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FRANCISCA VASCONCELOS

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EDUCATION

University of California Berkeley *2022-Present*

Degree PhD Student Advisors: Prof. Michael I. Jordan and Prof. Umesh Vazirani GPA: 4.0/4.0
Fellowships National Science Foundation Graduate Research Fellowship (2022-2025)
Paul & Daisy Soros Fellowship for New Americans (2024-2026)

University of Oxford – Rhodes Scholar *2021-2022*

Degree Master of Studies (MSt) in Philosophy of Physics College: Keble Mark: Pass
Tutors Prof. Owen Maroney, Prof. James Reed, Prof. Oliver Pooley

University of Oxford – Rhodes Scholar *2020-2021*

Degree Master of Science (MSc) in Statistical Science College: Keble Mark: Merit
Thesis *Uncertainty in Implicit Neural Representations for Medical Imaging* Supervisor: Prof. Yee Whye Teh

Massachusetts Institute of Technology *Class of 2020*

Degree BS in Electrical Engineering & Computer Science, Physics Humanities Concentration: Philosophy
Honors Phi Beta Kappa ◇ Tau Beta Pi ◇ Sigma Xi Societies: IEEE ◇ APS ◇ SWE GPA: 4.9/5.0
Thesis *Extending Quantum State Tomography for Superconducting Q. Processors* Supervisor: Prof. William Oliver

Torrey Pines High School *Class of 2016*

PUBLICATIONS

Publications sorted by category and ordered in reverse chronological order, with relevant presentations and awards listed.
* denotes equal contribution or alphabetical ordering. (Note that TCS papers are typically alphabetical order.)

Journal ◇ "**A Quadratic Speedup in Finding Nash Equilibria of Quantum Zero-Sum Games**."
Francisca Vasconcelos*, Emmanouil-Vasileios Vlatakis-Gkaragkounis*, Panayotis Mertikopoulos, Georgios Piliouras, and Michael I. Jordan.
Quantum, April 2025. [*arXiv:2311.10859*]
◇ **Long Talk** (∼6% acceptance) at *Quantum Techniques in Machine Learning (QTML) Conference 2023* (CERN, Switzerland) [*Slides*]
◇ I also presented at: Surfing the Ocean ERC Seminar [*Video*]

◇ "**UncertaINR: Uncertainty Quantification of End-to-End Implicit Neural Representations for Computed Tomography**."
Francisca Vasconcelos*, Bobby He*, Nalini Singh, and Yee Whye Teh.
Transactions on Machine Learning Research (TMLR), April 2023. [*arXiv:2202.10847*] [*Talk*] [*Slides*] [*Code*]
◇ **Oral** (∼6% acceptance) at *MedNeurIPS 2021 Workshop* (Virtual) [*Video*]
◇ **Poster** at *NeurIPS 2021 Bayesian Deep Learning Workshop* (Virtual) [*Poster*]

◇ "**Generating Spatially Entangled Itinerant Photons with Waveguide Quantum Electrodynamics**."
Bharath Kannan, Daniel Campbell, Francisca Vasconcelos, Roni Winik, David Kim, Morten Kjaergaard, Philip Krantz, Alexander Melville, Bethany Niedzielski, Jonilyn Yoder, Terry Orlando, Simon Gustavsson, and William Oliver.
Science Advances, Vol. 6, No. 41, 2020. [*arXiv:2003.07300*] [*MIT News*]

◇ "**Impact of ionizing radiation on superconducting qubit coherence.**"
Antti Vepsalainen, Amir Karamlou, John Orrell, Aksunna Dogra, Ben Loer, John Orrell, Francisca Vasconcelos, David Kim, Alexander Melville, Bethany Niedzielsk, Jonilyn Yoder, Simon Gustavsson, Joseph Formaggio, Brent VanDevender, and William Oliver.
Nature, Vol. 584, pages 551–556. 2020. [*arXiv:2001.09190*] [*MIT News*] ◇

Paper ◇ "**Learning shallow quantum circuits with many-qubit gates**."
Francisca Vasconcelos, Hsin-Yuan Huang
In the proceedings of the *38th Annual Conference on Learning Theory (COLT), 2025*. [*Slides*]
◇ **Talk** at the *Quantum Techniques in Machine Learning (QTML) Conference. 2024* (Melbourne, Australia)
◇ I also presented at: NYU CQP, Cambridge Quantum Computing Seminar.

◇ "**On the Pauli Spectrum of QAC^0.**"
Shivam Nadimpall*, Natalie Parham*, Francisca Vasconcelos*, Henry Yuen*.
In the proceedings of the *56th Annual ACM Symposium on Theory of Computing (STOC), 2024*.
◇ **Talk** at the *Quantum Information Processing (QIP) Conference 2024* (Taipei, Taiwan).
◇ I presented at: Simons Quantum Pod, Berkeley TCS Seminar, QuSoft Seminar. [*Talk*] [*Slides*]

◇ "**Person-following UAVs**."
Francisca Vasconcelos and Nuno Vasconcelos.
In the proceedings of the *2016 IEEE Winter Conference on Applications of Computer Vision*.

Article ◇ "**Why Quantum Education?**"
Francisca Vasconcelos.
SPIE Photonics Focus, Vol. 4, pages 6-7. May/June 2023.

◇ "**Quantum Computing @ MIT: The Past, Present, and Future of the Second Revolution in Computing**."
Francisca Vasconcelos.
Abridged version in *MIT Undergraduate Research Journal*, Vol. 38, pages 13-24. 2020.
Full version on [*arXiv: 2002.05559*].

Poster ◇ "**Extending Quantum State Tomography for Superconducting Quantum Processors**."
Francisca Vasconcelos, Morten Kjaergaard, Terry Orlando, Simon Gustavsson, and William Oliver.
In the proceedings of the *2019 MIT MTL Microsystems Annual Research Conference*.
◇ Poster received a Top-10 Presentation Award [Poster]

Preprint ◇ "**Random Unitaries in Constant (Quantum) Time**."
Ben Foxman*, Natalie Parham*, Francisca Vasconcelos*, Henry Yuen*
[*arXiv:2508.11487*]

◇ "**Methods for Reducing Ancilla-Overhead in Block Encodings**."
Francisca Vasconcelos, Andras Gilyen
[*arXiv:2311.10859*]
◇ **Talk** at the *Quantum Techniques in Machine Learning (QTML) Conference. 2024* (Melbourne, Australia)
◇ **Talk** at the *Quantum Simulation (QSim) Conference. 2025* (New York City) [*Slides*]

RESEARCH TALKS

2025 ◇ "**Methods for Reducing Ancilla-Overhead in Block Encodings**"
Talk (20 min) at the Quantum Simulation (QSim) conference in NYC on August 8th.

◇ "**Learning shallow quantum circuits with many-qubit gates**"
Talk (12 min) at the Conference on Learning Theory (COLT) in Lyon, France on July 4th.

◇ "**Rethinking Quantum Advantage via the Quantum Singular Value Transform**"
Talk (25 min) at the 22nd European Conference on Foundations of Physics in Gdansk, Poland on July 1st.

◇ "**Learning shallow quantum circuits with many-qubit gates**"
Invited talk (1 hour chalkboard) at Cambridge University Quantum Computing Seminar, hosted by Tom Gur, on June 19th.

◇ "**Rethinking Quantum Advantage via the Quantum Singular Value Transform**"
Lightning talk (5 min) at the Foundations of Quantum Computing (FQC) Conference in Edinburgh, Scotland on June 17th.

◇ "**A Quadratic Speedup for Finding Nash Equilibria of Quantum Zero-Sum Games**" [*Video*]
Invited talk (45 min) at the Surfing the Ocean ERC Seminar (virtual) on March 13th.

◇ "**On the Pauli Spectrum of QAC^0**"
Talk (1 hour) at the UC Berkeley SAIL Seminar on March 10th.

◇ "**Methods for Reducing Ancilla Overhead in Block Encodings**"
Talk (1 hour) at the Simons Institute Quantum Pod Seminar at UC Berkeley on March 6th.

2024 ◇ "**Methods for Reducing Ancilla Overhead in Block Encodings**" [*Video*]
Talk (15 min) at the 2024 Quantum Techniques in Machine Learning (QTML) Conference in Melbourne, Australia on November 29th.

◇ "**Learning shallow quantum circuits with many-qubit gates**" [*Video*]
Talk (15 min) at the 2024 Quantum Techniques in Machine Learning (QTML) Conference in Melbourne, Australia on November 26th.

◇ "**Learning shallow quantum circuits with many-qubit gates**"
Special seminar (1 hour chalkboard talk) at the NYU Center for Quantum Phenomenon on October 28th.

◇ "**On the Pauli Spectrum of QAC^0**" [*Video*]
Invited talk (1 hour) at the CWI QuSoft Seminar (virtual) on April 12th.

◇ "**On the Pauli Spectrum of QAC^0**"
Invited talk (1 hour) at the Berkeley Theory Lunch Seminar at UC Berkeley on March 13th.

2023 ◇ "**A Quadratic Speedup for Finding Nash Equilibria of Quantum Zero-Sum Games.**" [*Slides*]
Long talk (∼6% acceptance) (30 min) at the 2023 Quantum Techniques in Machine Learning (QTML) Conference in CERN, Switzerland on November 21st.

◇ "**On the Pauli Spectrum of QAC^0**"
Invited talk (3 hours) at Simons Institute Quantum Pod Seminar at UC Berkeley on October 31st.

2019 ◇ "**Uncertainty Quantification in End-to-End Implicit Neural Representations for Medical Imaging.**" [*Video*]
Oral (∼6% acceptance) (30 min) at the 2021 MedNeurIPS Workshop (Virtual) on December 14th.

2016 ◇ "**Person-following UAVs.**" [*Video*]
Talk (5 min) at the 2016 IEEE Winter Applications in Computer Vision (WACV) Conference at Lake Placid, New York on March 10th.

SCHOLARSHIPS & FELLOWSHIPS

2024 Paul and Daisy Soros Fellowship for New Americans ($90,000) - 1st Portuguese recipient of the fellowship.
2019 NSF Graduate Research Fellowship
Rhodes Scholarship*
Marshall Scholarship* [Declined for Rhodes]
*3rd student in MIT history to receive both the Rhodes and Marshall. [Reference: Kimberly Benard]
2017-18 Johnson & Johnson MIT Summer Research Fellowship ($5,520)
D.E. Shaw Latitude Fellowship ($1,500)
Palantir Women in Technology Scholarship ($7,000)
SWE GE Women's Network Scholarship (x2, $10,000)
2015-16 SanDisk Scholar ($10,000)
Athena Pinnacle Scholarship ($10,000)
San Diego AFCEA Scholarship ($8,000)
SWE Paula Loring Simon Scholarship ($1,250)
San Diego Society of Women Engineers ViaSat Scholarship ($1,000)
Professional Engineers in CA Government Fellowship ($1000)
Cabrillo Civics Scholarship ($400)
National Space Club Foundation Scholarship ($1,000)
ISEF+JSHS Awards ($7,000)

AWARDS & HONORS

2024 Played for the Portuguese national lacrosse team in the 2024 Women's European Lacrosse Championships
2022 Oxford University Blues Award "Highest honour granted to individual sportspeople at the University of Oxford."
2021 OneQuantum Leading Female Women Quantum Community Creator of the Year Award (Sponsored by QuEra)
Oxford University Half-Blue Athletic Award
2020 Ford Foundation PhD Fellowship Honorable Mention
2019 Paul and Daisy Soros Fellowship Finalist - *forfeited application upon receiving Rhodes*
Hertz PhD Fellowship Regional Finalist
MIT Churchill Nominee (1 of 2 possible MIT nominees) - *forfeited application upon receiving Rhodes*
2018 MIT EECS SuperUROP Draper Laboratory Undergraduate Research and Innovation Scholar
MIT School of Engineering Barry Goldwater Nominee (2 nominees from MIT each year)
MIT Society of Women Engineers Outstanding Board Member
2017 Minor Planet 33680 (Main-belt Asteroid, discovered 5/13/99 by Lincoln Labs) named "Vasconcelos"
2016 Intel International Science & Engineering Fair "Robotics & Intelligent Machines" 2nd Place Grand Award
Intel International Science & Engineering Fair WebValley Special Award
Intel Excellence in Computer Science Award
Greater San Diego Science & Engineering Fair ISEF Sweepstakes Winner (Top 6)
Southern California Junior Science and Humanities Symposium 1st Place
Scholastic Gold Key & 3 Honorable Mentions
2015 Intel International Science & Engineering Fair "Robotics & Intelligent Machines" 4th Place Grand Award
Intel International Science & Engineering Fair CERN Special Award
Intel International Science & Engineering Fair United Technologies Special Awards
Intel Excellence in Computer Science Award
Greater San Diego Science & Engineering Fair ISEF Sweepstakes Winner (Top 6)
2 Scholastic Silver Keys & 2 Honorable Mentions
2014 California Senate Award
National Honor Society (NHS) & National Art Honor Society (NAHS) Inductee
Trained with Portuguese WU17 National Soccer Team

NEWS

2024
Press Minho: European Women's Lacrosse Championship already moves in Braga
Braga TV: Braga hosts European Women's Lacrosse Championship
Diario do Minho: Portugal in group of Norway, Czechia, Austria & Ireland at Lacrosse European Championship
Radio Vale do Minho: Women's National Lacrosse Team passed through Valença
MIT News: Two from MIT awarded 2024 Paul and Daisy Soros Fellowships for New Americans
Berkeley CDSS: Francisca Vasconcelos chosen as Paul and Daisy Soros New American fellow
PD Soros: Meet the Class of 2024 Paul & Daisy Soros Fellows
PD Soros: Paul & Daisy Soros Fellowships Announce 2024 Class of Distinguished New Americans

2022
Cherwell: Oxford victory at 36th Women's Varsity Football match

2020
IBM Research: IBM and The Coding School to offer free online quantum computing course for 5,000 students
MIT News: MIT researchers lead high school educational initiative on quantum computing
MIT News: Generating photons for communication in a quantum computing system
MIT News: Cosmic rays may soon stymie quantum computing
MIT News: MIT chapter of the Phi Beta Kappa Society inducts 115 students from the Class of 2020
Torrey Pines High School Falconer: TPHS alumna awarded the Rhodes Scholarship

2019
San Diego Union Tribune: San Diego engineering whiz chosen to be a Rhodes Scholar
MIT.edu Spotlight: Five named Rhodes Scholars
MIT News: Five MIT students named 2020 Rhodes Scholars
The Tech: Four more MIT seniors declared 2020 Rhodes Scholars

2017
MIT News: Adding hands-on practice to science and engineering classes

2016
Congressional App Challenge: #TechTeen – Francisca Vasconcelos
Congressman Scott Peters: Quantum App Recognized
San Diego Union Tribune: 2016 San Diego Science & Engineering Fair Winners
Society for Science & the Public: Society Alumni offer advice

2015
Society for Science & the Public: Intel ISEF alumna creates app to explain physics
Torrey Pines High School Falconer: One in 2,616: Francisca Vasconcelos
San Diego Union Tribune: Science Fair Crowns Contest Winners

RESEARCH & TECHNICAL WORK EXPERIENCE

Oxford OxCSML Masters Research *Nov 2020-May 2022*
Supervisor: Yee Whye Teh

- project title: "UncertaINR: Uncertainty Quantification in End-to-End Implicit Neural Representations"
- improving reliability of CT image reconstruction, via calibrated implicit neural representations
- study and characterize the relative performance of several Bayesian deep learning approaches

Microsoft Research Quantum Intern *May-Aug 2020*
Supervisor: Marcus DaSilva

- project title: "Learning the Spatial Correlation Structure in Multiqubit Measurement Error" (NDA)

MIT RLE Engineering Quantum Systems SuperUROP *June 2018 - May 2020*
Supervisor: Morten Kjaergaard (Postdoc) ⋄ Prof. William Oliver, Terry Orlando, and Simon Gustavsson's Lab

- expanded lab's quantum state tomography suite (based on MLE) from 2-qubit to n-qubit systems, improved runtime by 100x
- developing novel QST approach using generative adversarial networks
- programmed an FPGA (with Megan Yamoah) to speed-up lab's measurement of the quantum computer
- improved speed and computation resources of data analysis code for waveguide QED experiment

Rigetti Computing Junior Quantum Engineering Intern *June - August 2019*
Supervisors: Peter Karalekas, Marcus DaSilva ⋄ Full Stack Quantum Engineering Group

- research to improve the algorithmic performance of noisy quantum devices using ensembling techniques from machine learning

MIT Media Lab Camera Culture UROP *Sept. 2017 - Sept. 2018*
Supervisor: Achuta Kadambi (Grad Student) ⋄ Prof. Ramesh Raskar's Lab

- worked on LIDAR to "see through fog," using 2-laser interferometry
- worked on learning a general transformation to boost ImageNet classification performance of major networks (i.e. AlexNet)

NASA Jet Propulsion Laboratory (JPL) Engineering Intern *June 2017 - Aug. 2017*
Supervisor: Jose Velazco (Researcher) ⋄ Ground Communication Group (333K)

- worked with other interns to create "smart" monitoring system for new Deep Space Network amplifiers, consisting of thousands of ESP32s connected to central database and visualization/control webpage
- modified CAD designs of Inter-Satellite Omnidirectional Optical Communicator transmitters for LIDAR functionality

MIT CSAIL NetMIT UROP *Oct. 2016 - June 2017*
Supervisors: Deepak Vashit (Grad Student) & Anubhav Jain (MEng) ⋄ Prof. Dina Katabi's Lab

- developed an API and "Smart Home" application (smart alarm clock) for the group's research on wireless location tracking
- developed location data collection iOS application to train neural network to improve localization pattern recognition

Sidus Solutions Engineering Intern *June 2015 - Aug. 2015*
San Diego Marine Technology Company

- soldered micro-controllers, programmed GUIs, CADed product parts on Solidworks, fixed broken camera systems, tested products, and laser etched logo information into products

TEACHING EXPERIENCE

TCS Qubit x Qubit Intro to Quantum Computing Year-Long Course Instructor *AY 2020/21, AY 2022/23*
The Coding School Non-Profit ⋄ Co-Instructor with Amir Karamlou

· developed and instructed this first-of-a-kind global, virtual 'Intro to Quantum Computing' course
· 8,000+ students, representing 120+ countries, with over 50% students coming from underrepresented backgrounds
· targeted towards young students - only pre-req was high school level geometry
· 99% of students would recommend the course to a friend, 96% of students rated the course as good or excellent
· 96% of students felt more confident in their STEM skills as result of the course

MIT EECS Intro to Quantum Computing IAP Course Instructor *Jan 2019, Jan 2020*
6.s089 ⋄ Co-instructor with Amir Karamlou & Megan Yamoah

· 4 week crash course on quantum computing open to MIT community, no quantum mechanics knowledge required
· specifically lectured on quantum algorithms/protocols: Quantum Key Distribution, Grover search, QFT and Shor's Algo.
· developed QuTip problem set questions and ran tutorials on QuTip and IBM Quantum Experience
· received a 6.7/7 rating on MIT course evaluations (6/20 eligible students responded)

PROFESSIONAL SERVICE

Conference Reviewer:	QIP 2023, QIP 2024, ITCS 2024, TQC 2024 (2 papers), FOCS 2024, QIP 2025 (3 papers), QCTiP 2025, FOCS 2025, QEC 2025
Journal Reviewer:	IEEE Transactions on Communications, Nature Communications, Quantum Journal
Seminar Organizer:	Simons Institute Quantum Pod Seminar (Fall 2024, Spring 2025) UC Berkeley EECS SAIL Seminar (Spring 2025)
Departmental:	UC Berkeley TCS Grad Admits Visit Organizer (Spring 2024), UC Berkeley TCS Grad Application Reviewer (Spring 2025), Grad Student Interview Coordinator for the Simons Institute Director Hiring (Spring 2025)
Other:	MIT Distinguished Fellowships Application Reviewer (2023, 2024, 2025) MIT Undergraduate Admission Maker Portfolio Reviewer (2020, 2021, 2022)

MIT IEEE URTC Conference Chair *Jan 2017 - Oct 2019*
2018 MIT IEEE Undergraduate Research Technology Conference

· led small group of students to organize 4th IEEE URTC (2018), a 3-day conference (approx. 300 attendees), at Stata Center
· there were 67 posters, 59 papers, and 16 lightning talks with 8 different conference tracks and 5 keynote speakers
· managed almost all logistics including sponsorship, publicity, registration, set-up, attendee housing, etc.
· served as Paper/Posters Chair for the 2017 conference, getting reviewers for all the submissions and keynote speakers
· serving as Conference Advisor for the 2019 conference, guiding the new conference chairs and board

OUTREACH

TCS Qubit x Qubit Founding Academic Program Director *June 2019 - Present*
The Coding School Non-Profit

- founding member of The Coding School Qubit x Qubit initiative for K-12 quantum education
- created and co-lectured an 8,000+ student global, high-school 'Intro to Quantum Computing' course
- secured IBM quantum sponsorship for the course and am developing further teaching materials

MIT iQuISE Public Relations Manager *July 2019 - May 2020*
MIT Interdisciplinary Quantum Information Science and Engineering program

- only undergrad board member of grad weekly seminars on quantum information, manage social media accounts and publicity

MIT Undergraduate Research Journal (MURJ) Copy Editor & Features Staff *Sept 2018 - Feb 2020*
Volume 36 Fall 2018 & Volume 37 Spring 2019

- Author of "Quantum Computing @ MIT" - conducted interviews with Prof. Isaac Chuang, Prof. Dirk Englund, Prof. Aram Harrow, Prof. William Oliver; article published in MURJ Fall 2019 publication

MIT SWE Technology Chair *Nov 2016 - Nov 2019*
MIT Society of Women Engineers

- organize workshops to teach SWE club members about tech topics (ie. Personal Websites, LaTeX, Quantum Computing, etc.)
- volunteer at STEM education events for local elementary and high-school girls

The Coding School Curriculum Developer, Teacher, & Advisory Board *June 2019 - May 2020*
The Coding School Non-Profit

- revamped Python curriculum, taught high-school girl for 2-weeks, and created LaTeX template to be used for entire curriculum
- member of the TCS Young Professionals Advisory Board
- lead development of a Quantum Computing curriculum, resulting in the Qubit by Qubit initiative

MIT Associate Academic Advisor *Sept. 2017 - May 2018*
Assistant to Prof. Dennis Freeman

- advised group of freshman on classes and navigating MIT, attended registration meetings with advisor

TPHS Math Tutoring *Nov 2012 - Jan 2015*
After-School Math Tutoring Center (Unpaid)

- tutored students in all grade levels in high school math courses including geometry, algebra, and calculus

OUTREACH TALKS

2025 ◇ "**Starting Your STEM Adventure**"

Invited Talk (30 min) for The Coding School's end of summer 2025 student celebration (NYC) on August 8th.

2024 ◇ "**Into the Quantum World**"

Invited Talk (1 hour) for Qubit by Qubit's World Quantum Day 2024 (Virtual) on April 11th.

2023 ◇ "**What we've learned from training 20,000 students in QISE**"

Invited speaker and panelist on the Quantum Workforce Development Panel at the SPIE Photonics West Conference 2023 (San Francisco) on Februrary 1st. Spoke on behalf of The Coding School non-profit CEO Kiera Peltz, presenting on K-12 quantum education work as Founding Academic Director and Lead Course Instructor for the Qubit x Qubit initiative.

2021 ◇ "**Lessons learned from teaching a year-long global, virtual intro to quantum computing course**" [Program]

Invited speaker at the IEEE Quantum Engineering Conference 2021 (virtual) on October 21st. Presenting on K-12 quantum education work as the Founding Academic Director and Lead Course Instructor for the Qubit x Qubit initiative.

◇ "**The Quantum Road Not Taken**" [Video]

Invited speaker at the Women in Quantum Summit IV Fireside Chat (virtual) on March 10th. Talking about my personal path into and work in quantum computing, inspiring younger females in the field.

◇ "**Educational Opportunities and Policy Landscape Roundtable**" [Conference Website]

Invited panel moderator for the Qubit x Qubit Diversity in Quantum Computing Conference (virtual) on Februrary 27th. I discussed quantum education and policy with: Dr. Jessica Rosenberg (Associate Professor of Physics, George Mason University), Dr. Olivia Lanes (Quantum Researcher, IBM Quantum), Dr. Tomasz Durakiewicz (Program Director for Condensed Matter Physics, NSF), Dr. Kate Weber (Policy Lead for AI Research and Innovation, Google), and Dr. James Freericks (Professor of Physics, Georgetown University).

2016 ◇ "**Limitless Possibility**"

Invited talk (20 min) at the MIT Museum Girl's Day "Secret Life of Robots" (Cambridge) on November 15th. Spoke about my high school engineering and computer science projects to inspire young girls in greater-Boston.