

# Andreea Beatrice Alexandru

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## Summary

- Graduate researcher with expertise in the design and implementation of privacy-preserving estimation and control protocols for cyber-physical systems
- Goal: conduct research in security and privacy with broad real-world impact

## Education

### University of Pennsylvania

Ph.D. candidate in Electrical and Systems Engineering 2015–present

- Expected graduation Spring 2021, GPA 4.00/4
- Thesis: *Cryptographic Foundations for Control and Optimization—Designing Cloud-based and Networked Decisions on Encrypted Data*
- Advisors: George J. Pappas, Ali Jadbabaie (year I)
- Committee members: Manfred Morari, Tal Rabin, Sebastian Angel

### “Politehnica” University of Bucharest

B.Eng. in Automatic Control and Computer Science 2011–2015

- Thesis: *An analysis of performance measures for prediction algorithms in telemonitoring systems*
- GPA 9.78/10, valedictorian in Department of Automatic Control and Systems Engineering

## Professional Experience and Teaching

### Intern at Duality Technologies

<https://duality.cloud/> 05.2019–08.2019

- Designing applications of encrypted computing technologies, prototyping and implementing encrypted computing applications
- Development and optimization of encrypted computing software libraries

### Research Assistant at University of Pennsylvania

Electrical and Systems Engineering Department, GRASP Lab, Seclab 08.2015–present

- Design and implementation of privacy-preserving algorithms for cyber-physical systems using homomorphic encryption and secure multi-party computation
- Design and analysis of algorithms for local observability of distributed systems

### Teaching Assistant

Introduction to Linear Optimization ESE 504 08.2017–12.2017

Modern Convex Optimization ESE 605 01.2017–05.2017

### Intern at Philips Research Eindhoven, Netherlands

Department of Chronic Disease Management 06.2014–09.2014

- Data mining in Impedance Cardiography
- Automated diagnosis and classification of heart-failure

## Research Assistant at the Laboratory of Numerical Modeling

Electrical Engineering Department, “Politehnica” University of Bucharest

10.2012–10.2013

- Processing geometric information, electric circuits analysis, code optimization

## Honors

- Fellowship for the ESE Diversity, Equity and Inclusion Committee 2021
- Travel award, Conference on Decision and Control (CDC) 2017,2020
- EECS Rising Stars selection 2019
- ACM Student Research Competition selection and travel award, Grace Hopper Celebration 2019
- Finalist for best paper award, International Conference on Cyber-Physical Systems, ACM/IEEE 2019
- Finalist for student best paper award, American Control Conference, IEEE 2019
- NSF iREDEFINE Professional Development Award 2019
- Full scholarship, Women in CyberSecurity Conference 2018
- Erasmus Mobility Placement grant 2014
- First prize at Student Scientific Communications Session, “Politehnica” University 2013,2015
- Finalist for student best paper award, Advanced Topics in Electrical Engineering Conference, IEEE 2013
- Annual merit scholarships in college and high school 2007–2015

## Research Interests

- Security and privacy through applied cryptography
- Cyber-physical systems
- Zero-knowledge verification
- Ethical machine learning and data mining
- Control and optimization theory

## Publications

Published:

- **Alexandru A. B.** and Pappas G. J., *Private Weighted Sum Aggregation for Distributed Control Systems*, 21st International Federation of Automatic Control (IFAC) World Congress, 2020.
- **Alexandru A. B.**, Pappas G. J., *Secure Multi-party Computation for Cloud-Based Control*. In: Farokhi F. (eds) *Privacy in Dynamical Systems*, pp. 179–207, 2020, Springer, Singapore.
- **Alexandru A. B.**, Gatsis K., Shoukry Y., Seshia S. A., Tabuada P. and Pappas G. J., *Cloud-based Quadratic Optimization with Partially Homomorphic Encryption*, IEEE Transactions on Automatic Control, 2020.
- **Alexandru A. B.**, Schulze Darup M. and Pappas G. J., *Encrypted Cooperative Control Revisited*, in Proceedings of 58th IEEE Conference on Decision and Control, pp. 7196–7202, 2019.
- **Alexandru A. B.** and Pappas G. J., *Encrypted LQG using Labeled Homomorphic Encryption*, in Proceedings of 10th International Conference on Cyber-Physical Systems (ICCPS), pp. 129–140, 2019, ACM/IEEE. **Best paper award finalist.**
- Tsiamis, A., **Alexandru, A. B.** and Pappas, G. J., *Motion Planning with Secrecy*, in Proceedings of the American Control Conference (ACC), pp. 784–791, 2019, IEEE. **Best student paper award finalist.**

- **Alexandru A. B.**, Morari M. and Pappas G. J., *Cloud-based MPC with Encrypted Data*, in Proceedings of the 57th Conference on Decision and Control (CDC), pp. 5014–5019, 2018, IEEE.
- **Alexandru A. B.**, Pequito S., Jadbabaie A. and Pappas G. J., *On the Limited Communication Analysis and Design for Decentralized Estimation*, in Proceedings of the 56th Conference on Decision and Control (CDC), pp. 1713–1718, 2017, IEEE.
- **Alexandru A. B.**, Gatsis K. and Pappas G. J., *Privacy preserving Cloud-based Quadratic Optimization*, in Proceedings of the 55th Allerton Conference on Communication, Control, and Computing, pp. 1168–1175, 2017, IEEE.
- **Alexandru A. B.**, Pequito S., Jadbabaie A. and Pappas G. J., *Decentralized observability with limited communication between sensors*, in Proceedings of the 55th Conference on Decision and Control (CDC), pp. 885–890, 2016, IEEE.
- **Alexandru A. B.**, Lup S., Dita B., *GDS2M: Preprocessing Tool for MEMS Devices*, in Proceedings of the 8th International Symposium on Advanced Topics in Electrical Engineering (ATEE), pp. 1–4, 2013, IEEE. **Best student paper award finalist.**

To appear:

- **Alexandru A. B.**, Tsiamis A. and Pappas G. J., *Towards Private Data-driven Control*, 59th Conference on Decision and Control (CDC), 2020, IEEE.
- Schulze Darup M., **Alexandru A. B.**, Quevedo D. E. and Pappas G. J., *Encrypted control for networked systems - An illustrative introduction and current challenges*, IEEE Control Systems Magazine, 2020.

Preprints:

- **Alexandru A. B.** and Pappas G. J., *Private Weighted Sum Aggregation*, arXiv preprint <https://arxiv.org/abs/2010.10640>.
- **Alexandru A. B.**, Tsiamis A. and Pappas G. J., *Data-driven Control on Encrypted Data*, arXiv preprint <https://arxiv.org/abs/2008.12671>.

## Invited talks and posters (excluding conference presentations)

- *Privacy for Cyber-Physical Systems*, EECS Rising Stars at UIUC, Champaign, IL Oct 2019
- *Private Cooperative Control*, Grace Hopper Celebration, ACM Student Research Competition, Orlando, FL Oct 2019
- *Privacy for Cyber-Physical Systems*, iREDEFINE workshop, ECEDHA Annual Conference and ECExpo, Tucson, AZ Mar 2019
- *Cloud-based Model Predictive Control on Encrypted Data*, ESE Department PhD Colloquium, University of Pennsylvania, Philadelphia, PA Oct 2018
- *Privacy preserving Cloud-based Quadratic Optimization*, 5th Annual Women in Cybersecurity Conference, Chicago, IL Mar 2018
- *Privacy Preserving Cloud-based Quadratic Optimization*, ESE Department PhD Colloquium, University of Pennsylvania, Philadelphia, PA Oct 2017
- *Secure Cloud-outsourced Optimization Problems through Homomorphic Encryption*, Intel-NSF Center on Cyber Physical System Security, Hillsboro, OR Aug 2017
- *GDS2M: Preprocessing Tool for MEMS Devices*, Scientific Communications Session, “Politehnica” University of Bucharest, Romania May 2015
- *Analysis of performance measures for prediction algorithms in telemonitoring systems*, Scientific Communications Session, “Politehnica” University of Bucharest, Romania May 2013

## Professional service

- Reviewer: IEEE Transactions of Automatic Control (TAC), ACM Transactions on Cyber-Physical Systems (TCPS), IEEE Transactions on Control of Network Systems (TCNS), IEEE Transactions on Cloud Computing (TCC), IEEE Conference on Decision and Control (CDC), IEEE American Control Conference (ACC), ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS)
- Co-organizer and co-chair of the invited session “Encrypted Control and Optimization” at the 58th and 59th Conference on Decision and Control (CDC) 2019, 2020

## Workshops and Certificates

- Lattices: Algorithms, Complexity, and Cryptography Workshops at the Simons Institute for the Theory of Computing 2020
- Deep Learning specialization by deeplearning.ai on Coursera (5 courses) 2019
- Machine Learning by Columbia University on edX 2018
- Collaborative Institutional Training Initiative (CITI) 2016–2017
- Optimization with IBM ILOG OPL Training by Linux Competence Center and IBM 2014
- National Instruments Certified LabVIEW Associate Developer (CLAD) 2014
- Applied Electronics Training by EAP InGear Laboratory and Microchip 2013–2014

## Skills

- Programming: Python, C/C++, MATLAB (proficient), Oracle SQL, Java (past experience)
- Languages: Romanian (native), English (proficient), French (conversational), Spanish (beginner)

## Outreach

- Fellow of the Electrical and Systems Engineering Diversity, Equity and Inclusion (ESE DEI) Committee 2021
- Presenter at Grace Hopper Celebration (GHC) 2019
- Instructor of Electrical Engineering at Girls in Engineering, Math and Science (GEMS) 2018
- Presenter at Women in Cybersecurity Conference (WiCyS) 2018
- Member of UPenn Women Community in Science, Technology, and Engineering 2015-present