Anshula Gandhi

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Education

2023– **University of Cambridge**, *PhD in Math*, Supervised by Timothy Gowers.

2015–2019 **Massachusetts Institute of Technology**, *B.Sc. in Math and History*, 4.8/5 GPA.

Research

Spring – Summer 2021 **Fulbright at Czech Technical University**, *Fulbright Research Fellowship Grantee*.
Worked with mathematicians to develop tools for automated deductive reasoning when applying the polynomial method. Focused on using automated-theorem-proving tools in combination with human insight and ingenuity to prove mathematical lemmas.

Spring 2020 – Fall 2020 **MIT Center for Brains, Minds, and Machines**, *Senior Research Assistant*.
Developed neurally-guided program synthesis techniques to solve a variety of symbolic reasoning problems through applying the neuroscience behind how humans do math.

Fall 2019 **Universidad Nacional Autónoma de México**, *Visiting Researcher*.
Developed reinforcement learning algorithms to prove theorems in lattice theory, and developed a Coq tactic to apply duality to prove theorems in a single step.

Spring 2019 **MIT Center for Brains, Minds, and Machines**, *Undergraduate Researcher*.
Designed reinforcement learning environment to prove math theorems in group theory. Combined machine learning and automated theorem proving to design an artificially intelligent agent.

Spring 2016, Fall 2017–Fall 2018 **MIT Distributed Robotics Lab**, *Undergraduate Researcher*.
Developed algorithms to determine safe advisory speed for parallel autonomous vehicles, given locations and speeds of other cars. Explored mathematical path-planning algorithms such as harmonic potential fields and visibility graphs. Constructed a closed-form cost function to determine the riskiness of moving in a certain direction based on surrounding density and velocity data.

Summer 2016 **MITRE Nanosystems Group**, *Research Assistant*.
Designed circuits and algorithms for novel non-invasive medical diagnostic tool to reduce size, weight, and required power. Conducted chemical laboratory tests to correlate quantum dot fluorescence in the device's sensors to the presence of analytes.

Publications

2020 **NeurIPS 2020 Workshop: Beyond Backpropagation** *Supervised Learning with Brain Assemblies* by Akshay Rangamani and Anshula Gandhi. In this paper, we propose a new supervised learning model based on a network of neural assemblies that learns through Hebbian plasticity instead of backpropagation.

2020 **NeurIPS 2020 Workshop: Learning Meets Combinatorial Algorithms** *Dreaming with ARC* by Andrzej Banburski, Anshula Gandhi, Simon Alford, Sylee Dandekar, Sang Chin, Tomaso Poggio. In this paper we propose an approach to solving mathematical abstract reasoning problems using program synthesis algorithm using a DSL made of human "Core Knowledge" priors.

2019 **ICRA 2019.** *Dynamic Risk Density for Autonomous Navigation in Cluttered Environments without Object Detection* by Alyssa Pierson, Cristian-Ioan Vasile, Anshula Gandhi, Wilko Schwarting, Sertac Karaman, and Daniela Rus. We introduce in this paper a closed-form vector equation that allows a car to navigate its environment without explicit object detection and movement, and experimental verification of validity.

Teaching

Fall 2023 **University of Cambridge**, *Undergraduate Supervisor*.
Worked on practice problems with pairs of students taking the Groups course at Cambridge.

Winter 2023 **University of Cambridge**, *Undergraduate Supervisor*.
Worked on practice problems with pairs of students taking the Real Analysis course at Cambridge.

Spring 2021 **Boston Partners in Education**, *Math and Reading Mentor*.
Worked within a second grade class at Boston Public Schools to provide extra one-on-one attention and tutoring for students.

Spring 2019 **MIT Combinatorics Seminar**, *Student Presenter*.
Presented a series of three talks on Combinatorial Nullstellensatz, a discrete mathematical proof technique, as a student in MIT's *Seminar on Combinatorics* course.

Summer 2017 **MIT Educational Studies Program**, *History of Mathematics Course Teacher*.
Taught summer course to middle schoolers on the history of mathematics, including the history of infinity, lotteries, and computing.

Winter 2017 **MIT Development Lab**, *Electronics Workshop Leader*.
Co-led month-long workshop on circuit building and microcomputer programming, as a student in MIT's Development Lab. Worked with community organization C-Innova in Bogota, Colombia.

Awards

2020-2021 **Fulbright Grantee**.
Selected to conduct math research in the Czech Republic on a Fulbright U.S. Student grant.

2017 **Burchard Scholar**.
Chosen as one of 35 MIT undergrads for excellence in the humanities.

Languages

English (fluent)
Spanish (intermediate)
Bengali (basic)
Czech (basic).