

Zahmeeth S. Sakkaff

EDUCATION

Ph.D. in Computer Engineering, University of Nebraska – Lincoln (UNL), US	2014-2019
M.S. in Computer Science, University of Nebraska – Lincoln (UNL), US	2014-2016
M.Phil. in Computer Science, University of Peradeniya (UOP), LK	2006-2010
B.Sc. in Computer Science (major), and Chemistry (minor), The Open University of Sri Lanka, LK	2001-2005
Diploma in Computer Studies - Informatics Computer Training Centre, LK	1996-1997

KEY EXPERIENCE

- Around 5 years of teaching experience, covering disciplines like machine learning and AI, database, and big data
- 17+ years Computational Research Scientist experience in interdisciplinary and advanced computational methods
- 12+ years written and oral science communication experience including 15 peer-reviewed research articles, 5 grant applications, 9 distinguished awards, and more than 20 posters and presentations
- 17 year of programing experience using diverse languages including Python, Matlab, R, SQL, bash scripts, FORTRAN, Visual Basic, Visual C++, Pascal, and Prolog
- Project leadership experience from a \$250K interdisciplinary grant application and from lab manager position

COMPUTATIONAL RESEARCH EXPERIENCE

St. Bonaventure University (SBU), Department of Computer Science Jan 2024-presnet
Assistant Professor (tenure)

Argonne National Laboratory US Department of Energy, Data Science and Learning Division Sept 2019-Dec 2023
Postdoctoral Researcher, Current Research Supervisor: Christopher S Henry, Former Supervisor: James J. Davis

- Applying data science and machine learning expertise to develop models that integrate multiple sources of biological data to answer fundamental questions in microbiology
- Developing machine learning (ML) algorithms based on microbial nutrient utilization data to predict growth phenotypes from genotypes that provide insights into microbial interactions and behavior
- Enhancing phenotype predictions to discover and validate novel gene functions by comparing mechanistic models to machine learning-based models and reconciling divergence points
- Writing Python scripts that integrate laboratory equipment software including robots and plate readers to generate an AI-driven experimental pipeline capable of producing high-throughput growth phenotype data
- Coding using Matlab, R, Jupiter Notebook, Git repo, and Bash Scripts to load, clean, store and reduce data in preparation for ML algorithm development, and for statistical data visualization such as plots, heatmaps, and network diagrams
- Co-investigated/Coauthored a research grant aiming to self-directed laboratory capabilities to build an automated pipeline for the discovery and validation of novel metabolic pathways and was awarded \$250,000 of funding per year
- Collaborated on a DARPA funded research project within an interdisciplinary and multi-institution team of experts in microbial pathogenicity, data science, database management, microfluidics, biology, and chemistry. Internal collaboration with various Argonne teams such as Self Driven Lab (SDL), Systems Biology Knowledgebase (KBase), ModelSEED, and Bacterial and Viral Bioinformatics Resource Center (BV-BRC)
- Using Python for software development and Code Editors for predictive models, enabling submission to supercomputing resources for ultrafast processing and analysis of giga/tera/petabytes-scale datasets

University of Nebraska - Lincoln, Department of Computer Science and Engineering Jan. 2014 to Dec. 2019
Graduate Researcher and Teaching Assistant, Supervisor: Massimiliano Pierobon

- Planned and independently managed a project that used computational and bioinformatics techniques to apply telecommunications systems theory, specifically a transformative layer-by-layer abstraction approach, to quantitatively model biological information flow between and within cells
- Derived models and simulations to both qualitatively and quantitatively study information exchange among biological cells, and proposed synthetic biology design techniques to generate artificial communication systems in cells
- Applied models to quantitatively study and model how genetic mutations disrupt molecular information flow through the JAK-STAT signaling pathway using benign and cancer genomics high-throughput datasets
- Developed written and oral science communication skills through publication of 6 peer-reviewed research articles, a dissertation and a thesis (Won CSE Best Master's Thesis Award (2016) based on universal information and

communication-centric computational approach to quantify/estimate information flow in biological pathways for healthy and diseased human cells, along with presenting at prestigious international conferences such as SIAM 2019 where I earned the Best Poster Award

SOFTWARE EXPERIENCE

Coding Related Software: Coding languages such as Python* its related IDEs and text editors, MATLAB, Anaconda, Jupiter notebook, HTML, Batch Scripts, R, Visual C++, SQL, source control like Git and bitbucket, supercomputer related services, APIs controlling liquid handling robots, Prolog, Pascal, Visual Basic, Fortran, familiar with various operating systems, and cloud platform

Bioinformatics/Biological design tools: KBase, BV-BRC, and ModelSEED tools (Bioinformatics applications and data platform), GenoCAD (synthetic biology tool), iBioSim (genetic circuits tool), CellDesigner, and various related tool in the field

General Software: LaTeX Editor overleaf, Microsoft Excel, PowerPoint, and Word, Illustrator, CorelDRAW, Photoshop, Trello, and Slack, Teams, Zoom, Dropbox and Box, Google apps, Mail, Mendeley, and Endnote

Published Applications: Released publicly available online bioinformatic app - Run Flux Mutual Information Analysis app link: https://kbase.us/applist/apps/MutualInformationAnalysisModule/run_flux_mutual_information_analysis/release

ACADEMIC PUBLICATIONS

Journals

- Nanayakkara, A., and Sakka, Z., “Fixed Distance Neighbour Classifiers in Brain Computer Interface Systems,” Journal of the National Science Foundation of Sri Lanka 40(3), 2012
- Catlett, J., Carr, S., Cashman, M., Smith, M., Walter, M., Sakka, Z., Kelley, C., Pierobon, M., Cohen M., and Buan, N., “Metabolic syntrophy between human symbionts Bacteroides and *Methanobrevibacter*”, Microbiology Spectrum 10 (3), e01067-22, 2022

Conference Proceedings

- Sakka, Z., Buge, D.U., and Pierobon, M., “Applying molecular communication theory to multiscale integrated models of biological pathways”. In Proceedings of the 6th ACM International Conference on Nanoscale Computing and Communication, 25–27 September 2019
- Sakka, Z., Immaneni, A., Pierobon, M., “Applying molecular communication theory to estimate information loss in cell signal transduction: An approach based on cancer transcriptomics”. In Proceedings of the 5th ACM/IEEE International Conference on Nanoscale Computing and Communication, (p.16), 5–7 September 2018
- Sakka, Z., Immaneni, A., Pierobon, M., “Estimating the molecular information through cell signal transduction pathways”. In Proceedings of the IEEE 19th International workshop on Signal Processing Advances in Wireless Communications (SPAWC) (pp. 1-5), 25–28 June 2018
- Sakka, Z., Catlett, J.L., Cashman, M., Pierobon, M., Buan, N.R., Cohen, M.B., and Kelley, C., “End-to-end molecular communication channels in cell metabolism: An Information theoretic study”, In Proceedings of the 4th ACM International Conference on Nanoscale Computing and Communication (p. 21), 2017 (**best paper award in the area of molecular communication**)
- Cashman, M., Catlett, J.L., Cohen, M.B., Buan N.R., Sakka, Z., Pierobon, M., and Kelley, C., “BioSIMP: Using software testing Techniques for sampling and inference in biological organisms”. In Proceedings of the 12th International Workshop on Software Engineering for Science IEEE Press (pp. 2–8), 2017
- Pierobon, M.*, Sakka, Z.*, Catlett, J.L., and Buan, N.R., “Mutual information upper bound of molecular communication based on cell metabolism”. In Proceedings of Signal Processing Advances in Wireless Communications (SPAWC), IEEE 17th International Workshop on IEEE (pp. 1–6), 2016, *co-first authors
- Sakka, Z., and Nanayakkara, A., “Determination of optimal frequency ranges using common spatial pattern images”. In Proceedings of Industrial and Information Systems (ICIIS), 8th IEEE International Conference on. IEEE (pp. 133–138), 2013
- Sakka, Z., and Nanayakkara, A., “New set of cognitive tasks in EEG based Brain Computer Interface”. Information and Automation for Sustainability (ICIAFs), 5th International Conference on IEEE (pp. 70–74, 2010 (**best paper award in the area of machine learning track of intelligent machines and man-machine co-existence**))

- Nanayakkara, A.*, and Sakkaiff, Z.*, “Automated dimensionality reduction in EEG based Brain Computer Interface”. In Proceedings of Information and Automation for Sustainability (ICIAFs). 5th International Conference on IEEE (pp. 87–90), 2010, *co-first authors
- Sakkaiff, Z., and Nanayakkara, A., “Removal of ocular artifacts from EEG signals in brain computer interface”. In Proceedings of the Technical Sessions (Vol. 24, pp. 51–57), 2008

Presented abstracts, posters, and talks

- Looking Beyond Geometric and Probability-Based Distances for Multiclass Classification in Network Communication Systems (poster abstract accepted - October 25, 2024). Venkat Sai Suman Lamba Karanam, University of Nebraska, Lincoln, U.S.; Zahmeeth S. Sakkaiff, St. Bonaventure University, U.S., [2024 SIAM Conference on Mathematics of Data Science](#)
- Sakkaiff Z., Gupta, N., Weisenhorn, P., N., Edirisinghe, J. N., Aaron, A. B., Davis, J. J., and Henry, C. S., Improving Phenotype Prediction and Revealing Mechanistic Insights by Combining Machine Learning and Metabolic Modeling, abstract accepted at the American Society of Microbiology (ASM) Microbe 2023, June 15–19, 2023, Houston TX (Rapid Fire and Poster Presentation)
- Gupta, N., Sakkaiff Z., Casey S., Weinberg, B., Aaron, A. B., Antonopoulos, D. A., Davis, J. J., Henry, C. S., and Weisenhorn, P., N., Improving E.coli metabolic and machine learning models utilizing robotic pipeline, abstract accepted at the American Society of Microbiology (ASM) Microbe 2023, June 15–19, 2023, Houston TX (Poster Presentation)
- Edirisinghe, J. N., Borton, M. A., Shaffer, M., Sakkaiff, Z., Liu, F., Flynn, R. M., Davoudi, S., Guatney, L. S., Singleton, D., Lie, T., Stegen, J. C., Crump, B. C., Davis, J. J., Banaei-Kashani, F., Wrighton, K., Henry, C. S., and Miller, C. S., Scalable Computational Tools for Inference of Protein Annotation and Metabolic Models in Microbial Communities Genomic Science Program (GSP), U.S. Department of Energy Office of Biological and Environmental Research, Feb. 2022 (Poster Presentation)
- Sakkaiff, Z., Gupta, N., Pierobon, M., and Henry, C.S., Information- and Communication-Centric Approach in Cell Metabolism, Metabolic Pathway Analysis (MPA): The Frontiers 2021, Aug. 2021 (Poster Presentation)
- Sakkaiff, Z., Weisenhorn, P., Henry, C.S., and Davis, J.J., Machine Learning-Based Feature Extraction to Characterize the Behavior of Organisms in Vitro, Annual Postdoctoral Research and Career Symposium, Nov. 2020 (Poster Presentation)
- Sakkaiff, Z., Catlett, J.L., Cashman, Immaneni, A., M., Buan, N.R., Cohen, M.B., and M., Pierobon, Molecular Communication Based on Cell Metabolism: A Case Study with Human Gut Microbes, Mathematical Models in Biology: from Information Theory to Thermodynamics (Online), July 28, 2020 (Poster Presentation)
- Gupta, N., Skinner, K., Sakkaiff, Z., and Henry, C.S., “Complex bacterial communities involved in polyaromatic compound degradation”, abstract submitted at the American Society of Microbiology (ASM) Microbe 2020, June 18–22, 2020, Chicago (Poster Presentation)
- Sakkaiff, Z., Henry, C.S., and Pierobon, M., "Information and Communication-Centric: Molecular Communication in Biological Cells", 2019 Postdoctoral Research and Career Symposium, Nov. 2019 (Poster Presentation)
- Sakkaiff, Z., Bige, D.U., and Pierobon, M., “Applying Molecular Communication Theory to Multi-Scale Integrated Models of Biological Pathways. In Proceedings of the 6th ACM International Conference on Nanoscale Computing and Communication, September 25–27, 2019 (Poster presented by Bige, D.U.)
- Sakkaiff, Z*, Gupta, N*, Pierobon, M., and Henry, C.S., “Computational Information Theoretic Study on Microbial Communities”, abstract presented at the American Society of Microbiology (ASM) Microbe 2019, June 20–24, 2019, at the Moscone Center in San Francisco (*Both authors contributed equally to this work) (Abstract and Poster Presentation)
- Sakkaiff, Z., Gupta, N., Pierobon, M., and Henry, C.S., “Molecular Communication in Cell Metabolism Communication & Information-centric Computational Tool at KBase”, 2019 SIAM Computational Science and Engineering Conference - SIAM CSE19 BE, at Spokane, Feb. 2019 (Poster Presentation) (2019 best poster award)
- Sakkaiff, Z., “Molecular Communication in Biological Cells: Foundational Study and Development of Computational Techniques”, presented Ph.D. dissertation work at Argonne Computing Coffee Hour in Viz Lab on Aug. 15, 2018, ANL
- Sakkaiff, Z., “KBase: An Integrated System Biology Knowledgebase for Predictive Biological and Environmental research”, presented on first day on behalf of Dr. Henry, C.S, at international Society for Computational Biology and Bioinformatics (iSCB), Chicago, July 6–10, 2018

- Sakkaiff, Z., “Molecular Communication in Biological Cells: Foundational Study and Development of Computational Techniques”, Doctoral dissertation at digitalcommons.unl.edu/ (not published)
- Sakkaiff, Z., “Characterization of Molecular Communication Based on Cell Metabolism Through Mutual Information and Flux Balance Analysis”, Master’s thesis at digitalcommons.unl.edu/ (published), University of Nebraska-Lincoln, 2016 (2016 Best Master’s thesis award, CSE dept-UNL)
- Sakkaiff, Z., “Brain Computer Interface (BCI) Based on Electroencephalographic (EEG) Patterns due to new Cognitive Tasks”, M.Phil. Thesis at Digital Library @ University of Peradeniya (July 18, 2012)
- Sakkaiff, Z., and Pierobon, M., “Realization of Telecommunication Systems via Engineered Cell-to-Cell Communication with Synthetic Biology Strategies, CRA-Women Grad Cohort Workshop 2015, San Francisco, CA, April 2015 (Graduate Student Poster Presentation)
- Catlett, J.L., Smith, M., Sakkaiff, Z., Walter, M., Pierobon, M., and Buan, N.R., “Interspecies electron transfer within the human gut”, UNL Redox Biology Retreat, Omaha, NE (also, Div. Of Molecular and Cellular Bioscience (MCB)-1449014); March 2015 (Graduate Student Poster Presentation)
- Catlett, J.L., Smith, M., Sakkaiff, Z., Walter, M., Pierobon, M., and Buan, N.R., “Interspecies electron transfer within the human gut”, 2015 American Society for Microbiology Missouri Valley Branch Meeting, Lincoln, NE (also, MCB-1449014); March 2015 (Graduate Student Talk)
- Catlett, J.L., Smith, M., Sakkaiff, Z., Walter, M., Pierobon, M., and Buan, N.R., “Interspecies communications within the human gut”, UNL Research Fair, Lincoln, NE (also, MCB-1449014); April 2015 (Graduate Student Electronic Poster Presentation)
- Pavlovikj, N., Cashman, M., Dibbern, B., Sakkaiff, Z., Rawal, S., and Acharya, U., Pathfinders: Nebraska Women in Technology, Grace Hopper Celebration of Women in Computing, Oct. 19, 2016 (Poster Presentation)

ACADEMIC TEACHING

- Teaching at St. Bonaventure, Spring 2024: CS-243 Database and Big Data; CSL-243 (CS-243 Database and Big Data Lab), CS-258 Machine Learning; CSL-258 (CS-258 Machine Learning Lab)
Fall 2024: CS-131 Object Oriented Programming; CSL-131 (Object Oriented Programming Lab), CS-346 Operating Systems; CSL-346 (Operating Systems Lab), CS-401 Research Methods
- **Undergraduate Mentor** - WetCoDe UNL senior design project 2018 (A Software Framework for Wet Communication System Design Automation), Fall 2018–Fall 2019 (<http://wetcode.unl.edu/>) Winning team: Gold Award (<https://newsroom.unl.edu/announce/cse/9559/56587>)
- **Graduate and Undergraduate Teaching Assistant** – UNL course: CSCE 840/440 - Numerical Analysis, Fall 2017
- **Teaching Assistant** – UNL course: CSCE 896/496 - Molecular and Nanoscale Communication, CSE Department. Helped on the half-semester-long projects, focused on the design and analysis of a diffusion-based molecular communication system using COMSOL and multiphysics, Spring 2016–Spring 2018
- **Undergraduate Teaching Assistant and Visiting Academic** - Department of Mathematics and Computer Science and Department of Chemistry, Faculty of Natural Science, The Open University of Sri Lanka, 2003–2006
 - ♦ Taught and carried out all the laboratory practicals in Programming Perspectives and Languages, Introduction to Information Systems, Computer Studies, Data Structures and Algorithms, Deductive Reasoning and Prolog for Artificial Intelligence, Automata theory, Basic Principles of Chemistry, Inorganic, Analytical, Organic (I) and Industrial Chemistry

LEADERSHIP, PROFESSIONAL ACTIVITIES AND SERVICE EXPERIENCE

Organization of Workshops and Symposia

- ♦ ACM NanoCom **session chair**: Molecular Communication and Computing (II), 2020
- ♦ Technical Programs **co-lead**: 2020 Postdoctoral Research and Career Symposium Organizing Committee
- ♦ Web/Social Media **co-chair** for 5th ACM/IEEE NanoCom 2018, University of Iceland, in Reykjavik, Iceland
- **President**: Association for Woman in Science (AWIS)-Chicago Area Chapter (AWIS-CAC) – (Aug 22– May 24)
 - ♦ AWIS Chicago – Masters of Mentorship Award 2023
 - ♦ AWIS Shooting Star Award for Mentoring 2022
- **Moderator**: on the occasion of the International Day of Women and Girls in Science, the Office for Science and Technology of the French Embassy, in co-partnership with the International House – Global Voices program at University of Chicago, organized a roundtable on the topic of Voice of Scientists: Woman in Science, 02/17/2023
- **Review editor**: Editorial Board of Non-Conventional Communications and Networks (specialty section of Frontiers in Communications and Networks) – Aug. 2020 - to date

- **Editorial board member:** Journal of Nano Communication Networks (NanoComNet) at Elsevier; took the Editorial Manager training – Nov. 2019 - to date
- **Panelist presenter:** "Computing the future": WIST (Women in Science and Technology) 2021 SCSW (Science Career in Search of Women) – ANL, (2021-2023)
- **Postdoctoral liaison:** Postdoctoral Society of ANL (PSA) - 2020–2021
- **Educational volunteer:**
 - ♦ Argonne STEM Chats program, Educational Programs and Outreach – ANL 2021
 - ♦ Virtual presentation on career path, what a computational biologist does; concluded with Q & A for Chicago Public Schools Computer Science Seminar for high school students – STEM outreach – ANL, Oct. 2020
- **Mentor:**
 - ♦ Faculty mentor: High school student research program – summer 2024 at SBU
 - ♦ Mentor at Calculated Genius Inc. (<https://www.calculatedgenius.org>), Oct. 2023 – Present
 - ♦ Mentor at Argonne ACT-SO Student Research Program Mentor
 - Mentee: Delia Akyea, Title: Data comparison study: Gene therapy and bone repair, Oct. 2021 – July 2022
 - Mentee: Wesley Akyea (Oct. 2022 – July 2023): Improving Hospital Infection Control Techniques on Infectious Disease
 - Mentee: Brandon Mann (Oct. 2023 – July 2024): Title: Assessing the Effects of Environmental Factors on Axolotl Growth and Development
 - ♦ Mentor, *SIAM*, for Ph.D. students, 2021
 - ♦ Mentor for CSE – UNL at Peer Mentor Program and member of Peer Mentor Board at CSE Student Advisory Board, Fall 2018–2019
 - ♦ Mentor, *Hour of Code*, 2015, 2016, and 2018
- **Judge:**
 - ♦ CyberForce Competition Scoring Assistant team, ANL, 2021
 - ♦ ACM program at University of Nebraska – Lincoln, 2015, 2016, and 2018
- **Volunteer recruiter:** maintained the Grace Hopper Tracker for graduate internship at vGHC21, ANL booth, 2021
- **Reviewer:**
 - ♦ Committee member and reviewer at GHC 2020 Data Science track, 2020
 - ♦ IEEE 19th SPAWC 2018 in Biological Communications and Signal Processing Track, 2018
 - ♦ IEEE Transactions on Communications, 2017 and 2018
 - ♦ IEEE GLOBECOM 2017 in Convolutional Neural Network for visual track, 2017
 - ♦ IEEE ICC 2017 SAC Symposium Molecular, Biological, and Multi-Scale Communications Track, 2017
 - ♦ IEEE International Conference Reviewer: 17th and 16th E-health Networking, Application and Services (HealthCom) Conferences; reviewed bioscience and computer science interdisciplinary manuscripts, 2014–2015
- **MBiTe lab manager**, CSE, UNL, 2016–2019
- **Graduate student representative** for Department Curriculum Committee, 2016-2017 – CSE, UNL
- **Active member** of ACM-W chapter projects (e.g., ACM–W project titled “NE Women in Technology, “Pathfinders: Nebraska Women in Technology,” 2014 – present
- **Selected Membership**
 - ♦ Institutional Membership: Association for Computing Machinery: 2160246 (Exp. February 28, 2025)
 - ♦ Membership: American Society for Microbiology Member ID: 200108559
 - ♦ Membership: AWIS ANL institutional membership number: 2485
 - ♦ Membership: Society for Industrial and Applied Mathematics (SIAM) – Membership No: 02087506
 - ♦ Membership: International Society for Computational Biology ISCB – 2018 (Membership ID: 3173), 2022(Membership ID: 31739)
 - ♦ Membership: Advancing Computing as a Science & Profession (ACM Membership No.: 2896865)

HONORS AND AWARDS

- Best Poster Award, “Molecular Communication in Cell Metabolism Communication & Information-Centric Computational Tool in KBase.” Society for Industrial and Applied Mathematics (SIAM) conference on Computational Science and Engineering, 2019
- Dean’s Fellowship for outstanding academic performance and scholarly potential -- Graduate Studies, UNL, 2018–2019 ([Press](#)) Awarded: \$5000
- Milton Mohr Graduate Fellowship award -- College of Engineering, UNL, 2018–2019 ([Press](#))
- Outstanding Graduate Student Research Award - Department of CSE, UNL, 2017–2018 ([Press](#))

- 2017 Best Paper Award, “End-to-End Molecular Communication Channels in Cell Metabolism: An Information Theoretic Study,” 4th ACM International Conference on Nanoscale Computing and Communication (NanoCom 2017) ([Press](#))
- 2016–2017 Outstanding Master’s Thesis Award - Department of CSE, UNL ([Press](#))
- Ph.D. dissertation (2020) and M.S. thesis (2017) -- nominated by the CSE Department at the UNL to Graduate School for Folsom Distinguished Doctoral Dissertation Award and Master’s Thesis Award
- Best Student Paper Award in the track of Intelligent Machines and Man-machine Co- existence” 5th Int. IEEE Conf. ICIAFs., 2010
- Bucky Ball Awards for Excellence in Organic Chemistry (2002/2003) and in Industrial Chemistry, (2003/2004) – Department of Chemistry, The Open University of Sri Lanka
- Recipient of 5 travel and financial support awards
 - ♦ Recipient for full funding to attend the SIAM 2019 Computational Science and Engineering (CSE19) conference Broader Engagement program, Washington (Feb. 25, 2019)
 - ♦ Full fund is awarded to attend Grace Hopper Celebration of Women in Computing Houston, Texas (2015 and 2016), vGHC (2021 sponsored by ANL)
 - ♦ Full fund is awarded to attend Attended CRA-W workshop (2014, 2015, and 2016)
 - ♦ National Science Foundation Student Travel Grant - ACM NanoCom (2018, 2017)
 - ♦ UNL College of Engineering Graduate Student Conference Travel Grant (2018, 2017)