EMRE R. ALCA

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EDUCATION

University of Toronto *September 2019 - November 2023*
H.B.Sc. Physics Major & Cognitive Science Major with Distinction
Student Representative for the University College Curriculum Committee

TECHNICAL STRENGTHS

Math & Physics	Stochastic Processes, Thermodynamics, Graph Theory, Neural Networks, Dynamical Systems & Chaos
Programming Languages	Python, Java, JavaScript,
Software	NumPy, SciPy, Git, Tensorflow, JAX, Excel
Design	LaTeX, Illustrator, Photoshop, Fusion360,

EXPERIENCE

Associate of Systems Biology, Harvard Medical School Boston, MA.
Supervisor: Prof. Jeremy Gunawardena *January 2024 - Present*

· Proved new theorems in graph theory on topologies specific to gene regulation and molecular information processing.
· Developed new methods for numerical calculation of the transient quantities of stochastic processes (steady state and splitting probabilities, moments of conditional and unconditional first-passage-times).
· Supervised undergraduate student projects.

Visiting Research Student, California Institute of Technology Pasadena, CA.
Supervisor: Prof. Erik Winfree *May 2023 - August 2023*

· Performed novel research on relationships between neural computation (Hopfield Networks) and highly multi-component liquid-liquid phase separation, investigating the physics underlying the formation of biomolecular condensates.
· Developed numerical simulations by integration of nonlinear partial differential equations (Cahn-Hilliard), utilizing spectral differentiation methods to calculate spacial derivatives.

Research Assistant, PI: Prof. Alan Aspuru-Guzik Toronto, On.
Departments of Computer Science and Chemistry, University of Toronto *November 2020 - February 2022*

· Developed foundational software for an automated laboratory in materials science. This software integrated multiple proprietary robots into a single interoperable python package.
· Developed autonomous (closed-loop) experimental workflows using machine learning for experimental recommendations (Bayesian optimization across categorical variables).
· Managed undergraduate students developing software for the lab.

PUBLICATIONS

Seifrid, M., Strieth-Kalthoff, F., Haddadnia, M., Wu, T. C., **Alca, E.**, Bodo, L., ... & Aspuru-Guzik, A. (2024). Chemspyd: an open-source python interface for Chemspeed robotic chemistry and materials platforms. Digital Discovery.