

Zeliha Dilsun Kaynar

Contact Information

Associate Teaching Professor
School of Computer Science
Carnegie Mellon University
5000 Forbes Avenue, GHC 6009
Pittsburgh, PA 15213, USA

Email: dilsun@cs.cmu.edu
Phone (office): 412-268-9297
Phone (mobile): 617-365-3950
<http://www.cs.cmu.edu/~dilsun>

Education

- The University of Edinburgh, Scotland, UK (1996 – 2001)
PhD in Computer Science, 2002
MSc in Computer Science, 1997
Advisor: Stephen Gilmore
PhD Thesis: *Mobile Computation with Functions*
Thesis also published as a book by Kluwer Academic Publishers.
MSc Thesis: *Test-case Assessment in SML*
Received Distinction Award from the University of Edinburgh.
- The Middle East Technical University, Ankara, Turkey (1992 – 1996)
BSc in Computer Engineering, 1996

Employment

- Carnegie Mellon University (2012 – present)
Associate Teaching Professor (since Fall 2020), Academic Advisor (since Summer 2018)
Computer Science Department, School of Computer Science
- Carnegie Mellon University (2007 – 2012)
Research Staff, CyLab. **Host:** Anupam Datta.
- Carnegie Mellon University (2006 – 2007)
Postdoctoral Fellow, School of Computer Science. **Host:** Jeannette Wing.
- Massachusetts Institute of Technology (2001 – 2006)
Postdoctoral Research Associate
Computer Science and Artificial Intelligence Laboratory
Theory of Distributed Systems Group. **Host:** Nancy Lynch.
- The University of Edinburgh (2000 – 2001)
Part-time Lecturer, School of Informatics
Part-time Research Assistant, Laboratory for Foundations of Computer Science

Teaching Interests

Introduction to Computer Science, Principles of Programming, Data Structures and Algorithms, Discrete Mathematics, Logic, Modeling and Verification, Foundations of Security

Teaching Experience

- Carnegie Mellon University, School of Computer Science
Computer Science Department
 - Instructor** for 15-122: Principles of Imperative Computation (Spring 2019 – present): Entry-level core computer science course.
 - Instructor** for 15-150: Functional Programming (Fall 2016 – Spring 2018): Entry-level core computer science course.
 - Instructor** for 15-110: Principles of Computing (Fall 2012 – Spring 2016): An introductory course for non-majors.
- Carnegie Mellon University, School of Computer Science
Master of Software Engineering Program (MSE) and CyLab
 - Instructor** for 17-651: Models of Software Systems (Fall 2011): Focused on techniques for creating and analyzing abstract models of software systems.
 - Mentor** for PhD students in the research group at CyLab
- Massachusetts Institute of Technology
Computer Science and Artificial Intelligence Laboratory
 - Supervisor** of Master's theses and undergraduate research projects:
 - * Edward Solovey. *Simulation of Composite I/O Automata*, MEng Thesis, completed in 2003.
 - * Christine Robson. *TIOA and UPPAAL*, MEng Thesis, completed in 2004. Later earned a PhD at Berkeley.
 - * Panayiotis Mavrommatis. *Simulation of Timed Input/Output Automata*, MEng Thesis, completed in 2006.
 - * Toh Ne Win, Fivos Constantinou.
Undergraduate research students on the IOA project
- The University of Edinburgh, The School of Informatics
 - Lecturer** for Distributed Systems (Senior and Master's level, 2000–2001): Focused on major concepts and design issues for distributed systems, basic distributed algorithms
 - Tutor** for CS1, CS2 courses (1997 – 2000):
 - * Introduced basic concepts of computer science and software engineering process
 - * Taught programming and data structures using Java and Standard ML
 - * Taught logics and techniques for reasoning about programs

Service

- Office of Undergraduate Research and Scholar Development (OURSD) SURG/SURF Grants Review Committee (current)
- Computer Science Department Faculty Hiring Committee (2018-2019, 2021-2022, 2022-2023)
- Software and Societal Systems Teaching-Track Faculty Hiring Committee (external member, 2022-2023)
- The University Disciplinary Committee and Academic Review Board (current)
- Summer Undergraduate Research Apprenticeship (SURA) advisor (Summer 2022)
 - * Aaresh Pourkavoos, Computer Science Department, *Standard ML Proof Verification*
- The University Graduate Student Teaching Award Committee (completed in 2018)
- The School of Computer Science TA Advisory Committee (disbanded in 2018)
- PhD Thesis Committee Member
 - * Yannis Mallios, CMU CyLab. Completed PhD in October 2017. Thesis title: *Foundations for the Analysis of the Cost of Run-time Policy Enforcement in Distributed Systems.*
 - * Divya Sharma, CMU CyLab. Completed PhD in September 2015. Thesis title: *Interaction-aware Actual Causation: A Building Block for Accountability in Security Protocols.*
- PhD Writing Skills Reviewer
 - * Qing Zheng, CMU Computer Science Department (2021)
- Reviewer for academic journals and conferences
 - * Journals: Distributed Computing, Journal of Computer Security, ACM Transactions on Information and System Security, ACM Transactions on Security and Privacy
 - * Major international conferences on security and programming languages including Oakland, CCS, POST
- Reviewer and judge for competitions
 - * CMU School of Computer Science Senior (SCS) Thesis Awards (2022, 2023)
 - * Uskudar American Academy Academic Research Conference, Turkey (2023)
 - * CMU Sigma Xi Poster Competition, Meeting of the Minds (2017)
 - * CMU SRC-URO Poster Competition, Meeting of the Minds (2016)

Recent Invited Panels and Other Professional Activities

- SCS Teaching Panel for the Academic Job Market (Spring 2023)
- Women in Academia, event run by Alpha Chi Omega CMU Chapter (Spring 2023)
- CMU Career Champions Workshop (Spring 2023)
- Women@SCS Professor Ask Me Anything Lunch (Fall 2022)
- Learning Engineering in Action, Faculty Dialogues (Fall 2020), CMU Alumni Association

Research Interests

Formal Modeling and Verification, Security, Privacy, Distributed Computing, Timed Systems, Programming Languages, Logics, Type Systems, Computer Science Education

Research Experience

Postdoctoral Research at CMU (2006 – 2012)

- Foundations of Privacy and Accountability
- Logic for Secure Systems
- Attack Graphs

Postdoctoral Research at MIT (2001 – 2006):

- Security Protocol Analysis
- Modeling and Analysis of Timed Systems
- The IOA Language and Toolset

Doctoral Research (1997 – 2001):

- Functional languages for distributed computing
- Type systems for security

UK Engineering and Physical Sciences Research Council Project, 2001:

- Type systems for resource-bounded programming and compilation

Publications

Instructional Material

- *Modules for the Open Learning Initiative (OLI) course Principles of Computing*

Introduction to Programming with Python

Making Decisions

Iteration

Putting Together Decisions and Iterations

This work was highlighted in the CMU publication *1 Day in the Life: The Simon Initiative and Carnegie Mellon's Digital Education Revolution*.

- Video introducing the project. *The Simon Initiative: The Professor's Experience*.
<https://www.youtube.com/watch?v=MM8G1qJosmQ>
- *Teaching Principles of Computing with OLI*. Poster in CMU Teaching and Learning Summit 2016 with co-authors Norman Bier and Tom Cortina. Presents preliminary analysis of data obtained in using the online material in blended teaching mode.

Books

- Dilsun K. Kaynar, Nancy A. Lynch, Roberto Segala, and Frits W. Vaandrager. *The Theory of Timed I/O Automata*. In series Synthesis Lectures on Computer Science, Morgan and Claypool Publishers, 101pp, 2006. ISBN 159829010X. Second edition in series Synthesis Lectures on Distributed Computing Theory, 137 pp, 2010.
- Dilsun Kırıl. *Mobile Computation with Functions*. In series Advances in Information Security. Kluwer Academic Publishers, 2002. ISBN 1-4020-7024-1. This monograph is based on my PhD thesis.

Journal Papers

- Ran Canetti, Ling Cheung, Dilsun Kaynar, Moses Liskov, Nancy Lynch, Olivier Pereira, and Roberto Segala. Task-structured Probabilistic I/O Automata. *Journal of Computer and Systems Sciences*, Volume 94: 63-97, 2018.
- Yannis Mallios, Lujo Bauer, Dilsun Kaynar, Fabio Martinelli, and Charles Morisset. Probabilistic Cost Enforcement of Security Policies. *Journal of Computer Security*, 759 – 787, 2015.
- Anupam Datta, Deepak Garg, Jason Franklin, Limin Jia, and Dilsun Kaynar. On Adversary Models and Compositional Security. *IEEE Security and Privacy*, Special Issue on Science of Security, Volume 9(3): 26-32, 2011.

- Ran Canetti, Ling Cheung, Dilsun Kaynar, Moses Liskov, Nancy Lynch, Olivier Pereira, and Roberto Segala. Analyzing Security Protocols Using Time-bounded Task-PIOAs. *Discrete Event Dynamic Systems: Theory and Practice* Volume 18 (1): 111-159, 2008.
- Ran Canetti, Ling Cheung, Dilsun Kaynar, Moses Liskov, Nancy Lynch, Olivier Pereira, and Roberto Segala. Using Probabilistic I/O Automata to Improve the Analysis of Cryptographic Protocols. In *ERCIM News* 63: 40-41, October 2005.
- Toh Ne Win, Michael D. Ernst, Stephen J. Garland, Dilsun K. Kaynar, and Nancy Lynch. Using simulated execution in verifying distributed algorithms. In *Software Tools for Technology Transfer* 4: 1-10, 2004. Extended abstract appeared in *Proceedings of Fourth International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI)*, New York, January 2003.
- Dilsun Kirli. Distributed call-tracking for security. In *Computer Languages, Systems and Structures* 28: 129-154, 2002. Invited paper for the special issue on Computer Languages and Security.
- Chris Walton, Dilsun Kirli, and Stephen Gilmore. An abstract machine model of dynamic module replacement. In *Future Generation Computer Systems*, 16(7): 793-808, May 2000.

Papers in Refereed Conferences and Workshops

- Anupam Datta, Deepak Garg, Dilsun Kaynar, Divya Sharma, Arunesh Sinha, Program Actions as Actual Causes: A Building Block for Accountability, In *Proceedings of 28th IEEE Computer Security Foundations Symposium (CSF)*, July 2015.
- Anupam Datta, Dilsun Kaynar, Divya Sharma, Arunesh Sinha. Actual Causes of Security Violations (Extended Abstract). In *Proceedings of the Joint Workshop on Foundations of Computer Security and Formal and Computational Cryptography (FCS-FCC)*, affiliated with Computer Security Foundations (CSF), July 2014.
- Yannis Mallios, Lujo Bauer, Dilsun Kaynar, F. Martinelli, C. Morrisset. Probabilistic Cost Enforcement of Security Policies. In *Proceedings of the 9th International Workshop on Security and Trust Management*, September 2013.
- Yannis Mallios, Lujo Bauer, Dilsun Kaynar, and Jay Ligatti. Enforcing More with Less: Formalizing Target-aware Run-time Monitors. In *Proceedings of the 8th International Workshop on Security and Trust Management*, September 2012.
- Anupam Datta, Jeremiah Blocki, Nicolas Christin, Henry DeYoung, Deepak Garg, Limin Jia, Dilsun Kaynar, and Arunesh Sinha. Understanding and Protecting Privacy: Formal Semantics and Principled Audit Mechanisms. In *Proceeding of the 7th International Conference on Information Systems Security*, December 2011. Invited Paper.

- Michael Tschantz, Anupam Datta, and Dilsun Kaynar. Formal Verification of Differential Privacy for Interactive Systems. Extended abstract in *Proceedings of the 27th Annual Conference on Mathematical Foundations of Programming Semantics (MFPS)*, Electronic Notes in Theoretical Computer Science, pages 61-79, May 2011. Elsevier. Invited paper.
- Henry DeYoung, Deepak Garg, Limin Jia, Dilsun Kaynar, and Anupam Datta. Experiences in the Logical Specification of the HIPAA and GLBA Privacy Laws. In *Proceedings of 9th ACM Workshop on Privacy in the Electronic Society (WPES)*, October 2010. ACM.
- Anupam Datta, Jason Franklin, Deepak Garg, and Dilsun Kaynar. Compositional System Security with Interface-Confined Adversaries. In *Proceedings of 26th Annual Conference on Mathematical Foundations of Programming Semantics (MFPS)*, Electronic Notes in Theoretical Computer Science, pages 49-71, May 2010. Elsevier. Invited paper.
- Anupam Datta, Jason Franklin, Deepak Garg, and Dilsun Kaynar. A Logic of Secure Systems and its Application to Trusted Computing. In *Proceedings of the 30th IEEE Symposium on Security and Privacy (Oakland)*, pages 221-236, May 2009. IEEE Computer Society.
- Ran Canetti, Ling Cheung, Dilsun Kaynar, Nancy Lynch, and Olivier Pereira. Modeling Computational Security in Long-Lived Systems. In *Proceedings of the 19th International Conference on Concurrency Theory (CONCUR)*, Volume 5201 of Lecture Notes on Computer Science, pages 114-130, Toronto, Canada, July 2008. Springer.
- Deepak Garg, Jason Franklin, Dilsun Kaynar, and Anupam Datta. A Logic for Reasoning About Networked Secure Systems . In *Proceedings of the Joint Workshop on Foundations of Computer Security, Automated Reasoning for Security Protocol Analysis and Issues in the Theory of Security (FCS-ARSPA-WITS)*, pages 143-161, Pittsburgh, Pennsylvania. June, 2008.
- Ran Canetti, Ling Cheung, Dilsun Kaynar, Nancy Lynch, and Olivier Pereira. Compositional Security for Task-PIOAs. In *Proceedings of 20th IEEE Computer Security Foundations Symposium (CSF)*, pages. 125-139, Venice, Italy, 2007. IEEE Computer Society.
- Ran Canetti, Ling Cheung, Dilsun Kaynar, Moses Liskov, Nancy Lynch, Olivier Pereira, and Roberto Segala. Time-bounded Task-PIOAs: A Framework for Analyzing Security Protocols. In *Proceedings of the 20th International Symposium on Distributed Computing (DISC)*, pages 238-253, Stockholm, Sweden, September 18-20, 2006. Invited paper. Springer.
- Ran Canetti, Ling Cheung, Dilsun Kaynar, Moses Liskov, Nancy Lynch, Olivier Pereira, and Roberto Segala. Task-Structured Probabilistic I/O Automata. In *Proceedings the 8th International Workshop on Discrete Event Systems (WODES)*, Ann Arbor, Michigan, July, 2006. IEEE.
- Ran Canetti, Ling Cheung, Dilsun Kirli, Moses Liskov, Nancy Lynch, Olivier Pereira, Roberto Segala. Using Task-Structured Probabilistic I/O Automata to Analyze Cryptographic Protocols . In *Proceedings of the Workshop on Formal and Computational Cryptography (FCC)*, pages 34-39, July 2006.

- Hongping Lim, Dilsun Kaynar, Nancy Lynch, and Sayan Mitra. Translating timed I/O automata specifications for theorem proving in PVS. In *Proceedings of International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS)*, Volume 3829 of Lecture Notes on Computer Science, pages 17-31, Uppsala, Sweden, September 26 - 28, 2005. Springer.
- Dilsun Kaynar, Nancy Lynch, and Sayan Mitra. Specifying and Proving Timing Properties with TIOA Tools. In *25th IEEE International Real-Time Systems Symposium, Work in Progress Session (RTSS WIP)*, Lisbon, Portugal, December 5-8 2004.
- Dilsun Kaynar and Nancy Lynch. Decomposing Verification of Timed I/O Automata. In *Proceedings of the Joint Conference on Formal Modelling and Analysis of Timed Systems (FORMATS) Formal Techniques in Real-Time and Fault Tolerant System (FTRTFT)*, Volume 3253 of Lecture Notes in Computer Science, pages 84-101, Grenoble, France, September, 2004. Springer.
- Dilsun K. Kaynar, Nancy Lynch, Roberto Segala, and Frits Vaandrager. Timed I/O Automata: A Framework for modeling and analyzing real-time systems. In *Proceedings of the 24th IEEE International Real-Time Systems Symposium (RTSS)*, pages 166-177. Cancun, Mexico, December 2003. IEEE Computer Society.
- Toh Ne Win, Michael D. Ernst, Stephen J. Garland, Dilsun K. Kaynar, and Nancy Lynch. Using simulated execution in verifying distributed algorithms. In *Proceedings of Fourth International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI)*, Volume 2575 of Lecture Notes in Computer Science, pages 283-297, New York, January 2003. Springer.
- Dilsun K. Kaynar, Anna Chefter, Laura Dean, Stephen Garland, Nancy Lynch, Toh Ne Win, and Antonio Ramirez. Simulating nondeterministic systems at multiple levels of abstraction. In *Proceedings of Tools Day*, held in conjunction with CONCUR, pages 44-60, Brno, Czech Republic, August 2002.
- Dilsun Kirli. Confined mobile functions. In *Proceedings of the 14th IEEE Computer Security Foundations Workshop (CSFW)*, pages 283-294, Nova Scotia, Canada, June 2001. IEEE Computer Society.
- Dilsun Kirli. Secure information flow for mobile functions. In *Proceedings of the Workshop on Issues in the Theory of Security (WITS)*, pages 30-35, Geneva, July 2000.
- Dilsun Kirli. A survey on functions, concurrency, distribution and mobility. In *Proceedings of the 1st Scottish Functional Programming Workshop*, pages 203-213, Stirling, UK, September 1999.
- Dilsun Kirli. A static type system for detecting potentially transmissible functions. In P. Sewell and J. Vitek, editors, *Proceedings of the 5th Mobile Object Systems Workshop: Programming Languages for Wide Area Networks*, Lisbon, Portugal, June 1999.

Technical Reports

- Henry DeYoung, Deepak Garg, Dilsun Kaynar, Anupam Datta. Privacy Policy Specification and Audit in a Fixed-Point Logic - How to enforce HIPAA, GLBA and all that. Technical report CMU-CyLab-10-008, 2010.
- Henry DeYoung, Deepak Garg, Dilsun Kaynar, Anupam Datta. Logical Specification of the GLBA and HIPAA Privacy Laws. Technical report CMU-CyLab-10-007, 2010.
- Michael Tschantz, Anupam Datta, and Dilsun Kaynar. Differential Privacy for Probabilistic Systems. Technical Report CMU-CyLab-09-008, May, 2009.
- Deepak Garg, Jason Franklin, Dilsun Kaynar, and Anupam Datta. Towards a Theory of Secure Systems. Technical Report CMU-CyLab-08-003, February, 2008.
- Ran Canetti, Ling Cheung, Dilsun Kaynar, Nancy Lynch, and Olivier Pereira. Modeling Computational Security in Long-Lived Systems, Version 2. Technical Report MIT-CSAIL-TR-2008-068, Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology, Cambridge, MA, November 2008.
- Pratyusa K. Manadhata, Dilsun K. Kaynar, and Jeannette M. Wing. A Formal Model for A System's Attack Surface. CMU Technical Report CMU-CS-07-144, July 2007.
- Ran Canetti, Ling Cheung, Dilsun Kaynar, Moses Liskov, Nancy Lynch, Olivier Pereira, and Roberto Segala. Using Task-Structured Probabilistic I/O Automata to Analyze an Oblivious Transfer Protocol. MIT-CSAIL-TR-2006-047, June 2006. This report is a revision of MIT-CSAIL-TR-2006-019, March 2006.
- Ran Canetti, Ling Cheung, Dilsun Kaynar, Moses Liskov, Nancy Lynch, Olivier Pereira, and Roberto Segala. Using Probabilistic I/O Automata to Analyze an Oblivious Transfer Protocol. Technical Report MIT-LCS-TR-1001a, MIT CSAIL, Cambridge, MA, August 2005. Also published as Cryptology ePrint Archive Report 2005/452.
- Dilsun K. Kaynar, Anna Chefter, Laura Dean, Stephen Garland, Nancy Lynch, Toh Ne Win, Antonio Ramirez. The IOA simulator manual. Technical Report MIT-LCS-TR-843, MIT Laboratory for Computer Science. Available at <http://theory.lcs.mit.edu/tds/ioa.html>.
- Dilsun Kirli. A polymorphic type and effect system for detecting mobile functions. Technical Report ECS-LFCS-99-413, Laboratory for Foundations of Computer Science, Division of Informatics, University of Edinburgh, 1999.
- Stephen Gilmore, Dilsun Kirli, and Chris Walton. Dynamic ML without dynamic types. Technical Report ECS-LFCS-97-378, Laboratory for Foundations of Computer Science, Department of Computer Science, The University of Edinburgh, 1998.

Other Publications

- Michael Tschantz, Anupam Datta, and Dilsun Kaynar. Formal Verification of Differential Privacy for Interactive Systems. Technical Report arXiv:1101.2819v1 [cs.CR], ArXiv, January 2011.
- Nancy Lynch, Stephen Garland, Dilsun Kaynar, Laurent Michel, Alex Shvartsman. The Tempo Language User Guide and Reference Manual. 2007. Available at <http://www.veromodo.com/tempo/>.
- Dilsun Kırıl. Test case assessment in SML. MSc Thesis. The University of Edinburgh, 1997.

Project Grants

- CA Learning Labs Project *Facilitating Student-Driven Learning through a Hybrid Interactive Learning Environment that Actively Listens to, Observes and Responds to Student Inputs and Behaviors*, with partners at California State University San Marcos (CSUSM) and MiraCosta Community College (MCC) (2019-2022).
Principal Investigator: Norman Bier, Advisor: Dilsun Kaynar.
- Blameworthy Programs: Accountability via Deviance and Causal Program Determination. NSF Secure and Trustworthy Cyberspace (SaTC) (2014-2017)
Principal Investigators: Anupam Datta, Limin Jia, Dilsun Kaynar, Frank Pfenning.

Awards and Honors

- Doçent Degree from the Turkish Council of Higher Education (2012)
- Distinction Award for Master of Science Degree (1997)
- Overseas Research Student Award, UK (1997 – 2000)
- The University of Edinburgh, LFCS PhD Studentship (1997 – 2000)
- British Council Chevening Scholarship (1996 – 1997)
- Turkish Educational Foundation (T.E.V.) Scholarship (1992 – 1997)
- AFS Intercultural Exchange Student, Belgium (1991 – 1992)