Emmanuel Asante-Asamani

CONTACT INFORMATION

Clarkson University

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RESEARCH INTERESTS

- Multi-scale Modeling, Numerical Solution of Nonlinear PDEs, Machine Learning, Cell Mechanics and Signaling, Biological Pattern Formation and Recognition.

EDUCATION

Hunter College of CUNY, NY. 2017–2020

- Postdoc, Mathematical Biology
- *Project:* Development of a Mathematical Model for Bleb-Based Chemotaxis.
- Advisors: Derrick Brazill, John Loustau.

University of Wisconsin, Milwaukee, Milwaukee, WI 2012–2016

- Ph.D, Applied Mathematics
- *Doctoral Thesis:* An Exponential Time Differencing Scheme with a Real Distinct Poles Rational Function for Solving Advection-Diffusion-Reaction Equations.
- Advisor: Bruce Wade.

University of Wisconsin, Milwaukee, Milwaukee, WI 2010–2012

- M.Sc., Industrial Mathematics
- Thesis: *An Efficient Methodology for Learning Bayesian Networks.*
- Advisors: Peter Tonellato, Bruce Wade.

Kwame Nkrumah University of Science and Technology, Kumasi, Ghana 2005–2009

- B.Sc., Mathematics
- Project: *A MATLAB-based Educational Software for Teaching Numerical Methods in Undergraduate Institutions*

POSITIONS

Assistant Professor, Clarkson University, Potsdam, NY. 2020–Present

Research Assistant, Research Foundation of CUNY, NY 2017–2020

Adjunct Assistant Professor, Hunter College of CUNY, NY 2018–2020

Visiting Assistant Professor, Drake University, Des Moines, IA 2016–2017

Associate Lecturer, University of Wisconsin Milwaukee, Waukesha, WI 2015–2016

Graduate Teaching Assistant, University of Wisconsin Milwaukee, Milwaukee, WI 2010–2016

Graduate Research Assistant, University of Wisconsin Milwaukee, WI 2014–2016

GRANTS

- AMS Simons Travel Grant (2019-2023) $4000
- **DMS/NIGMS Initiative to support research at the interface of Biological and Mathematical Sciences**

  Title: Multiscale modeling of Notch signaling during long-range lateral inhibition.

  Role: Principal Investigator; **Amount:** $588,706; **Duration:** September 2023-Sep 2026;

FELLOWSHIPS

- MAA Project NExT Fellow 2023-2024

Submitted Proposals

1. **David A. Walsh's 67 Arts & Science Mini Conference Proposal:** Recent Advances in High Performance Computing for Simulating Computational Models. Amount Requested: $2000, Period: 1 year. Submitted March 2023.
2. **NSF Computational Math:** A Python solver for simulating generalized advection-diffusion-reaction equations. Amount Requested: $695,884, Period: 3 years. Submitted Dec 2022.
3. **Department of Defense (CDMRP):** Risk stratification of aggressive prostate cancer in men of African ancestry using web-based composite score. Amount Requested: $899,940.46, Period: 3 years.Submitted: August 2022
4. **Prostate Cancer Foundation:** Risk stratification and diagnosis of aggressive prostate cancer in men of African ancestry using web-based composite score. Amount Requested: $1,000,000, Period: 2 years.Submitted: June 2022
5. **NSF Computational Math:** An open source computational platform for simulating integer and fractional advection-diffusion-reaction equations. Amount Requested: $698,883, Period: 3 years. Submitted Dec 2021.
6. **NIH/NCI:** A copula-based probabilistic discriminative method for identifying and classifying prostate cancer. Amount Requested: $155,617, Period: 2 years.Submitted: Nov 2021

Publications

1. *William Ebo Annan,* ***E.O. Asante-Asamani****, Diana White.* Mathematical model for rod outer segment dynamics during retinal detachment and reattachment. *Submitted to Journal of Computational Biology and Chemistry* **(2023)**
2. ***E.O. Asante-Asamani****, Mackenzie Dalton, Derrick Brazill, Wanda Strychalski.* Actin and myosin dynamics in cellular blebs. *bioRxiv 2023.10.26.564082; doi:10.1101/2023.10.26.564082* **(2023)**
3. *Mohammad Partohaghigi,* ***E.O. Asante-Asamani****, Olaniyi Iyiola.* A Robust Numerical Scheme for Solving Riesz-Tempered Fractional Reaction-Diffusion Equations. *Under review in Journal of Applied and Computational Mathematics* **(2023)**
4. **E.O. Asante-Asamani** *Dinuka Sewandi De Silva, Gargi Pal, Michael Liss, Robin Leach, Olorunseun Ogunwobi.* Prediction of positive prostate biopsy is significantly improved in Black and Hispanic men when serum PVT1 exon 9 copy number is combined with serum prostate specific antigen [abstract]. *In: Proceedings of the AACR Special Conference: Advances in Prostate Cancer Research; 2023 Mar 15-18; Denver, Colorado. Philadelphia (PA): AACR; Cancer Res* ***(2023)****;83(11 Suppl):Abstract nr A064..*
5. **E.O. Asante-Asamani** *Daniel Grange, Devarshi Rawal, Zully Santiago, John Loustau, Derrick Brazill.* A role for myosin II clusters and membrane energy in cortex rupture for *Dictyostelium discoideum. PLoS ONE 17(4): e0265380.***(2022)**
6. *Mackenzie Dalton, Paul Dougall, Frederick Laud Amoah Darko, William, Annan,* **E.O. Asante-Asamani**, *Susan Bailey, James Greene, Diana White*, Modeling optimal reopening strategies for COVID-19 and its variants by keeping infections low and fixing testing capacity. *PLoS ONE 17(11): e0274407.***(2022)**
7. **E.O. Asante-Asamani** *Derrick Brazill, Wanda Strychalski.* Actin-myosin dynamics during bleb stabilization *Biophysical Journal*, 121 (3) Supplement 1**(2022)**118A.
8. **E.O. Asante-Asamani** *G. Pal, L. Liu, OO Ogunwobi.* Computation of a user-friendly composite score from three prostate cancer biomarkers [abstract]. *In: Proceedings of the American Association for Cancer Research Annual Meeting 2021, 2021 Apr 10-15 and May 17-21. Philadelphia (PA): AACR; Cancer Res* ***2021****; 81(13-Suppl):Abstract nr 2391.*
9. **E.O. Asante-Asamani** *G. Pal, L. Liu, OO Ogunwobi.* A new composite score with potential predictive value in prostate cancer. *Frontiers in Oncology*, 11**(2021)**783.
10. **E.O. Asante-Asamani** *Andreas Kleefeld, Bruce Wade.* A second order exponential time differencing scheme for nonlinear reaction-diffusion systems with dimensional splitting. *Journal of Computational Physics*, 415**(2020)**109490.

11. *O.S. Lyiola*, **E.O. Asante-Asamani** *K.M. Furati, A.Q.M. Khaliq, B.A. Wade.* Efficient time discretization scheme for nonlinear space fractional reaction-diffusion equations. *International Journal of Computer Mathematics*, 95(6-7) **(2018)** Pg. 1274-1291.

12. *O.S. Lyiola*, **E.O. Asante-Asamani** *B.A. Wade,*. A real distinct poles rational approximation of generalized Mittag-Leffler functions and their inverses: Applications to fractional calculus. *Journal of Computational and Applied Mathematics*, 330, **(2017)**, Pg. 307-317.

13. **E.O. Asante-Asamani** *Lei Wang and Zeyun Yu.* A cylindrical basis function for solving partial differential equations on manifolds. *In:* Procedia Computer Science, 80, **(2016)**, Pg. 233-244.

14. **E.O. Asante-Asamani** *Abdul Q.M. Khaliq and Bruce A. Wade,*. A real distinct poles exponential time differencing scheme for reaction-diffusion equations. *Journal of Computational and Applied Mathematics*, 299, **(2016)**,Pg 24-34.

15. **E.O. Asante-Asamani** *and Bruce A. Wade.* A Dimensional Splitting of ETD Schemes for Reaction-Diffusion Systems. *Communications in computational physics*, 19(5)**(2016)** pg. 1343-1356.

16. *E. Wornyoh, M. M. Rahman,F. Akresi*, **E.O. Asante-Asamani**. Nonlinear mechanics of wear at boundary lubricated interfaces. *In:* STLE Tribology Frontiers Conference, **(2015)**.

17. *E. Wornyoh, D. Patel*, **E.O. Asante-Asamani**, O.S. Iyiola. Deterministic friction based efficiency formalism for engine modeling. *In:* STLE Tribology Frontiers Conference, **(2015)**.

18. **E.O. Asante-Asamani**. An Efficient Methodology for Learning Bayesian Networks. *Theses and Dissertations*, Paper 69.http://dc.uwm.edu/etd/69, **(2012)**.

Conferences, Workshops, Colloquia

1. (Contributed Talk) A fourth-order exponential time differencing scheme with dimensional splitting for non-linear reaction-diffusion systems. *SIAM-NNP Annual Meeting* , Oct 20-22, 2023. Newark, NJ.

2. (Invited Talk) Actin and myosin dynamics in the cell cortex during confined bleb-based chemotaxis. *SIAM Conference on Applications of Dynamical Systems*, May 14-18, 2023. Portland, OR.

3. (Poster) Addition of serum PVT1 exons 4A, 4B and 9 copy numbers to PSA improves the prediction and stratification of prostate cancer in Blacks and Hispanics. *American Association of Cancer Research Annual Meeting*, April 14-19, 2023. Orlando, FL.

4. (Invited Talk), Predictive Modeling in Prostate Cancer- A Case Study of Using Math to Validate New Biomarkers. *Department of Biology, Hunter College of CUNY, Inga Richter Seminar Series*, March 2023, New York, NY.

5. (Invited Talk), Mathematical modeling of myosin dynamics in the cell cortex during confined bleb-based chemotaxis. *Department of Mathematics, Rochester Institute of Technology, Applied Mathematics Seminar*, March 2023, Rochester, NY.

6. (Talk), Serum PVT1 exon 9 copy number is a better predictor of positive prostate biopsy in Black and Hispanic men than serum prostate specific antigen *2nd Annual ConDUC Prostate Cancer Scientific Symposium, Clark Atlanta University*, November 2022, Atlanta, GA.

7. (Talk) , Mathematical modeling of actin and myosin dynamics in the cell cortex during confined bleb-based chemotaxis *Department of Mathematics, University of Louisiana Lafayette, Colloquium*, October 2022, Lafayette, LA.

8. (Talk) Actin-myosin dynamics during bleb stabilization, *SIAM Conference on Life Sciences*, July 2022, Pittsburgh, PA. & *ICMA-VII*, October 2022, Lafayette, LA.

9. (Poster) Actin-myosin dynamics during bleb stabilization,66^{th} *Biophysical Society Annual Meeting*, February 2022, San Francisco, CA.

10. (Talk) An exponential time differencing (ETD) scheme with a Real distinct poles rational approximation to the matrix exponential for semilinear evolution equations, *ICERM Topical Workshop: Holistic Design of Time Discretization Schemes*, January 2022, Providence, RI.

11. (Talk) An exponential time differencing with real distinct poles for simulating chemotaxis problems . 4^{th} *Annual Meeting of the SIAM Texas-Louisiana Section*, 2021, South Padre Island, TX.

12. (Talk) A hormone based thermodynamic model of weight regultion in humans. *Applied Mathematics Seminar, Hunter College of CUNY*, 2021, New York, NY.
13. (Talk) Dimensional Splitting with exponential time differencing schemes for reaction-diffusion systems. *SIAM CSE*, 2021, Virtual Conference
14. (Talk) A mathematical model for chemotaxis in D. discoideum cells *Colloquium, Case Western Reserve University*, 2019, Cleveland, OH.
15. (Talk) A bleb initiation model for chemotaxis points to a role for myosin II clustering in the formation of cortex gaps *International Dictyostelium Conference*, 2019, Ann Arbor, MI.
16. (Poster) A differential geometric procedure to predict bleb nucleation sites in *Dictyostelium discoideum Inaugural symposium on multiscale cell fate, UC Irvine*, 2018, Irvine, CA.
17. (Poster) A differential geometric procedure to predict bleb nucleation sites in *Dictyostelium discoideum SIAM Conference on Life Sciences*, 2018, Minneapolis, MN.
18. (Poster) A two phase approach for modeling sedimentation of pigments in liquid coating formulations. *SIAM conference on computational science and engineering*, 2017, Atlanta, GA.
19. (Poster) A meshfree method for numerical simulation of calcium dynamics in ventricular myocytes, *SIAM conference on computational science and engineering*, 2015, Salt Lake City, UT.
20. (Talk) A real distinct poles exponential time differencing scheme for nonlinear advection-diffusion-reaction systems, *Joint Mathematics Meeting*, 2015, San Antonio, TX.
21. (Talk) A cylindrical basis function for solving partial differential equations on manifolds, *SIAM Annual Meeting*, 2014, Chicago, IL.
22. (Talk) An efficient methodology for learning Bayesian Networks *Colloquium, Center for Biomedical Informatics, Harvard Medical School*, 2013, Cambridge, MA.
23. (Poster) An optimal Bayesian Network modeling approach in breast cancer risk prediction, *New England Science Symposium*, 2013, Cambridge, MA.
24. (Poster) A comparative assessment of greedy equivalence search and PC algorithm for learning Bayesian Networks in complex data sets, *Computational Science Symposium, Marquette University*, 2012, Milwaukee, WI.

Editorial Activities

1. **Guest Editor**, International Journal of Computer Mathematics, 2022-2023
2. **Reviewer**, Frontiers in Applied Mathematics and Statistics, 2019
3. **Reviewer**, International Journal of Computer Mathematics, 2019
4. **Reviewer**, Biophysical Journal, 2021
5. **Reviewer**, Journal of Applied Mathematics and Computing,2022
6. **Reviewer**, Computational and Mathematical Methods, 2021
7. **Reviewer**, Journal of Biological Systems, 2022
8. **Reviewer**, Frontiers in Oncology, 2023

Courses Taught

Clarkson University

- Nonlinear Partial Differential Equations (MA 550, Graduate), Classical Real Analysis (MA 522, Graduate), Classical Complex Analysis (MA 521, Graduate), Numerical Solutions to Differential Equations (MA 571, Graduate), Complex Analysis with Applications (MA 362, Undergraduate/graduate), Numerical Methods (MA 377, Undergraduate), Mathematical Modeling (MA 363, Undergraduate), Advanced Engineering Mathematics (MA 330, Undergraduate), Ordinary Differential Equations (MA 232, Undergraduate); Introduction to Numerical Methods (MA 277, Undergraduate).

Hunter College of CUNY

- Numerical Methods Using Mathematica (MATH 685, Graduate/Undergraduate); Ordinary Differential Equations (MATH 254, Undergraduate).

Drake University

- Complex Analysis (MATH 187, Undergraduate); Calculus I (MATH 50, Undergraduate), College Algebra (MATH 20, Undergraduate).

University of Wisconsin Milwaukee at Waukesha

- College Algebra with ALEKS (MATH 110, Undergraduate), Mathematics Tutorial (MATH 099, Undergraduate)

University of Wisconsin Milwaukee

- Differential Equations and Linear Algebra (MATH 321, Undergraduate), Algebraic Structures for Elementary School Teachers (MATH 276, Undergraduate), Calculus I, Trigonometry, Intermediate Algebra with ALEKS (MATH 105, Undergraduate), Beginning Algebra with ALEKS (MATH 095, Undergraduate)

Student Mentoring

PhD. Students

1. **Clarkson University**, *S.H. Dinuka Sewwandi (Advisor)*, A level set based formalism for modeling bleb-based chemotaxis. Planned completion 05/31/2024.
2. **Clarkson University**, *Wisdom Attipoe (Advisor)*, An Adaptive Time Stepping Exponential Time Differencing Scheme for Solving Stiff Advection Diffusion Reaction Equations. Proposal defense planned for Summer 2024.
3. **Clarkson University**, *William Ebo Annan (Co-Advisor)*, Modeling rod outer segment dynamics during retina detachment. Planned completion 05/31/2024.
    - Awarded best graduate poster presentation from Bioscience, Mathematics and Computer science department at Clarkson University RAPS symposium.
4. **Clarkson University**, *Mackenzie Dalton (Co-Advisor)*, Modeling the dynamics of β-cells during the onset of type-I diabetes. Proposal defense planned for 11/16/2023.

Master's Students

1. **Clarkson University**, *Mohammad Partohaghighi (Co-Advisor)*, An efficient second order method for solving generalized reaction diffusion equations, 05/2023.
2. **Clarkson University**, *Mackenzie Dalton (Advisor)*, Mathematical modeling of cell signaling during bleb-based chemotaxis, 05/2022
    - Winner of ACoP13 Communications Challenge
    - Winner of ACoP13 Mathematical and Computational Sciences Special Interest Group Poster Award(MCS SIG)
    - Boston QSP Summit 1st Place Poster Award
3. **Hunter College of CUNY**, *Bart Rosenzweig (Co-Advisor)*, The exact factorization equations for one and two level electron-nuclei systems, 2021.
4. **Hunter College of CUNY**, *Na Cai (Advisor)*, An exponential time differencing scheme with real distinct poles for simulating aggregation of *Dictyostelium discoideum*, 2020
5. **Hunter College of CUNY**, *Daniel Grange (Advisor)*, A computational platform for autonomous detection of blebs from microscopy images, 2020.
6. **Hunter College of CUNY**, *Say Park (Advisor)*, The role of cell geometry in bleb expansion, 2020.
7. **Hunter College of CUNY**, *Michael Barile (Advisor)*, The effect of cortical tension on bleb size and frequency in mechanically restrictive environments, 2019.

Undergraduate Students

1. **MBioTS REU 2023**, *Hannah Cho, Gabriella Suchers (Co-Mentor)*, Modeling filopodia induced activation of Notch receptors during long-range lateral inhibition in *Drosophila Melanogastar*.

- Won best presentation award at RAPS 2023 in the Biomedical/Biosciences, Environmental-Sciences, and Sustainability session.

2. **MBioTS REU 2022**, *Audrey Neighmond (Co-Mentor)*, Quantifying bristle cell patters in *Drosophila Melanogastar*.

3. **Hunter College of CUNY**, *Emily Movsumova & Jessica Resnik (Supervisor)* , The role of talA in bleb expansion, 2020-2022.

4. **Drake University**, *Charlote Orr (Supervisor)*, Simulating calcium signaling during excitation contraction coupling using exponential time differencing, 2016

High School Students

1. **Schreiber High School, Summer 2023** , *Anna Drewes (Supervisor)*, Python GUI for analyzing protrusion and retraction dynamics of cells during bleb-based chemotaxis.

University Service

Clarkson University

1. **Phd Thesis Committee:** Served on the thesis committee of three Ph.d students.
   - **Kalani Rubasinghe, Completed in Spring 2023** *Localized radial basis function collocation methods for data interpolation and for solving partial differential equations*
   - **Frederick Laud Amoah-Darko, Completed in Summer 2023** *Modeling microtubule dynamic instability: microtuble growth, shortening and pausing*
   - **Alissa Whiteley, Spring 2022 Proposal**
2. **Masters Thesis Committee:** Served on the thesis committee of the following Masters students.
   - **Tristan Ball, Mechanical Engineering, Spring 2023** *Linear Analysis of the Effect of Upwinding on Shock-Fitting Schemes*
3. **Computational Math Seminar** Co-organized a computational math seminar for graduate students in the Mathematics department. Spring 2023.
4. **HPC Workshop:** Organized a high performance computing workshop on shared memory programming with OpenMP at Clarkson, 2023.
5. **COMAP, 2022, 2023:** Trained undergraduate students to prepare for a national mathematical contests in modeling, Spring 2023.
6. **Graduate Committee** Member of the Department's Graduate Committee since 2022.
7. **Hiring Committee:** Served on the hiring committee for a postdoctoral research associate position in the Institute of STEM Education, Jan-Mar, 2022
8. **Teaching Effectiveness Working Group:** Served on a committee to develop a criteria for evaluating and documenting excellent teaching in mathematics, 2021
9. **Summer REU:** Key personnel on a summer REU to train undergraduates at the interface of mathematics and biology, 2022-2025.
10. **Review of Graduate Applications:** Reviewed graduate applications for Fall 2021 and Fall 2022 admission into the department of mathematics.

Hunter College of CUNY

1. **Graduate Seminar:** Organized an applied math graduate seminar at Hunter College (2017-2020).

Drake University

1. **Judge for Summer Research Symposium:** Served as a faculty judge for Drake Undergraduate Science Collaborative Institute Summer Research Conference.

Professional Service

1. **NSF proposal review panel:** Reviewing proposals submitted to the DMS/NIGMS Initiative to Support Research at the Interface of Biological and Mathematical Sciences. 12/04/2023-10/05/2023.
2. **Chair of Contributed Paper Session:** Served as Chair of the Numerical Analysis Contributed Paper Session at SIAM-NNP 2023.
3. **MATHFEST poster judge:** Served as a judge for undergraduate student posters during MATHFEST 2023.
4. **Mini Symposium chair:** Chaired a minisymposium (MS73) at SIAM conference on Computational Science and Engineering, March 2021.
5. **Special Session Organizer:** Co-organized a special session on exponential integrators and operator splitting methods for nonlinear evolution equations at the 4^{th} annual meeting of the SIAM Texas-Lousianna section in South Padre Island, Texas in November 2021.
6. **Co-organizer for virtual Bio Math Seminar:** Co-organized the virtual cold-place bio math seminar featuring prominent speakers from several universities across the nation. (https://docs.google.com/document/d/1KNmFNF6CM90_-CvCrz-h8-inGySflbRQV_Smx9nWPdE/edit).
7. **Industry Academic Collaboration:** Developed a computational platform for benchmark formulation of emulsion paint for Rust-Oleum Corporation in Northern Illinois, 2015. (https://uwm.edu/news/mathematicians-help-rust-oleum-paint-problem/.

Professional Memberships

1. Society of Industrial and Applied Mathematics.
2. American Mathematical Society.
3. Mathematical Association of America.
4. Biophysical Society.
5. Consortium of Mathematics and its Application.