

# David Hacker

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## Education

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### University of California San Diego

La Jolla

Major: Computer Science, Minor: Mathematics, 3.94, Provost Honors

2017–2021

Courses Taken: Intro to CS & OOP, Discrete Mathematics, Basic Data Structures, UNIX Tools Laboratory, Mathematics for Algorithms & Systems Analysis, Computer Architecture & Systems Programming, Advanced Data Structures, Computational Theory, Linear Algebra, Statistical Methods, Calculus & Analytic Geometry

## Work Experience

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### Positions Held.....

#### University of California San Diego

La Jolla

Undergraduate Research Assistant

July 2018–August 2018

- Assisted Professor Daniele Micciancio in performing GWAS on homomorphically encrypted data
- Worked on implementations of BGV, GSW-style homomorphic cryptosystems
- Team's results submitted to the iDASH 2018 Privacy & Security Workshop

#### University of California San Diego

La Jolla

CSE Department Tutor

April 2018–Present

- Taught CSE 20, Discrete Mathematics, under Professor Daniele Micciancio
- Currently teaching CSE 21, Mathematics for Algorithms & Systems Analysis, under Professor Quang Bach
- Held office hours on a weekly basis and provided tutoring to students who required additional help
- Graded students' homework assignments, midterms and final exams

#### Medspace

La Jolla

Software Engineering Intern

February 2018–September 2018

- Wrote a command line tool in C# to import 166 million rows of CSV data into a Neo4j graph database
- Created an ASP.NET Core backend & RESTful API to interface with the database
- Implemented a k-dimensional tree in the backend to speed up geospatial queries by a factor of several hundred
- Managed nearly \$20,000 worth of server resources, used to store data and host the backend
- Designed another backend using the Java Spring framework to supply customers with medical analytics
- Integrated an Auth0 authentication system into the Spring backend to protect user data

### Notable Projects.....

#### RLWE Cryptography: C++, Number Theoretic Library, Libsodium

- Implemented several prominent post-quantum cryptosystems related to the ring learning with errors (RLWE) problem
- Designed a fast version of the Fan-Vercauterean cryptosystem, allowing for computations on encrypted data
- Additionally integrated NewHope key exchange & Ring-TESLA digital signature algorithms
- Project selected for presentation at the UCSD CSES DevFair in Winter 2018

#### Dual\_EC\_DRBG Backdoor: Rust, GNU Multiple Precision Arithmetic

- Demonstrated how a Shumlow-Ferguson attack could be used to break a dual elliptic curve random number generator
- Heavily optimized the attack by writing custom implementations for NIST P-256, P-385, and P-521 elliptic curves
- Can determine a generator's internal state in less than 30 seconds using an 8-core i7-8650U processor

#### Alexa YouTube Skill: NodeJS, FFmpeg, AWS Lambda, Heroku

- Created a skill that lets Amazon Alexa devices play audio from YouTube videos as a hobbyist project
- Downloaded over 4000 times and has over 100 stars on GitHub
- Reviewed by the German tech channel Venix, which has over 25,000 subscribers

## Technical Skills

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**Languages:** C, C++, C#, Rust, Java, Python, JavaScript, ARM Assembly, R, Solidity

**Cryptographic Libraries:** GMP, NTL, Libsodium, SEAL, Nettle, Crypto++, Forge

**Web & UI Frameworks:** MEAN, Spring, ASP.NET Core, Flask, React Native, wxWidgets