

# Joseph P. Near

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## Research Interests

**Data Privacy**, especially differential privacy.

**Security and Cryptography**, especially multiparty computation and zero-knowledge proof.

**Programming Languages and Program Analysis**, especially for security and privacy.

**Fairness and Transparency**, especially in deep learning.

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## Education

2010–2015 **Ph.D. computer science**, *Massachusetts Institute of Technology*, Cambridge, MA, USA

Thesis: “Domain-Specific Static Analysis for Web Applications.”

Advisor: Daniel Jackson

2008–2010 **M.S. computer science**, *Massachusetts Institute of Technology*, Cambridge, MA, USA

Thesis: “An Imperative Extension to Alloy and a Compiler for its Execution.”

Advisor: Daniel Jackson

2003–2008 **B.S. computer science**, *Indiana University*, Bloomington, IN, USA

Advisor: Daniel Friedman

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## Academic Appointments

2024-present **Associate Professor**, *University of Vermont*, Burlington, VT

2018-2024 **Assistant Professor**, *University of Vermont*, Burlington, VT

2015-2018 **Postdoctoral Researcher**, *University of California, Berkeley*, Berkeley, CA

Advised by Professor Dawn Song.

2008-2015 **Research Assistant**, *Massachusetts Institute of Technology*, Cambridge, MA

Advised by Professor Daniel Jackson.

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## Awards

2023 **Top Reviewer Award**, *CCS 2024*

2023 **Distinguished Reviewer**, *VLDB 2023*

2019 **ACM SIGPLAN Distinguished Paper Award**, *OOPSLA 2019*

2018 **DARPA Riser**

2015 **ACM SIGSOFT Distinguished Paper Award**, *ICSE 2015*

2009-2013 **National Science Foundation Graduate Research Fellowship**

2007 **Undergraduate Instructor of the Year**, *Department of Computer Science, Indiana University*

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## Peer-Reviewed Conference Publications

- **Efficient, Portable, Census-Polymorphic Choreographic Programming.** Mako Bates, Shun Kashiwa, Syed Jafri, Gan Shen, Lindsey Kuper, Joseph P. Near. In PLDI, 2025.
- **SMT-Boosted Security Types for Low-Level MPC.** Christian Skalka, Joseph P. Near. In ESOP, 2025.
- **Differentially Private Learning Needs Better Model Initialization and Self-Distillation.** Ivoline C. Ngong, Joseph P. Near, Niloofar Mireshghallah. In NAACL, 2025.
- **Foldable, Recursive Proofs of Isogeny Computation with Reduced Time Complexity.** Krystal Maughan, Joseph P. Near, Christelle Vincent. In IEEE QCE, 2024.
- **Language-Based Security for Low-Level MPC.** Christian Skalka, Joseph P. Near. In PPDP, 2024.
- **Evaluating the Usability of Differential Privacy Tools with Data Practitioners.** Ivoline C. Ngong, Brad Stenger, Joseph P. Near, Yuanyuan Feng. In SOUPS, 2024.
- **OLYMPIA: A Simulation Framework for Evaluating the Concrete Scalability of Secure Aggregation Protocols.** Ivoline C. Ngong, Nicholas Gibson, Joseph P. Near. In IEEE SaTML, 2024.
- **Contextual Linear Types for Differential Privacy.** Matias Toro, David Darais, Chike Abuah, Joseph P. Near, Damian Arquez, Federico Olmedo, Eric Tanter. ACM Transactions on Programming Languages and Systems, 2023.
- **Solo: A Lightweight Static Analysis for Differential Privacy.** Chike Abuah, David Darais, Joseph P. Near. In OOPSLA, 2022.
- **Efficient Differentially Private Secure Aggregation for Federated Learning via Hardness of Learning with Errors.** Timothy Stevens, Christian Skalka, Christelle Vincent, John Ring, Samuel Clark, Joseph P. Near. In USENIX Security, 2022.
- **PrivGuard: Privacy Regulation Compliance Made Easier.** Lun Wang, Usman Khan, Joseph P. Near, Qi Pang, Jithendaraa Subramanian, Neel Somani, Peng Gao, Andrew Low, and Dawn Song. In USENIX Security, 2022.
- **Zero Knowledge Static Program Analysis.** Zhiyong Fang, David Darais, Joseph P. Near, and Yupeng Zhang. In Communications and Computer Security (CCS), 2021.
- **DDUO: General-Purpose Dynamic Analysis for Differential Privacy.** Chike Abuah, Alex Silence, David Darais, Joseph P. Near. In Computer Security Foundations (CSF), 2021.
- **Chorus: a Programming Framework for Building Scalable Differential Privacy Mechanisms.** Noah Johnson, Joseph P. Near, Joseph M. Hellerstein, and Dawn Song. In European Symposium on Security & Privacy (EuroS&P), 2020.
- **Duet: An Expressive Higher-Order Language and Linear Type System for Statically Enforcing Differential Privacy.** Joseph P. Near, David Darais, Chike Abuah, Tim Stevens, Pranav Gaddamadugu, Lun Wang, Neel Somani, Mu Zhang, Nikhil Sharma, Alex Shan, and Dawn Song. In Object-oriented Programming, Systems, Languages, and Applications (OOPSLA). 2019. **ACM SIGPLAN Distinguished paper award.**
- **Towards Practical Differentially Private Convex Optimization.** Roger Iyengar, Joseph P. Near, Dawn Song, Om Thakkar, Abhradeep Thakurta, Lun Wang. In Symposium on Security and Privacy (Oakland), 2019.
- **Towards practical differential privacy for SQL queries.** Noah Johnson, Joseph P. Near, and Dawn Song. In International Conference on Very Large Data Bases (VLDB), 2018.
- **Finding security bugs in web applications using a catalog of access control patterns.** Joseph P. Near and Daniel Jackson. In International Conference on Software Engineering (ICSE), 2016.

- **Alloy\***: **A general-purpose higher-order relational constraint solver**. Aleksandar Milicevic, Joseph P. Near, Eunsuk Kang, and Daniel Jackson. In International Conference on Software Engineering (ICSE), 2015. **ACM SIGSOFT Distinguished Paper Award**.
- **Derailer: Interactive Security Analysis for Web Applications**. Joseph P. Near and Daniel Jackson. In International Conference on Automated Software Engineering (ASE), 2014.
- **Rubicon: bounded verification of web applications**. Joseph P. Near and Daniel Jackson. In International Symposium on the Foundations of Software Engineering (FSE), 2012.
- **A lightweight code analysis and its role in evaluation of a dependability case**. Joseph P. Near, Aleksandar Milicevic, Eunsuk Kang and Daniel Jackson. In International Conference on Software Engineering (ICSE), 2011.
- **From Relational Specifications to Logic Programs**. Joseph P. Near. In International Conference on Logic Programming (Technical Communications), 2010.
- **An Imperative Extension to Alloy**. Joseph P. Near and Daniel Jackson. In International Conference on Abstract State Machines, Alloy, B and Z, 2010.
- **Equality and Hashing for (almost) Free: Generating Implementations from Abstraction Functions**. Derek Rayside, Zev Benjamin, Rishabh Singh, Joseph P. Near, Aleksandar Milicevic, and Daniel Jackson. In International Conference on Software Engineering, 2009.
- **alphaleanTAP: A Declarative Theorem Prover for First-Order Classical Logic**. Joseph P. Near, William E. Byrd, and Daniel P. Friedman. In International Conference on Logic Programming, 2008. .

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## Peer-Reviewed Journal Publications

- **Methods for Host-Based Intrusion Detection with Deep Learning**. John Ring, Colin Van Oort, Samson Durst, Vanessa White, Joseph P. Near, and Christian Skalka. Digital Threats: Research and Practice (DTRAP), 2021.
- **Alloy\*: a general-purpose higher-order relational constraint solver**. Aleksandar Milicevic, Joseph P. Near, Eunsuk Kang, and Daniel Jackson. Formal Methods in System Design, Jan 2017.
- **Applications and extensions of Alloy: past, present and future**. Emina Torlak, Mana Taghdiri, Greg Dennis, and Joseph P. Near. In Mathematical Structures in Computer Science, volume 23 number 4, 2013.

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## Peer-Reviewed Workshop Publications

- **Evaluating the Usability of Differential Privacy with Data Practitioners**. Ivoline C. Ngong, Brad Stenger, Joseph P. Near, Yuanyuan Feng. In Theory and Practice of Differential Privacy (TPDP), 2023.
- **Distributed HDMM: Optimal Accuracy without a Trusted Curator**. Ratang Sedimo, Ivoline C. Ngong, Joseph P. Near. In Theory and Practice of Differential Privacy (TPDP), 2023.
- **PiMPC: Automatic Security Proofs for MPC Protocols**. Mako Bates, Joseph P. Near. In Workshop on Programming Languages and Analysis for Security (PLAS), 2022.
- **Solo: Enforcing Differential Privacy Without Fancy Types**. Chike Abuah, David Darais, Joseph P. Near. In Theory and Practice of Differential Privacy (TPDP), 2021.
- **Improving Privacy-Preserving Deep Learning With Immediate Sensitivity**. Timothy Stevens, David Darais, Ben U Gelman, David Slater, Joseph P. Near. In Theory and Practice of Differential Privacy (TPDP), 2021.
- **PrivFramework: A System for Configurable and Automated Privacy Policy Compliance**. Usman Khan, Lun Wang, Jithendaraa Subramanian, Joseph P. Near, and Dawn Song. In NeurIPS 2020 Workshop on Dataset Security and Curation, 2020.

- **Towards Auditability for Fairness in Deep Learning.** Ivoline Ngong, Krystal Maughan, and Joseph P. Near. In NeurIPS 2020 Workshop on Algorithmic Fairness through the Lens of Causality and Interpretability, 2020.
- **DuetSGX: Differential Privacy with Secure Hardware.** Phillip Nguyen, Alex Silence, David Darais, and Joseph P. Near. In Theory and Practice of Differential Privacy (TPDP), 2020.
- **Towards a Measure of Individual Fairness for Deep Learning.** Krystal Maughan and Joseph P. Near. In Mechanism Design for Social Good (MD4SG), 2020.
- **Data Capsule: A New Paradigm for Automatic Compliance of Data Privacy Regulations.** Lun Wang, Joseph P. Near, Neel Somani, Peng Gao, Andrew Low, David Dao, and Dawn Song. In POLY19 Workshop @ VLDB2019. 2019.

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## Theses

- **Finding Security Bugs in Web Applications using Domain-Specific Static Analysis.** Joseph P. Near. MIT PhD Thesis, 2015.
- **An Imperative Extension to Alloy and a Compiler for its Execution.** Joseph P. Near. MIT Masters Thesis, 2010.

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## Grants

- 2025 – 2027 **DARPA, TOPSPIN: TOols for Proving Security and Performance of Instances of weird Networks**, Co-PI
- 2024 – 2026 **NSF SaTC, CORE: Small: A Novel Mechanism for Effective and Accountable Communication of Differential Privacy through Multi-Stakeholder Research**, Co-PI
- 2023 – 2028 **NSF CAREER, Distributed Differential Privacy via Secure Multiparty Computation**, PI
- 2023 – 2026 **DARPA SBIR, SALSA: Securing Antiquated Languages via Program Synthesis and Human Assistance (phase 2)**, Co-PI
- 2022 – 2023 **DOE SBIR, TRIFECTA**, Co-PI
- 2022 – 2023 **DARPA SBIR, SALSA: Securing Antiquated Languages via Program Synthesis and Human Assistance**, Co-PI
- 2022 – 2023 **NSF FW-HTF-RL, Testing a responsible innovation approach for integrating precision agriculture (PA) technologies with future farm workers and work**, Senior personnel
- 2021 – 2025 **CRREL Program, AVATAR Project**, Co-I
- 2021 – 2022 **Amazon Research Partnership, Amazon Partnership Pilot: Fairness in AI**, PI
- 2020 – 2022 **DARPA CSL Program, CLAMPED: Collaborative Learning Architecture with Mathematical Privacy over Embedded Data**, Co-PI
- 2020 – 2021 **Amazon Research Award, Provable Fairness for Deep Learning via Automatic Differentiation**, PI
- 2020 – 2024 **DARPA SIEVE Program, Wizkit: Wide-scale Zero-Knowledge Interpreter Toolkit**, Co-PI
- 2019 – 2020 **Industry Collaboration, Threat Stack, Inc., Detecting Security Events in System Logs**, Co-I
- 2019 – 2020 **UVM OVPR REACH, Differentially Private Deep Learning via Automatic Differentiation**, Co-PI
- 2018 – 2019 **UVM OVPR EXPRESS, A Platform for Privacy-Preserving Deep Learning**, PI
- 2015 – 2020 **DARPA Brandeis Program, Helio: Program Synthesis for Efficient, Privacy-Preserving Distributed Computation**, Co-PI

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## Teaching

- Fall 2024 **CS 3110/5110: Data Privacy**, University of Vermont
- Spring 2024 **CS 3020: Compiler Construction**, University of Vermont
- Fall 2023 **CS 3110/5110: Data Privacy**, University of Vermont

CS 3990/5990: **Secure Distributed Computation**, *University of Vermont*  
 Spring 2023 CS 202: **Compiler Construction**, *University of Vermont*  
 Fall 2022 CS 211: **Data Privacy**, *University of Vermont*  
 CS 295: **Secure Distributed Computation**, *University of Vermont*  
 Spring 2022 CS 202: **Compiler Construction**, *University of Vermont*  
 Fall 2021 CS 211: **Data Privacy**, *University of Vermont*  
 Spring 2021 CS 202: **Compiler Construction**, *University of Vermont*  
 Fall 2020 CS 211: **Data Privacy**, *University of Vermont*  
 CS 295: **Secure Distributed Computation**, *University of Vermont*  
 Spring 2020 CS 202: **Compiler Construction**, *University of Vermont*  
 Fall 2019 CS 295B: **Data Privacy**, *University of Vermont*  
 Spring 2019 CS 295F: **Compiler Construction**, *University of Vermont*  
 Fall 2018 CS 295B: **Data Privacy**, *University of Vermont*  
 Fall 2015 **Co-Instructor, 294-116: Secure and Intelligent Programming**, *University of California, Berkeley*  
 January 2010 **Co-Instructor, So You've Always Wanted to Learn Haskell?**, *Massachusetts Institute of Technology, short IAP course*  
 Spring 2009 **Teaching Assistant, 6.005: Elements of Software Construction**, *Massachusetts Institute of Technology*  
 Fall 2005 – **Undergraduate Instructor, C311: Programming Languages**, *Indiana University*  
 Spring 2008  
 (6 semesters) Awarded “Undergraduate Instructor of the Year,” 2007.  
 1998 – 2008 **Summer Class Instructor: programming, video & image editing**, *Bloomington Montessori School*  
 (10 summers)

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## University Service

- Department
- Interim Graduate Program Director (2023—2024)
  - Co-Chair, faculty search committee (2023)
  - Chair, faculty search committee (2020)
  - Member, faculty search committee (2018, 2019, 2022)
  - Member, curriculum committee (2019—present)
  - Data Czar (2018—present)
  - Faculty Senator (2019—present)
  - Broadening Participation in Computing committee (2021—present)
- College
- CEMS Secretary (2020—present)

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## Professional Service

- Outreach
  - Author & coordinator, NIST Federated Learning blog series (2023 - present)
  - Author & coordinator, NIST Differential Privacy blog series (2019 - present)
  - Subject matter expert, NIST 2020 Differential Privacy Temporal Map Challenge
  - Subject matter expert, NIST 2018 Differential Privacy Synthetic Data Challenge
  - Presenter, Census Bureau JASON study (2020)
  - Presenter, Vermont Teen Science Cafe (2020)
  - Member, Open Differential Privacy working group on educational materials
  
- Conference Organization
  - Co-chair, **TPDP**: Theory and Practice of Differential Privacy (2024, 2025)
  - Co-chair, **miniKanren** Workshop (2024)
  - Co-chair, **FCS**: Workshop on Foundations of Computer Security (2021, 2022)
  
- Program Committee
  - **PETS**: Privacy Enhancing Technologies Symposium (2025)
  - **USENIX Security** (2025)
  - **CCS**: Conference on Computer and Communications Security (2022, 2023, 2024)
  - **AISTATS**: Conference on AI & Statistics (2022, 2024)
  - **VLDB**: Conference on Very Large Databases (2022, 2023)
  - **PLAS**: Programming Languages & Security Workshop (2022)
  - **TPDP**: Theory and Practice of Differential Privacy (2021, 2020)
  - **FCS**: Workshop on Foundations of Computer Security (2020)
  - miniKanren Workshop (2020)
  - **ICDCS**: International Conference on Distributed Computing Systems (2016)
  
- Journal Reviewer
  - IEEE Transactions on Information Forensics and Security (2019, 2020)
  - IEEE Internet of Things Journal (2019)
  - Software: Practice and Experience (2018)
  - Transactions on Knowledge and Data Engineering (2018, 2020)
  - IET Software (2017)
  - Journal of Software: Evolution and Process (2017)
  - Software Testing, Verification and Reliability (2014)
  
- Subject Matter Expert
  - NIST Differential Privacy Synthetic Data Challenge (2018-2019)
  - NIST Unlinkable Data Challenge (2018)