infection in a Stochastic SIS Epidemic Model.* January 29, 2021.
7. **Marshall University Mathematics Colloquium**, Huntington, WV. *Time Dependent Probability Density Function for Number of Infection in a Stochastic SIS Epidemic Model.* October 21, 2020.
8. **International Conference on Statistical Distributions and Applications, ICOSDA 2019**, Grand Rapid, MI, USA. *Closed form probability distribution of number of infections at a given time in a stochastic SIS epidemic model.* October 10-12, 2019.
9. **Biology and Medicine Through Mathematics Conference**, Virginia Commonwealth University, Richmond, VA. *Parameter Identification for a Stochastic SEIRS Epidemic Model: Case Study Influenza.* . May 16, 2019.
10. **3rd Computer Science Symposium on Emerging Technologies**, Department of Computer Science, Marshall University, Huntington, WV. *Time Varying Parameter Estimation Scheme for a Stochastic Dynamical System Using the LLGMM Method.* April 30, 2019.
11. **Marshall University Colloquium**, Huntington, WV, *Global stability for a* $(2n+1)$*- dimensional HIV/AIDS epidemic model with treatments.* February 21, 2018.
12. **Joint Mathematical Meetings, American Mathematical Society,** , San Diego Convention Center and Marriott Marquis, San Diego, CA, *Global stability for a system of HIV epidemic stochastic model with treatments.* January 10-13, 2018.
13. **Joint Mathematical Meetings, American Mathematical Society,** , Hyatt Regency Atlanta and Marriott Atlanta Marquis, Atlanta, GA. *Parameter Identification For The SEIRS Epidemic Model: Case Study Influenza.* January 4-7, 2017.
14. **International Conference on Statistical Distributions and Applications, ICOSDA 2016**, Crowne Plaza, Niagara Falls, Canada. *Distribution Models of Energy Commodity Spot Price Processes.* . October 14-16, 2016.
15. **Marshall University Colloquium**, Huntington, WV, *Stochastic Modeling of Energy Commodity Spot Price Processes.* October 21, 2015.
16. **99th Annual Meeting of MAA**, Ohio Section, Marshall University, Huntington, WV, USA, *A Local Lagged Adapted Generalized Method of Moments and Applications.* March 27-28, 2015.
17. **Joint Mathematical Meetings, American Mathematical Society**, San Antonio, Texas, *Two-scale Network Dynamic Model for Energy Commodity Process.* Jan. 12, 2015.
18. **Joint Mathematical Meetings, American Mathematical Society**, Baltimore, Maryland, *Multivariate Stochastic Dynamic Model of Energy Commodities Under External Interventions.* Jan. 2014.
19. **Joint Mathematical meetings, American Mathematical Society**, San Diego, USA, *Non-linear Stochastic Energy Spot Prices Processes with Delayed Volatility* Jan 9-10 2013.

20. **1079th American Mathematical Society Meeting**, University of South Florida, Tampa, FL, USA, *Development of Stochastic model by Using Natural Gas Price Data.* March 10-11, 2012.

21. **RMMS - Recent Developments in Dynamic Equations on Time Scales**, Wyoming University, Laramie, Wyoming State, USA. June 8-19, 2009.

22. **Appalachian Association of Mathematics Teacher Education**, Marshall University, Huntington, WV, USA. January 2008.

23. **Ohio Mathematical Association of America**, Spring Meeting, Marietta College, Marietta, Ohio, USA. April 11-12, 2008.

24. **Fall meeting of the Mathematical Association of America**, Capital University, USA. *Riemann Hypothesis.* Oct 24-25, 2008.

25. **Fall Meeting of the Mathematical Association of America, (MAA)**, Wittenberg University, Springfield, Ohio State, USA, *Fermat's Last theorem using the properties of the solution of a Cubic Equation.* Oct 26-27, 2007.

26. **34th Annual Pi Mu Epsilon Student Conference**, Miami University, USA, *General Solution to all Real-roots Cubic Equations.* Sept 28-29, 2007.

Department and University Service: Augusta University

- **Recruitment and Public Relations Committee**, Augusta University. Fall 2022-Present.
- **Undergraduate Curriculum Committee**, Augusta University. Fall 2022-Present.
- **Faculty Development and Recognition Committee**, Augusta University. Fall 2022-Present.
- **Hiring Committee**, Augusta University. Fall 2021.
- **Member, Graduate Committee**, Augusta University. Fall 2021-Present.
- **Goldwater Scholarship advisor for CSM students**, Augusta University. Fall 2021-Present.
- **Statistics Track Committee**, Augusta University. Fall 2021.

Department and University Service: Marshall University

- **Advisor, Pi Mu Epsilon WV Beta Chapter**, Marshall University. Fall 2015 - Present.
  I am involved with coordinating the Pi Mu Epsilon Honor mathematic society for the department of Mathematics, Marshall chapter.
- **Member, Calculus Course Committee**, Marshall University. Spring 2016 - 2017.
  I am involved with the organization of all related calculus' courses as well as selection of textbook and designing of syllabus for calculus for the Math department at Marshall University.
- **Member, Calculus Course Committee**, Marshall University. Spring 2019 - 2020.
  I am involved with the organization of all related calculus' courses as well as selection of textbook and designing of syllabus for calculus for the Math department at Marshall University.

Teaching Duties

1. Contributing to the intellectual life of the university by engaging in high quality teaching
2. Contributing to the monitoring and enhancement of quality in teaching within the department
3. Teaching and examining undergraduate and graduate students
4. Developing innovative and attractive courses, shaping and influencing curriculum development and actively contributing to the review of courses in accordance with departmental strategy Actively contributing to departmental teaching administration

Teaching Experience

- **Augusta University**: Course Title and Description.
  - MATH 2011: Calculus & Analytic Geometry I
  - MATH 2012: Calculus & Analytic Geometry II
  - MATH 3020: Differential Equations
  - MATH 3250: Intro Stat & Data Analysis
  - MATH 6200: Applied PDE
  - CURS 2990: Undergraduate Research
- **Marshall University**: Course Title and Description.
  - MTH 640: Complex Analysis
  - MTH 616: Advanced Differential Equations
  - MTH 528: Advanced Calculus II
  - MTH 428: Advanced Calculus II
  - MTH 416: Advanced Differential Equations
  - MTH 360: Complex Variable
  - MTH 335: Differential Equations
  - MTH 231: Calculus with Analytic Geometry III
  - MTH 230: Calculus with Analytic Geometry II
  - MTH 229: Calculus with Analytic Geometry I (CT)
  - MTH 140: Applied Calculus
  - MTH 132: Pre-Calculus
  - MTH 130: College Algebra
  - MTH 127: College Algebra-Expanded
  - MTH 122: Plane trigonometry
  - STA 225: Introductory Statistics (CT)
- **University of South Florida**: Course Title and Description.
  - COP 4313: Symbolic Computation in Mathematics
  - MAC 3301: Bridge to Abstract Algebra
  - MAC 2302: Differential Equations
  - MAC 2311-2312: Calculus I, II and III
  - MAC 2241-2242: Life Science Calculus,
  - MAC 2233: Business Calculus
  - MAC 1147: Precalculus Algebra and Trigonometry
  - MAC 1106: Finite Mathematics
  - MAC 1105: College Algebra

Awards and Honors

- **John Marshall Scholar for Summer 2021**, Marshall University. Summer 2021.
- **Research Committee Funding**, Faculty Senate, Marshall University. Fall 2019.
- **Undergraduate Creative Discovery Summer Grant**, Marshall University. Spring 2018.
- **Research Committee Funding**, Faculty Senate, Marshall University. Spring 2017.
- **Graduate Research Assistantship**, U.S. Army Research Office, Math. Sciences. Summer 2012-14.
- **Tharp Endowed Award, College of Arts and Sciences, Univ. South Florida** Summer 2011-13.

- **Travel Grant AMS/MAA Joint Mathematical Meeting**, San Diego, California. Spring 2013.
- **Travel Grant AMS/MAA Joint Mathematical Meeting**, Univ. South Florida. Spring 2012.
- **Lamina Faye Maynard Queen Memorial Graduate Research Scholarship**, Marshall University. Summer 2009.
- **International Student Award, Marshall University**, Huntington, WV. Spring 2009.
- **Pi Mu Epsilon Best student of the month**, Marshall University, Huntington, WV. Spring 2009.
- **First Class graduating Mathematical Student**, Federal Univ. of Agriculture, Ogun, Nigeria. 2006.

Professional Services

- **Editorial Member - International Journal of Statistics and Probability**. 2018-Present.
- **Reviewer - PLOS One**. 2020-Present.
- **Reviewer - Heliyon**. 2020-Present.
- **Reviewer - International Journal of Biomathematics**. 2019-Present.
- **Reviewer - Journal of Computational and Mathematical Methods**. 2019-Present.
- **Reviewer - Journal of Advances in Mathematics and Computer Science**. 2018-Present.
- **Reviewer - Journal of Mathematical Biosciences**. 2018-Present.
- **Reviewer - Journal of Stochastic Analysis and Applications**. 2016-Present.
- **Reviewer - Journal of Nigerian Mathematical Society, (JNMS)**. 2016-Present.

Professional Organizations

1. Member, Society for Mathematical Biology. 2021-present.
2. Member, American Mathematical Society. 2010-present.
3. Member, Mathematical Association of America. 2007-present.
4. Member, Pi Mu Epsilon Mathematics Society. 2007-present.