KARAN NEWATIA

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EDUCATION

University of Pennsylvania *Jul 2020 - May 2025 (Expected)*
PhD in Computer and Information Science
Advised by Profs. Andreas Haeberlen and Linh Thi Xuan Phan
Research interests: distributed systems, system security, privacy

Cornell University
Bachelor of Arts in Computer Science *Aug 2016 - Dec 2019*
Master of Engineering in Computer Science *Jan 2020 - May 2020*

PUBLICATIONS

Mycelium: Large-Scale Distributed Graph Queries with Differential Privacy.
E. Roth, **K. Newatia**, Y. Ma, K. Zhong, S. Angel, and A. Haeberlen.
Proceedings of the 28th ACM Symposium on Operating Systems Principles (**SOSP '21**), Virtual, October 2021.

RESEARCH EXPERIENCE

Mycelium Oct 2020 - Aug 2021
Supervised by Profs. Andreas Haeberlen and Sebastian Angel *University of Pennsylvania*

· Developed Mycelium, the first system to process large-scale differentially private graph queries, using a combination of cryptographic techniques (Fully Homomorphic Encryption, Zero Knowledge Proofs, Multi Party Computation). Worked on optimizing query processing, handling special queries, ensuring the security of our novel mix-net communication protocol, and led the implementation and evaluation of the system.

Vegvisir Jun 2019 - Dec 2019
Supervised by Profs. Robbert van Renesse and Hakim Weatherspoon *Cornell University*

· Developed Vegvisir, a partition-tolerant blockchain for use in power-constrained IoT environments with limited network connectivity. Built Android apps for emergency response and healthcare using the blockchain system. Integrated Vegvisir into Farmval.io (a startup which provides digital credit score evaluation of soil quality) using machine learning algorithms trained on agricultural datasets.

Chain Replication Made Moderately Complex Jan 2020 - May 2020
Supervised by Prof. Robbert van Renesse *Cornell University*

· Evaluated the Chain Replication revisited (CR^2) protocol using Ovid and Emulab. The CR^2 prtocol addresses the limitations of the original Chain Replication protocol and improves fault tolerance, latency, and throughput using speculative history, batched writes, and an improved system design.

Fabric Aug 2018 - May 2019
Supervised by Prof. Andrew Myers *Cornell University*

· Implemented a distributed version of Scrabble with security guarantees using Fabric, a high-level programming language for building distributed applications with strong security.

PROGRAMMING SKILLS

• Python • C • C++ • Java • OCaml

SELECTED PROJECTS

GeoWave-FoundationDB Sep 2019 - Dec 2019
Project for CS 5152 (Open Source SWE) *Cornell University*

· Worked on creating a data store extension within GeoWave for FoundationDB (a fault-tolerant distributed database) to retrieve and analyze massive geospatial datasets. Implemented reader, writer and deleter for FoundationDB using transactions.

Destination Matcher Apr 2019 - May 2019
Project for CS 4300 (Language & Information) *Cornell University*

· Implemented a travel destination recommendation system which returns destinations based on user's interests and preferences (such as activities, climate, local language, drinking age). Created a custom nicheness metric calculated using network structure of Wikivoyage to emphasize the "hidden gems" of world travel.

Cislunar Explorers Jun 2018 - Aug 2018
Supervised by Prof. Mason Peck *Cornell University*

· Implemented flight software for the Cislunar spacecraft which will be carried as a secondary payload on NASA's Artemis 1 mission (scheduled to launch in December 2021). Collaborated with JPL to implement flight telemetry using JPL's FPrime framework.

AguaClara, Software sub-team Jan 2017 - May 2018
Supervised by Prof. Monroe Weber-Shirk *Cornell University*

· Used Python to model the environmental engineering equations behind the design of water treatment plants of AguaClara, a project team at Cornell which aims to provide clean drinking water to tens of thousands of people in Honduras and India.

TEACHING EXPERIENCE

Teaching Assistant, CIS 505: Software Systems Aug 2021 - current
https://www.cis.upenn.edu/~cis505/ *University of Pennsylvania*

· Responsibilities include grading programming assignments and exams, teaching special lab sessions, and holding weekly office hours.

Code Afrique Jan 2019 - current
https://codeafrique.com *Ghana*

· Taught the basics of Computer Science using Python to over 450 high school students in Ghana at Code Afrique, a program designed to encourage African high school students to pursue Computer Science.

SELECTED COURSEWORK

• Operating Systems, Distributed Computing, System Security, Databases, Cryptography
• ML, Computational Linguistics, Language & Information, Large-Scale ML
• Algorithms, Functional Programming, Open-Source Software Engineering, Game Theory