# Oian Han

in linkedin.com/in/QianHan i https://gian-han.github.io

I am a Ph.D. student in the Department of Computer Science at Dartmouth College, where I work at Dartmouth College Security and Artificial Intelligence Laboratory, advised by Prof. V.S. Subrahmanian, and I will join Facebook as a research scientist in June, 2021. I received my Bachelor's Degree from the Department of Electronic Engineering at Tsinghua University in 2016. That year, my dissertation entitled "Hardware Design and Implementation of a Discrete Multi-channel Optically Controlled Oscillator System" won Tsinghua University's Distinguished Dissertation Award.

My research lies at the intersection of cybersecurity and artificial intelligence (AI). Specifically, I create innovative and robust technologies to help people combat cybercrime using machine learning. Examples include developing general-purpose tools for Android malware detection and analysis. Moreover, our research results on Android malware are recognized by Google Android Security Team and our research group was invited twice for a talk at Google HQ, Mountain View. I also use game theory to build strategies to predict whether severe zero-day vulnerabilities will be exploited or disclosed by nations, and how long to exploit the vulnerability if they decide to exploit. Most recently, I lead an effort to develop a general framework for adversarial malware generation using deep learning, a unified and validated set of guidelines for designing Android malware which can evade anti-virus engines. The generated samples can be used to enhance AI-based malware detection systems.



#### **FDUCATION**

**DARTMOUTH COLLEGE** 

SEPT. 2016 - MAY. 2021 (EXPECTED)

Hanover, NH

Ph.D. candidate, Department of Computer Science

**TSINGHUA UNIVERSITY** AUG. 2012 - JUL. 2016

Beijing, China

Bachelor of Engineering, Department of Electronic Engineering



## PROFESSIONAL EXPERIENCE

Jun. 2021 Incoming Research Scientist, FACEBOOK, Seattle, United States

Sept. 2020 Boot-camp team match

Machine Learning Infrastructure

Research Assistant, Dartmouth College Security and Artificial Intelligence Laboratory, Hanover, NH, United States

Sept. 2017

- > Proposed novel Suspicion Score & Rank features based on PageRank
- > Found previously unlabeled banking Trojans and rooting malware
- > Built feature transformation based Android malware detector and applied it on the detection of Android rooting malware, spyware, and Banking Trojans
- > Designed Ensemble Clustering and Classification algorithm synthesized training data to reduce imbalance ratio on datasets

Python Scikit-learn Networkx Keras

Sept. 2020

### Software Engineer Intern, FACEBOOK, Menlo Park, California, United States

Jun. 2020

- > Modeled Facebook's backbone network demand and built micro-service to forecast the demand
- > Improved the demand forecast efficiency of backbone network by more than 15 times

Python PyTorch Scikit-learn Pandas

Sept. 2019

### Research Intern, Deutsche Telekom Innovation Laboratories, Be'er Sheva, Israel

Jun. 2019

> Designed Android-centric attack on well-known Android malware classifiers using static features

> Proposed mechanisms to enhance robustness of anti-virus engines based on deep learning and reduce impact of adversary attack

Python PyTorch Scikit-learn Pandas

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### Aug. 2017

#### Research Assistant, DARTMOUTH HCI LABORATORY, Hanover, NH, United States

Sept. 2016

- > Designed 3D printed smart-ring prototype
- > Implemented the Smart Ring control system using Python and Arduino
- > Used the prototype to control the cursor and play Angry Birds

Python Arduino 3D printing

### Sept. 2015 Jun. 2015

### Research Assistant, Nanyang Technological University, Singapore

- > Developed flight path monitoring device based on Radio Frequency using Linux GNU Radio Companion and RTL-SDR
- > Implemented Gardner synchronous phase-locked loop algorithm into simulated GMSK communication system

Android Studio GNU MATLAB



## PUBLICATIONS

#### GENERATING FAKE DOCUMENTS USING PROBABILISTIC LOGIC GRAPHS

Q. Han, C. Molinaro, A. Picariello, G. Sperli, V.S. Subrahmanian, Y. Xiong Under Review, IEEE Transactions on Dependable and Secure Computing

#### A DATA-DRIVEN CHARACTERIZATION OF MODERN ANDROID SPYWARE

APR. 2020

F. Pierazzi, G. Mezzour, O. Han, M. Colajanni, V.S. Subrahmanian ACM Transactions on Management Information Systems (TMIS'20)

https://dl.acm.org/doi/abs/10.1145/3382158

## ANDROID MALWARE DETECTION VIA (SOMEWHAT) ROBUST IRREVERSIBLE FEATURE TRANSFORMATIONS

FEB. 2020

Q. Han, V.S. Subrahmanian and Y. Xiong

IEEE Transactions on Information Forensics and Security (TFIS'20)

https://ieeexplore.ieee.org/document/9013026

#### DISCLOSE OR EXPLOIT? A GAME THEORETIC APPROACH TO STRATEGIC DECISION MAKING IN CYBER WARFARE

JAN. 2020

H. Chen, Q. Han, S. Jajodia, R. Lindelauf, V.S. Subrahmanian, Y. Xiong (authors listed in alphabetic order, as a major contributor)

IEEE System Journals (ISJ'20)

https://ieeexplore.ieee.org/document/8967205

### DBANK: PREDICTIVE BEHAVIORAL ANALYSIS OF RECENT ANDROID BANKING TROJANS

APR. 2019

C. Bai, Q. Han, G. Mezzour, F. Pierazzi, and V.S. Subrahmanian (authors listed in alphabetic order, as a major contributor) IEEE Transactions on Dependable and Secure Computing (TDSC'19)

https://ieeexplore.ieee.org/document/8684321

#### FRICTIO: PASSIVE KINESTHETIC FORCE FEEDBACK FOR SMART RING OUTPUT

JUL. 2017

T. Han, Q. Han, M. Annett, F. Anderson, D. Huang, and X. Yang

In Proceedings of the ACM Symposium on User Interface Software and Technology (UIST'17)

https://dl.acm.org/citation.cfm?id=3126594.3126622

## LOW-COMPLEXITY LSQR-BASED LINEAR PRECODING FOR MASSIVE MIMO SYSTEMS

SEPT. 2015

T. Xie, Z. Lu, Q. Han, J. Quan, B. Wang

In Proceedings of the 2015 IEEE 82nd Vehicular Technology Conference (VTC'15-Fall)

https://ieeexplore.ieee.org/document/7391016

### SIMULTANEOUS MULTI-CHANNEL RECONSTRUCTION FOR TDS-OFDM SYSTEMS

SEPT. 2015

Q. Han, W. Shen, and B. Wang

In Proceedings of the 2015 IEEE 82nd Vehicular Technology Conference (VTC'15-Fall)

https://ieeexplore.ieee.org/document/7391139

#### SPECTRUM-EFFICIENCY PARAMETRIC CHANNEL ESTIMATION SCHEME FOR MASSIVE MIMO SYSTEMS

JUN. 2014

Z. Gao, C. Zhang, C. Dai, Q. Han

2014 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB'14)

https://ieeexplore.ieee.org/document/6873562



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#### CLUSTERING AND CLASSIFICATION METHODS FOR PREDICTING MALICIOUS ANDROID APPS

OCT. 2018

O. Han and V.S. Subrahmanian

Conference on Android Security, Local Research Day, Google HQ, Mountain View, CA

#### BEHAVIORAL ANALYSIS AND AUTOMATED DETECTION OF ANDROID BANKING TROJANS

JUL. 2018

**Q. Han**, C. Bai and V.S. Subrahmanian Android Security Team, **Google HQ**, Mountain View, CA

## **AWARDS**

- 2020 Dartmouth College Graduate Alumni Research Award
- 2019 Dartmouth College Graduate Student Council Student Professional Development Support Fund
- 2019 Dartmouth College Graduate Alumni Research Award
- 2019 Dartmouth College Neukom Prize for Outstanding Graduate Research
- 2016 Tsinghua University's Distinguished Dissertation Award
- 2015 First Prize of Chinese National College Students Science and Technology Innovation Project
- 2015 Tsinghua University Overseas Summer Research Fund
- 2014 Tsinghua University Science and Technology Innovation Scholarship

# LANGUAGES





- > Programming language : Python, Java, MATLAB, SQL, Bash
- > Operating systems: Mac OS X, Linux, Windows
- > Tools and Frameworks : LTEX, Git, Hadoop, Spark, PyTorch, Keras, Android, Pandas, Scikit-learn, Networkx,

# **TEACHING ASSISTANT EXPERIENCE**

2017 Spring Human-Computer Interaction, COSC 167, Dartmouth College
2017 Winter Smartphone Programming, COSC 165, Dartmouth College
2016 Fall Numerical & Computational Tools, COSC 170, Dartmouth College

# SERVICE AND LEADERSHIP

Reviewer AAMAS 2020, IEEE Systems Journal 2019, 2020, IEEE Intelligent Systems 2018, IEEE VTC 2015

Student Volunteer 2015 IEEE 82nd Vehicular Technology Conference

Student Organization Leadership President of Dartmouth College Chinese Students and Scholars Association

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