

# Rohan Tan Bhowmik

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## Summary:

I am a rising sophomore at Stanford University studying Computer Science and Electrical Engineering with an emphasis on artificial intelligence. I am constantly seeking to learn and develop new machine-learning techniques and build applications based on them, especially in the areas of health, environment, and human-computer interaction. I'm especially interested in brain-inspired computing for energy-efficient systems. Outside of academics, I play clarinet, tennis, and volunteer with organizations to help sensory-deficient individuals, including the Baker Institute for Children with Hearing Loss, Starkey Hearing Foundation, and VocaliD.

## Education:

Stanford University

B.S., Computer Science and Electrical Engineering, Class of 2027

## Experience:

### Software Engineering Intern, AMD AI Group (Jun 2024-present)

- Developed a comprehensive understanding of machine learning compilers and gained expertise in optimizing model performance across diverse hardware architectures.
- Optimized and unified AI/ML model implementations for high-performance computing environments on CPUs, GPUs, and AI accelerators.
- Implemented FP8 quantization on paged attention to boost memory and runtime efficiency of LLM inference.
- Created operators and enabled lowering of PyTorch functions to LinAlg dialect in Torch-MLIR.

### Research Intern, Stanford University School of Medicine (Jun 2022-Jan 2024)

- Developed a wildfire prediction system based on a novel machine-learning framework, successfully predicting 85% of major wildfires in California up to 2 weeks in advance.
- Compiled a comprehensive wildfire dataset with >37 million data points including environmental, meteorological, and geological factors.
- Presentation link: <https://www.youtube.com/watch?v=BrrxihmmZis>
- Publication link: <https://doi.org/10.1016/j.jenvman.2023.117908>

### Research Intern, Stanford University School of Medicine (Jun 2021-May 2022)

- Developed AI algorithms to aid surgical planning for correcting facial structural deformities that cause debilitating breathing, sleeping, and sensory disorders in patients.
- Achieved >95% accuracy in classifying patient conditions with machine learning training.
- Publication link: <https://doi.org/10.1089/fpsam.2022.0306>

### **Research Intern, Stanford University School of Medicine (Jun 2020-May 2021)**

- Developed a multi-modal solution for predicting the climate's impact on exacerbation risks of respiratory diseases, such as COPD.
- Created a new AI architecture that combines key attributes of both convolutional and recurrent neural networks with 93% cough detection accuracy.
- Proposed a predictive model based on retrospective medical studies to assess respiratory exacerbation risk.
- Presentation link: <https://www.youtube.com/watch?v=2v78ReRNDVg>
- Publication link: <https://doi.org/10.3390/electronics11162562>

### **Independent Research (Jun 2019-Mar 2020)**

- Created a novel framework to simulate the training of convolutional neural networks on quantum computing systems.
- Demonstrated >100x boosts in computational and memory efficiency for training a novel Quantum Optical Convolutional Neural Network, as compared with a classical Convolutional Neural Network.
- Publication link: <https://doi.org/10.1109/ACCESS.2021.3098775>

## **Publications:**

### **Journal Papers:**

1. **R. T. Bhowmik**, Y. S. Jung, J. Aguilera, M. Prunicki, K. Nadeau, "A Multi-Modal Wildfire Prediction and Personalized Early-Warning System Based on a Novel Machine Learning Framework," *Journal of Environmental Management*, **341**, 117908, 2023 (<https://doi.org/10.1016/j.jenvman.2023.117908>).
2. **R. T. Bhowmik**, C. Kandathil, S. P. Most, "Automating the Standardized Cosmesis and Health Nasal Outcomes Survey (SCHNOS) Classification with Convolutional Neural Networks," *Facial Plastic Surgery & Aesthetic Medicine*, PMID: 36749153, 2023 (<https://doi.org/10.1089/fpsam.2022.0306>).
3. **R. T. Bhowmik**, S. P. Most, "A Personalized Respiratory Disease Exacerbation Prediction Technique Based on a Novel Spatio-Temporal Machine Learning Architecture and Local Environmental Sensor Networks," *Electronics*, **11** (16), 2562, 2022. (<https://doi.org/10.3390/electronics11162562>).
4. R. Parthasarathy, **R. T. Bhowmik**, "Quantum Optical Convolutional Neural Network: A Novel Image Recognition Framework for Quantum Computing," *IEEE Access*, **9**, 103337, 2021. (<https://doi.org/10.1109/ACCESS.2021.3098775>).
5. **R. T. Bhowmik**, Y. S. Jung, J. Aguilera, M. Prunicki, K. Nadeau, "California Wildfire Forecasting Inventory - Extensive Wildfire Prediction Dataset for Artificial Intelligence," *Nature Scientific Data* (under review).

### **Preprints:**

6. **R. T. Bhowmik**, "A Multi-Modal Wildfire Prediction and Personalized Early-Warning System Based on a Novel Machine Learning Framework," arXiv:2208.09079, 2022.
7. **R. T. Bhowmik**, "A Multi-Modal Respiratory Disease Exacerbation Prediction Technique Based on a Spatio-Temporal Machine Learning Architecture," arXiv:2103.03086, 2021.
8. R. Parthasarathy, **R. T. Bhowmik**, "Quantum Optical Convolutional Neural Network: A Novel Image Recognition Framework for Quantum Computing," arXiv:2012.10812, 2020.

### **Conferences:**

1. **R. T. Bhowmik**, "A Multi-Modal Wildfire Prediction and Personalized Early-Warning System Based on a Novel Machine Learning Framework," Stanford BigEarth Hackathon, 2022.

### **Honors and Awards:**

- Stanford XR Hackathon Grand Prize Winner (2023)
- Egleston Scholar, Columbia University (2023)
- Turing Scholar, University of Texas Austin (2023)
- Regeneron Science Talent Search National Top 300 Scholar (2023)
- USA Physics Olympiad National Silver Medalist (2022, 2023)
- USA Astronomy & Astrophysics Olympiad, National Top 30 (2021-2022), Bronze Medalist (2023)
- USA Junior Math Olympiad Qualifier (2020), American Invitational Math Exam Qualifier (2020-2023)
- S. T. Yau High School Science Award, Computer Science Division Bronze Medal (2022)
- USA Computational Olympiad Gold Level (2020-2023)
- USA Biology Olympiad, Semifinalist (2021-2022)
- TEAMS (Tests of Engineering Aptitude, Mathematics, and Science) Competition, National 2<sup>nd</sup> Place Overall (2022), California 1<sup>st</sup> Place (2020)
- Synopsys Science and Engineering Fair First Place (2023)
- South Coast Air Quality Management District Award (2023)
- Environment Protection Agency Special Recognition (2022)
- U.S. Naval Research Award (2021)
- Regional Physics Bowl, 1st Place (2021)
- Arete Labs Online Math Tournament National High School Champion (2022)
- Broadcom MASTERS National Semifinalist (2019)

### **Leadership and Community Services:**

- The President's Volunteer Service Award, Gold Level (2020, 2021, 2022)
- Co-founder, Organizer, and Problem Writer, Online Physics Olympiad (2020-2023)
- Volunteer, Baker Institute for Children with Hearing Loss (2022-present)
- Volunteer, Starkey Hearing Foundation (2019-present)
- Head Coach (2022), Assistant Head Coach (2019-2021), Harker Middle School Science

- Bowl (2019-2023)
- President (2022-2023), Director (2021-2022), Harker Science Competition Club (2021-2023)
  - Voice Ambassador, VocaliD (a voicebank that synthesizes natural AI voice personas for speech-impaired individuals) (2022-present)
  - Principal Clarinet and Solo Bass Clarinet, The Harker School Orchestra (2019-2023)
  - Officer, Harker Programming Club (2020-2023)
  - Coordinator, MathCounts and Harker Math Invitational (2020-2021)
  - Club officer, Public Health Club, Harker School (2020)

## **References:**

Available upon request.