Alex Bellon

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EDUCATION

Ph.D., Computer Science *2021 - Present*
University of California San Diego, La Jolla, CA

- Advised by Alex Snoeren and Deian Stefan, with a focus on the security of embedded and IoT devices and firmware. Part of SysNet and CryptoSec groups

B.S., Computer Science *2017 - 2021*
The University of Texas at Austin, Austin, TX

B.S., Mathematics *2017 - 2021*
The University of Texas at Austin, Austin, TX

RESEARCH EXPERIENCE

Graduate Student Researcher *2021 - Present*
University of California San Diego, La Jolla, CA

- **Evaluating and securing insulin pump fimware**
  - Disassembled an insulin pump and developed custom PCBs to connect to board and allow firmware to be extracted from ICs
  - Currently reverse engineering extracted firmware to find cryptographic functions and keys that will allow the captured update files to be decrypted
  - Future goals include finding security vulnerabilites in the firmware, and developing a framework to formally verify firmware to prevent further security vulnerabilites
- **Measuring the coverage, reliability, and privacy implications of a wide-area LoRa deployment (Helium)**
  - Conducted mobility experiments to test LoRa packet reception and SNR/RSSI values
  - Set up experiments with an SDR broadcasting noise over different bandwidths to measure LoRa's robustness to interference
- **Finding security vulnerabilities in airplane firmware**
  - Assisted in tracing out connections between chips and I/O ports on Flight Management Computer (FMC) board to allow firmware to be extracted
  - Currently reverse engineering extracted firmware to understand the flow of execution and find possible security vulnerabilities
- **Evaluating the usability of security indicators in Gmail's UI**
  - Performed a pilot study with users to determine if they noticed security indicators in Gmail's UI, and whether they understood explanations of the indicators provided by Google
  - Currently preparing a full-scale user study, already obtained IRB approval

INDUSTRY EXPERIENCE

Security Engineering Intern *Summer 2020*
Mozilla, Mountain View, CA (remote)

- Researched security issues in language-based package managers like Cargo, NPM and PyPI
- Calculated attack possibilities for package maintainer account takeover, package code compromise, and vulnerability exploitation
- Used research about past security incidents to fix security scoring algorithm on Mozilla's Dependency Observatory (*github.com/mozilla-services/dependency-observatory*) project, used to estimate the security of NPM packages

Security Analyst Intern *Summer 2019*
Electronic Arts, Seattle, WA

- Used Python to automate checking for open ports and other attack vectors on EA's cloud instances.
- Scanned 800+ instances, found 1400+ security incidents sending summary of vulnerabilities to affected parties, with descriptions of the vulnerabilities and instructions to resolve them

TEACHING EXPERIENCE

Undergrad. TA - CS349 Contemporary Issues in Comp. Sci. *Spring 2021*
The University of Texas at Austin, Austin, TX
- Graded assignments and held office hours for a class of 40+ students
- Shared resources and information regarding ethical and social issues in computer science

Undergrad. TA - CS361 Intro to Security *Spring, Fall 2019*
The University of Texas at Austin, Austin, TX
- Created and graded security-focused assignments for 80+ students
- Lectured on various topics in security including cryptography and data forensics
- Wrote, hosted and ran a CTF competition for the students' final exam

HONORS

San Diego Fellowship, UCSD Graduate Division *2021*
Cactus Standout Award, UT Cactus Yearbook *2021*
Louis E. Rosier Memorial Scholarship, UT Dept. of Computer Science *2020/2021*
Tapia Conference Scholarship, UT Dept. of Computer Science *2020*
USENIX Security Diversity Grant, USENIX Security *2020*
Grace Hopper Conference Scholarship, UT Dept. of Computer Science *2019*
BlackHat Student Scholarship, BlackHat *2019*
DEFCON 27 Scholarship, Women in Security & Privacy *2019*
Jack S. Blanton Family Scholarship, Texas Exes Houston Chapter *2017/2018*

AWARDS

CAPTURE THE FLAG (JEOPARDY)
1st, Sunshine CTF, with team "UTC" *2019*
1st, AtlassianCTF, with team "hhh_" *2020*
3rd, AngstromCTF, with team "UTC" *2019*
3rd, AtlassianCTF, with team "hhh_" *2018, 2019*
10th, SwampCTF, with team "UTC" *2019*

CAPTURE THE FLAG (ATTACK/DEFENSE)
1st, Texas Network Massacre *2019*

HACKATHONS
1st, TAMUHack, with our project AllerGen (*devpost.com/software/allergen*) *2019*
3rd, Hacklahoma, with our project Access Atlas (*devpost.com/software/access-atlas*) *2019*
Top 10, Hacklahoma, with our project PlayFuse (*devpost.com/software/fuseplay*) *2018*
Competed in 15+ hackathons total

LEADERSHIP

President, Engineering Officer *2018 - 2021*
UT Information & Systems Security Society
- Led a team of 15 officers and served an organization with 200+ members
- Led the UTCTF project in 2021 and 2020, our yearly international 48 hour CTF with over 2500+ participants. Coordinated event planning, communication channels, prizes, etc in addition to writing my challenges for the CTF (*isss.io/github/UTCTF-21*, *isss.io/github/UTCTF-20*)
- Created and led our ForeverCTF initiative, an always available, entry level CTF to allow members to build and practice their security skills (*forever.isss.io*)
- Created and led our Beginner Series initiative, a series of technical talks aimed at teaching newcomers the basics of different areas in security (*isss.io/talks/beginner-series*)

- Wrote security challenges for biweekly Capture the Flag (CTF) competitions with 50+ regular participants (*isss.io/github/ctf*)
- Gave talks about security-related topics such as cryptography, data forensics, personal security and privacy, etc. (*isss.io/talks*)

Captain, previously Co-Captain *2019 - 2021*
UT Collegiate Cyber Defense Competition (CCDC) and Collegiate Penetration Testing Competition (CPTC)
- CCDC: Led a team of 8 in a blue team simulation, where students must defend 8-10 machines from red team attackers while also completing business 'injects' (setting up new services, managing users, etc.). Competed at Nationals in 2021, placed 1st (2021), 2nd (2019), 3rd (2020) at Southwest Regionals
- CPTC: Led a team of 6 students in a red team simulation, where students perform a comprehensive penetration test of a company network with , then write a detailed report of the vulnerabilities and security flaws they found. Placed 2nd (2019) at New England Regionals

Web/Tech Senior Officer, previously Web/Tech Junior Officer *2018 - 2020*
UT Association for Computing Machinery
- Implemented new features and fixed bugs on UT's ACM chapter website
- Wrote curriculum for and hosted 'CS101', a series of 8-10 introductory workshops for freshmen with topics like Linux basics, Git/VCS, debugging, etc (*github.com/UTACM/CS101*)
- Created and implemented 'A to Zs of UTCS', a glossary of terms related to computer science, UTCS and UT Austin to help new students get up to speed (*texasacm.org/AtoZ*)

SELECTED PROJECTS

See my GitHub page for all projects.

Elitzur-Vaidman attack on quantum money (*ggithub.com/alex-bellon/quantum-money-attack*)
- Implementation of an attack in which a user can recover the state of a piece of quantum money using only basic quantum logic gates

Anshel-Anshel-Goldfeld key exchange (*github.com/alex-bellon/anshel-anshel-goldfeld-rubiks-cube*)
- Implementation of a key exchange protocol that uses non-commutative cryptography with the Rubik's Cube Group

Scrambled: Rubik's Cube based steganography (*github.com/alex-bellon/rubikstega*)
- Implemented steganographic algorithm to encode text in Rubik's Cube move notation, based on whitepaper
- Wrote paper for "PagedOut" security zine about project (*pagedout.institute*)

OTHER ACTIVITIES

Q++ (Member) *LGBTQ+ computer science club* *2019 - 2021*
Hispanic Association of Computer Scientists (Member) *2017 - 2021*
Hook 'Em Arts (Member) *Performing arts appreciation club* *2017 - 2021*
Austin Quidditch (Chaser/Seeker) *Club sports team* *2017 - 2019*

TECHNICAL SKILLS

Most comfortable in Python, Java and C; familiar with C++, MySQL, JS, HTML/CSS and Haskell.

Comfortable with Linux (Ubuntu, Arch/Manjaro) and UNIX, Shell (`bash`, `zsh`), `git`, `vim`, LaTeX, and command line tools. Familiar with Wireshark, Ghidra, `gdb`, Kubernetes and Docker.