Agni Kumar

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Education

Massachusetts Institute of Technology (MIT) Cambridge, MA
M.Eng. in Computer Science 2019 – 2020
Thesis: *Learning infection influence using self-excitatory temporal point processes*

Massachusetts Institute of Technology (MIT) Cambridge, MA
B.S. in Computer Science and Engineering, B.S. in Mathematics 2016 – 2019

Milton High School Milton, GA
Valedictorian, dual-enrolled at Georgia Tech 2012 – 2016

Experience

Apple | Senior Machine Learning Research Engineer Cupertino, CA
Data & ML Innovation (DMLI) org, Health AI team 2020 – present

Drove the design and pre-training of large-scale foundation models for time series data using self-supervised representation learning. Led the development of multimodal vision-language LLM pipelines, including image-text interleaved supervised fine-tuning and RL-based post-training for alignment and reasoning. Scaled and optimized models for deployment, powering safe and personalized health features across billions of devices.

Shipped features: Workout-Ready Performance in AirPods Pro (personalized fitness insights powered by motion AI), Training Load in watchOS 11 (to help users understand strain and recovery), Power Zones in watchOS 10 (to help users get the most out of training by estimating FTP), Medications app experience in iOS 16 (enabling scanning via camera), Visual Look Up in iOS 15 (to identify objects in photos and videos), Inferred Contact Suggestions in Siri X (a personalized feature employing privacy-preserving ML)

Publications: *RelCon* at ICLR 2025 (relative contrastive learning for a motion foundation model), *MM1* at ECCV 2024 (insights from multimodal LLM pre-training and fine-tuning), *PhysioMTL* at CHIL 2022 (assessing the impact of acute and chronic confounding factors on heart rate variability), *Estimating respiratory rate from breath audio* at EMBC 2021 (sensing respiration with microphone and IMU sensors in AirPods, featured in Forbes)

Patents: *Device Agnostic Motion-Related Metric Prediction for Wearable Electronic Devices* (P71910USP1), *Functional Threshold Power Prediction Using Machine Learning* (P61656US1), *Audio Detection and Monitoring of Respiration* (P52044US1)

Microsoft | Machine Learning Engineer Sunnyvale, CA
Internship with Open Neural Network Exchange (ONNX) team June – August 2019
Targeted deep learning framework interoperability at Microsoft AI, working within Azure to implement ML deployment pipelines and infrastructure at a global scale

Apple | Research Scientist Seattle, WA
Internship with Health AI team February – May 2019
Developed structured models of users' smartphone interactions to reveal differences in phone usage patterns between people with and without cognitive impairment, featured in the WSJ and supporting the Intuition study

Microsoft | Software Engineer Cambridge, MA
Internship at NERD Center June – August 2018
Collaborated on the development of Seeing AI, a cross-platform mobile app creating everyday navigational experiences for the visually impaired

VerifAI | Co-Founder Cambridge, MA
The Martin Trust Center for MIT Entrepreneurship 2017 – 2018
Offered deception detection in standard-res video via hand-coded and machine-learned biological cues for streamlining the insurance claim pipeline, pitching a pilot program to three major insurance companies

Microsoft | Machine Learning Engineer Cambridge, MA
Internship at NERD Center January – February 2018
Integrated TensorFlow into SynapseML, an open-source library simplifying the creation of massively scalable ML pipelines by enabling embedding models into existing Apache Spark workflows

Macy's | Machine Learning Engineer Atlanta, GA
Internship with Supply Chain and Logistics Systems group June – August 2017
Developed anomaly detection models with frontend interface to identify inefficiencies in operations of fulfillment mega-centers

Nasdaq | Machine Learning Engineer Boston, MA
Internship at Innovation Lab January – February 2017
Implemented reinforcement learning algorithms to predict stock price fluctuations

Research

Select Publications

RelCon: Relative Contrastive Learning for a Motion Foundation Model for Wearable Data 2025
International Conference on Representation Learning (ICLR)

MM1: Methods, Analysis & Insights from Multimodal LLM Pre-training 2024
European Conference on Computer Vision (ECCV)

Personalizing Physiological Patterns using Optimal Transport Multi-Task Regression 2022
Conference on Health, Inference, and Learning (CHIL)

Estimating Respiratory Rate From Breath Audio Obtained Through Wearable Microphones 2021
Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)

Predictive Modeling for Telemedicine Service Demand 2020
Telehealth and Medicine Today (THMT)

Discovery of Hierarchical Representations for Efficient Planning 2020
Public Library of Science (PLOS) Computational Biology

Workshops

Co-organizer for Interpretable Machine Learning in Healthcare (IMLH) workshop at ICML 2023

Panelist on *Best Practices for Research: Increasing Efficiency and Research Impact, and Navigating Hybrid Collaborations* at the Women in Machine Learning (WiML) workshop at ICML 2022

Co-organizer for Computational Approaches to Mental Health (CA2MH) workshop at ICML 2021

Labs

MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) 2019 – 2020
Clinical and Applied Machine Learning group

Developed mathematical models with self-exciting properties to learn infection influence patterns over time, in partnership with Massachusetts General Hospital (MGH)

MIT Center for Brains, Minds and Machines (CBMM) 2018
Sinha Lab for Developmental Research
Investigated habituation profiles across diverse sensory modalities in individuals with autism

Purdue University 2016
Interdisciplinary Life Science group
Purified, characterized, and designed a novel drug inhibitor for the Cdc14 enzyme in pathogenic fungal species *Botrytis cinerea*

New Mexico Institute of Mining and Technology 2015
Etscorn Observatory
Tracked asteroids and took space images, primarily of various Messier objects, and submitted data for archiving to the Harvard-Smithsonian Center for Astrophysics

Georgia Institute of Technology 2014 – 2015
School of Mathematics
Conducted graph theory research proving a bijection between break divisor sequence labels and spanning trees in complete networks

Georgia Institute of Technology 2013 – 2015
NASA-funded Center for the Origin of Life (COOL)
Studied the evolution of a eukaryotic ribosomal expansion segment from one of the most diverse regions of the ribosome, discovering extreme secondary structure conservation over evolution through both computation and experimentation at atomic resolution

Accolades

Grand Award Winner in Mathematics, Intel ISEF 2016
Mu Alpha Theta Governor's Leadership and Service National Award 2016
Top Honors in H&R Block Budget Challenge (rank 1 of 20,045 participants) 2015
International Regional Finalist, Google Science Fair 2015
U.S. Finalist, International BioGENEius Challenge 2015
Regional Finalist, Siemens Competition 2014
National Winner, Actuarial Foundation's Project Math Minds 2014
Georgia Senate Resolution 821 2012

Skills

Areas: machine learning, deep learning, generative AI, data science, software development
Languages: Python, R, SQL, Java, MATLAB, C/C++
Libraries and tools: NumPy, Pandas, PyTorch, TensorFlow, Apache Spark, Git, Linux/Unix

Miscellaneous

Writer and Editor at *Towards Data Science* (700K followers) on Medium 2020 – present
Teaching Assistant (TA) at MIT EECS 2017 – 2020
Violinist 2006 – present