Rajiv Nagipogu

Ph.D. Candidate in Computer Science
Duke University

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Education

PhD in Computer Science 2021-Present
(in progress) Duke University (Expected Fall '26)
Thesis: Adaptive Molecular Computing Systems
Advisor: John Reif

Bachelors in Computer Science 2013-2017
Indian Institute of Technology, Madras
GPA: 8.25/10
Thesis: A Webserver Unikernel in Rust (featured in Rust newsletter)
Advisor: Chester Rebeiro

Current Research

- **Neural CRNs:** Instead of replicating traditional neural networks in chemistry, we developed an analog neural network implementation that is synergistic with chemical kinetics hardware. [paper]
- **An Improved shadow cancellation methodology.** We showed that through coarse-grained control of kinetics, shadow cancellation could enable robust leak elimination in autocatalytic DNA circuits using a catalytic shadow circuit. [paper]

Peer-reviewed Journal Publications

[α]: author order according to contribution [†]: equal contribution

[α] Nagipogu, R.T., & Reif, J.H. (2024). Neural CRNs: A Natural Implementation of Learning in Chemical Reaction Networks. `arXiv:2409.00034`. (**In review**)

[α] Nagipogu, R.T. and Reif, J.H., (2024). Leak-resilient enzyme-free nucleic acid dynamical systems through shadow cancellation. Journal of the Royal Society Interface, 21(215), p.20240053.

[α] Nagipogu, R.T., Fu, D. and Reif, J.H., (2023). A survey on molecular-scale learning systems with relevance to DNA computing. Nanoscale, 15(17), pp.7676-7694.

Khanuja, S., Bansal, D., ..., **Nagipogu, R.T.**, et al. (2021). MuRIL: Multilingual Representations for Indian Languages. `arXiv:2103.10730`

Labhishetty S.[†], Nagipogu, R.[†], Siddiqa, A., et al. (2017). WikiSeeAlso: Suggesting tangentially related concepts to Wikipedia articles. *MIKE*, pp. 274-286.

Academic Presentations

Posters:

Nagipogu, R.T. and Reif, J.H., Leak-resilient nucleic acid dynamical systems through an improved shadow cancellation strategy. DNA 2024.

Skills

Laboratory: Gel electrophoresis, DNA strand displacement, PCR, Atomic Force Microscopy (theory)
Programming: Python, C++, Julia, Java, Peppercorn
Machine Learning: PyTorch, TensorFlow
Course Work: Molecular Assembly and Computation, Introduction to Nanoscience, Nanobiomechanics
Miscellaneous: Competitive Programming, Developing Chrome Plugins, and Web applications

Teaching

Teaching Assistant — Molecular Assembly and Computation
COMPSCI 590D Spring 2024 at Duke University, Instructor: John Reif.
Prepared the problem sets and assisted in slide preparation.

Teaching Assistant — History of Computing, Cryptography, and Robotic Devices
COMPSCI 093 Fall 2023 at Duke University, Instructor: John Reif.
Prepared the problem sets.

Teaching Assistant — Introduction to Machine Learning
COMPSCI 371 Fall 2022 at Duke University, Instructor: Carlo Tomasi.
Assisted in the preparation of problem sets.

Teaching Assistant — Advanced Natural Language Processing
COMPSCI 590.03 Spring 2022 at Duke University, Instructor: Bhuwan Dhingra.

Employment History

Research Intern Jun 2024 - Aug 2024
Domus Diagnostics Inc. | *Mentor*: Dr. Xin Song
◦ Developed a novel Python-based web application for an EXPAR-based point-of-care diagnostics device to automate the primer design.

Research Engineer 2020-2021
Google Research (via acquisition) | *Mentor:* Dr. Partha Talukdar
◦ Finetuned and evaluated the efficacy of in-house LLMs on complex reasoning tasks.

Machine Learning Engineer 2018-2020
Kenome.io | *Mentor:* Dr. Partha Talukdar
◦ Applied LLMs and Knowledge Graphs towards enterprise NLP applications.

Software Engineer 2017-2018
PayPal

Awards and Honors

◦ GP-NANO Fellowship – Awarded by the Duke Nanoscience Group
◦ Undergraduate thesis featured in Rust community newsletter.
◦ Tuition scholarship for undergraduate study – Awarded by the Govt. of India
◦ Ranked 1865 among 5 million applicants in IIT-JEE, India's premier engineering entrance exam.
◦ Second place in a state-wide talent search examination conducted by S.A.S.T while in high school.

Community Service

◦ Member, Problem sets team, The Art of Molecular Programming textbook.
◦ Volunteer organizer, Foundations of Nanoscience conferences FNANO 2023 and FNANO 2024.

Mentoring

◦ Raghavendra Satwik, a highschool student in DNA computing. Incoming undergrad at Univ. of Washington.
◦ Antonio Llano, a highschool student in strand displacement. Now an undergrad at Stanford.