Miroslav Pajic

Department of Electrical and Computer Engineering, Duke University,
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ACADEMIC APPOINTMENTS

Dickinson Family Associate Professor July 2020 – present
Department of Electrical and Computer Engineering
Department of Computer Science
Duke University, *Durham, NC*

Nortel Networks Assistant Professor Jan. 2018 – June 2020
Pratt School of Engineering
Duke University, *Durham, NC*

Assistant Professor July 2015 – June 2020
Department of Electrical and Computer Engineering
Department of Computer Science
Duke University, *Durham, NC*

Adjunct Assistant Professor Aug. 2014 – June 2015
Department of Electrical and Computer Engineering
Duke University, *Durham, NC*

Postdoctoral Researcher Oct. 2012 – June 2015
PRECISE (The Penn Research in Embedded Computing and Integrated System) Center
Department of Electrical and Systems Engineering
University of Pennsylvania, *Philadelphia*, *PA*

EDUCATION

Ph.D. in Electrical Engineering 2012
University of Pennsylvania, Philadelphia, PA
Dissertation: "Closing the Loop: Architectures and Algorithms for Real-Time Control over Wireless Networks"
Joseph and Rosaline Wolf Best Dissertation Award

M.S. in Electrical Engineering 2010
University of Pennsylvania, *Philadelphia, PA*

M.S. in Electrical Engineering 2007
School of Electrical Engineering, University of Belgrade, *Serbia*
Thesis: "Multirate digital signal processing for timing synchronization in digital modems design"

Diploma Engineer in Electrical Engineering 1998 - 2003
School of Electrical Engineering, University of Belgrade, *Serbia*
Department of Electronics, Telecommunication and Automatic Control
Best Student Award

RESEARCH INTERESTS

Cyber-Physical Systems (CPS) with varying levels of autonomy and human interaction; Data- and model-based system design; High-assurance CPS, Embedded systems, High-confidence medical devices and systems

HONORS & AWARDS (CHRONOLOGICAL ORDER)

Dickinson Family Professorship 2020
Awarded by Pratt School of Engineering, Duke University

Best Paper Award Finalist 2019
19th ACM SIGBED International Conference on Embedded Software (**EMSOFT**) for the paper "*Statistical Verification of Hyper-properties for Cyber-Physical Systems*"

IEEE TCCPS Early-Career Award 2019
Awarded by the IEEE Technical Committee on Cyber-Physical Systems (TCCPS) for "*outstanding contributions to design and analysis methodologies for high-assurance cyber-physical systems*"

ACM SIGBED Early-Career Researcher Award 2019
Awarded by the ACM Special Interest Group on Embedded Systems (SIGBED) to recognize outstanding contributions by early career investigators in the area of embedded, real-time, and cyber-physical systems

IEEE Senior Member 2019

Nortel Networks Professorship 2018
Awarded by Pratt School of Engineering, Duke University

IBM Faculty Award 2018

NSF Faculty Early Career Development (CAREER) Award 2017
Awarded by the National Science Foundation (NSF)

ONR Young Investigator Award 2017
Awarded by the Office of Naval Research (ONR)

Best Paper Award 2017
17th ACM SIGBED International Conference on Embedded Software (**EMSOFT**) for the paper "*Security-Aware Scheduling of Embedded Control Tasks*"

National Academy of Engineering's US Frontiers of Engineering Symposium Invitation 2017

Best Paper Award 2014
5th ACM/IEEE International Conference on Cyber-Physical Systems (**ICCPS'14**) for the paper "*Robustness of Attack-resilient State Estimators*"

Best Paper Award Finalist 2014
5th ACM/IEEE International Conference on Cyber-Physical Systems (**ICCPS'14**) for the paper "*Opportunistic Scheduling of Control Tasks over Shared Wireless Channels*"

Joseph and Rosaline Wolf Best Dissertation Award 2013
Award for the Best Dissertation in Electrical and Systems Engineering
Awarded by the School and Engineering and Applied Science, University of Pennsylvania

Best Student Paper Award 2012
18th IEEE Real-Time and Embedded Technology and Applications Symposium (**RTAS'12**) for the paper "*From Verification to Implementation: A Model Translation Tool and a Pacemaker Case Study*"

Best Presentation Award 2012
11th ACM/IEEE Conference on Information Processing in Sensor Networks (**IPSN'12**) for the presentation "*Closing the Loop: A Simple Distributed Method for Control over Wireless Networks*"

Best Paper Candidate 2012
18th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (**TACAS'12**) for the paper "*Modeling and Verification of a Dual Chamber Implantable Pacemaker*"

University of Pennsylvania President Gutmann Leadership Award 2012

ACM SIGBED/SIGSOFT Frank Anger Memorial Award 2011
Presented by the ACM Special Interest Group on Embedded Systems (SIGBED) to promote cross-disciplinary research between embedded systems and software engineering

Winner of the Honeywell Users Group Wireless Student Competition 2011
Awarded by Honeywell Process Solutions for innovative use of wireless control in industrial plants

Scholarship awarded by Serbian Ministry for Science and Technology 2004

Best Student Award at the School of Electrical Engineering 2003
Awarded by the University of Belgrade, *Serbia*

Professor Aleksandar Damjanovic Foundation Award 2003
Awarded to the best student in the Department of Electronic, Telecommunication and Automatic Control School of Electrical Engineering, *Belgrade, Serbia*

ETF BAFA Best Student Award, Class 2003 2003
Awarded by the School of Electrical Engineering in Belgrade Alumni and Friends Association (BAFA)

Scholarship awarded by Serbian Royal Family 2003
Award presented to only two students of Electrical and Computer Engineering in Serbia

PUBLICATIONS (JOURNALS)

J1. A. Khazraei and M. Pajic, "Attack-Resilient State Estimation with Intermittent Data Authentication", Automatica, submitted.

J2. V. Lesi, Z. Jakovljevic and M. Pajic, "Security-Analysis for Distributed IoT-Based Industrial Automation", *IEEE Transactions on Automation Science and Engineering*, **accepted**.

J3. M. Elfar, T.C. Liang, K. Chakrabarty, and M. Pajic, "Formal Synthesis of Adaptive Droplet Routing for MEDA Biochips", *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, **accepted**.

J4. Q. Gao, J. Amason, S. Cousins, M. Pajic, and M. Hadziahmetovic, "Automated Remote Diagnosis Tool for Multi-modal Identification of Retinal Pathology", *ARVO's Translational Vision Science & Technology* (TVST), vol. 10, no. 30, pp. 30.1-30.12, May 2021.

J5. X. Luo, M. Pajic, and M. Zavlanos, "A Scalable and Optimal Graph-Search Method for Secure State Estimation", *Automatica*, vol. 123, no. 109323, January 2021.

J6. Z. Jakovljevic, V. Lesi, and M. Pajic, "Attacks on Distributed Sequential Control in Manufacturing Automation", *IEEE Transactions on Industrial Informatics*, vol. 17, no. 2, pp. 775-786, Feb. 2021.

J7. T.C. Liang, Z. Zhong, M. Pajic, and K. Chakrabarty, "Extending the Lifetime of MEDA Biochips by Selective Sensing on Microelectrodes", *IEEE Transactions on Computer-Aided Design*, part of the ESWEEK-TCAD special issue, presented in the *2020 International Conference on Compilers, Architectures and Synthesis for Embedded Systems* (***CASES***), 2020, vol. 39, no. 11, pp. 3531-3543, November 2020.

J8. V. Lesi, I. Jovanov, and M. Pajic, "Integrating Security in Resource-Constrained Cyber-Physical Systems", *ACM Transactions on Cyber-Physical Systems*, vol. 4, no. 3, 28:1-28:7, May 2020.

J9. Z. Jakovljevic, V. Lesi, S. Mitrovic, and M. Pajic, "Distributing Sequential Control for Manufacturing Automation Systems", *IEEE Transactions on Control Systems Technology*, vol. 28, no. 4, pp. 1586-1594, July 2020.

J10. Q. Gao, Y. Xu, J. Amason, A. Loksztejn, S. Cousins, M. Pajic, and M. Hadziahmetovic, "Automated Recognition of Retinal Pigment Epithelium Cells on Limited Training Samples using Deep Learning", ARVO's Translational Vision Science & Technology (TVST), vol. 9, no. 2, pp. 31.1-31.13, June 2020.

J11. Y. Wang, M. Zarei, B. Bonakdarpour and M. Pajic, "Statistical Verification of Hyper-properties for Cyber-Physical Systems", *ACM Transactions on Embedded Computing Systems*, part of the ESWEEK-TECS special issue, presented in the ACM SIGBED International Conference on Embedded Software (EMSOFT), vol. 18, no. 5s, pp. 92:1-92:23, October 2019.

J12. I. Jovanov and M. Pajic, "Relaxing Integrity Requirements for Attack-Resilient Cyber-Physical Systems", *IEEE Transactions on Automatic Control*, vol. 64, no. 12, pp. 4843-4858, December 2019.

J13. H. Zhu, M. Cummings, M. Elfar, Z. Wang, and M. Pajic, "Operator Strategy Model Development in UAV Hacking Detection", *IEEE Transactions on Human-Machine Systems*, vol. 49, no. 6, pp. 540-549, December 2019.

J14. R. Ivanov, N. Atanasov, M. Pajic, J. Weimer, G.J. Pappas, and I. Lee, "Continuous Estimation Using Context-Dependent Discrete Measurements", *IEEE Transactions on Automatic Control*, vol. 64, no. 1, pp. 235-250, January 2019.

J15. F. Miao, Q. Zhu, M. Pajic, and G. J. Pappas, "A Hybrid Stochastic Game for Secure Control of Cyber-Physical Systems", *Automatica*, vol. 93, pp. 55-63, July 2018.

J16. Z. Li, K. Yi-Tse Lai, P.H. Yu, K. Chakrabarty, M. Pajic, T.Y. Ho and C.Y. Lee, "Efficient and Adaptive Error Recovery in a Micro-Electrode-Dot-Array Digital Microfluidic Biochip", *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, vol. 37, no. 3, pp. 601-614, March 2018.

J17. V. Lesi, I. Jovanov, and M. Pajic, "Security-Aware Scheduling of Embedded Control Tasks", *ACM Transactions on Embedded Computing Systems*, part of the ESWEEK-TECS special issue, presented in the ACM SIGBED International Conference on Embedded Software (EMSOFT), vol. 16, no. 5s, pp. 188:1-188:21, October 2017.

J18. M. Elfar, Z. Zhong, Z. Li, K. Chakrabarty, and M. Pajic, "Synthesis of Error-Recovery Protocols for Micro-Electrode-Dot-Array Digital Microfluidic Biochips", *ACM Transactions on Embedded Computing Systems*, part of the ESWEEK-TECS special issue, presented in the International Conference on Compilers, Architecture, and Synthesis for Embedded Systems (CASES), vol. 16, no. 5s, pp. 127:1-127:22, Oct 2017.

J19. J. Park, R. Ivanov, J. Weimer, M. Pajic, I. Lee, and S. H. Son, "Security of Cyber-Physical Systems in the Presence of Transient Sensor Faults", *ACM Transactions on Cyber-Physical Systems*, vol. 1, no. 3, pp. 15:1-15:23, May 2017.

J20. M. Pajic, I. Lee, and G. J. Pappas, “Attack-Resilient State Estimation for Noisy Dynamical Systems”, *IEEE Transactions on Control of Network Systems*, vol. 4, no. 1, pp. 82 -92, March 2017.

J21. M. Pajic, J. Weimer, N. Bezzo, O. Sokolsky, G. J. Pappas, I. Lee, “Design and Implementation of Attack-Resilient Cyber-Physical Systems”, *IEEE Control Systems Magazine*, vol. 37, no. 2, pp. 66-81, April 2017.

J22. F. Miao, Q. Zhu, M. Pajic, and G. J. Pappas, “Coding Schemes for Securing Cyber-Physical Systems Against Stealthy Data Injection Attacks”, *IEEE Transactions on Control of Network Systems*, vol. 4, no. 1, pp. 106 -117, March 2017.

J23. R. Ivanov, M. Pajic, and I. Lee, “Attack-Resilient Sensor Fusion for Safety-Critical Cyber-Physical Systems", *ACM Transactions on Embedded Computing Systems*, vol. 15, no. 1, pp. 21:1 - 21:24, Feb 2016.

J24. Z. Jakovljevic, R. Puzovic, and M. Pajic, “Recognition of Planar Segments in Point Cloud based on Wavelet Transform”, *IEEE Transactions on Industrial Informatics*, vol. 11, no. 2, pp. 342 - 352, April 2015.

J25. Z. Jakovljevic, P. B. Petrovic, D. Milkovic, and M. Pajic, “Diagnosis of irregularities in the robotized part mating process based on contextual recognition of contact states transitions”, *Assembly Automation*, vol. 35, no. 2, pp. 190 - 199, April 2015.

J26. K. Gatsis, M. Pajic, A. Ribeiro, and G. J. Pappas, “Opportunistic Control over Shared Wireless Channels", *IEEE Transactions on Automatic Control*, vol. 60, no. 12, pp. 3140 - 3155, March 2015.

J27. M. Pajic, Z. Jiang, I. Lee, O. Sokolsky, and R. Mangharam, “Safety-critical Medical Device Development using the UPP2SF Model Translati*on Tool*”*, ACM Transactions on Embedded Computing Systems*, vol. 13, no. 4s, pp. 127.1-127.26, March 2014.

J28. M. Pajic, R. Mangharam, O. Sokolsky, D. Arney, J. Goldman, and I. Lee, “Model-Driven Safety Analysis of Closed-Loop Medical Systems”, *IEEE Transactions on Industrial Informatics*, vol. 10, no. 1, pp. 3-16, February 2014.

J29. Z. Jakovljevic, P. Petrovic, D. Milkovic, and M. Pajic, “Fuzzy inference mechanism for recognition of contact states in intelligent robotic assembly”, *Journal of Intelligent Manufacturing*, vol. 25, no. 3, pp. 571-587, June 2014.

J30. Z. Jiang, M. Pajic, R. Alur, and R. Mangharam, “Closed-loop Verification of Medical Devices with Model Abstraction and Refinement”*, International Journal on Software Tools for Technology Transfer*, vol. 16, no. 2, pp 191-213, April 2014.

J31. R. Mangharam and M. Pajic, “Distributed Control for Cyber-Physical Systems”*, Journal of the Indian Institute of Science*, vol. 93, no. 3, pp. 353-387, July - September 2013. **Invited paper.**

J32. M. Pajic, R. Mangharam, G. J. Pappas, and S. Sundaram, “Topological Conditions for In-Network Stabilization of Dynamical Systems”, IEEE *Journal on Selected Areas in Communications*, vol. 31, no. 4, pp. 794-807, April 2013.

J33. M. Pajic, A. Chernoguzov, and R. Mangharam, “Robust Architectures for Embedded Wireless Network Control and Actuation”, *ACM Transactions on Embedded Computing Systems*, vol. 11, no. 4, pp. 82:1-82:24, December 2012.

J34. M. Hadziahmetovic, M. Pajic, S. Grieco, Y. Song, D. Song, Y. Li, A. Cwanger, J. Iacovelli, S. Chu, J. Connelly, M. Spino, and J. Dunaief, “The oral iron chelator deferiprone protects against retinal degeneration induced through diverse mechanisms”, *Translational Vision Science & Technology*, vol. 1, no. 3, 2012.

J35. Z. Jiang, M. Pajic, and R. Mangharam, “Cyber-Physical Modeling of Implantable Cardiac Medical Devices”, *Proceedings of the IEEE*, vol. 100, no. 1, pp. 122-137, January 2012.

J36. M. Pajic, S. Sundaram, G. J. Pappas, and R. Mangharam, "The Wireless Control Network: A New Approach for Control over Networks", *IEEE Transactions on Automatic Control*, vol. 56, no. 10, pp. 2305-2318, October 2011.

J37. M. Pajic and R. Mangharam, "Spatio-Temporal Techniques for Anti-Jamming in Embedded Wireless Networks", *EURASIP Journal on Wireless Communication and Networking, vol. 2010, ID* 819318, doi: 10.1155/2010/819318, 2010.

J38. C. Dick, F. Harris, M. Pajic, and D. Vuletic, "Implementing a Real-Time Beamformer on an FPGA Platform", *XCell Journal*, Second Quarter 2007, pp. 36-40, May 2007.

PUBLICATIONS (JOURNALS, SUBMITTED)

1. Y. Wang, A. Bozkurt, and M. Pajic, "Attack-Resilient Supervisory Control of Discrete Event Systems", submitted. Available at: https://arxiv.org/abs/1904.03264.
2. V. Lesi, Z. Jakovljevic, and M. Pajic, "IoT-enabled Motion Control: Architectural Design Challenges and Solutions", submitted.
3. V. Lesi, Z. Jakovljevic, and M. Pajic, "Flattening the Automation Pyramid: From Electromechanical Parts to Smart Manufacturing Resources", submitted.

PUBLICATIONS (CONFERENCES)

C1. A. K. Bozkurt, Y. Wang, and M. Pajic, "Model-Free Learning of Safe yet Effective Controllers", *60th IEEE Conference on Decision and* Control (**CDC**), 2021, **accepted**.

C2. A. K. Bozkurt, Y. Wang, M. Zavlanos, and M. Pajic, "Model-Free Reinforcement Learning for Stochastic Games with Linear Temporal Logic Objectives", *IEEE International Conference on Robotics and Automation* (**ICRA**), 2021, **to appear**.

C3. A. K. Bozkurt, Y. Wang, and M. Pajic, "Secure Planning Against Stealthy Attacks via Model-Free Reinforcement Learning", *IEEE International Conference on Robotics and Automation* (**ICRA**), 2021, **to appear**.

C4. Y. Wang, M. Zarei, B. Bonakdarpour, and M. Pajic, "Probabilistic Conformance for Cyber-Physical Systems", *12th ACM/IEEE International Conf. on Cyber-Physical Systems* (**ICCPS**), pp. 55-66, May 2021.

C5. M. Elfar, T. C. Liang, K. Chakrabarty and M. Pajic, "Formal Synthesis of Adaptive Droplet Routing for MEDA Biochips", Design, Automation and Test in Europe (**DATE**), 2021, **to appear**.

C6. Y. Wang, S. Nalluri, B. Bonakdarpour, and M. Pajic, "Statistical Model Checking for Hyperproperties", *34th IEEE Computer Security Foundations Symposium* (**CSF**), Dubrovnik, Croatia, 2021, **to appear**.

C7. T.C. Liang, Z. Zhong, M. Pajic, and K. Chakrabarty, "Extending the Lifetime of MEDA Biochips by Selective Sensing on Microelectrodes", *2020 International Conference on Compilers, Architectures and Synthesis for Embedded Systems* (***CASES***), November 2020.

C8. M. Elfar, Y. Wang, and M. Pajic, "Context-Aware Temporal Logic for Probabilistic Systems", *18th International Symposium on Automated Technology for Verification and Analysis* **(ATVA**), pp. 215-232, 2020**.**

C9. K. Kim, S. Nalluri, A. Kashinath, Y. Wang, S. Mohan, M. Pajic, and B. Li, "Security Analysis Against Spoofing Attacks for Distributed UAVs", *Workshop on Decentralized IoT Systems and Security* (**DISS**), pp. 1-6, San Diego, CA, April 2020.

C10. A. Khazraei and M. Pajic, “Perfect Attackability of Linear Dynamical Systems with Bounded Noise”, 2020 American Control Conference (**ACC**), pp. 749-754, Denver, CO, June 2020.

C11. A. Bozkurt, Y. Wang, M. Zavlanos, and M. Pajic, "Control Synthesis from Linear Temporal Logic Specifications using Model-Free Reinforcement Learning", *IEEE International Conference on Robotics and Automation* (**ICRA**), pp. 10349-10355, Paris, France, May 2020.

C12. Y. Wang, S. Nalluri, and M. Pajic, “Hyperproperties for Robotics: Planning via HyperLTL”, *IEEE International Conference on Robotics and Automation* (**ICRA**), pp. 8462-8468, Paris, France, May 2020.

C13. Q. Gao, M. Pajic, and M. Zavlanos, "Deep Imitative Reinforcement Learning for Temporal Logic Robot Motion Planning with Noisy Semantic Observations", *IEEE International Conference on Robotics and Automation* (**ICRA**), pp. 8490-8496, Paris, France, May 2020.

C14. Q. Gao, M. Naumann, I. Jovanov, V. Lesi, K. Kumaravelu, W. Grill, and M. Pajic, “Model-based Design of Closed-Loop Deep Brain Stimulation Controllers using Reinforcement Learning”, *11th ACM/IEEE International Conference on Cyber-Physical Systems* (**ICCPS**), pp. 108-118, Sydney, Australia, April 2020.

C15. M. Zarei, Y. Wang, and M. Pajic, “Statistical Verification of Learning-Based Cyber-Physical Systems”, *23rd ACM International Conference on Hybrid Systems: Computation and Control* (**HSCC**), pp. 1-7, Sydney, Australia, April 2020.

C16. Y. Wang and M. Pajic, “Supervisory Control of Discrete Event Systems in the Presence of Sensor and Actuator Attacks”, *58th IEEE Conference on Decision and* Control (**CDC**), pp. 5350-5355, Nice, France, December 2019.

C17. Y. Wang and M. Pajic, “Attack-Resilient Supervisory Control with Intermittently Secure Communication”, *58th IEEE Conference on Decision and* Control (**CDC**), pp. 2015-2020, Nice, France, December 2019.

C18. Y. Wang, M. Zarei, B. Bonakdarpour and M. Pajic, “Statistical Verification of Hyper-properties for Cyber-Physical Systems”, *19th ACM SIGBED International Conference on Embedded Software* (**EMSOFT**), New York, NY, October 2019, (**Best Paper Award Finalist**)**.**

C19. V. Lesi, Z. Jakovljevic, and M. Pajic, “Synchronization of Distributed Controllers in Cyber-Physical Systems”, 24th IEEE International Conference on Emerging Technologies and Factory Automation (**ETFA**), pp. 710-717, Zaragoza, Spain, September 2019.

C20. M. Elfar, Y. Wang, and M. Pajic, “Security-Aware Synthesis using Delayed Action Games”, *31st International Conference on Computer-Aided Verification* (**CAV**), pp. 180-199, New York, NY, July 2019.

C21. M. Elfar, H. Zhu, M. L. Cummings, and M. Pajic, “Security-Aware Synthesis of Human-UAV Protocols”, *IEEE International Conference on Robotics and Automation* (**ICRA**), pp. 8011-8017, Montreal, Canada, May 2019.

C22. V. Lesi, Z. Jakovljevic and M. Pajic, “Reliable Industrial IoT-Based Distributed Automation”, *ACM/IEEE International Conference on Internet of Things Design and Implementation* (**IoTDI**), pp. 94-105, Montreal, Canada, April 2019.

C23. J. Park, M. Pajic, O. Sokolsky, I. Lee, “LCV: A Verification Tool for Linear Controller Software”, *International Conference on Tools and Algorithms for the Construction and Analysis of Systems* (**TACAS**), pp. 213-225, Prague, Czech Republic, April 2019.

C24. V. Lesi, Z. Jakovljevic and M. Pajic, “Towards Resilient and Reliable Distributed Automation for Smart Manufacturing Systems”, Workshop on Smart Manufacturing Modeling and Analysis (**SM²N**), part of CPS-IoT Week, Montreal, Canada, April 2019.

C25. I. Jovanov, and M. Pajic, "Secure State Estimation with Cumulative Message Authentication", *57th IEEE Conference on Decision and Control* (***CDC***), pp. 2074-2079, Miami, Fl, Dec 2018.

C26. B. Bonakdarpour, J. Deshmukh, and M. Pajic, "Opportunities and Challenges in Monitoring Cyber-Physical Systems Security", International Symposium on Leveraging Applications of Formal Methods, Verification and Validation (***ISOLA*)**, pp. 9-18, Limassol, Cyprus, November 2018.

C27. I. Jovanov, M. Naumann, K. Kumaravelu, W. Grill, and M. Pajic, "Platform for Model-Based Design and Testing for Deep Brain Stimulation", *9th ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS***), pp. 263-274, Porto, Portugal, April 2018.

C28. H. Zhu, M. Elfar, M. Pajic, and M. L. Cummings, "Human Augmentation of UAV Cyber-Attack Detection", International Conference on Human-Computer Interaction (**HCII**), pp. 154-167, Las Vegas, NV, July 2018.

C29. I. Jovanov and M. Pajic, "Sporadic Data Integrity for Secure State Estimation", P*roceedings of the 56th IEEE Conference on Decision and* Control (***CDC***), pp. 163-169, Melbourne, Australia, December 2017.

C30. V. Lesi, I. Jovanov, and M. Pajic, "Network Scheduling for Secure Cyber-Physical Systems", *IEEE Real-Time Systems Symposium* (***RTSS***), pp. 45-55, Paris, France, December 2017.

C31. V. Lesi, I. Jovanov, and M. Pajic, "Security-Aware Scheduling of Embedded Control Tasks", *17th ACM SIGBED International Conference on Embedded Software* (***EMSOFT***), Seoul, Korea, October 2017 (**Best Paper Award**).

C32. M. Elfar, Z. Zhong, Z. Li, K. Chakrabarty, and M. Pajic, "Synthesis of Error-Recovery Protocols for Micro-Electrode-Dot-Array Digital Microfluidic Biochips", International Conference on Compilers, Architectures and Synthesis for Embedded Systems (***CASES***), Seoul, Korea, October 2017.

C33. Z. Jakovljevic, S. Mitrovic and M. Pajic, "Cyber Physical Production Systems-An IEC 61499 Perspective", Proceedings of 5th International Conference on Advanced Manufacturing Engineering and Technologies (**NEWTECH**), pp. 27-39, June 2017.

C34. Z. Jakovljevic, V. Majstorovic, S. Stojadinovic, S. Zivkovic, N. Gligorijevic and M. Pajic, "Cyber-Physical Manufacturing Systems (CPMS)", Proceedings of 5th International Conference on Advanced Manufacturing Engineering and Technologies (**NEWTECH**), pp. 199-214, June 2017.

C35. J. Park, M. Pajic, O. Sokolsky, and I. Lee, "Automatic Verification of Finite Precision Implementations of Linear Controllers", *International Conference on Tools and Algorithms for the Construction and Analysis of Systems* (***TACAS***), pp. 153-169, April 2017.

C36. R. Fricks, H. Tseng, M. Pajic, and K. Trivedi, "Transient Performance and Availability Modeling in High Volume Eye Care Clinics", *63rd Annual IEEE Reliability and Maintainability Symposium* (***RAMS***), pp. 1-6, January 2017.

C37. Z. Li, K. Yi-Tse Lai Lai, P. H. Yu, K. Chakrabarty, M. Pajic, T. Y. Ho, and C.Y. Lee, "Error Recovery in a Micro-Electrode-Dot-Array Digital Microfluidic Biochip", *International Conference on Computer Aided Design* (***ICCAD***), pp. 105:1-105:8, Austin, TX, November 2016.

C38. P. Bogdan, M. Pajic, P. Pande, and V. Raghunathan, "Making the Internet-of-Things a Reality: From Smart Models, Sensing and Actuation to Energy-Efficient Architectures", Proceedings of the 11th *International Conference on Hardware/Software Co-design and System Synthesis* (**CODES+ISSS),** pp. 25:1-25:10, Pittsburgh, PA, October 2016.

C39. M. Ibrahim, C. Boswell, K. Chakrabarty, K. Scott, and M. Pajic, "A Real-Time Digital-Microfluidic Platform for Epigenetics", International Conference on Compilers, Architectures and Synthesis for Embedded Systems (***CASES***), pp. 10:1-10:10, Pittsburgh, Pennsylvania, October 2016.

C40. V. Lesi, Z. Jakovljevic and M. Pajic, “Towards Plug-n-Play Numerical Control for Reconfigurable Manufacturing Systems”, *21st IEEE International Conference on Emerging Technologies and Factory Automation* (***ETFA***), pp. 1-8, Berlin, Germany, September 2016.

C41. J. Park, M. Pajic, I. Lee, and O. Sokolsky, “Scalable Verification of Linear Controller Software", *22nd International Conference on Tools and Algorithms for the Construction and Analysis of Systems* (***TACAS***), pp. 662-679, Eindhoven, Netherlands, April 2016.

C42. R. Ivanov, N. Atanasov, J. Weimer, M. Pajic, A. Simpao, M. Rehman, G.J. Pappas, and I. Lee, “Estimation of Blood Oxygen Content Using Context-Aware Filtering", *Proceedings of the 7th ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS***), pp. 1-10, Vienna, Austria, April 2016.

C43. R. Mangharam, H. Abbas, M. Behl, K. Jang, M. Pajic and Z. Jiang, “*Three challenges in cyber-physical systems*", *8th International Conference on Communication Systems and Networks* (***COMSNETS***), pp. 1-8, Bangalore, India, 2016.

C44. M. Pajic, P. Tabuada, I. Lee, and G. J. Pappas, “Attack-Resilient State Estimation in the Presence of Noise", *Proceedings of the 54th IEEE Conference on Decision and Control* (***CDC***), pp. 527-532, Osaka, Japan, December 2015.

C45. M. Pajic, J. Park, I. Lee, G. J. Pappas, and O. Sokolsky, “Automatic Verification of Linear Controller Software", *Proceedings of the 15th ACM SIGBED International Conference on Embedded Software* (***EMSOFT***), pp. 217-226, Amsterdam, Netherlands, October 2015.

C46. M. Al Faruque, F. Regazzoni, and M. Pajic, “Design Methodologies for Securing Cyber-Physical Systems", Proceedings of the 10th *International Conference on Hardware/Software Codesign and System Synthesis* (***CODES+ISSS***), pp. 30-36, Amsterdam, Netherlands, October 2015.

C47. R. Ivanov, N. Atanasov, M. Pajic, G. J. Pappas, and I. Lee, “Robust Estimation Using Context-Aware Filtering", *53rd Annual Allerton Conference on Communication, Control, and Computing* (***Allerton***), 2015.

C48. R. Ivanov, N. Atanasov, M. Pajic, I. Lee, and G. J. Pappas, “Robust Localization Using Context-Aware Filtering", *Workshop* on Multi VIew Geometry in Robotics (***MVIGRO***), *in conjunction with RSS*, Rome, Italy, July 2015.

C49. J. Park, R. Ivanov, J. Weimer, M. Pajic, and I. Lee, “Sensor Attack Detection in the Presence of Transient Faults", *Proceedings of the 6th ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS***), pp. 1-10, Seattle, WA, April 2015.

C50. K. Gatsis, M. Pajic, A. Ribeiro, and G. J. Pappas, “Opportunistic sensor scheduling in wireless control systems", *Proceedings of the 53rd IEEE Conference on Decision and Control* (***CDC***), pp. 3777 - 3782, Los Angeles, CA, December 2014.

C51. F. Miao, Q. Zhu, M. Pajic, and G. J. Pappas, “Coding Sensor Outputs for Injection Attacks Detection", *Proceedings of the 53rd IEEE Conference on Decision and Control* (***CDC***), pp. 5776 - 5781, Los Angeles, CA, December 2014.

C52. O. Sokolsky, M. Pajic, N. Bezzo, and I. Lee, “Architecture-Centric Software Development for Cyber-Physical Systems”, *Workshop on Cyber-Physical System Architectures and Design Methodologies* (***CPSArch***), *ESWeek,* New Delhi, India, 2014.

C53. N. Bezzo, J. Weimer, M. Pajic, O. Sokolsky, G. J. Pappas, and I. Lee, “Attack Resilient State Estimation for Autonomous Robotic Systems", *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems* (***IROS***), pp. 3692 - 3698, Chicago, IL, September 2014.

C54. J. Weimer, N. Bezzo, M. Pajic, O. Sokolsky, and I. Lee, “Attack-Resilient Minimum-Variance Estimation", *American Control Conference* (***ACC***), pp. 1114-1119, June 2014.

C55. M. Pajic, J. Weimer, N. Bezzo, P. Tabuada, O. Sokolsky, I. Lee, and G. J. Pappas, "Robustness of Attack-resilient State Estimators", *Proceedings of the 5th ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS***), pp. 163-174, Berlin, Germany, April 2014 (**Best Paper Award**).

C56. K. Gatsis, M. Pajic, A. Ribeiro, and G. J. Pappas, "Opportunistic Scheduling of Control Tasks over Shared Wireless Channels", *Proceedings of the 5th ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS***), pp. 48-59, Berlin, Germany, April 2014 (**Best Paper Award Finalist**).

C57. R. Ivanov, M. Pajic, and I. Lee, "Resilient Multidimensional Sensor Fusion using Measurement History", Proceedings of the 3rd *ACM International Conference on High Confidence Networked Systems* (***HiCoNS***), pp. 1-10, Berlin, Germany, April 2014.

C58. R. Ivanov, M. Pajic, and I. Lee, "Attack-Resilient Sensor Fusion", *Design, Automation and Test in Europe* (***DATE***), Dresden, Germany, March 2014.

C59. M. Pajic, S. Sundaram, and G. J. Pappas, "Stabilizability over Deterministic Relay Networks", *Proceedings of the 52nd IEEE Conference on Decision and Control* (***CDC***), pp. 4018-4023, Florence, Italy, December 2013**.**

C60. K. Gatsis, M. Pajic, A. Ribeiro, and G. J. Pappas, "Power-aware communication for wireless sensor-actuator systems", *Proceedings of the 52nd IEEE Conference on Decision and Control* (***CDC***), pp. 4006-4011, Florence, Italy, December 2013**.**

C61. F. Miao, M. Pajic, and G. J. Pappas, "Stochastic Game Approach for Replay Attack Detection", *Proceedings of the 52nd IEEE Conference on Decision and Control* (***CDC***), pp. 1854-1859, Florence, Italy, December 2013**.**

C62. F. Miao, M. Pajic, R. Mangharam, and G. J. Pappas, "Networked Realization of Discrete-Time Controllers", *American Control Conferences* (***ACC***), pp. 3002-3007, Washington DC, June 2013.

C63. M. Pajic, N. Bezzo, J. Weimer, O. Sokolsky, R. Alur, R. Mangharam, N. Michael, G. J. Pappas, P. Tabuada, S. Weirich, and I. Lee, "Towards Synthesis of Platform-aware Attack-Resilient Control Systems", Proceedings of the 2nd *ACM International Conference on High Confidence Networked Systems* (***HiCoNS***), Philadelphia, PA, April 2013.

C64. J. Weimer, N. Bezzo, M. Pajic, G. J. Pappas, O. Sokolsky, and I. Lee, "Resilient Parameter-Invariant Control with Application to Vehicle Cruise Control", *Control of Cyber-Physical Systems* (*Workshop held at Johns Hopkins University*), *Lecture Notes in Control and Information Sc.*, vol. 449, pp. 197-216, 2013.

C65. M. Pajic, S. Sundaram, J. Le Ny, G. J. Pappas, and R. Mangharam, "Closing the Loop: A Simple Distributed Method for Control over Wireless Networks", *Proceedings of the 11th ACM/IEEE International Conference on Information Processing in Sensor Networks* (***IPSN***), pp. 25-36, Beijing, China, April 2012 (**Best Presentation Award**).

C66. M. Pajic, Z. Jiang, I. Lee, O. Sokolsky, and R. Mangharam, "From Verification to Implementation: A Model Translation Tool and a Pacemaker Case Study", Proceedings of the *18th IEEE Real-Time and Embedded Technology and Applications Symposium* (***RTAS***), pp. 173-184, Beijing, China, April 2012 (**Best Student Paper Award**).

C67. Z. Jiang, M. Pajic, S. Moarref, R. Alur, and R. Mangharam, "Modeling and Verification of a Dual Chamber Implantable Pacemaker", *Lecture Notes in Computer Science, 2012, Volume 7214, Tools and Algorithms for the Construction and Analysis of Systems* (***TACAS***), pp. 188-203, Tallinn, Estonia, March 2012 (**Best Paper Candidate**).

C68. M. Pajic, S. Sundaram, G. J. Pappas, and R. Mangharam, "Topological Conditions for Wireless Control Networks", *Proceedings of the 50th IEEE Conference on Decision and Control* (***CDC***), pp. 2353-2360, Orlando, FL, December 2011.

C69. M. Pajic, S. Sundaram, G. J. Pappas, and R. Mangharam, "Network Synthesis for Dynamical System Stabilization", *45th Annual Asilomar Conference on Signals, Systems, and Computers* (***Asilomar***), Pacific Grove, CA, November 2011. **Invited paper**.

C70. Z. Jakovljevic, M. Pajic, D. Aleksendric, and D. Milkovic, "Wireless Sensors Network Application in Machining Operations Control", *Proceedings of the 34th International Conference on Production Engineering* (***ICPE***), pp. 365-368, Nis, Serbia, September 2011.

C71. M. Pajic, S. Sundaram, G. J. Pappas, and R. Mangharam, "A Simple Distributed Method for Control over Wireless Networks", *CPS Week Workshop on Real-Time Wireless for Industrial Applications* (***RealWIN***), Chicago, IL, April 2011.

C72. Z. Jiang, M. Pajic, and R. Mangharam, "Model-based Closed-loop Testing of Implantable Pacemakers", *Proceedings of the 2nd ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS***), pp. 131-140, Chicago, IL, April 2011.

C73. M. Pajic, S. Sundaram, J. Le Ny, G. J. Pappas, and R. Mangharam, "The Wireless Control Network: Synthesis and Robustness", *Proceedings of the 49th IEEE Conference on Decision and Control* (***CDC***), pp. 7576-7581, Atlanta, GA, December 2010.

C74. S. Sundaram, M. Pajic, C. N. Hadjicostis, R. Mangharam, and G. J. Pappas, "The Wireless Control Network: Monitoring for Malicious Behavior", *Proc. of the 49th IEEE Conference on Decision and Control* (***CDC***), pp. 5979 - 5984, Atlanta, GA, December 2010. **Invited paper**.

C75. Z. Jiang, M. Pajic, A. Connolly, S. Dixit, and R. Mangharam, "Real-time Heart Model for Implantable Cardiac Device Validation and Verification", *Proc. of the 2010 22nd IEEE/Euromicro Conference on Real-Time Systems* (***ECRTS***), pp. 239-248, Brussels, Belgium, July 2010.

C76. M. Pajic and R. Mangharam, "Embedded Virtual Machines for Robust Wireless Control and Actuation", *Proceedings of the 2010 16th IEEE Real-Time and Embedded Technology and Applications Symposium* (***RTAS***), pp. 79-88, Stockholm, Sweden, April 2010.

C77. D. Arney, M. Pajic, J. M. Goldman, I. Lee, R. Mangharam, and O. Sokolsky, "Toward patient safety in closed-loop medical device systems", *Proceedings of the 1st ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS***), pp. 139-148, Stockholm, Sweden, April 2010.

C78. R. Mangharam and M. Pajic, "Embedded Virtual Machines for Robust Wireless Control Systems", ***ICDCSW '09****: Proc. of the 29th IEEE Int. Conf. on Distributed Computing Systems Workshops – 2nd Int. Workshop on Cyber-Physical Systems* (***WCPS***), pp. 38-43, Montreal, Canada, June 2009.

C79. M. Pajic and R. Mangharam, "Anti-Jamming for Wireless Sensor Networks*", Proceedings of the 8th ACM/IEEE International Conference on Information Processing in Sensor Networks* (***IPSN***), pp. 301-312, San Francisco, CA, April 2009.

C80. M. Pajic and R. Mangharam, "WisperNet: Anti-Jamming for Wireless Sensor Networks", *Proceedings of the 2nd Workshop on Embedded Systems Security, A Workshop of the IEEE/ACM EMSOFT'2008 and the Embedded Systems Week* (***WESS***), pp. 38 – 43, Atlanta, GA, September 2008.

C81. M. Jorgovanovic, M. Pajic, G. Kvascev, and J. Popovic, "FPGA Design of Arbitrary Down-sampler", *Proceedings of 26th IEEE International Conference on Microelectronics* (***MIEL***), pp. 391-394, Nis, Serbia, September 2008.

C82. C. Dick, f. harris, M. Pajic, and D. Vuletic, "Real-Time QRD-Based Beamforming on an FPGA Platform", *Proceedings of Fortieth Asilomar Conference on Conference on Signals, Systems and Computers* (***Asilomar***), pp. 1200 – 1204, Monterey, CA, 2006.

C83. M. Pajic and S. Tadic, "QR Matrix Decomposition Algorithm Based on Virtex-4 FPGA Architecture", *50th Conference for Electronics, Telecommunications, Computers, Automatic Control and Nuclear Engineering* (***Etran***), Belgrade, Serbia, June 2006.

C84. M. Pajic, S. Denic, and S. Tadic, "Timing Synchronization in Burst PAM Modem", *13th Telecommunications Forum* (***Telfor***), Belgrade, Serbia, October 2005.

C85. S. Tadic, S. Denic, M. Pajic, and D. M. Dramicanin, "SDR implementation of CPFSK modem for land mobile radio", *12th Telecommunications Forum* (***Telfor***), Belgrade, Serbia, Oct 2004.

PUBLICATIONS (CONFERENCES, SUBMITTED)

1. A. Khazraei, S. Hallyburton, Q. Gao, Y. Wang, and M. Pajic, "Learning-Based Vulnerability Analysis of Cyber-Physical Systems", submitted.
2. S. Hallyburton, Y. Liu, and M. Pajic, "Security Analysis of Camera-LiDAR Semantic-Level Fusion Against Black-Box Attacks on Autonomous Vehicles", submitted.
3. Q. Gao, D. Wang, J. Amason, S. Yuan, C. Tao, R. Henao, M. Hadziahmetovic, L. Carin, M. Pajic, "Imputation-Free Learning from Incomplete Observations", submitted.
4. A. K. Bozkurt, Y. Wang, and M. Pajic, "Learning Optimal Strategies for Temporal Tasks in Stochastic Games", submitted.
5. Y. Wang, A. K. Bozkurt, and M. Pajic, "Reinforcement Learning with Temporal Logic Constraints for Partially-Observable Markov Decision Processes", submitted.
6. M. A. Naeem and M. Pajic, "Learning Expected Reward for Switched Linear Control Systems: A Non-Asymptotic View", submitted.
7. Y. Wang, Q. Gao, and M. Pajic, "Deep Learning for Stable Monotone Dynamical Systems", submitted.
8. T.H. Hsu, Y. Wang, B. Bonakdarpour, and M. Pajic, "Multi-Agent Path Planning with Hyperproperties", submitted.
9. S. Sun, Y. Zhang, X. Luo, P. Vlantis, M. Pajic, and M. Zavlanos, "Formal Verification of Stochastic Systems with ReLU Neural Network Controllers", submitted.
10. M. Elfar, Y. Wang, and M. Pajic, "Inverse Reinforcement Learning of Linear Temporal Logic for Human-Autonomy Interaction", submitted.

PUBLICATIONS (BOOK CHAPTERS)

B1. R. Ivanov, M. Pajic, and I. Lee, "Attack-Resilient Sensor Fusion for Cyber-Physical Systems", *Multisensor Data Fusion: From Algorithm and Architecture Design to Applications*, pp. 409-424, Aug 2015.

PUBLICATIONS (OTHER)

1. Q. Gao, J. Amason, S. Cousins, M. Pajic, and M. Hadziahmetovic, "A Deep Learning-based Automated Tool for the Identification of Referable Retinal Pathology from Multi-Modal Imaging Sources", *The Association for Research in Vision and Ophthalmology* (**ARVO**) 2021 Annual Meeting, 2021.

2. M. Hu, J. Amason, T. Lee, Q. Gao, D. Borkar, M. Pajic, and M. Hadziahmetovic, "Deep Learning Approach for Automated Detection of Retinal Pathology from Ultra-Widefield Retinal Images*", The Association for Research in Vision and Ophthalmology* (**ARVO**) 2021 Annual Meeting, 2021.
3. M. Hadziahmetovic, Q. Gao, Y. Xu, J. Amason, A. Loksztejn, S. Cousins, and M. Pajic, "Deep Learning Approach for Automated Recognition of Retinal Pigment Epithelium Cell", *The Association for Research in Vision and Ophthalmology (**ARVO**) 2020 Annual Meeting*, 2020.
4. I. Jovanov, M. Naumann, K. Kumaravelu, V. Lesi, A. Zutshi, W. Grill, and M. Pajic, "Learning-Based Control Design for Deep Brain Stimulation", **Demonstration at** *the 9th ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS, CPSWEEK 2018***), Porto, Portugal, April 2018.
5. M. Elfar, H. Zhu, A. Raghunathan, Y. Tay, J. Wubbenhorst, M. L. Cummings, M. Pajic, "Platform for Security-Aware Design of Human-on-the-Loop Cyber-Physical Systems", **Demonstration at** *the 8th ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS, CPSWEEK* 2017**)*,* Pittsburgh, PA, April 2017.
6. M. Pajic, N. Bezzo, J. Weimer, O. Sokolsky, N. Michael, G. J. Pappas, P. Tabuada, and I. Lee, "Synthesis of Platform-aware Attack-Resilient Vehicular Systems", **Demonstration at** *the 4th ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS, CPSWEEK* 2013**)*,* Philadelphia, PA, April 2013.
7. S. Sarode, S. Radhakrishnan, V. Sampath, Z. Jiang, M. Pajic, and R. Mangharam, "Model-Based Testing of Implantable Cardiac Devices", **Demonstration at** *the 3rd ACM/IEEE International Conference on Cyber-Physical Systems* (***ICCPS, CPSWEEK* 2012**)*,* Beijing, China, April 2012.
8. M. Pajic, S. Sundaram, M. Aneja, S. Vemuri, G. J. Pappas, and R. Mangharam, "Architecture for a Fully Distributed Wireless Control Network", **Demonstration at** *ACM/IEEE Int. Conf. on Information Processing in Sensor Networks* (***IPSN, CPSWEEK* 2011**)*,* Chicago, IL, April 2011.
9. Z. Jiang, M. Pajic, and R. Mangharam, "Closed-loop Testing for Implantable Cardiac Pacemakers", **Demonstration at** *the 10th ACM/IEEE International Conference on Information Processing in Sensor Networks* (***IPSN, CPSWEEK* 2011**)*,* Chicago, IL, April 2011.
10. M. Pajic, S. Sundaram, G. J. Pappas, and R. Mangharam, "The Wireless Control Network", **Demonstration at** *the Annual Multiscale Systems Center* (***MuSyC***) *Meeting*, September 2010.
11. M. Pajic, Z. Jiang, A. Connolly, S. Dixit, and R. Mangharam, "A platform for implantable medical device validation", **Demonstration at** *the 9th ACM/IEEE International Conference on Information Processing in Sensor Networks* (***IPSN, CPSWEEK* 2010**)*,* Stockholm, Sweden, April 2010.
12. M. Pajic and R. Mangharam, "Embedded Virtual Machines for Wireless Industrial Automation", ***Demonstration* at** *the 8th ACM/IEEE International Conference on Information Processing in Sensor Networks* (***IPSN, CPSWEEK* 2009**) San Francisco, CA, April 2009.
13. M. Ponjavic and M. Pajic, "Signals and systems - Laboratory Manual" (in Serbian), ISBN 86-7466-252-8, Akademska Misao, Belgrade 2006.

SELECTED TALKS

1. "Security-Aware Cyber-Physical Systems with Varying Levels of Autonomy", *Galois Invited Seminar Series*, September 2020.
2. "Autonomous System Security", *SRC ICT Hardware Enabled Security Workshop*, August 2020.
3. "Security-Aware Control of Autonomous Vehicles", *Automated Vehicles Symposium,* Session on *Security and Privacy of Automated Driving: Hot Topics*, July 2020.

4. "High-Assurance Autonomy in Adversarial Environments", *Army Research Office (ARO) Workshop on Assuring Autonomy*, June 2020.
5. "Assuring Safety and Security in Cyber-Physical Systems with Varying Levels of Autonomy", **Keynote**, *IEEE Workshop on the Internet of Safe Things (SafeThings)*, Co-located with 41st IEEE Symposium on Security and Privacy, San Francisco, CA, June 2020.
6. "Securing Cyber-Physical Systems with Varying Levels of Autonomy***", NATO Science and Technology Board Meeting, IST-164 RTG Securing Unmanned and Autonomous Vehicles For Mission Assurance (IWA),*** United States Air Force Academy, Colorado Springs, CO, November 2019.
7. "Securing Cyber-Physical Systems: Research Challenges and Opportunities", **Distinguished Speaker Keynote**, *International Workshop on Cyber-Physical Systems*, DGIST, Daegu, South Korea, June 2019.
8. "Assuring Safety and Security in Cyber-Physical Systems", **invited talk**, *CEDA Workshop on CAD for Safe and Secure Electronic System Design*, Las Vegas, NV, June 2019.
9. "Integrating Security in Cyber-Physical Systems", **invited talk**, *4th International Workshop on Design Automation for Cyber-Physical Systems (**DACPS**)*, Las Vegas, NV, June 2019.
10. "Integrating Security in Cyber-Physical Systems", ***North Carolina State University***, Computer Science Seminar Series, February 2019.
11. "Integrating Security in Cyber-Physical Systems", ***Iowa State University***, Computer Science Seminar Series, November 2018.
12. "Integrating Security in Cyber-Physical Systems", ***University of South California***, Center for Cyber-Physical Systems and the Internet-of-Things, Viterbi School of Engineering Seminar Series, Oct 2018.
13. "Design of Security-Aware Cyber-Physical Systems", ***University of Waterloo***, Electrical and Computer Engineering Seminar Series, December 2017.
14. "Towards Automatic Software Verification for Safety-Critical Cyber-Physical Systems", **Safe and Secure Systems and Software Symposium** (**S5**), July 2016.
15. "Securing Autonomy in Contested Environments", **Assured Autonomy Workshop at the Florida Institute on National Security**, **Invited Talk,** April 2016.
16. *"Automatic Software Verification for High-Confidence Cyber-Physical Systems*", **High-Confidence Software and Systems Conference** (**HCSS**), May 2016.
17. "Model-Based Design of Closed-Loop Medical Cyber-Physical Systems", ***University of North Carolina,*** November 2015.
18. "From Verified Models to Verified Code for Medical Devices", ***IEEE Engineering in Medicine and Biology Society Conference* (*EMBC*)**, **NSF/NIH Organized Session on Health Cyber-Physical Systems, Invited Talk**, August 2014.
19. "Design and Implementation of Attack-Resilient Cyber-Physical Systems", ***High Confidence Software and Systems Conference*** (**HCSS**), **Invited Talk**, May 2014.
20. "Closing the Loop with Medical Cyber-Physical Systems", ***UCLA Electrical Engineering***, April 2014.
21. "Closing the Loop with Medical Cyber-Physical Systems", ***University of Minnesota, Computer Science and Engineering Department Seminar***, April 2014.
22. "Model-Based Design of Closed-Loop Medical Cyber-Physical Systems", ***University of Maryland, ISR Special Seminar***, March 2014.
23. "Closing the Loop with Medical Cyber-Physical Systems", ***Cornell University, School of Electrical and Computer Engineering***, March 2014.

24. "Closing the Loop with Medical Cyber-Physical Systems", ***University of Illinois Urbana-Champaign, Electrical and Computer Engineering Seminar***, March 2014.
25. "Closing the Loop with Medical Cyber-Physical Systems", ***Duke University, Electrical and Computer Engineering Seminar***, March 2014.
26. "Closing the Loop with Wireless Cyber-Physical Systems", ***Washington University in St. Louis, Department of Computer Science and Engineering Colloquia Series***, February 2014.
27. "Closing the Loop with Medical Cyber-Physical Systems", ***University of Virginia, Computer Science Colloquia***, February 2014.
28. "Closing the Loop with Medical Cyber-Physical Systems", ***Virginia Tech, Electrical and Computer Engineering Department***, February 2014.
29. "Closing the Loop with Medical Cyber-Physical Systems", ***Washington University in St. Louis, Department of Computer Science and Engineering Colloquia Series***, November 2013.
30. "Control Clouds - Cloud Computing for CPS Control", ***NSF Workshop on Cloud Computing for Cyber-Physical Systems- Invited talk***, March 2013.
31. "Closing the Loop: A Simple Distributed Method for Control over Wireless Networks", ***IPSN***, April 2012 (**Best Presentation Award**).
32. "Wireless Control: Current State of the Art and Future Research", ***NAMUR*** (International user association of automation technology in process industries) ***meeting- Invited talk***, February 2012.
33. "Architecture and Algorithms for the Wireless Controller Cloud", ***Honeywell Senior Technologists eSeminar***, October 2010.
34. "The Wireless Contro*l Network: A New Approach for Control ov*er N*etworks",* ***Multiscale Systems Center (MuSyC) Mid-Year eWorkshop***, June 2010.

SOFTWARE ARTIFACTS

1. **ARSC** – open-source tool for design of *attack-resilient supervisory controllers*, https://gitlab.oit.duke.edu/cpsl/arsc, 2019.
2. **CSRL** – Control synthesis for LTL objectives via model-free reinforcement learning, https://gitlab.oit.duke.edu/cpsl/csrl, 2019.
3. **HyperSMC** – Statistical model checker for hyper probabilistic temporal logics, https://gitlab.oit.duke.edu/cpsl/hypersmc, 2019.
4. **SMCLearning** – Statistical model checker for *deep-neural-network-based cyber-physical systems*, https://gitlab.oit.duke.edu/cpsl/smclearning, 2019.
5. **MPHyper** – Symbolic motion planner for HyperLTL objectives, https://gitlab.oit.duke.edu/cpsl/mp_hyper, 2019.
6. Basal-Gangia Model **(BGM)** of the brain – software (Matlab/Simulink) and hardware (Verilog) models for development, validation and verification of deep-brain stimulation controllers, 2017.
7. **RESCHU-SA**: An open-source extendable virtual platform for studying the impact that a human-on-the-loop have on security and resiliency of cyber-physical systems with varying levels of autonomy, 2017.
8. **UPP2SF** – tool for automatic translation of UPPAAL timed-automata models to Simulink/Stateflow, 2012.
9. Penn Virtual Heart Model (**VHM**) and Closed-loop Implantable Device Models for medical device software validation and verification. Open-source Matlab/Simulink models, 2011.

RESEARCH GROUP

PhD Students

1. Alper Kamil Bozkurt (CS Duke)
2. Mahmoud Elfar (ECE Duke)
3. Anne M. French (ECE Duke)
4. Qitong Gao (ECE Duke)
5. Spencer Hallyburton (ECE Duke)
6. Amir Khazraei (ECE Duke)
7. Muhammad Abdullah Naeem (ECE Duke)
8. Michael Naumann (ECE Duke)

MS & Undergraduate Students

1. Harsh Bandhey (MS ECE Duke)
2. Afsana Chowdhury (MS ECE Duke)
3. Yifei Ke (MS CS Duke)
4. Yupei Liu (MS CS Duke)
5. Jamee Krzanich (undergrade ECE Duke)

Alumni

1. Vuk Lesi (ECE PhD 2019) – Next position: Research Scientist, Security & Privacy Research Group, Intel Labs, Hillsborough, OR
2. Yu Wang (Postdoc) – Next Position: Assistant Professor, University of Florida
3. Aditya Zutshi (Postdoc) – Next position: Research Scientist, Galois, Portland, OR
4. Siddhartha Nalluri (MS CS, 2020) – Next position: Bloomberg, NYC, NY
5. Ilija Jovanov (MS ECE, 2018) – Next position: Philips Healthcare, Boston, MA; Now: Amazon Robotics, Boston, MA
6. Lang Qin (MS ECE) – Next position: Silicon Engineer, Quantum Computing Team, Microsoft, Raleigh, NC
7. Ying Xu (MEng Duke) – Next Position: Engineering Development Group (EDG), MathWorks, Boston, MA
8. Mingzhe Hu (ECE Duke) – Next Position: PhD Student at Emory CSI, Atlanta, GA
9. Minhui Yu (ECE Duke) – Next Position: PhD Student at UNC, Chapel Hill, NC
10. Adithya Raghunathan (ECE undergraduate) – Next position: Software Engineer, Facebook, San Francisco Bay Area, CA
11. Matthew Cleaveland (ECE undergraduate) – Next position: PhD student at the University of Pennsylvania
12. Brianna Loomis (ECE/BME undergraduate) – Next position: PhD student at the University of Pennsylvania
13. Yi Yan Tay (ECE undergraduate) – Next position: Google, Cloud Security and Privacy team
14. Edward Kim (ECE undergraduate), received NSF Fellowship – Next position: PhD student at Berkeley

Visiting Students

1. Nishant Patel (Summer 2017), undergraduate student from IIT Gandhinagar, India
2. Milos Grubor (Summer 2018), undergraduate student from ETF Belgrade, Serbia
3. Kaustubh Sridhar (Summer 2018), undergraduate student from IIT Bombay, India

TEACHING EXPERIENCE

Department of Electrical and Computer Engineering
Duke University, *Durham, NC*
Fully responsible for curriculum development and teaching graduate and undergraduate courses

- *ECE 590 – Formal Methods for Cyber-Physical Systems Design* Spring 2017
- *ECE 459 – Introduction to Embedded Systems* Fall 2016-2017, 2019-2020
- *ECE 590 – Cyber-Physical Systems Design* Fall 2015, Spring 2018-2019

Instructor
Department of Computer & Information Science, University of Pennsylvania, *Philadelphia, PA*
Fully responsible for curriculum development and teaching a mandatory graduate course

- *CIS 542 – Embedded Systems Programming* Spring 2013

Lecturer, School of Electrical Engineering, University of Belgrade, *Serbia* 2004-2007
Planned and delivered lectures and course notes; designed exams and homework sets; coordinated laboratory teaching assistants

- *Digital Signal Processing* Fall 2004, Fall 2005, Spring 2007
- *Systems for Real-Time Signal Processing* Spring 2004, Spring 2005
- *Digital VLSI Systems Design* Spring 2007
- *Signals and Systems* Spring *2007*
- *Digital Systems Design* Fall 2007
- *Basics of Electronics* Fall 2004, Fall 2005, Fall 2007

PROFESSIONAL EXPERIENCE

Research Assistant Sept. 2008 – Sept. 2012
ESE Department, University of Pennsylvania, *Philadelphia*, *PA*
Research on distributed fault-tolerant wireless controller grids and medical cyber-physical systems

Research Scholar Feb. 2008 – Aug. 2008
ESE Department, University of Pennsylvania, *Philadelphia*, *PA*
Developed spatio-temporal techniques for anti-jamming in embedded wireless networks

Research Scholar Mar. 2006 – June 2006
Department of Electronic Engineering, E.T.S.I Telecomunicacion, Universidad Politécnica, *Madrid, Spain*
Developed a special purpose OFDM system in FPGA, as part of AMEBA2 project (under TEMPUS JEP 17028-02)

Research Associate Jan. 2004 – Jan. 2008
School of Electrical Engineering, University of Belgrade, *Serbia*
Researched and developed real-time signal processing *proof-of-concept* solutions and architectures on FPGAs and DSPs (in collaboration with Xilinx Advanced Systems Technology Group – DSP Division, Cubic Corporation, IPMobileNet, Signumconcepts and Bitgear Wireless)

Lecturer Mar. 2004 – Jan. 2008
Department of Electronics Engineering, School of Electrical Engineering, University of Belgrade, *Serbia*

Taught courses in (real-time) digital signal processing, VLSI system design and digital systems design

PROFESSIONAL SERVICE

Journal Editor

1. Associate Editor, *ACM Transactions on Computing for Healthcare* (**ACM HEALTH**), 2018-present.
2. Guest-editor, *Special Issue on Medical Cyber-Physical Systems, ACM Transactions on Cyber-Physical Systems,* 2016-2017.

Conference Organization

1. **General Co-Chair**, *11th ACM/IEEE International Conference on Cyber-Physical Systems* (**ICCPS**), Sydney, Australia, April 2020.
2. **Technical Program Committee Co-Chair**, *10th ACM/IEEE International Conference on Cyber-Physical Systems* (**ICCPS**), Montreal, Canada, April 2019.
3. **Technical Program Committee Track Co-Chair**, *2021 Design Automation Conference* (**DAC**), Embedded Software & OS Track, 2021.
4. **Associate Editor**, *American Control Conference* (**ACC**), 2019**.**
5. Publicity Chair, *9th Conference on Decision and Game Theory for Security* (**GameSec**), Seattle, WA, Oct 2018.
6. Associate Editor, *Mediterranean Conference on Control and Automation* (**MED**), 2017**.**
7. Publicity Chair, *23rd IEEE International Conference on Embedded and Real-Time Computing Systems and Applications* (**RTCSA**), Hsinchu, Taiwan, August 2017.
8. Co-Chair, *2nd International Workshop on the Swarm at the Edge of the Cloud*, Co-located with CPS Week, Seattle, WA, April 2015.
9. Track Chair, "Technologies for Safety Assurance of Embedded Circuits and Systems", *15th International Conference on Embedded Systems*, Kolkata, India, January 2016.
10. Chair, **RTSS WiP** Session - *IEEE Real-Time Systems Symposium (RTSS), Work in Progress Session*, San Antonio, TX, December 2015.
11. Chair, **RTSS@Work** Session - *IEEE Real-Time Systems Symposium (RTSS), Demo Session*, Rome, Italy, December 2014.

Program Committees

1. ACM/IEEE International Conference on Cyber-Physical Systems (**ICCPS 2015 – 2017, 2021**)
2. AAAI Conference on Artificial Intelligence (**AAAI 2021**)
3. ACM Conference on Embedded Software (**EMSOFT 2015 – 2018, 2021)**
4. USENIX Security Symposium (**USENIX SECURITY 2022**)
5. ACM International Conference on Hybrid Systems: Computation and Control (**HSCC 2021**)
6. IEEE Real-Time Systems Symposium (**RTSS 2013 – 2017, 2019**) – main, CPS and IoT/WSN tracks
7. IEEE Real-Time and Embedded Technology and Applications Symposium (**RTAS 2015, 2017**)
8. Design Automation Conference (**DAC 2020**)
9. IEEE/IFIP International Conference on Dependable Systems and Networks (**DSN 2020**)
10. International Conference on Formal Modelling and Analysis of Timed Systems (**FORMATS 2018**)
11. IEEE Int. Conf. on Embedded and Real-Time Computing Systems & Applications (**RTCSA 2016, 2018, 2021**)
12. International Conference on Computer Aided Design (**ICCAD 2016**)

13. IEEE International Conference on Embedded Software Systems (**ICESS 2018**)
14. IEEE Workshop on the Internet of Safe Things (**SafeThings 2019**)
15. First Workshop on Design Automation for CPS (**DESTION 2019**)
16. 2nd Workshop on Benchmarking Cyber-Physical Systems and Internet of Things (**CPS-IoTBench 2019**)
17. Conference on Decision and Game Theory for Security (**GameSec 2018, 2019**)
18. International Workshop on Security and Privacy for the Internet-of-Things (**IoTSec 2018**)
19. Workshop on Cyber-Physical Systems Security and Resilience (**CPS-SR 2018**)
20. 6th International Workshop on Hybrid Systems and Biology (**HSB 2019**)
21. ACM International Conference on High Confidence Networked Systems (**HiCoNS 2014**)
22. IEEE International Conference on Autonomic Computing (**ICAC 2016**)
23. ACM Symposium on Applied Computing (**SAC 2014**) - Track on Mobile Platforms
24. The Analytic Virtual Integration Cyber-Physical Systems (**AVICPS 2014**) Workshop
25. Euromicro Conference on Digital System Design (**DSD 2013, 2014**) - Special Session on CPS
26. ACM/IEEE Conference on Information Processing in Sensor Networks (**IPSN 2013**) – PhD Forum

Panelist

1. Federal Trade Commission (FTC) and the National Highway Traffic Safety Administration (NHTSA) workshop on Connected Cars, Panelist on "Security of Connected Cars", *Washington, DC*, June 2017.
2. NSF SaTC PI meeting, Panelist on “Security Challenges for Cyber-Physical Systems”, *Washington, DC,* January 2017.
3. Panelist at an NSF Workshop on Cloud Computing for Cyber-Physical System, *Washington, DC*, March 2013.

Government Activities

1. General Chair, NSF CPS PI meeting, Washington DC, November 2019
2. NSF proposal panels: CPS 2014, 2016, 2018, 2020, CISE 2015, 2018, 2019, SaTC 2017
3. Organizer, Workshop on CPS Security and Privacy, NSF CPS PI Meeting, November 2018
4. Organizer, NSF CPS PI meeting, November 2018
5. NSF Workshop on Research Frontiers in Medical Cyber-Physical Systems, *Washington, DC*, February 2014, Breakout Group Co-Chair for “Modeling, Simulation, and Verification to Predict Performance & Reliability”
6. Reviewer for Canadian funding agencies: NSERC (2019) and Mitacs Accelerate (2017-2018), Technology Foundation STW, Netherlands’ research council for the engineering and applied sciences (2015), Research Grants Council (RGC) of Hong Kong (2019)

Professional Activities

1. Consultant: DTS Cybersecurity Standard for Connected Diabetes Devices, *Diabetes Technology Society*, 2015

UNIVERSITY SERVICE

Committees

1. Pratt Space Committee, Duke University, September 2016 – present
2. Pratt Steering Committee on Robotics Master’s Program, October 2019 – present

3. Graduate Studies Committee, September 2019 – present
4. Seven Tenure-track/Professor-of-Practice Search Committees, Duke University, July 2016 – present

Ph.D. Thesis Committees

1. Xusheng Luo, Duke University, September 2020
2. Rana Elnaggar, Duke University, August 2020
3. Fan Wang, Duke University, July 2020
4. Georgios Mappouras, Duke University, March 2020
5. Morteza Hashemi, Technical University in Munich (TUM), June 2019
6. Shi Jin, Duke University, June 2018
7. Mohamed Ibrahim, Duke University, May 2018
8. Junkil Park, University of Pennsylvania, April 2018
9. Yiannis Kantaros, Duke University, February 2018
10. Ramy Medhat, University of Waterloo, December 2017
11. Radoslav Ivanov, University of Pennsylvania, July 2017
12. Gabriella Fiore, PhD Thesis Assessor, University of L'Aquila, April 2017
13. Zipeng Li, Duke University, April 2017

M.S. Thesis Committees

1. Chenyu Liu, Duke University, November 2020
2. Jayson Zhou, Duke University, November 2020
3. Shiqi Sun, Duke University, November 2020
4. Qitong Gao, Duke University, April 2018
5. Minwoo Kim, Duke University, April 2018

Ph.D. Qualifier Committees

1. Sayan Mandal, PhD Qualifying Exam, August 2020
2. Ang Li, PhD Qualifying Exam, May 2020
3. Timothy Scargill, PhD Qualifying Exam, April 2020
4. Kavinayan Sivakumar, PhD Qualifying Exam, May 2019,
5. Dan Sun, PhD Qualifying Exam, April 2019,
6. Jerry Wang, PhD Qualifying Exam, April 2019,
7. Renjian Pan, PhD Qualifying Exam, February 2019,
8. Tung-Che Liang, PhD Qualifying Exam (Chair), January 2019,
9. Huanrui Yang, PhD Qualifying Exam, November 2018,
10. Ximing Qiao, PhD Qualifying Exam (Chair), October 2018,
11. Haibei Zhu, PhD Qualifying Exam (Chair), November 2017,
12. Atefeh Mehrabi, PhD Qualifying Exam (Chair), October 2017,
13. Jianqiao Li, PhD Qualifying Exam, May 2017,
14. Fan Wang, PhD Qualifying Exam (Chair), April 2017,
15. Adam Konneker, PhD Qualifying Exam (Chair), November 2016,

16. Zhongxi Li, PhD Qualifying Exam, November 2016,
17. Abhishek Koneru, PhD PhD Qualifying Exam, October 2015,
18. Alfredo Velasco, PhD Qualifying Exam, October 2015,
19. Xusheng Luo, PhD Preliminary Exam, August 2020,
20. Benjamin Bauchwitz, RIP Exam, 2020
21. Rana Elnaggar, PhD Preliminary Exam, Duke University, January 2019,
22. Haibei Zhu, PhD Preliminary Exam, Duke University, November 2018,
23. Fan Wang, PhD Preliminary Exam, Duke University, November 2018,
24. Zhongxi Li, PhD Preliminary Exam, May 2018,
25. Adam Konneker, PhD Preliminary Exam, August 2017,
26. Shi Jin, PhD Preliminary Exam, May 2017,
27. Georgios Mappouras, PhD Preliminary Exam, May 2017,
28. Mohamed Ibrahim, PhD Preliminary Exam, March 2017,
29. Yiannis Kantaros, PhD Preliminary Exam, December 2016.

FUNDING

Total amount (since 07/2015): $26,638,656.00

Current

1. *AI Institute for Edge Computing Leveraging Next Generation Networks (Athena)*
   National Science Foundation (NSF)
   PI: Yiran Chen (Duke), co-PIs: Miroslav Pajic, Hai Li (Duke), Suman Banerjee (Wisconsin), Lin Zhong (Yale)
   $20,000,000; 10/01/2021 – 09/30/2026
2. *Center of Excellence: Assured Autonomy in Contested Environments*
   Air Force Office of Scientific Research (AFOSR)
   Duke PI: Miroslav Pajic
   $1,489,759; 04/01/2019 – 03/31/2025
3. *CAREER: Foundations for Secure Control of Cyber-Physical Systems*
   National Science Foundation (NSF)
   PI: Miroslav Pajic
   $530,339; 03/15/2017 – 02/28/2022
4. *Platform-Level Services for Security of Naval Cyber-Physical Systems*
   Office of Naval Research (ONR)
   PI: Miroslav Pajic
   $570,000; 12/01/2019 – 11/30/2022
5. *Adaptive Protocol Synthesis and Error Recovery in Micro-Electrode-Dot-Array (MEDA) Microfluidic Biochips*
   National Science Foundation, Communications, Circuits, and Sensing-Systems (CCSS) Program
   PI: Krishnendu Chakrabarty (Duke), co-PIs: Miroslav Pajic (Duke)
   $449,927; 07/01/2019 – 06/30/2022

6. *Scalar Closed-Loop STN/GPi DBS Based on Evoked and Spontaneous Potentials*
   National Institutes of Health (NIH)
   PI: Dennis Turner (Duke), co-Investigators: Warren Grill, Miroslav Pajic
   $1,983,070; 09/01/2017 – 07/01/2022
7. *CPS: Medium: Collaborative Research: Human-on-the-Loop Control for Smart Ultrasound Imaging*
   National Science Foundation, Cyber-Physical Systems Program
   PI: Michael Zavlanos (Duke), co-PIs: Miroslav Pajic, Wilkins Aqino (Duke)
   $599,995; 10/01/2018 – 09/30/2021
8. *IUCRC Proposal Phase 1 Duke: Center for Alternative Sustainable and Intelligent Computing (ASIC)*
   National Science Foundation
   PI: Yiran Chen (Duke), co-PIs: Robert Calderbank, Krishnendu Chakrabarty, Maria Gorlatova, Benjamin Lee, Hai Li, Xin Li, Miroslav Pajic (Duke)
   $750,000; 07/01/2018 – 06/30/2023

Past

9. *Young Investigator Program: Design of High-Assurance Cyber-Physical Systems*
   Office of Naval Research (ONR)
   PI: Miroslav Pajic
   $510,000; 06/01/2017 – 05/31/2021
10. *Synergy: Collaborative Research: Security and Privacy-Aware Cyber-Physical Systems*
    National Science Foundation (NSF) and Intel Partnership, CPS-Security Program
    Duke PI: Miroslav Pajic
    $400,000; 07/01/2015 – 06/30/2020
11. *Development of Control-Aware Cyber Techniques for Attack-Resilient Industrial Control & Combat Systems*
    Office of Naval Research (ONR)
    Duke PI: Miroslav Pajic
    $744,876; 10/01/2016 – 05/31/2020
12. *Development of Hardware-in-the Loop Testbeds and Course Modules for Hands-on Student Experiences in Embedded and Cyber-Physical Systems*
    Lord Foundation of North Carolina
    PI: Miroslav Pajic
    $15,721; 07/01/2018 – 06/30/2019
13. *Attack and Anomaly Detection for Secure Control in Embedded and Internet-of-Things Systems*
    2018 IBM Faculty Award
    PI: Miroslav Pajic
    $20,000; 07/01/2018 – 06/30/2019
14. *Development of Safe and Reliable Embedded Systems for Internet-of-Things Applications*
    Lord Foundation of North Carolina
    PI: Miroslav Pajic
    $13,200; 07/01/2016 – 06/30/2017
15. *Design of High-Assurance Autonomous Vehicles*
    DARPA High-Assurance Cyber Military Systems (HAMCS) Program subcontract
    PI: Miroslav Pajic
    $35,000; 07/01/2015 – 06/30/2016