Arko Chakrabartiroy

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Education

- **Stuyvesant High School**, New York, NY (Graduation June 2026)
- **Cumulative Unweighted Average**: 91% | **SAT**: 1590 | **PSAT 10**: 1520 | **PSAT/NMSQT**: 1500 | **AIME** Qualifier (2025)
- **AP**: Precalculus (5), Computer Science A (5), World History (5), Biology (4) | Senior Year AP – AP Calculus BC, AP Statistics, AP Physics 1
- **Regents**: Algebra II (98), Chemistry (98), Physics (92), Geometry (94), Spanish LOTE (96), Living Environment (95), ELA (89), Global History & Geography II (89)
- **Honors**: National Merit Semifinalist, National School Recognition Award Winner, AP Scholar with Honor, National Society of High School Scholars (NSHSS) Invited member, College Board Invited SAT bootcamp peer tutor through Schoolhouse.world

Research Papers & Publications

Feature-Optimized Machine Learning for Early Identification of College Dropout

- Mentor: M. Sarmadi (MIT Ph.D.)
- Revision & submission invited (and submitted revision) to *National High School Journal of Science* (*NHSJS*), 2025.
- Presented at the *Symposium of Rising Scholars,* **September 2025**, after competitive selection
- Preprint accepted at preprints.org, available here, with **100+downloads in first 24 hours**.
- Leveraging seven grid search optimized machine learning models and a comprehensive dataset including academic and demographic characteristics of undergraduate students, this paper identifies the optimum machine learning model for predicting college dropout and identifies the key predictors of dropout risk
- Built an online app for student/administrator use to assess dropout probability, harnessing/utilizing the paper's findings

Development of a Large Language Model-Based System for Enhanced Access to Chess for Visually Impaired Individuals

- Mentors: C. Ellison (Cornell B.S.), M. Sarmadi (MIT Ph.D.).
- Published, *Curieux Academic Journal (CAJ)*, **56(2), pages 322-335, 2025**.
- Preprint accepted at preprints.org available here.
- Leveraging machine learning model advancements, such as LLMs, speech-to-text and chess AI models, this paper develops a computerized system that enables the visually impaired to play chess
- Built and launched an app enabling visually impaired players to play chess

Academic Programs & Research Experience

Columbia Engineering SHAPE — Math in Action: Operations Research for Social Good (Summer 2025)
- Dean's Fellowship; applied optimization, simulation, and data analysis to healthcare, education, and city planning
- Collaboratively designed and implemented a research project leveraging math tools – "Gerrymandering"
- Presented "Gerrymandering" project at the 2025 "Math in Action: Operations Research for Social Good" SHAPE Symposium at Columbia University
- Gained hands-on experience translating abstract mathematical methods into practical solutions for social good

Johns Hopkins University — Engineering Innovation Pre-College Program (Summer 2025)
- Explored civil, chemical, electrical/computer, mechanical, and materials engineering
- Built a spaghetti bridge, engineered a bioreactor, and prototyped an electronic device
- Collaborated with an international team to present a final engineering design solution

NYU Courant Institute of Mathematical Sciences — Math Circle (Summer 2024)
- Most advanced MC program in mathematical problem solving and contest preparation
- Developed creative problem-solving and intellectual humility.

New York Math Circle (NYMC, Summer 2024)
- Advanced-level coursework in mathematical problem solving and contest preparation

Medgar Evers College Research Foundation — SYEP (Summer 2023)
- Led obesity health-tech project; built website & led formal team presentation

NYC Urban Debate League — Summer Debate Institute (Summer 2023)
- Led team and participated in public forum debate on current policy matters

Medgar Evers College Research Foundation — SYEP (Summer 2022)
- Led and collaborated with a team of peers; Conceived Undersound, a platform for underrepresented composers; produced technical design, site, and presentation

New York Math Circle (Summer 2022)
- Contest math & problem solving (Algebra, Geometry, Graphing)

Leadership, Tutoring & Service

Founder & Lead Tutor — Pro Bono SHSAT Online Platform (2024–Present)
- Built Discord-based tutoring community offering free SHSAT prep
- Designed curriculum, Kahoots, slides, and practice exams; led group & 1:1 sessions

Senior Tutor — Schoolhouse.world (2024–Present)
- Tutored SAT Math/Reading bootcamp, Algebra II, and Geometry

- Ranked top 10% in tutoring hours and top 10% in sessions hosted
- Invited by College Board to serve as peer tutor in national SAT bootcamp

Teaching Assistant and Grader — Stuyvesant Math Team (2025–Present)
- Taught competition math to freshman Stuyvesant students, wrote contest math problems
- Graded problem sets and exams, conducted notebook checks, proctored tests

Teaching Assistant — Yang Taekwondo (2024–Present)
- Taught fundamentals to students ages 6–12; led warm-ups, drills, patterns, sparring
- Modeled perseverance, leadership, accountability, and teamwork

Junior Advisory Board Member — The Gift of Chess (2025–Present)
- Distributed chess sets globally to underserved communities
- Organized free tournaments to expand access and build community engagement

Creative Work, Skills & Interests

STEM
- **Programming**: Java, Python, HTML, CSS, JavaScript | Replit, VS Code | Advent of Code| Coded clicker games, sequence simulations, personal website

Arts & Creative Work
- **Piano Performance**
    - **1st Place, *Crescendo International Piano Competition*** (among 6,500+ applicants in age group 16-24), 2024-2025
    - **Carnegie Hall recital**, 2025; 92nd Street Y recitals, 2023, 2024

- **Violin Performance**
    - Manhattan School of Music recital, 2024, 2025
    - Competing in *Crescendo International Violin Competition* (age group 16-24), 2025-26.

- **Music (Composition)**
    - NY Philharmonic Young Composers Bridge Program
    - Music composition performed by NY Philharmonic musicians
    - Independent portfolio

- **Chess**
    - **Captain, Stuyvesant U1800 Blitz Team — 1st Place** SuperNationals 2025
    - **3rd Place NY State U1800 Scholastic** (2025)
    - 21 Trophies (8 First place, 7 Second place, 4 Third place), 8 cash prizes
    - USCF 1889 | FIDE 1890

- **Creative Writing**
    - Independent portfolio: fiction, fantasy, and poetry

Athletics
- **Taekwondo**: Second-Degree Black Belt; Teaching Assistant at Yang Taekwondo for ages 6-8

- **Swimming**: Lifeguard and Swim Coach (All City Aquatics)