

# RADOSLAV IVANOV

## CONTACT

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Department of Computer Science  
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## ACADEMIC APPOINTMENTS

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**Assistant Professor**  
Department of Computer Science  
Rensselaer Polytechnic Institute, Troy, NY

*January 2022 – Present*

**Postdoctoral Fellow**  
Department of Computer and Information Science  
University of Pennsylvania, Philadelphia, PA  
Advisors: Dr. Rajeev Alur, Dr. George J. Pappas

*August 2017 – December 2021*

## EDUCATION

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**Ph.D., Computer and Information Science**  
University of Pennsylvania, Philadelphia, PA  
Dissertation: “Context-Aware Sensor Fusion for Securing Cyber-Physical Systems”  
Advisors: Dr. Insup Lee, Dr. James Weimer

*August 2017*

**B.A., Computer Science and Mathematical Economics (double major)**  
Colgate University, Hamilton, NY  
Cumulative GPA: 3.96

*May 2011*

## RESEARCH INTERESTS

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**Application Domains:** Cyber-Physical Systems (CPS); Safe Autonomy; Neuro-Symbolic Systems; CPS Security; Medical CPS.

**Technical Areas:** Formal Methods; Control Theory; Machine Learning; Sensor Fusion.

## HONORS & AWARDS

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**Young Investigator Program Award** 2025  
Air Force Office of Scientific Research

**Outstanding Early Research Award** 2025  
School of Science, Rensselaer Polytechnic Institute

**Best Paper Award** 2019-20  
ACM Transactions on Embedded Computing Systems  
Paper: “Verifying the Safety of Autonomous Systems with Neural Network Controllers”

**Best Tool Award Finalist** 2020  
23rd International Conference on Hybrid Systems: Computation and Control  
Paper: “Case study: Verifying the safety of an autonomous racing car with a neural network controller”

<b>Best Paper Award</b> 4th International Conference on Cyber-Physical Systems, Networks, and Applications Paper: “Adaptive Transient Fault Model for Sensor Attack Detection”	2016
<b>1st Place Finish in the F1/10 Autonomous Racing Competition</b> ESWeek 2016	2016
<b>Best Paper Award Finalist</b> 6th International Conference on Cyber-Physical Systems (ICCPS’15) Paper: “Early Detection of Critical Pulmonary Shunts in Infants”	2015
<b>Salutatorian (2<sup>nd</sup> highest cumulative GPA) of the Class of 2011</b> Colgate University	2011
<b>Upsilon Pi Epsilon Society</b> Colgate University	2011

## PUBLIC SERVICE

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<b>NSF Reviewer</b>	<i>2024 – Present</i>
<b>Artifact Evaluation Committee Co-Chair</b> International Conference on Cyber-Physical Systems, 2023-25	<i>2023 –25</i>
<b>Program Committee Co-Chair</b> Workshop on Numerical Software Verification, co-located with FLoC 2022	<i>August 2022</i>
<b>Program Committee Member</b> L4DC (2022-23, 25-26), ICCPS (2020, 2022-24), AAAI (2024, 2026), CoRL (2020-24), DAC (2020-22)	<i>Spring 2019 – Present</i>
<b>Covid-19 Research and Academic Safety Reporting Committee</b> The committee handles reports of Covid-19-related issues or concerns at UPenn	<i>Spring 2020 – Fall 2021</i>

## REFEREED JOURNAL PAPERS

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1. Michele Caprio, Souradeep Dutta, Kuk Jin Jang, Vivian Lin, Radoslav Ivanov, Oleg Sokolsky and Insup Lee, “**Credal Bayesian Deep Learning**”, *Transactions on Machine Learning Research*, 2024.
2. Matthew Cleaveland, Lars Lindemann, Radoslav Ivanov and George J. Pappas, “**Risk Verification of Stochastic Systems with Neural Network Controllers**”, *Artificial Intelligence*, 2022.
3. Radoslav Ivanov\*, Kishor Jothimurugan\*, Steve Hsu, Shaan Vaidya, Rajeev Alur, Osbert Bastani, “**Compositional Learning and Verification of Neural Network Controllers**”, *ACM Transactions on Embedded Computing Systems (TECS)*, journal track of International Conference on Embedded Software (EMSOFT), 2022.  
\* These authors contributed equally.
4. Radoslav Ivanov, Taylor J. Carpenter, James Weimer, Rajeev Alur, George J. Pappas and Insup Lee, “**Verifying the Safety of Autonomous Systems with Neural Network Controllers**”, *ACM Transactions on Embedded Computing Systems*. 2021.
5. Esen Yel, Taylor J. Carpenter, Carmelo Di Franco, Radoslav Ivanov, Yiannis Kantaros, Insup Lee, James Weimer and Nicola Bezzo, “**Assured Run-time Monitoring and Planning: Towards Verification of Deep Neural Networks for Safe Autonomous Operations**”, *IEEE Robotics and Automation Magazine*. 2020.

6. Radoslav Ivanov, Nikolay Atanasov, Miroslav Pajic, James Weimer, George Pappas and Insup Lee, “**Continuous Estimation Using Context-Dependent Discrete Measurements**”, *IEEE Transactions on Automatic Control*, 2019.
7. James Weimer, Radoslav Ivanov, Sanjian Chen, Alexander Roederer, Oleg Sokolsky and Insup Lee, “**Parameter Invariant Monitor Design for Cyber-Physical Systems**”, *Proceedings of the IEEE*, 2017.
8. Junkil Park\*, Radoslav Ivanov\*, James Weimer, Miroslav Pajic, Sang Hyuk Son and Insup Lee, “**Security of Cyber-Physical Systems in the Presence of Transient Sensor Faults**”, *ACM Transactions on Cyber-Physical Systems*, 2017.  
\*These authors contributed equally.
9. Radoslav Ivanov, James Weimer, Allan Simpao, Mohamed Rehman and Insup Lee, “**Prediction of Critical Pulmonary Shunts in Infants**”, *IEEE Transactions on Control Systems Technology*, 2016.
10. Radoslav Ivanov, Miroslav Pajic and Insup Lee, “**Attack-Resilient Sensor Fusion for Safety-Critical Cyber-Physical Systems**”, *ACM Transactions on Embedded Computing Systems*, 2016.
11. James Weimer, Radoslav Ivanov, Alexander Roederer, Sanjian Chen and Insup Lee, “**Parameter Invariant Design of Medical Alarms**”, *IEEE Design & Test*, 2015.

## BOOK CHAPTERS

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1. Radoslav Ivanov, Miroslav Pajic and Insup Lee, “**Attack-Resilient Sensor Fusion for CPS**”, *Multisensor Data Fusion: From Algorithm and Architecture Design to Applications*, pp. 409-422, CRC Press, 2015.

## REFEREED CONFERENCE PAPERS

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1. Thomas Waite, Yuang Geng, Trevor Turnquist, Ivan Ruchkin and Radoslav Ivanov, “**State-Dependent Conformal Perception Bounds for Neuro-Symbolic Verification of Autonomous Systems**”, *2nd International Conference on Neuro-symbolic Systems (NeuS)*, Philadelphia, PA, USA, 2025.
2. Shuhang Tan, Jayson Sia, Paul Bogdan and Radoslav Ivanov, “**Analyzing Neural Network Robustness Using Graph Curvature**”, *IEEE International Conference on Assured Autonomy (ICAA)*, Nashville, TN, USA, 2024.
3. Vivian Lin, Radoslav Ivanov, James Weimer, Oleg Sokolsky and Insup Lee, “**T4V: Exploring Neural Network Architectures that Improve the Scalability of Neural Network Verification**”, *Principles of Systems Design, Lecture Notes in Computer Science (vol. 13660)*, Paris, France, 2022.
4. Ivan Ruchkin, Matthew Cleaveland, Radoslav Ivanov, Pengyuan Lu, Taylor Carpenter, Oleg Sokolsky, Insup Lee, “**Confidence Composition for Monitors of Verification Assumptions**”, *13th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS)*, (virtual) 2022.
5. Radoslav Ivanov\*, Kishor Jothimurugan\*, Steve Hsu, Shaan Vaidya, Rajeev Alur, Osbert Bastani, “**Compositional Learning and Verification of Neural Network Controllers**”, *International Conference on Embedded Software (EMSOFT)*, (virtual) 2022.  
\* These authors contributed equally.
6. Radoslav Ivanov, Taylor J. Carpenter, James Weimer, Rajeev Alur, George J. Pappas and Insup Lee, “**Verisig 2.0: Verification of Neural Network Controllers Using Taylor Model Pre-**

- conditioning**”, *33rd International Conference on Computer-Aided Verification (CAV)*, (virtual) Los Angeles, CA, USA, 2021.
7. Taylor J. Carpenter, Radoslav Ivanov, Insup Lee, James Weimer, “**ModelGuard: Runtime Validation of Lipschitz-continuous Models**”, *7th IFAC Conference on Analysis and Design of Hybrid Systems (ADHS)*, (virtual) Brussels, Belgium, 2021.
  8. Radoslav Ivanov, Taylor J. Carpenter, James Weimer, Rajeev Alur, George J. Pappas and Insup Lee, “**Case study: Verifying the safety of an autonomous racing car with a neural network controller**”, *23rd ACM International Conference on Hybrid Systems: Computation and Control (HSCC)*, (virtual) Sydney, Australia, 2020.
  9. Radoslav Ivanov, James Weimer, Rajeev Alur, George J. Pappas and Insup Lee, “**Verisig: verifying safety properties of hybrid systems using neural network controllers**”, *22nd ACM International Conference on Hybrid Systems: Computation and Control (HSCC)*, Montreal, Canada, 2019.
  10. Hung Nguyen, Sooyong Jang, Radoslav Ivanov, Christopher P. Bonafide, James Weimer and Insup Lee, “**Reducing Pulse Oximetry False Alarms Without Missing Life-Threatening Events**”, *3rd IEEE/ACM Conference on Connected Health: Applications, Systems, and Engineering Technologies (CHASE)*, Washington, D.C., USA, 2018.
  11. Radoslav Ivanov, Hung Nguyen, James Weimer, Oleg Sokolsky, and Insup Lee, “**OpenICE-lite: Towards a Connectivity Platform for the Internet of Medical Things**”, *IEEE 21st International Symposium on Real-Time Distributed Computing (ISORC)*, Nanyang Technological University, Singapore, 2018.
  12. Radoslav Ivanov, James Weimer, and Insup Lee, “**Context-Aware Detection in Medical Cyber-Physical Systems**”, *9th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS)*, Porto, Portugal, 2018.
  13. Hung Nguyen, Radoslav Ivanov, Linh T. X. Phan, Oleg Sokolsky, James Weimer, and Insup Lee, “**LogSafe: Secure and Scalable Data Logger for IoT Devices**”, *ACM/IEEE International Conference on Internet of Things Design and Implementation (IoTDI)*, Orlando, FL, USA, 2018.
  14. Minsu Jo, Junkil Park, Youngmi Baek, Radoslav Ivanov, James Weimer, Sang Hyuk Son and Insup Lee, “**Adaptive Transient Fault Model for Sensor Attack Detection**”, *4th International Conference on Cyber-Physical Systems, Networks, and Applications (CPSNA)*, Nagoya, Japan, 2016.
  15. Radoslav Ivanov, Nikolay Atanasov, James Weimer, Miroslav Pajic, Allan Simpao, Mohamed Rehman, George Pappas and Insup Lee, “**Estimation of Blood Oxygen Content Using Context-Aware Filtering**”, *7th International Conference on Cyber-Physical Systems (ICCPS)*, Vienna, Austria, 2016.
  16. Radoslav Ivanov, Nikolay Atanasov, Miroslav Pajic, George Pappas and Insup Lee, “**Robust Estimation Using Context-Aware Filtering**”, *53rd Annual Allerton Conference on Communication, Control, and Computing*, Allerton, IL, USA, 2015.
  17. Junkil Park, Radoslav Ivanov, James Weimer, Miroslav Pajic and Insup Lee, “**Sensor Attack Detection in the Presence of Transient Faults**”, *6th International Conference on Cyber-Physical Systems (ICCPS)*, Seattle, WA, USA, 2015.
  18. Radoslav Ivanov, James Weimer, Allan Simpao, Mohamed Rehman and Insup Lee, “**Early Detection of Critical Pulmonary Shunts in Infants**”, *6th International Conference on Cyber-Physical Systems (ICCPS)*, Seattle, WA, USA, 2015 (**Best Paper Award Finalist**).
  19. Radoslav Ivanov, Miroslav Pajic and Insup Lee, “**Resilient Multidimensional Sensor Fusion**

- using Measurement History**”, *3rd International Conference on High Confidence Networked Systems (HiCoNS, now part of ICCPS)*, Berlin, Germany, 2014.
20. Radoslav Ivanov, Miroslav Pajic and Insup Lee, “**Attack-Resilient Sensor Fusion**”, *Design, Automation and Test in Europe (DATE)*, Dresden, Germany, 2014.
  21. Shaohui Wang, Anaheed Ayoub, Radoslav Ivanov, Oleg Sokolsky and Insup Lee, “**Contract-based Blame Assignment by Trace Analysis**”, *2nd International Conference on High Confidence Networked Systems (HiCoNS, now part of ICCPS)*, Philadelphia, PA, USA, 2013.

## REFEREED WORKSHOP PAPERS

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1. Radoslav Ivanov, James Weimer and Insup Lee, “**Towards Context-Aware Cyber-Physical Systems**”, *3rd Workshop on Monitoring and Testing of Cyber-Physical Systems*, in conjunction with CPSWeek 2018, Porto, Portugal, 2018.
2. Hung Nguyen, Radoslav Ivanov, Sara Demauro and James Weimer, “**RePulmo: A Remote Pulmonary Monitoring System**”, *7th Medical Cyber Physical Systems Workshop*, in conjunction with CPSWeek 2018, Porto, Portugal, 2018.
3. Hung Nguyen, Bipeen Acharya, Radoslav Ivanov, Andreas Haeberlen, Linh T.X. Phan, Oleg Sokolsky, Jesse Walker, James Weimer, William Hanson and Insup Lee, “**Cloud-based Secure Logger For Medical Devices**”, *MedSPT 2016: The First International Workshop on Security, Privacy, and Trustworthiness in Medical Cyber-Physical Systems*, in conjunction with the IEEE 1st International Conference on Connected Health: Applications, Systems and Engineering Technologies, Washington, DC, USA, 2016.
4. Radoslav Ivanov, Nikolay Atanasov, Miroslav Pajic, Insup Lee and George Pappas, “**Robust Localization Using Context-Aware Filtering**”, *Workshop on Multi-View Geometry in Robotics*, in conjunction with RSS, Rome, Italy, 2015.

## OTHER PUBLICATIONS

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1. Nicola Bezzo, Junkil Park, Andrew King, Peter Gebhard, Radoslav Ivanov and Insup Lee, “**ROSLab – A modular programming environment for robotic applications**”, *5th International Conference on Cyber-Physical Systems (ICCPS)*, 2014 (**Demo abstract**).
2. D. Shashidhar, M. Lin, R. Ivanov, I. Lee, A. Simpao, M. Lingappan, J. Galvez, P. Laje, A. Flake and M. Rehman, “**Application of Python to AIMS Data to Analyze Intraoperative Hypotension through Pediatric Blood Pressure Curves**”, *IEEE 27th International Symposium on Computer-Based Medical Systems (CBMS)*, 2014 (**Abstract**).
3. Allan Simpao, Radoslav Ivanov, Insup Lee, Jorge Galvez and Mohamed Rehman, “**The use of machine learning for data auditing and predictive modeling of open thoracotomy versus thoracoscopic surgical resections for congenital cystic lung lesions**”, *Anesthesia and Analgesia, vol. 117, pp. 60-61*, 2013 (**Abstract**).

## SOFTWARE ARTIFACTS

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1. Verisig. Verisig is a tool for verifying safety properties of autonomous systems with neural network components. Verisig takes 3 inputs: 1) a hybrid system model of the plant (in SpaceX format); 2) a Keras/YAML model of the neural network; 3) a safety property to be verified, along with initial conditions for the plant. Verisig converts the neural network into a hybrid system and uses Flow\* to solve the resulting hybrid system verification problem. Verisig is available online at [verisig.org](http://verisig.org).

2. OpenICE-Lite. This is a tool for enabling communication in operating rooms/intensive care units. The tool implements device drivers for communication with various medical devices (e.g., pulse oximeters, bedside monitors, ventilators) and provides a publish/subscribe framework in order for other nodes to process the data in real time and provide decision support to clinicians.
3. Prediction of Critical Pulmonary Shunts in Infants. This is an implementation of the parameter-invariant detector presented in the paper with the same name. The detector is implemented on a workstation on wheels that is used in operating rooms at the Children's Hospital of Philadelphia; data is obtained in real time from anesthesia machines.

## TEACHING

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**Instructor** *Spring 2024*  
 Rensselaer Polytechnic Institute  
 CSCI 2100: Foundations of Computer Science

**Instructor** *Fall 2023 – 25*  
 Rensselaer Polytechnic Institute  
 CSCI 4160/6963, ECSE 4965/6965: Reinforcement Learning

**Instructor** *Fall 2022*  
 Rensselaer Polytechnic Institute  
 CSCI 4963/6963: Machine Learning for Autonomous Systems

**Instructor** *Spring 2022-23, 25*  
 Rensselaer Polytechnic Institute  
 CSCI 4965/6965: Safe Autonomy

**Guest Lecturer** *Spring 2019*  
 University of Pennsylvania  
 CIS 700: Topics in Safe Autonomy

**Guest Lecturer** *Spring 2019*  
 University of Pennsylvania  
 ESE 680: Safe Learning for Control

**Instructor** *Fall 2017*  
 University of Pennsylvania  
 CIT 590 – Programming Languages and Techniques

**Teaching Assistant** *Sep. 2012 - Spring 2015*  
 University of Pennsylvania  
 CIS 400 – Senior Project

**Teaching Assistant** *Spring 2010*  
 Colgate University  
 ECON 375 – Applied Econometrics

**Teaching Assistant** *Spring 2009*

Colgate University  
CS 102 – Intro to Computing II

**Teaching Assistant**

*Fall 2008*

Colgate University  
CS 101 – Intro to Computing

**PROFESSIONAL EXPERIENCE**

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**Linux Administrator**

*Summer 2010*

Colgate University

**Investment Banking Intern**

*Fall 2009*

European Bank for Reconstruction and Development, London, UK

**TECHNICAL SKILLS**

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**Programming**      Java, C/C++, Matlab, Python

**Tools**                Verisig, Flow\*, SpaceEx, Spin, UPPAAL, SAS, Stata, L<sup>A</sup>T<sub>E</sub>X, Emacs

**Languages**         English (fluent), French (basic), Bulgarian (native)