

Yuandong Cyrus Liu

☎ +1 551-260-1767 | @ cyrus.cl@outlook.com | [in](#) cyruliu | [p](#) cyruliu | [globe](#) cyrusliu.me 📍 Hoboken, NJ

(Authorized to work without restrictions, no sponsorship required.)

EDUCATION

- Ph.D.** Computer Science, Stevens Institute of Technology, Dec. 2022
M.S. Information Security, Beijing University of Posts and Telecommunications, Mar. 2017
B.S. Information and Computing Science, North China University of Science and Technology, Jun. 2014

RESEARCH & WORK EXPERIENCE

- Stevens Institute of Technology** Hoboken, New Jersey, USA
Graduate Research Assistant *Jan. 2018 – Dec. 2022*
- Dissertation, [Temporal Verification of Nonlinear Programs](#).
 - Dynamic temporal verification for nonlinear programs (paper under review).
 - Bitwise branching for bitvector programs; LTL verification of decompiled binaries (2 publications).
- CarbonNo** Oakland, California, USA
Founder *May 2021 – Sept. 2022*
- Initial fund raise, designed carbon trading market on Web3, converting energy savings to carbon offset.
 - Released whitepaper, developed minting script for our first carbon credit product on the Cardano blockchain.
- New Jersey Institute of Technologies** New Jersey, USA
Teaching Assistant *Aug. 2017 – Dec. 2017*
- Lab instructor, class assistant for ECE 361 Electromagnetic Fields I.
- RedHat Inc.** Beijing, China
Virtualization Quality Assurance Intern *May 2017 – July 2017*
- Virt-manager product testing for RedHat OS, test case examination.
 - Design testing cases, and write bug reports to upstream.
- Beijing University of Posts of Telecommunications** Beijing, China
Graduate Research Assistant *Sept. 2014 – Mar. 2017*
- Mobile network security; App store reviews mining model design (3 publications).

SKILLS

Programming Languages: Python, Java, C, C++, LLVM, Ocaml, Haskell, Plutus, Assembly, Bash, Perl, C#, SQL, MATLAB, R, HTML, CSS.

Technologies: Static/Dynamic Analysis, System/Mobile/Web Security, Penetration Test, Mathematical Modeling, SSH/SSL, Git, AWS/GCP/Azure, Container/Docker, Automatic Verification/Testing, CI/CD, Latex, X86, Reverse Engineering, Compilers, Decompilation, SMT, Formal Methods, ASP.Net, Database, Android, Blockchain, Web3.

PROJECTS

- DrNLA** | [Source](#)
Static analysis often face state explosion problem solving practical programs, *DrNLA* leverages both static and dynamic analysis to mitigate this, allowing static analyzers to reason programs with nonlinear computations.
- Wrote a dual rewriting algorithm for branching-time verification of nonlinear programs.
 - Coded program transformations for dynamic and static analysis. (Ocaml, Python, Z3, C)
 - Devised nonlinear benchmark sets (97) for automated testing and tools evaluation. (Perl)
- DarkSea** | [GitHub](#)
Existing reverse engineering techniques focus on correct binary lifting, lacking the capability of automatically verifying whole-program properties. *DarkSea* is the first automated tool to verify temporal properties of de-compiled binaries.
- Engineered binary disassembly, LLVM transformations, decompilation, LLVM bytecode property-driven slicing for verification. (Radar2, IDA Pro, McSema, C++, LLVM, DG, CPAchecker)
 - Derived and coded bitwise branching rules for bitvector reasoning, it was merged to the main branch of *Ultimate* program analysis framework. (C, Ocaml, Java, SMT Solvers, Z3)
 - Submitted a rich set of benchmarks (310) for automated testing, to public repository *SV-COMP* (CI/CD).
 - Built and deployed docker image on the server for artifact evaluation (Container, AWS).

Mobile Network Security | [GitHub](#)

This project focuses on dynamic detection (URL Request, Camera, Microphone, SMS etc.) for mobile applications in real-time, it also has a nature language process model mining fraud reviews on Mobile App Market.

- Designed and implemented an Android API monitoring system for mobile App behaviors. (Android, Java)
- Created a hot entity discovering model for App reviews, providing insights for Mobile App Market security. (NLP)
- Malicious app detection based on real-time API activity data with deep learning (CNN).

Mathematical Contest in Modeling | [Paper](#) | Applying Mathematical Models to Practical Problems

- Computed a nationwide fresh water allocation and built the math model for future planning, won honorable prize. (objective optimization, Dijkstra algorithm, linear programming, Lindo)
- Built and trained a SVM model to classify wine quality based on its chemical substances data. (Matlab)

PUBLIC TALKS

- *Nov. 2022.* CarbonNo Web3 carbon trading market, Cardano Summit, New York City.
- *Nov. 2022.* Seton Hall University seminar talk on DrNLA and Cybersecurity, Virtual.
- *Oct. 2022.* Research work on DrNLA, NJPLS, University of Maryland, College Park. [Slides](#)
- *Oct. 2021.* Paper presentation on DarkSea, APLAS 2021, Chicago. [Video](#)
- *Oct. 2021.* Student forum, poster presentation, FMCAD 2021, Virtual. [Poster](#)
- *July 2018.* Participant talk on LTL, OPLSS 2018, Oregon.

PUBLICATIONS

- DrNLA: Dual Rewriting for Branching-Time Verification of Non-Linear Arithmetic Programs. (Under Submission)
- Proving LTL Properties of Bitvector Programs and Decompiled Binaries (Extended). Y. Cyrus Liu, C. Pang, D. Dietsch, E. Koskinen, T.C. Le, G. Portokalidis, J Xu. arXiv e-prints, arXiv: 2105.05159
- Liu, Y.C., Pang, C., Dietsch, D., Koskinen, E., Le, T.C., Portokalidis, G. and Xu, J., 2021, October. Proving LTL Properties of Bitvector Programs and Decompiled Binaries. In Asian Symposium on Programming Languages and Systems (pp. 285-304). Springer, Cham.
- Source-Level Bitwise Branching for Temporal Verification. Y. Cyrus Liu, T.C. Le, E. Koskinen arXiv e-prints, arXiv: 2111.02938
- Liu, Y., Li, Y., Guo, Y. and Zhang, M., 2016. Stratify Mobile App Reviews: E-LDA Model Based on Hot "Entity" Discovery. In 2016 12th International Conference on Signal-Image Technology & Internet-Based Systems (SITIS) (pp. 581-588). IEEE.
- Xu, S., Ma, X., Liu, Y. and Sheng, Q., 2016, December. Malicious application dynamic detection in real-time API analysis. In 2016 IEEE International Conference on IEEE Smart Data (SmartData) (pp. 788-794). IEEE.
- Wang Sai, Guo Yanhui, Wu Qiuxin, Liu Yuandong. A detection method of Android application malicious behaviors based on Xposed framework, Sciencepaper Online 12: 1264.

AWARDS & ACHIEVEMENTS

Cardano Project Catalyst: F8 initial grants for project proposal regarding Web3 carbon trading market (\$59k).

Stevens Institution of Technology: Graduate Assistantship (5 years).

SIGPLAN PAC Grants PLDI 2018: Awarded for graduate student traveling to research conference.

OPLSS Travel Grants: Awarded to early graduate student attending the summer school.

Udemy Course Certificate: Data Science and Machine Learning with R.

Teaching Certificate: Teaching at College Level.

National Postgraduate Mathematical Contest in Modeling: Third Prize.

National Computer Rank Examination Certificate: Information Management Technology.

America Mathematical Contest in Modeling: Honorable Mention.

PEER REVIEWS

- *July 2022.* Paper Review, APLAS 2022.
- *May 2022.* Artifact Evaluation Committee, CAV 2022.
- *Oct. 2020.* Artifact Evaluation Committee, TAP 2021, CGO 2021.
- *June 2018.* Student Volunteer, PLDI 2018.