Joseph Wakim, PhD

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Summary

Driven and innovative computational biologist with expertise in data science and artificial intelligence. Interdisciplinary scientist with strong foundations in chemical engineering, biophysics, and structural biology. Advanced programmer with experience leading the development of specialized scientific software to promote research goals. Passionate educator and mentor with 4+ years of experience designing and teaching applied machine learning curricula to diverse audiences.

Education

Stanford University   **Stanford, CA**

PhD, Chemical Engineering (GPA: 4.12)	09/2019 - 09/2024
PhD Minor, Biomedical Data Science	09/2021 - 09/2024
MS, Chemical Engineering	09/2019 - 09/2021

University of Massachusetts Lowell   **Lowell, MA**

BSE, Chemical Engineering, Biological Concentration (GPA: 4.0)	09/2015 - 05/2019
BS, Mathematics, Business Applications Option	09/2015 - 05/2019
Minor, Biomedical Engineering	09/2015 - 05/2019

Research Experience

Lawrence Livermore National Laboratory   **Livermore, CA**

Postdoctoral Researcher (Biomolecular Design and Development Group)   09/2024 - Present

- Developed a novel framework for scoring predicted protein-drug interactions using protein language models
- Prepared datasets linking DNA and protein sequences to functional outcomes using public biomedical databases
- Fine-tuned and evaluated ensembles of biological LLMs for applications pertaining to public health and biosecurity
- Participated in seven research proposals as lead or co-investigator, submitted across internal and external programs
- Hired, managed, and mentored three summer interns as part of the LLNL Data Science Summer Institute

Spakowitz Laboratory   **Stanford, CA**

Graduate Research Assistant   03/2020 - 09/2024

- Led development of a novel chromatin simulator based on principles in polymer physics and statistical mechanics
- Derived analytical theory governing the spatial organization of confined semiflexible polymers like DNA
- Trained AI models to predict relationships between physical parameters, epigenetic factors, and chromatin structure

Orbey Lab   **Lowell, MA**

Undergraduate Research Assistant   12/2018 - 06/2019

- Designed and evaluated passive microfluidic cell separators and mixers using finite element modeling
- Validated performance of optimized microfluidic devices using microsphere flow experiments

Industry Experience

Sarepta Therapeutics   **Andover, MA**

Process and Controls Engineer Intern   Summer 2019

- Identified critical quality attributes (CQAs) of a commercial drug product based on batch records
- Correlated process parameters and product quality to improve manufacturing protocols

Neo-Advent Technologies   **Littleton, MA**

Lead Technician   Summers 2017, 2018

- Perform quality-by-design experiments to optimize formulation for a liposomal drug product
- Characterized CQAs of drug products by spectroscopy and toxicity profiling

Teaching

Harnessing the Power of AI/ML to Address New Engineering Challenges — Santa Clara, CA
Teaching Assistant & Co-Instructor, Stanford Center for Professional Development — Springs 2023, 2024

- Developed 30+ examples of machine learning applications in science and engineering
- Presented lectures and consulted on course projects for 80+ scientists/engineers at Applied Materials

R for Data Science — Stanford, CA
Teaching Assistant, Stanford Medicine — Summers 2023, 2024

- Developed and presented examples of R programming for analysis of biomedical datasets
- Supported four week-long short-courses with diverse audiences from broad technical backgrounds

Data Science and Machine Learning Approaches in Chemical and Materials Engineering — Stanford, CA
Teaching Assistant, Stanford Engineering — Springs 2021, 2022

- Supported development of a new course introducing fundamentals and applications of machine learning to engineers
- Refined presentation and mentorship skills while lecturing, leading discussions, and hosting office hours

Publications

Wakim, JG; Spakowitz, AJ. Physical Models Reveal Indirect Reader-Protein Interactions that Facilitate Epigenetic Crosstalk. PNAS, In press.

Wakim, JG; Spakowitz, AJ. Model of Euchromatin Clustering Resulting from Local Nucleosome Interactions. PNAS, 2024, 121 (26), e2317911121.

Wakim, JG; Sandholtz, SH; Spakowitz, AJ. Impact of Chromosomal Organization on Epigenetic Drift and Domain Stability Revealed by Physics-Based Simulations. Biophys J, 2021, 120 (22), 4932–4943.

Rivnay, B; **Wakim, JG**; Avery, K; Petrochenko, P; Myung, JH; Kozak, D; Yoon, S; Landrau, N; Nivorozhkin, A. Critical Process Parameters in Manufacturing of Liposomal Formulations of Amphotericin B. Int J Pharm, 2019, 565, 447–457.

De Jesús Vega, M; **Wakim, JG**; Orbey, N; Barry, C. Numerical Evaluation and Experimental Validation of Cross-Flow Microfiltration Device Design. Biomed Microdevices, 2019, 21 (1), 21.

Select Presentations

"Artificial Intelligence for Small Data." Short-Course at Lawrence Livermore National Laboratory in Livermore, CA. June-July 2025.

"Physical Modeling of Nucleosome Clustering in Euchromatin Resulting from Interactions Between Epigenetic Reader Proteins." Talk at the Northwestern University Center for Physical Genomics and Engineering (CPGE) Symposium in Chicago, IL. April 2024.

"Model of Euchromatin Clustering Resulting from Local Nucleosome Interactions." Talk at the American Physical Society (APS) 2024 March Meeting in Minneapolis, MN. March 2024.

"Physics-Based Modeling of Chromatin Organization and Epigenetic Stability." Poster at the Genome Architecture Meeting in Sofia, Bulgaria. June 2023.

"Epigenetic Patterns Affecting Chromosomal Stability Revealed by Physics-Based Simulation." Talk at the American Institute of Chemical Engineers (AIChE) Annual Meeting in Phoenix, AZ. November 2022.

"Evaluating Epigenetic Domain Stability by Physics-Based Simulation." Poster at the Genomic Architecture Meeting in Boston, MA. July 2022.

Select Awards

- LLNL Computing Directorate Notable Achievement Award (2025)
- Centennial Teaching Assistant Award (2023)
- Tau Beta Pi Fellowship (2021)
- Outstanding Teaching Assistant Award (2021)
- NSF GRFP Honorable Mention (2020)
- UMass Lowell Trustee's Key (2019)
- UMass Lowell Chancellor's Medal for Distinguished Academic Achievement (2019)
- UMass Lowell Francis College of Engineering Dean's Medal (2019)
- Tau Beta Pi Scholarship (2018-19)
- Commonwealth Scholarship (2015-19)