BRIAN ZHANG

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EDUCATION

William Henry Harrison High School, class of 2023, Distinguished Honor Roll (4.0 GPA) ***Aug 2019 - present***
- AP Computer Science (5), AP Biology (5), AP Chemistry (5), AP Physics C Mechanics (5), AP Physics C Electricity and Magnetism (5), AP Calculus BC (5), AP Statistics (5), AP Physics AB (5)
- Taking AP English Literature and Composition, AP English Language and Composition, AP Government
- SAT (1570)

Purdue University ***Jun 2020 - Aug 2020, Aug 2022 - present***
- Took CS 251 Data Structures and Algorithms (A), MA 265 Linear Algebra (A)
- Sat in for CS 180 Intro to Computer Science, CS 290 Competitive Programming I and II
- Taking CS 240 Programming in C, MA 366 Ordinary Differential Equations Honors
- Plan to take CS 352 Compilers, and MA 375 Intro to Discrete Mathematics in Spring 2023

EXTRACURRICULARS

Research
- Improving Deep Learning model security, namely, securing Neural Networks used in critical applications such as auto-driving (*Jun 2021-present*)
- 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 $1.57 billion in the first 6 months of 2022) (*Apr 2022-present*)

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

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

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

Athletics – High School Track Junior Varsity, Varsity (*Nov 2020 - May 2022*), High School Cross-Country Varsity (*Jun 2022 - present*), High School Soccer Junior Varsity (*Jun 2020 - Oct 2020*), Purdue Half-Marathon 76th place out of 900+ runners (*Oct 2021*)

Others – National Honors Society (*Aug 2022 - present*)

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-present**

- 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 (supervised by PhD student Zhuo Zhang from Purdue) **Apr 2022 - 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 security vulnerabilities in **500+ real-world Smart Contracts**, 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 11 critical bugs that could endanger over **$22.52 million**
- Responsibly reported these bugs to their developers and helped fixing them before any exploitation by real attackers. Efforts were recognized by developers and a rising auditing company PwnedNoMore through Twitter.
- Published a co-first-author research paper and submitted another second-author paper

PEER-REVIEWED PUBLICATIONS

Slides, Papers, and Video Presentations can be found at **`https://niothefirst.github.io/publications`**

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)* **20% acceptance out of 747 submissions, my paper ranked in the top 9, and I was the presenter**

Zhuo Zhang, Brian Zhang (Co-first), Wen Xu, Zhiqiang Lin**,** ***A Systematic Study of Recent Smart Contract Vulnerabilities*****,** *Crypto Economics Security Conference (CESC 2022)* **14% acceptance out of 180 submissions, and I was the paper and poster co-presenter**

Zhuo Zhang, Brian Zhang, Wen Xu, Zhiqiang Lin**,** ***Demystifying Exploitable Bugs in Smart Contracts*****,** submitted to *The IEEE/ACM International Conference on Software Engineering (ICSE 2023), a flagship software engineering research conference* (**under review)**

INTERNATIONAL CONFERENCE PRESENTATION

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**

AWARDS

ICTAI'22 Best Student Paper Award (9 out of 747) ***Nov 13th***

First Place for Two Times in the International Code4rena Smart Contract Audit Contest ***Jul 11th and Jul 14th 2022***
- Code4rena is the most prestigious Smart Contract Audit contest in which industry provides bounties for competing auditors to find vulnerabilities in their products. It consists of multiple independent rounds throughout the year
- Ranked the first place for two rounds started on July 11th and 14th, out of 209 teams world-wide (including those from commercial companies), awarded $25,660

Found 11 Critical Security Vulnerabilities in Real World Smart Contracts ***Apr-Aug 2022***
- Awarded with overall personal bounties of $46,660, preventing $22 millions from being stolen; all bugs recognized and fixed by developers before exploitation by malicious hackers

Invited Talk at Google Regarding Smart Contract Vulnerabilities ***December 2022***

USACO Gold Qualifier ***Dec 2019***
- The latest score in USACO Gold (2022 Open) is 750, with full grades on two problems and 7 out of 22 test cases on the third problem, 2 test cases short from qualifying Platinum

USACO Silver Qualifier ***Dec 2018***

AIME Qualifier ***2019, 2020, 2021, 2022***

State Champion in Academic Super Bowl Science **May 2022**

State Runner-up in Academic Super Bowl Math **May 2022**

State Runner-up National Science Bowl **Feb 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***

National Merit Semifinalist ***Sep 2022***
- Finalist application is ongoing

Distinguished Honor Roll **2019-2021**

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

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

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 Co-founder and Coach ***Sep 2021 - Apr 2022***
- Coached students on programming at a competitive stage, *3 members had qualified for USACO Silver*
- Encouraged participation of students from minority groups

Founder and Sponsor of High School Smart Contract Auditing Competition **Aug 2022 - Dec 2022**
- Founded an individual auditing contest at William Henry Harrison High School which awards the top two boy and girl auditors every two months with a $1200 dollar total cash pool sponsored by personal audit gain. The winners will form a team to attend Code4rena contests
- Raised awareness on auditing and the dangers of cryptocurrency by encouraging students of both genders to participate in the competitions

SKILLS

Java, Python, C, Solidity, Tensorflow, Pytorch, Ethereum, Linux, Overleaf, Latex, and Github

HOBBIES

Running, Piano, Scuba diving, and Soccer