Roy Rinberg

Contact Information

Email: royrinberg+CV@gmail.com **Location:** New York, NY
Website: www.royrinberg.com

Education

Columbia University, New York, NY 2021 - Present
M.S. Computer Science; Thesis Track: Advised by Prof. Rachel Cummings and Prof. Steven Bellovin

New York University, New York, NY 2014 - 2018
B.A. Computer Science, Physics, Minor: Math.

Thomas Jefferson High School for Science and Technology, Alexandria, VA 2010 - 2014

Selected CS Coursework: Neural Networks, Foundations of Blockchain, Policy for Privacy Tech, ML, Security, Theory of Computation, Algorithmic Problem Solving, Algorithms, Operating Systems, Computer Systems Organization
Selected Math Coursework: Honors Algebra, Analysis, Probability, Linear Algebra, Calculus I-III, Grad Probability and Statistics for Data Science
Selected Physics Coursework: Statistical Mechanics, Computational Physics, Mathematical Physics, Quantum Mechanics, Electricity & Magnetism, Dynamics

Software Skills

Programming Languages: Python, C, C++
Software: Linux, Pytorch, Tensorflow, Docker, Google Cloud Services, AWS ROS, ELK Stack, Pandas, Jenkins, Artifactory, SQL, Web-scraping, Opacus, Jax

Research Experience

Columbia University, New York, NY August 2021 - Present
Privacy in ML [**Advisors: Prof. Rachel Cummings and Prof. Steven Bellovin**]

- Modern machine learning algorithms memorize training data. My main research studies trade-offs of memorization, privacy, and accuracy, primarily focusing on differential privacy.
- Other research focuses on on improvements in privacy consideration when considering heterogeneous data distributions.

University of Toronto, Toronto, Ontario May 2022 - September 2022
Privacy in Machine Learning [**Advisor: Prof. Nicolas Papernot**]

- Research on Individualization of PATE. Paper accepted to PoPETs 2023. Paper link.
- Extensions of Gaussian & Laplacian DP primitives, and their application to ML. *On-going.*
- Research on Catered PATE - PATE in the presence of heterogenous data (link). *On-going.*

New York University, New York, NY February 2017 - May 2018
Evolution of Language Models within Social Networks [**Advisor: Prof. Bud Mishra**]
This research investigated the development of echo chambers within social networks.

- Developed pipeline to study the evolution of clusters of users in social networks over time, using topological data analysis to study distances between Word2Vec models trained on text.
- Scraped Reddit to supplement a dataset of Reddit text from multiple years (∼1TB).
- Helped with mathematical proofs and ran simulations. Publication on arXiv.

Work Experience

Ouster, San Francisco, CA June 2018 - July 2021
Software Engineer
Ouster is a startup developing lidar sensors. I worked on lidar-based collision-avoidance systems

- Developed & deployed C++ algorithms for real-time predictions about dangerous driving.
- Developed pipeline to evaluate algorithms on 100s of hours of historical lidar data.
- Created automatic data-pulling service for IoT devices, saving >3hr/day across team.
- Improved logging and alerting (ELK stack) and continuous integration (Jenkins) frameworks.
- Developed and packaged python SDKs for cross-team developers and processes for visualization, management, and deterministic playback of data. Used ubiquitously across team.
- *Internship Project:* Produced open-source C++ lidar point-cloud data visualizer (Github link).

Career Copilots, San Francisco CA May 2020 - August 2020
Software Engineer Contractor
Career Copilots is a startup seeking to help individuals find jobs using data.
- Developed python web-scraper to scrape jobs-data to help users find roles catered to them.
- Developed pandas data-exploration pipeline for investigating LinkedIn user data.

Internships

Hong Kong University for Science and Technology, Hong Kong Summer 2016
Research in Industrial Projects for Students (RIPS-HK) [Advisor: Dr. Avery Ching]
RIPS-HK is an REU with HKUST and an industrial sponsor.
- Developed protocol for robust, acoustic communication by underwater drones in noisy channels, combining information theoretic approach and physics modeling of acoustic channels in water.
- Team lead for team of 3 other students.

Janelia Research Campus, HHMI, Ashburn, VA Summer 2015
Scientific Computing Group [Advisors: Dr. Khaled Khairy and Dr. Sean Murphy]
Janelia Research Campus is a neuroscience and imaging research center.
- Decreased stitching time from 13.7 sec/image-pair to 1.8 sec/image-pair, using OpenCV and OpenMP on GPU cluster, on the Stitching Multi-Terrabyte ssTEM Image Data project.

Weizmann Institute of Science, Rehovot, Israel Summer 2014
International Summer Science Institute (ISSI) [Advisor: Prof. Roee Ozeri]
ISSI is an international internship for natural sciences and math. I worked in the Trapped Ions Lab.
- Developed data visualization to study ultra-cold atoms in a laser-cooled Magneto-Optical Trap.

Publications

1. F. Boenisch, C Mühl, **R. Rinberg**, J. Ihrig, A. Dziedzic. Individualized PATE: Differentially Private Machine Learning with Individual Privacy Guarantees. Accepted to PoPETs 2023.
2. **R. Rinberg**, N. Agarwal. *Privacy when Everyone is Watching: An SOK on Anonymity on the Blockchain.* ePrint.
3. A. Tamaskar, **R. Rinberg**, S. Chakraborty, B. Mishra. *Creolizing the Web.* arXiv:2102.12382 . Research from my work at NYU with Professor Bud Mishra.

Articles and Pre-Prints

1. **R. Rinberg** and A. Nichani. *Improvements and Analysis of Private Ensemble-Based Federated Learning.* Pre-Print. 2021.
2. **R. Rinberg**. *Resources for Public-Interest Technology.* Medium (self-published). 2020.
   Comprehensive list of resources for working in Public-Interest Technology. Link.
3. **R. Rinberg**. *Jell-O Brains and DNA: High School Students Launch Innovative STEM Program.* Scientific American. 2014.
   Invited article in 'Budding Scientist' series describing work leading Project BEST. Link.

Teaching

NYU - General Physics I and II Tutor September 2017 - May 2018
- Tutored physics courses on classical mechanics and electricity & magnetism.

Awards, Memberships, Conferences

Advanced Master's Research Specialization 2022-2023
Workshop on DP and Statistical Data Analysis (Toronto, ON) Summer 2022
Differential Privacy Summer School (Boston, MA) Summer 2022
Presidential Honors Scholar (NYU) 2015 - 2018
Dean's List (NYU) 2014 - 2018
Sigma Pi Sigma (Physics Honor Society) (NYU) Inducted 2018
HPC for Undergraduates - Conference Scholarship for SC'17 Fall 2017
DURF & Research+ for Housing and Stipend (NYU) Summer 2017
University Leadership Honors Course (NYU) Spring 2017

Leadership

Project BEST (Building Excitement for Science and Technology) 2011 - 2014
CFO and Co-founder
Project BEST is a non-profit which develops after-school STEM programs for middle school students.
- Fundraised and grew organization to 25 chapters across 3 states, reaching 3000+ students.
- Led two full-day STEM programs for 100+ students, and co-led team of 20 volunteers.

Side-Projects and Service

Ouster Community Work 2018-2020
- Advocated management to institute paid volunteer-day and donate $6k to 6 public-interest orgs.