Ding Li

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Research Interests

My research interests are in system security and program analysis. I am working on developing a next generation AIOps system that integrates machine learning techniques with program and system analysis techniques to detect and resolve security, performance, and runtime issues in enterprise environments. I have published more than 50 papers, which have received more than 2500 citations. I was ranked second among the most influential early-career software engineering researchers between 2010 and 2017 by the Journal of Systems and Software. I also received the ISSTA 2023 Impact Paper Award.

Education

University of Southern California, Los Angeles, CA, USA

Ph.D., Computer Science, Dec. 2016
- Thesis Topic: *Energy Optimization of Mobile Applications*
- Advisor: William G. J. Halfond

Peking University, Beijing, China

B.S., Computer Science, May 2011

B.S., Statistics (Dual Major), May 2011

Work Experience

Assistant Professor
    School of Computer Science
    Peking University
	Sept. Dec 2020 to present

Researcher
    Computer Security Group
    NEC Labs America
	Sept. 2016 to Jan. 2020

Research Assistant
    Software Quality Lab
    Department of Computer Science
    University of Southern California
    Supervisor: William G. J. Halfond
	Aug. 2011 to Aug. 2016

Research Contractor
    Microsoft Research Redmond
    Supervisor: Suman Nath
	May 2015 to Aug. 2015

Research Intern
    Microsoft Research Redmond
    Supervisors: Suman Nath, James Mickens
	May 2014 to Aug. 2014

Research Assistant
    Institute of Software,
    School of Electronics Engineering and Computer Science
    Peking University
	Aug. 2009 to May 2011

AWARDS

Business & Acdemic Awards
- 2023 ISSTA Impact Paper Award
- 2021 Tecent Excellent Innovation Award

- 2018 NEC Excellent Invention Award
- 2017 NECLA Business Contribution Award

Travel Awards
- ACM SIGSOFT CAPS-Grad Grant for FSE 2015
- ACM SIGSOFT CAPS-Grad Grant for ISSTA 2013

Student Awards — University of Southern California
- Viterbi Undergraduate Research Mentoring Award: one of the two awardees among 5200 Ph.D. students   May 2014

JOURNAL PUBLICATIONS

1. Xuanzhe Liu, Chengxu Yang, **Ding Li***, Yuhan Zhou, Shaofei Li, Jiali Chen, Zhenpeng Chen*. "Adonis: Control Flow Recovery through OS-Level Traces." *ACM Transactions on Software Engineering and Methodology (TOSEM)*, CCF-A, * corresponding author.

2. Peng Jiang,Jifan Xiao, **Ding Li***, Hongyi Yu,Yu Bai,Yao Guo, Xiangqun Chen. "Detecting Malicious Websites from the Perspective of System Provenance Analysis." *IEEE Transactions on Dependable and Secure Computing (TDSC)*, CCF-A, * corresponding author.

3. Xuanzhe Liu, Jinfeng Wen, Zhenpeng Chen*, **Ding Li***, Junkai Chen, Yi Liu, Haoyu Wang, Xin Jin. "FaaSLight: Application-Level FaaS Optimization for Cold Start Latency in Serverless Computing." *ACM Transactions on Software Engineering and Methodology (TOSEM)*, CCF-A, * corresponding author.

4. Mian Wan, Yuchen Jin, **Ding Li**, Jiaping Gui, and William G. J. Halfond. "Detecting Display Energy Hotspots in Android Apps." *Software Testing, Verification and Reliability (STVR)*, 2017.

CONFERENCE PUBLICATIONS

1. Feng Dong, Shaofei Li, Peng Jiang, **Ding Li***, Haoyu Wang*, Liangyi Huang, Xusheng Xiao, Jiedong Chen, Xiapu Luo, Yao Guo, and Xiangqun Chen "Are we there yet? An Industrial Viewpoint on Provenance-based Endpoint Detection and Response Tools" *In Proceedings of the 30th ACM Conference on Computer and Communications Security (CCS)*, 2023, CCF-A, * corresponding author.

2. Peng Jiang, Ruizhe Huang, **Ding Li***, Yao Guo, Xiangqun Chen, Jianhai Luan, Yuxin Ren, and XinWei Hu. "Auditing Frameworks Need Resource Isolation: A Systematic Study on the Super Producer Threat to System Auditing and Its Mitigation." *In Proceedings of he 32nd USENIX Security Symposium (Security)* 2023, CCF-A, * corresponding author.

3. Ningyu He, Zhehao Zhao, Jikai Wang, Yubin Hu, Shengjian Guo, Haoyu Wang, Guangtai Liang, **Ding Li***, Xiangqun Chen, Yao Guo* . "Eunomia: Enabling User-specified Fine-Grained Search in Symbolic Execution." *In Proceedings of The ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA)*, 2023, CCF-A, * corresponding author.

4. Bingyan Liu, Yifeng Cai, Hongzhe Bi, Ziqi Zhang, **Ding Li**, Yao Guo, and Xiangqun Chen. "Beyond Fine-Tuning: Efficient and Effective Fed-Tuning for Mobile/Web Users." *In Proceedings of the International World Wide Web Conference (WWW)* CCF-A, 2023.

5. Ziqi Zhang, Yuanchun Li, Bingyan Liu, Yifeng Cai, **Ding Li***, Yao Guo*, Xiangqun Chen. "FedSlice: Protecting Federated Learning Models from Malicious Participants with Model Slicing." *In Proceedings of the International Conference on Software Engineering (ICSE)*, 2023, CCF-A, * corresponding author.

6. Feng Dong, Liu Wang, Xu Nie, Fei Shao, Haoyu Wang, **Ding Li**, Xiapu Luo, and Xusheng Xiao. "DISTDET: A Cost-Effective Distributed Cyber Threat Detection System." *In Proceedings of the USENIX Security Symposium (Security)*, 2023, CCF-A

7. Ziqi Zhang, Yuanchun Li, Jindong Wang, Bingyan Liu, **Ding Li**, Xiangqun Chen, Yao Guo, Yunxin Liu. "ReMoS: Reducing Defect Inheritance in Transfer Learning via Relevant Model Slicing." *Proceedings of the International Conference on Software Engineering (ICSE)*, 2022, CCF-A

8. Bingyan Liu, Yifeng Cai, Ziqi Zhang, Yuanchun Li, Leye Wang, **Ding Li**, Yao Guo, Xiangqun Chen. "DistFL: Distribution-aware Federated Learning for Mobile Scenarios." *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (UbiComp)*, 2022, CCF-A

9. Lei Cai, Zhengzhang Chen, Chen Luo, Jiaping Gui, Jingchao Ni, **Ding Li**, Haifeng Chen. "Structural Temporal Graph Neural Networks for Anomaly Detection in Dynamic Graphs." *the ACM International Conference on Information and Knowledge Management (CIKM)*, 2021

10. Peng Fei, Zhou Li, Zhiying Wang, **Ding Li**, Kangkook Jee. "SEAL: Storage-efficient Causality Analysis on Enterprise Logs with Query-friendly Compression." *the USENIX Security Symposium (Security)*, 2021, CCF-A

11. Xueyuan Han (), Xiao Yu, Thomas Pasquier, **Ding Li**, Junghwan Rhee, James Mickens, Margo Seltzer, Haifeng Chen. "SIGL: Securing software installations through deep graph learning." *the USENIX Security Symposium (Security)*, 2021, CCF-A

12. Wajih Ul Hassan,**Ding Li**, Kangkook Jee, Xiao Yu, Kexuan Zou, Dawei Wang, Zhengzhang Chen, Zhichun Li, Junghwan Rhee, Jiaping Gui, Adam Bates. "This is Why We Can't Cache Nice Things: Lightning-Fast Threat Hunting using Suspicion-Based Hierarchical Storage." *Annual Computer Security Applications Conference (ACSAC)*, 2020

13. Qi Wang, Wajih Ul Hassan, **Ding Li**, Kangkook Jee, Xiao Yu, Kexuan Zou, Junghwan Rhee, Zhengzhang Chen, Wei Cheng, C Gunter, Haifeng Chen. "You are what you do: Hunting stealthy malware via data provenance analysis." Served as one of the corresponding authors. *the Network and Distributed System Security Symposium (NDSS)*, 2020

14. Jiaping Gui, **Ding Li**, Zhengzhang Chen, Junghwan Rhee, Xusheng Xiao, Mu Zhang, Kangkook, Jee, Zhichun Li, Haifeng Chen. "APTrace: A Responsive System for Agile Enterprise Level Causality Analysis." Served as the corresponding author. *the IEEE International Conference on Data Engineering (ICDE)*, 2020, industrial track

15. Xuchao Zhang, Wei Cheng, Bo Zong, Yuncong Chen, Jianwu Xu,**Ding Li**, and Haifeng Chen. "Temporal Context-Aware Representation Learning for Question Routing." *the ACM International Conference on Web Search and Data Mining (WSDM)*, 2020

16. Jiaping Gui, Xusheng Xiao, **Ding Li**, Chung Hwan Kim, and Haifeng Chen. "Progressive Processing of System Behavioral Query." *the Annual Computer Security Applications Conference (ACSAC)*, 2019

17. Shen Wang (Intern) , Zhengzhang Chen, Xiao Yu, **Ding Li**, Jingchao Ni, Lu-An Tang, Jiaping Gui, Zhichun Li , Haifeng Chen, Philip Yu. "Detecting Unknown Malicious Programs in Enterprise Systems via Attentional Heterogeneous Graph Neural Networks." *the International Joint Conference on Artificial Intelligence (IJCAI)*, 2019

18. Shen Wang (Intern), Zhengzhang Chen, **Ding Li**, Lu-An Tang, Jingchao Ni, Zhichun Li, Junghwan Rhee, Haifeng Chen, Philip S. Yu. "Deep Program Reidentification: A Graph Neural Network Solution." *the SIAM International Conference on Data Mining (SDM)*, 2019

19. Suphannee Sivakorn (Intern), Kangkook Jee, Yixin Sun (Intern), Lauri Kort-Parn, Zhichun Li, Cristian Lumezanu, Lu-An Tang, **Ding Li**. "Countering Malicious Processes with Process-DNS Association." *the Network and Distributed System Security Symposium (NDSS)*, 2019

20. Wajih Ul Hassan (Intern), Shengjian Guo (Intern), **Ding Li**, Zhengzhang Chen, Kangkook Jee, Zhichun Li, Adam Bates. "NoDoze: Combatting Threat Alert Fatigue with Automated Provenance Triage." Served as the corresponding author. *the Network and Distributed System Security Symposium (NDSS)*, 2019

21. Yutao Tang (Intern), **Ding Li**, Zhichun Li, Mu Zhang, Kangkook Jee, Xusheng Xiao, Zhenyu Wu, Junghwan Rhee, Fengyuan Xu, Qun Li. "NodeMerge: Template Based Efficient Data Reduction For Big-Data Causality Analysis." Served as one of the corresponding authors and the co-first author. *the ACM Conference on Computer and Communications Security (CCS)*, 2018

22. Peng Gao (Intern), Xusheng Xiao, **Ding Li**, Zhichun Li, Kangkook Jee, Zhenyu Wu, Chung Hwan Kim, Sanjeev R. Kulkarni, Prateek Mittal. "SAQL: A Stream-based Query System for Real-Time Abnormal System Behavior Detection." *the USENIX Security Symposium (Security)*, 2018

23. Yingjun Lyu, **Ding Li**, William G. J. Halfond. "Remove RATs from Your Code: Automated Optimization of Resource Inefficient Database Writes for Mobile Applications." *the International Symposium on Software Testing and Analysis (ISSTA)*, 2018

24. Yushan Liu (Intern), Mu Zhang, **Ding Li**, Kangkook Jee, Zhichun Li, Zhenyu Wu, Junghwan Rhee, Prateek Mittal. "Towards a Timely Causality Analysis for Enterprise Security." Served as one of the corresponding authors. *the Network and Distributed System Security Symposium (NDSS)*, 2018

25. **Ding Li**, Yingjun Lyu, Jiaping Gui, William G. J. Halfond. "Automated Energy Optimization of HTTP Requests for Mobile Applications." *the International Conference on Software Engineering (ICSE)*, 2016

26. **Ding Li**, Yingjun Lyu, Mian Wan, William G. J. Halfond. "String Analysis for Java and Android Applications." *the Symposium on the Foundations of Software Engineering (FSE)*, 2015

27. **Ding Li**, James Mickens, Suman Nath, Lenin Ravindranath. "Domino: Understanding Wide-Area, Asynchronous Event Causality in Web Applications." *the ACM Symposium on Cloud Computing (SoCC)*, 2015, acceptance rate: 21.6% (34/157).

28. Mian Wan, Yuchen Jin, **Ding Li**, William G. J. Halfond. "Detecting Display Energy Hotspots in Android Apps." *the International Conference on Software Testing (ICST)*, 2015

29. **Ding Li**, Shuai Hao, Jiaping Gui, William G. J. Halfond. "An Empirical Study of the Energy Consumption of Android Applications." *the International Conference on Software Maintenance and Evolution (ICSME)*, 2014

30. **Ding Li**, Yuchen Jin, Cagri Sahin, James Clause, William G. J. Halfond. "Integrated Energy-Directed Test Suite Optimization." *the International Symposium on Software Testing and Analysis (ISSTA)*, 2014

31. **Ding Li**, Angelica Huyen Tran, William G. J. Halfond. "Making Web Applications More Energy Efficient for OLED Smartphones." *the International Conference on Software Engineering (ICSE)*, 2014

32. **Ding Li**, Shuai Hao, William G. J. Halfond, Ramesh Govindan. "Calculating Source Line Level Energy Information for Android Applications." *the International Symposium on Software Testing and Analysis (ISSTA)*, 2013

33. Shuai Hao, **Ding Li**, William G. J. Halfond, Ramesh Govindan. "SIF: A Selective Instrumentation Framework for Mobile Applications." *the International Conference on Mobile Systems, Applications, and Services (Mobisys)*, 2013

34. Shuai Hao, **Ding Li**, William G. J. Halfond, Ramesh Govindan. "Estimating Mobile Application Energy Consumption Using Program Analysis." *the International Conference on Software Engineering (ICSE)*, 2013

WORKSHOP AND OTHER PUBLICATIONS

1. Peng Gao, Xusheng Xiao, **Ding Li**, Kangkook Jee, Haifeng Chen, Sanjeev Kulkarni, Prateek Mittal. "Querying Streaming System Monitoring Data For Enterprise System Anomaly Detection." *the International Conference on Data Engineering (ICDE)*, demo track, 2020

2. Jiaping Gui, **Ding Li**, Mian Wan, William G.J. Halfond. "Lightweight Measurement and Estimation of Mobile Ad Energy Consumption." *the International Workshop on Green and Sustainable Software (Greens)*, collocated with ICSE, 2016

3. **Ding Li**, Angelica Huyen Tran, William G. J. Halfond. "Nyx: A Display Energy Optimizer for Mobile Web Apps." Tool track, *the Symposium on the Foundations of Software Engineering (FSE)*, 2015

4. **Ding Li**, Angelica Huyen Tran, William G. J. Halfond. "Optimizing Display Energy Consumption for Hybrid Android Apps." *the International Workshop on Software Development Lifecycle for Mobile (DeMobile)*, extended abstract, collocated with FSE, 2015

5. **Ding Li**, William G.J. Halfond. "Optimizing Energy of HTTP Requests in Android Applications." *the International Workshop on Software Development Lifecycle for Mobile (DeMobile)*, collocated with FSE, 2015

6. **Ding Li**, William G.J. Halfond. "An Investigation Into Energy-Saving Programming Practices for Android Smartphone App Development." *the International Workshop on Green and Sustainable Software (Greens)*, collocated with ICSE, 2014

7. **Ding Li**, Cagri Sahin, James Clause, William G.J. Halfond. "Energy-directed Test Suite Optimization." *the International Workshop on Green and Sustainable Software (Greens)*, collocated with ICSE, 2013

8. Shuai Hao, **Ding Li**, William G. J. Halfond, Ramesh Govindan. "Estimating Android applications' CPU Energy Usage Via Bytecode Profiling." *the International Workshop on Green and Sustainable Software (Greens)*, collocated with ICSE, 2012

PATENTS

1. **Ding Li**, Xusheng Xiao, Li Zhichun, Guofei Jiang, Peng Gao, "System and method for detecting security risks in a computer system." US Patent 10,909,242

2. Xusheng Xiao, Li Zhichun, Mu Zhang, Guofei Jiang, Jiaping Gui, **Ding Li**, "Security monitoring with progressive behavioral query language databases." US Patent 10,831,750

3. **Ding Li**, Kangkook Jee, Li Zhichun, Mu Zhang, Zhenyu Wu, "Template based data reduction for security related information flow data." US Patent 10,733,149

PRESENTATIONS

Software Engineering Conferences Presentations
- "Automated Energy Optimization of HTTP Requests for Mobile Applications." *the International Conference on Software Engineering (ICSE)*, May. 2016.
- "String Analysis for Java and Android Applications." *the Symposium on the Foundations of Software Engineering (FSE)*, Sept. 2015.
- "An Empirical Study of the Energy Consumption of Android Applications." *the International Conference on Software Maintenance and Evolution (ICSME)*, Oct. 2014.
- "Integrated Energy-Directed Test Suite Optimization." *the International Symposium on Software Testing and Analysis (ISSTA)*, Jul. 2014.
- "Calculating Source Line Level Energy Information for Android Applications." *the International Symposium on Software Testing and Analysis (ISSTA)*, Jul. 2013.

Workshop and Other Presentations
- "Energy Optimization of Mobile Applications" *Job Talk*, UT Dallas, May. 2016.
- "Energy Optimization of Mobile Applications" *Job Talk*, NEC Labs America, Feb. 2016.
- "Optimizing Energy of HTTP Requests in Android Applications." *the International Workshop on Software Development Lifecycle for Mobile (DeMobile)*, collocated with FSE, Aug. 2015.
- "Nyx: A Display Energy Optimizer for Mobile Web Apps." Tool track, *the Symposium on the Foundations of Software Engineering (FSE)*, Sept. 2015.
- "Energy Measurement and Empirical Study for Android Applications." *USC CSSE Annual Research Review*, Apr. 2015.
- "Energy-directed Test Suite Optimization." *the International Workshop on Green and Sustainable Software (Greens)*, collocated with ICSE, May. 2013.

SERVICE

Session Chairs:
- The Network and Distributed System Security Symposium (NDSS), Asia-Replay Session, 2021

Committee:
- The ACM Conference on Computer and Communications Security (CCS), 2023
- The IEEE/ACM International Conference on Automated Software Engineering (ASE), 2023
- The ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA), 2022
- The ACM Conference on Computer and Communications Security (CCS), 2022
- Student Research Competition of the International Conference of Software Engineering (ICSE), 2020

- The Annual Conference on Software Analysis, Testing and Evolution (SATE), 2019
- The Annual Conference on Software Analysis, Testing and Evolution (SATE), 2018
- Artifact Evaluation of the International Symposium on Software Testing and Analysis (ISSTA), 2017
- Artifact Evaluation of the International Symposium on Software Testing and Analysis (ISSTA), 2015

Conference Reviewer:
- IEEE the 81st Vehicular Technology Conference (VTC-Spring), 2015

Journal Reviewer:
- Transactions on Computer-Aided Design of Integrated Circuits and Systems & Security 2022
- IEEE Transactions on Information Forensics & Security 2022
- ACM Transactions on Privacy and Security, 2021
- IEEE Transactions on Mobile Computing, 2020
- IEEE Transactions on Software Engineering, 2019
- Software: Practice and Experience, 2019
- IEEE Transactions on Services Computing, 2018
- Applied Computing and Informatics, 2018
- IEEE Transactions on Mobile Computing, 2017
- IEEE Transactions on Services Computing, 2017
- Mobile Information System, 2017
- Software: Practice and Experience, 2017
- Journal of Systems and Software, 2017
- International Journal of Information and Communication Technology, 2016
- ACM Transactions on Design Automation of Electronic Systems, 2014
- IEEE Computer Architecture Letters, 2014

Conference External Reviewer:
- The ACM Conference on Computer and Communications Security (CCS), 2017
- The International Conference on Software Engineering (ICSE), 2016
- The International Conference on Software Testing (ICST), 2015
- The International Symposium on Software Testing and Analysis (ISSTA), 2015
- The International Conference on Automated Software Engineering (ASE), 2013

TEACHING EXPERIENCE	Teaching Assistant CSCI 402, Operating System Class, Department of Computer Science, University of Southern California, Professor: Michael Crowley	Aug 2011 to May 2012

RELEASED TOOLS
- Bouquet: A tool to automatically optimize the HTTP energy of Android apps
  https://github.com/marapapman/Merger
- Violist: A static string analysis framework
  https://github.com/marapapman/Violist
- Nyx: A static analysis tool to optimize display energy of mobile web apps
  https://github.com/marapapman/Nyx

LANGUAGES   Chinese (Native), English