

Georgios BAKIRTZIS

Researcher in cyber-physical system safety and security

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May 2021 (expected)	PhD in computer engineering	University of Virginia
May 2015	BS in electrical engineering	Virginia Commonwealth University

Research

University of Virginia

2017–present

As a graduate research assistant to Prof. Cody H. Fleming (SYS), I currently

- work on the theoretical foundations of model-based engineering,
- improve current hazard and security analysis methods, &
- design and analyze models of cyber-physical systems.

University of Oxford

2019

As a participant in the Applied Category Theory Adjoint School I researched category-theoretic models of computation with Prof. Pieter Hofstra (MTH).

Virginia Commonwealth University

2015–18

As a graduate research assistant to Prof. Carl R. Elks (ECE), I developed methods and tools for modeling and analyzing cyber-physical systems for their dependable and secure operation.

2013–15

As an undergraduate research assistant to Prof. Robert H. Klenke (ECE), I designed, programmed, and validated UAV flight control systems.

Awards

2020-21

I was awarded the James G. Simmonds Fellowship in Applied Mechanics and Applied Mathematics Research for demonstrating academic excellence and ability to engage in cutting-edge research in applied mathematics.

2019-20

I was awarded the William L. Ballard Jr. Endowed Graduate Fellowship for demonstrating academic excellence and leadership qualities.

2018

Best paper award in IEEE International Systems Conference.

2017

Travel award for USENIX Security Symposium.

2017

I received the School of Engineering Certificate of Scholarship for Outstanding Teaching Award Finalist and the ECE Graduate Student Teaching Assistant of the Year awards.

Scientific contributions

[journal]

G. Bakirtzis, B.J. Simon, A.G. Collins, C.H. Fleming, and C.R. Elks, “Data-Driven Vulnerability Exploration for Design Phase System Analysis”, *IEEE Systems Journal* (2019)

B.T. Carter, G. Bakirtzis, C.R. Elks, and C.H. Fleming, “Systems-Theoretic Security Requirements Modeling for Cyber-Physical Systems”, *Systems Engineering* (2019)

B.T. Carter, S. Adams, G. Bakirtzis, T. Sherburne, P.A. Beling, B. Horowitz, and C.H. Fleming, “A Preliminary Design-Phase Security Methodology for Cyber-Physical Systems”, *Systems* (2019)

[conference]

G. Bakirtzis, G.L. Ward, C.J. Deloglos, C.R. Elks, B.M. Horowitz, and C.H. Fleming, “Fundamental Challenges of Cyber-Physical Systems Security Modeling”, *DSN 2020, Proc. IEEE* (2020)

G. Bakirtzis, C. Vasilakopoulou, and C.H. Fleming, “Compositional Cyber-Physical Systems Modeling”, *ACT 2020, Proc. EPTCS* (2020)

S. Gautham, G. Bakirtzis, M.T. Leccadito, R.H. Klenke, and C.R. Elks, “WiP Abstract: A Multilevel Cybersecurity and Safety Monitor for Embedded Cyber-Physical Systems”, *ICCPS 2019, Proc. ACM* (2019)

G. Bakirtzis, B.J. Simon, C.H. Fleming, and C.R. Elks, “Looking for a Black Cat in a Dark Room: Security Visualization for Cyber-Physical System Design and Analysis”, *VizSec 2018, Proc. IEEE* (2018)

B.T. Carter, C.H. Fleming, C.R. Elks, and G. Bakirtzis, “Cyber-Physical Systems Modeling for Security using SysML”, *CSE 2018, Proc. Springer* (2018)

G. Bakirtzis, B.T. Carter, C.R. Elks, and C.H. Fleming, “A Model-Based Approach to Security Analysis for Cyber-Physical Systems”, *SysCon 2018, Proc. IEEE* (2018)

B.T. Carter, G. Bakirtzis, C.R. Elks, and C.H. Fleming,
“A Systems Approach for Eliciting Mission-Centric
Security Requirements”, SysCon 2018, Proc. IEEE (2018),
Best Student Paper Award

A.V. Filippas, U. Hasni, A. Docef, G. Bakirtzis, A. Sunga, H. Nabi,
and A. French, “The Freshman Experience: A Modular Approach
to Experiential Learning”, 2017 Zone II, Proc. ASEE (2017)

G.L. Ward, G. Bakirtzis, and R.H. Klenke, “A Modular Software Platform for
Unmanned Aerial Vehicle Autopilot Systems”, SciTech 2014, Proc. AIAA (2014)

[invited talk]

G. Bakirtzis and C.H. Fleming, “Cyber-Physical System Safety and Security
in the Nuclear Power Plant Context”, ANS Student Conference (2019)

G. Bakirtzis, P.A. Beling, and C.R. Elks, “Toward Mission-Centric
Vulnerability Analysis for Critical Systems: Methodology
and Approach”, Resilience Week (2016)

[technical report]

T. McDermott, C.H. Fleming, M.M. Clifford, T. Sherburne,
G. Bakirtzis, and K. Rand, “Methods to Evaluate Cost/Technical Risk
and Opportunity Decisions for Security Assurance in Design”, SERC (2020)

P.A. Beling, B. Horowitz, C.H. Fleming, S. Adams, G. Bakirtzis,
B.T. Carter, T. Sherburne, C.R. Elks, A.G. Collins, and B.J. Simon,
“Model-based Engineering for Functional Risk Assessment
and Design of Cyber Resilient Systems”, SERC (2019)

B. Horowitz, P.A. Beling, C.H. Fleming, S. Adams, B.T. Carter,
T. Sherburne, C.R. Elks, G. Bakirtzis, F. Shull, and N.R. Mead,
“Cyber Security Requirements Methodology”, SERC (2018)

B. Horowitz, P.A. Beling, C.H. Fleming, S. Adams, B.T. Carter,
K. Vemuru, C.R. Elks, T. Bakker, K. Cios, G. Bakirtzis, A.G. Collins,
N.R. Mead, and F. Shull, “Systems Aware Cybersecurity”, SERC (2017)

C.R. Elks, G.M. Atkinson, T. Bakker, S. Gautham, R.D. Hite,
F.E. Derenthal, and G. Bakirtzis, “Technologies for Enhancing Verifiability
of Embedded I&C Systems in Nuclear Power: A Survey of Advanced FPGA
and MEMs Technologies”, EPRI (2015)

[poster]

G. Bakirtzis, B.T. Carter, C.R. Elks, and C.H. Fleming,
“Cyber Assurance Assessment using Systems and Control Theory”,
USENIX Security Symposium (2017)

[open-source software]

G. Bakirtzis, “A Vulnerability Assessment Tool for System Models”,
cybok-cli, DOI: 10.5281/zenodo.1313696 (2018)

G. Bakirtzis and B.J. Simon, “A GraphML Exporter for MagicDraw SysML”,
graphml_export, DOI: 10.5281/zenodo.1308914 (2018)

G. Bakirtzis and B.J. Simon, “A Security Dashboard for Analyzing CPS Designs”,
security-analyst-dashboard, DOI: 10.5281/zenodo.1318537 (2018)

Teaching

University of Virginia

Fall 2017

I lectured a short course, *Model Sufficiency for Cybersecurity*, on modeling requirements, functional behaviors, and system architectures in SysML for Defense Intelligence Agency (DIA) analysts. (Enrollment: 10)

Virginia Commonwealth University

Fall 2018

As guest lecturer for *Signals and Systems II* I lectured on Markov chains and produced a corresponding homework assignment. (Enrollment: 46)

As teaching assistant for the graduate seminar *Systems-theoretic Cybersecurity*, I compiled a list of relevant seminal and current research publications and led weekly discussions. (Enrollment: 4)

Fall 2016

As codeveloper and lead teaching assistant for *Introduction to Engineering*, I designed homework assignments, laboratory exercises, and exam problems. I managed two graduate and five undergraduate teaching assistants and administered the course website. (Enrollment: 87)

Fall 2015

As laboratory assistant for *Microcomputer Systems*, I restructured and rewrote all laboratory assignments, including the final project. I developed problem sets to improve the understanding of low-level instructions and their relation to higher level languages. (Enrollment: 56)

As teaching assistant for *Introduction to Microelectronics*, I introduced weekly recitation sessions where I lectured extra material. (Enrollment: 55)

Spring 2015

As lead teaching and laboratory assistant for *Electrical Circuits I*, I designed and ran laboratory exercises. I wrote and graded quizzes and a portion of the exams. I provided solutions to homework and test problems. (Enrollment: 141)

Fall 2014	As lead teaching assistant for <i>Signals and Systems II</i> , I conducted review sessions and held weekly office hours. I graded homework and a portion of the exams. I lectured two class sessions. (Enrollment: 31)
	As teaching assistant for <i>Advanced Engineering Programming Using C/C++</i> , I ran weekly tutoring sessions. I formulated and applied grading criteria for homework assignments. (Enrollment: 55)
Spring 2014	As lead laboratory assistant for <i>Digital Logic Design</i> , I ran and graded laboratory exercises. I developed the laboratory policy, the grading rubric, two lab exercises, and the final design project. (Enrollment: 68)
Fall 2013	As teaching assistant for <i>Advanced Engineering Programming Using C/C++</i> , I ran multiple tutoring sessions each week. (Enrollment: 62)
Spring 2013	As teaching assistant for <i>Engineering Programming Using C</i> , I aided students during weekly help sessions and graded assignments. (Enrollment: 99)

Mentorship

Virginia Commonwealth University

2018	As on-demand mentor for Hyperloop at VCU – one of the twenty teams to advance to the final stage of the international Hyperloop competition – I advised on safety assessment and control system software design.
2017–18	I mentored capstone students Jasmine Norman and Tony Shin in designing and implementing a Vendor Managed Inventory (VMI) for Airline Hydraulics. I provided hands-on help with embedded system design and software engineering.

Service

Reviewer

2019	IEEE Intelligent Vehicles Symposium (IV)
2018–19	IEEE International Conference on Intelligent Transportation Systems (ITSC)
2018	INCOSE Conference on Systems Engineering Research (CSER)

Graduate Student Advisory Board (GSAB)

2015–16	As founding chair of GSAB, I coordinated the board to resolve graduate students' concerns by communicating with the ECE department chair. I organized and led committees on social media engagement and engineering outreach.
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Engineering Ambassadors

2013-15

As counselor, then activity leader, and finally event organizer I volunteered for several Virginia Commonwealth University K-12 educational programs.

Autonomous Robotics Group (ARG)

2013-15

As founding vice president of ARG I secured funds and managed a team that built and programmed a UAV to take part twice in the AUVSI SUAS competition.

Institute of Electrical and Electronics Engineers (IEEE)

2015

I was inducted in IEEE-HKN honor society.

2013-14

As student branch officer, I initiated a successful collaboration with HKN to acquire funds, attract new members, and organize joint volunteering outreach activities. I coordinated weekly tutoring sessions for most introductory electrical engineering courses. I created and administered the website of the Virginia Commonwealth University IEEE branch.