BRIAN ZHANG

github.com/NioTheFirst bzhangprogramming@gmail.com
3450 Burnley Drive, West Lafayette, IN, United States (520)-302-1785

EDUCATION

William Henry Harrison High School, Graduated Class of 2023 Valedictorian, Distinguished Honor Roll (4.0 GPA) ***Aug 2019 - June 2023***

- AP Computer Science A (5), AP Biology (5), AP Chemistry (5), AP Physics C Mechanics (5), AP Physics C Electricity and Magnetism (5), AP Calculus BC (5), AP Calculus AB Subscore (5), AP Statistics (5), AP Physics AB (5)
- SAT (1570)

Purdue University (nondegree) ***Jun 2020 - Aug 2020, Aug 2022 - present***

- Took CS 251 Data Structures and Algorithms (A), MA 265 Linear Algebra (A), CS 240 Programming in C (A+), MA 366 Ordinary Differential Equations Honors (A), CS 352 Compilers (A), CS 252 Systems Programming (B+), STAT 512 Applied Linear Regression (A+)
- Sat in for CS 180 Intro to Computer Science, CS 290 Competitive Programming I and II
- Taking CS 373 Data Mining and Machine Learning and CS 354 Operating Systems in Fall 2023

EXTRACURRICULARS

Research

- Improving Deep Learning model security, namely, securing Neural Networks used in critical applications such as auto-driving (*Jun 2021- Jun 2022*)
- Improving Smart Contract security (NOTE: Smart Contracts are virtual business applications with a recent explosive growth due to the inventions of blockchain, crypto-currency, and Virtual Reality; Smart Contract attacks have costed **$300 million** in the 2nd Quarter of 2023) (*Apr 2021-present*)

Programming – USACO (*Aug 2018 - Mar 2022*), High School Competitive Programming (*Aug 2021 - present*)

Mathematics – Indiana Math League (*Aug 2019 - May 2022*), Mathcounts *(Dec 2017 - Mar 2019*), AMC (*Nov 2017 - May 2022*), AIME (*Feb 2019 - May 2022*), Academic Super Bowl Math (*Jan 2021 - May 2022*)

Science – Academic Super Bowl Science (*Jan 2022 - May 2022*), National Science Bowl (*Jan 2022 - May 2023)*

Athletics – High School Track Junior Varsity, Varsity (*Nov 2020 - May 2022*), High School Cross-Country Varsity (*Jun 2022 - Nov 2022*), High School Soccer Junior Varsity (*Jun 2020 - Oct 2020*)

Others – National Honors Society (*Aug 2022 - May 2023*)

RESEARCH EXPERIENCE

Improving Deep Learning model security by improving model robustness against adversary attack (supervised by Prof. Shiqing Ma from Rutgers University CS**)** **Jun 2021- Jun 2022**

- Studied Deep Learning (DL) image recognition models and various training methods of these models to correctly identify images along with malicious small modifications that can be applied so that images are miss-classified, namely, *adversarial attack*.
- Proposed a new training method by changing *batch normalization* to improve model accuracy (i.e., how accurate a model is in recognizing images) and robustness against adversarial attack. Batch normalization is a method used in DL training to accelerate convergence. However, it causes a few confoundings and degrades model robusntess.
- Achieved **0.94 model accuracy** and **0.81 robustness** against adversarial attack whereas the state-of-the-art yields 0.88 model accuracy and 0.47 robustness
- **Published a first-author research paper**

Improving Smart Contract security **Apr 2021 - Present**

- Learned blockchains, crypto-currency, Smart Contracts (SC), Ethereum (an SC deployment environment powered by blockchain), Solidity (a programming language for SC), and SC attack and defense
- Studied and summarized **500+ real-world** smart contract security vulnerabilities in 2021-2022, and proposed a new categorization of these issues along with typical symptoms and remedies
- Applied my findings to real-world Smart Contracts to find security vulnerabilities and found 25 critical bugs that could endanger over 33.4 million dollars.
- Responsibly reported these bugs to their developers and helped fixing them before any exploitation by real attackers.
- Efforts were rewarded with an **accumulated personal bounty of $52,660**, and recognized by rising auditing company PwnedNoMore through Twitter
- Invited for an interview by Code4rena, a premier security vendor for smart contracts
- Invited for a $5000 internship by PwnedNoMore to audit a private smart contract
- **Published a co-first-author research paper** on summarizing all the Smart Contract vulnerablities and attacks in 2021-2022.
- **Published a second-author research paper** extending the previous paper through the use of existing tools.

Developing an automated Smart Contract security tool (solo project) **(May 2023 - Aug 2023)**
- Developed a Smart Contract security tool which utilizes refinement types on solidity variables to detect vulnerabilities that arise from accounting errors. The tool can catch 29 out of the 33 accounting type bugs in the benchmark, greatly outperforming current state-of-the-art tools.
- Used the tool to find 6 zero-day vulnerabilities and earned a combined **bounty of more than $10,000**
- **Published a single-author research paper** about the tool

PEER- REVIEWED PUBLICATIONS

Slides, Papers, and Video Presentations can be found ***here***

Brian Zhang, Shiqing Ma**,** ***Achieving Both Model Accuracy and Robustness by Adversarial Training with Batch Norm Shaping*****,** *The 34th IEEE International Conference on Tools with Artificial Intelligence (ICTAI 2022)* **(Accepted, presented on October 31 virtually)**

Zhuo Zhang, Brian Zhang (Co-first), Wen Xu, Zhiqiang Lin**,** ***A Systematic Study of Recent Smart Contract Vulnerabilities*****,** submitted to *Crypto Economics Security Conference (CESEC 2022)* **(Accepted, presented on November 1 at UC Berkeley)**

Zhuo Zhang, Brian Zhang, Wen Xu, Zhiqiang Lin**,** ***Demystifying Exploitable Bugs in Smart Contracts*** **,** *International Conference on Software Engineering (ICSE 2023)* **(Published, presented on May 23 in Melbourne, Australia)**

Brian Zhang**,** ***Towards Finding Accounting Errors in Smart Contracts*****,** *International Conferene on Software Engineering (ICSE 2024)* **(Accepted, will be presented April 2024 in Lisbon, Portugal)**

INTERNATIONAL CONFERENCE PRESENTATIONS

Achieving Both Model Accuracy and Robustness by Adversarial Training with Batch Norm Shaping, The 34th IEEE International Conference on Tools with Artificial Intelligence (ICTAI 2022), **October 31st 2022 (Virtual)**

A Systematic Study of Recent Smart Contract Vulnerabilities, Crypto Economics Security Conference (CESC 2022) **November 1th 2022, UC Berkeley, Oakland, CA**

Demystifying Exploitable Bugs in Smart Contracts, The 45th International Conference on Software Engineering (ICSE 2023), **May 17th 2023, Melbourne, Australia**

AWARDS

Found 25 Critical Security Vulnerabilites in Real World Smart Contracts, ***Apr-Aug 2022***
- Rewarded with an overall bounty of over $52,660, preventing $33.4 million from being stolen; all bugs recognized and fixed by developers before exploitation by malicious hackers

First place in the 4th round of Code4rena Smart Contract Audit Contest in July *Jul 2022*
- Code4rena is the most prestigious Smart Contract Audit contest in which industry provides substantial bounty for auditors to find vulnerabilities in their real-world products
- Out of 209 active teams world-wide, awarded $7659.99

First place in the ENS Code4rena Smart Contract Audit contest in August *Aug 2022*
- Out of 197 activate teams world-wide, awarded $18,700

Tenth place solo audit in Tapioca Code4rena Smart Contract Audit contest in October *Oct 2023*
- Out of 134 contributing teams, awarded $6386.18

USACO Platinum Qualifier *Dec 2022*

USACO Gold Qualifier *Dec 2019*

USACO Silver Qualifier *Dec 2018*

Valedictorian *May 2023*

U.S. Presidential Scholarship Candidate *Feb 2023*

National Merit Finalist *Apr 2023*
- Won the $2,500 award given to only 2,500 candidates in the State

AIME Qualifier *2019, 2020, 2021, 2022*

Mathcounts Indiana State 8th place Individual, 6th place Team *Mar 2019*

Mathcounts Chapter 2nd place Individual, 2nd place Countdown, 2nd place Team *Dec 2018, Dec 2019*

Mathcounts Chapter 2nd place Team Coach *Dec 2020*

Academic Super Bowl Science Indiana State 1st place **May 2022**

National Science Bowl Indiana Regional 2nd place **Feb 2022**

Academic Super Bowl Math Indiana State 2nd place **May 2022**

ISSMA (Piano) County Solo Gold, State Solo Silver *Mar 2019*

ISSMA (Brass Quintuplet) County Ensemble Gold *Mar 2019*

Purdue Half-Marathon 76th place overall out of 900+ total runners **Oct 2021**

Purdue Half-Marathon 107th place overall out of 1300+ total runners **Oct 2023**

VOLUNTEER EXPERIENCE

Mathcounts Coach *Aug 2019 - Mar 2020*
- Coached the Mathcounts Team for Battleground Middle School, with **1 member placed the 55th at the 2020 Mathcounts National Individual Competition**

High School Competitive Programming Club Founder and Coach *Sep 2021 - Apr 2022*
- Coached students on programming at a competitive stage**, 8 members had qualified for USACO Silver, 3 members had qualified for USACO Gold**
- Encouraged participation of students from minority groups

NHS Volunteer *Aug 2022 - May 2023*

Founder and Sponsor High School Smart Contract Auditing Competition
Aug 2022 - Dec 2022
- Raised awareness on auditing and the dangers of cryptocurrency by encouraging students of both genders to participate in the competitions

SKILLS

Java, Python, C, C++, Bash, ARM, Tensorflow, Pytorch, Solidity, Ethereum, Linux, Overleaf, Latex, Typescript, and Github

HOBBIES

Running, Piano, Scuba diving, and Soccer