

Theofilos Petsios

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Research Interests

I am interested in all aspects of systems and software security, with a focus on application security, binary analysis, and privacy.

Education

Ph.D. in Computer Science

COLUMBIA UNIVERSITY

New York, USA

2012 - 2018

- Ph.D. Thesis: *"Compiler-assisted Adaptive Software Testing"*
- Academic Advisors: Angelos D. Keromytis & Steven M. Bellovin

M.Phil. in Computer Science

COLUMBIA UNIVERSITY

New York, USA

2015

M.Sc. in Computer Science (GPA 3.9 / 4)

COLUMBIA UNIVERSITY

New York, USA

2012 - 2014

B.S. in Electrical Engineering & Computer Science (GPA 8.2/10)

NATIONAL TECHNICAL UNIVERSITY OF ATHENS (NTUA)

Athens, Greece

2005 - 2011

- B.S. Thesis: *"Term suggestion mechanisms for Scientific Database Systems"*
- Thesis Advisor: Timos Sellis

Professional Appointments

Capsule8

RESEARCH SCIENTIST

New York, NY, USA

April 2018 - Present

Microsoft Research

RESEARCH INTERN

Cambridge, UK

October 2017 - December 2017

- Systems and Networking Group: Developed a framework for large-scale network traffic analysis and prediction for the Iris Project

Trail of Bits

RESEARCH INTERN

New York, NY, USA

May 2017 - August 2017

- Worked on the Manticore symbolic execution engine, adding support for symbolic execution of Binary Ninja IL, and performed security audits.

Symantec Corporation

RESEARCH INTERN

Herndon, VA, USA

June 2015 - August 2015

- Developed an ELF binary rewriting library for ARM. Designed and implemented interfaces supporting binary rewriting, injection of anti-debugging features, injection of new modules into an existing binary, as well as detection of packers and backdoors.

Greek Army (Obligatory Service)

IT SUPPORT & WEBSITE ADMINISTRATOR

Athens, Greece

August 2011 - June 2012

- Responsible for the backup & maintenance of the servers hosting the website of the Greek Ministry of National Defence.

Cybex S.A.

SYSTEM ADMINISTRATOR & WEB DEVELOPER

Athens, Greece

January 2011 - July 2011

- Responsible for the administration of the server infrastructure, as well as the hosting and domain name registration services of the company.

Talks & Media Coverage

CONFERENCE TALKS

November 2017	“SLOWFuzz : Automated Domain-Independent Detection of Algorithmic Complexity Vulnerabilities”	ACM CCS, Dallas, USA
May 2017	“NEZHA : Efficient Domain - Independent Differential Testing”	S&P, San Jose, USA
December 2015	“DYNAGUARD : Armoring Canary-Based Protections against Brute-force Attacks”	ACSAC, Los Angeles, USA

INVITED TALKS

April 2019	“Using Linux Tracing to Detect Attacks at Scale”	OSIRIS Lab, NYU, USA
March 2018	Guest Lecture on “Fuzz Testing” for Graduate-Level Course “Reliable Software”	Columbia University, USA
August 2017	Empire Hacking NYC: “Extending Manticore with Binary Ninja”	MongoDB, New York, USA
March 2017	Guest Lecture on “Fuzz Testing” for Graduate-Level Course “Reliable Software”	Columbia University, USA
October 2016	Empire Hacking NYC: “Differential Fuzzing with LLVM’s LibFuzzer”	TwoSigma, New York, USA

MEDIA COVERAGE

March 2019	“Millions of Binaries Later: a Look Into Linux Hardening in the Wild”	Hacker News Front Page
November 2017	“Found: Our Best Future Cyber Protectors in World’s Biggest Student-Led Cybersecurity Games”	Morning Star
August 2014	NYT Bits: “XRay: A New Tool for Tracking the Use of Personal Data on the Web”	The New York Times

Skills

Programming	C/C++, Python, Go, \LaTeX , HTML, CSS, Javascript, SQL, PHP, Java, Vimscript
Technologies	LLVM & GCC internals, Intel PIN, Pandas, Bokeh, Flask
Languages	Greek (<i>Native</i>) English (<i>Proficient</i>) French, Spanish (<i>Elementary proficiency - ILR scale 1+</i>)

Honors & Awards

2012-2018	Fellowship , Graduate Research Assistantship (GRA), Columbia University	New York, USA
2017	2nd Place at NYU-CSAW Applied Research Competition , New York University (NYU)	New York, USA
2017	Finalist Travel Grant for NYU-CSAW , New York University (NYU)	New York, USA
2014	Bug Bounty Grant , Facebook	New York, USA
2014	Scholarship (for Ph.D. studies) , Gerondelis Foundation	New York, USA
2005	Scholarship (for B.S. studies) , Eurobank EFG	Athens, Greece

Service

PROGRAM COMMITTEE

CSAW CSAW Research Competition: 2018, 2019

REVIEWER

TOSEM ACM Transactions on Software Engineering and Methodology (TOSEM): 2018

EXTERNAL REVIEWER

USENIX USENIX Security Symposium: 2017

CCS ACM Conference on Computer and Communications Security: 2013, 2014

IWSEC International Workshop on Security: 2014

MTD ACM Workshop on Moving Target Defense: 2015
IET IET Information Security: 2014

OTHER

Columbia University Reviewer of applications for the Master's Program in Computer Science : 2015, 2016

Open-Source Software

BibTeX entry from URL A Chrome extension that produces BibTeX entries from the active URL (Users > 8500, Rating: 5 stars).
LBSProximityAuditor An auditing framework for Location Based Services.
NEZHA A differential fuzzing framework built on top of libFuzzer.
SQLRand A compiler pass that guards against SQL injections.
INTFlow An LLVM pass to detect integer errors with low false positives.
DYNAGUARD A set of protections of canary-based defenses against brute-force attacks.

Teaching and Mentorship

Instructor, Introduction to Programming in C

New York, USA

COLUMBIA UNIVERSITY

Summer 2014

- Designed and taught a three week summer intensive course for the School of Continuing Education at Columbia University (Students: 16)

Teaching Assistant

New York, USA

COLUMBIA UNIVERSITY

Summer 2013 - Fall 2016

- Fall 2016: Head Teaching Assistant (TA) for Network Security (Graduate level. Instr. Debbie Cook. Students: 34)
- Spring 2015: TA for Network Security (Graduate level. Instr. Debbie Cook. Students: 33)
- Fall 2013: Head TA for Data Structures & Algorithms (Undergraduate level. Instr.: Shlomo Hershkop. Students: 70)
- Spring 2013: Head TA for Advanced Programming (Undergraduate level. Instr.: Shlomo Hershkop. Students: 14)

Student Mentor

New York, USA

COLUMBIA UNIVERSITY

2016

- Fall 2016: Jason Zhao (undergraduate student). Project: Guided fuzzing for resource exhaustion bugs.
- Spring 2016: Benjamin Low (undergraduate student). Project: Towards a taxonomy of the security properties of major OSes.

Publications

CONFERENCE PUBLICATIONS

- C1 **Theofilos Petsios**, Jason Zhao, Angelos D. Keromytis, and Suman Jana. "SlowFuzz : Automated Domain-Independent Detection of Algorithmic Complexity Vulnerabilities. ". In Proceedings of the 24th ACM Conference on Computer and Communications Security (CCS), Dallas, TX, November 2017.
- C2 **Theofilos Petsios**, Adrian Tang, Salvatore Stolfo, Angelos D. Keromytis, and Suman Jana. "NEZHA : Efficient Domain - Independent Differential Testing". In 38th IEEE Symposium on Security and Privacy (S&P), San Jose, CA, May 2017.
- C3 Marios Pomonis, **Theofilos Petsios**, Angelos D. Keromytis, Michalis Polychronakis, Vasileios P. Kemerlis. " kR^X : Comprehensive Kernel Protection against Just-In-Time Code Reuse". In Proceedings of the 12th European Conference on Computer Systems (EuroSys), April 2017.
- C4 **Theofilos Petsios**, Vasileios P. Kemerlis, Michalis Polychronakis, Angelos D. Keromytis. "DynaGuard: Armoring Canary-based Protections against Brute-force Attacks". In Proceedings of the 31th Annual Computer Security Applications Conference (ACSAC), December 2015.
- C5 Iasonas Polakis, George Argyros, **Theofilos Petsios**, Suphanee Sivakorn, Angelos D. Keromytis. "Where's Wally? Precise User Discovery Attacks in Location Proximity Services". In Proceedings of the 22nd ACM Conference on Computer and Communications Security (CCS), October 2015.

- C6 Marios Pomonis, **Theofilos Petsios**, Kangkook Jee, Michalis Polychronakis, and Angelos D. Keromytis. “*IntFlow: Improving the Accuracy of Arithmetic Error Detection Using Information Flow Tracking*”. In Proceedings of the 30th Annual Computer Security Applications Conference (ACSAC), December 2014.
- C7 M. Lecuyer, G. Ducoffe, F. Lan, A. Papancea, **T. Petsios**, R. Spahn, A. Chaintreau, and R. Geambasu. “*XRay: Enhancing the Web’s Transparency with Differential Correlation*.”, in Proceedings of the USENIX Security Symposium, August 2014.

JOURNAL PUBLICATIONS

- J1 George Argyros, **Theofilos Petsios**, Suphannee Sivakorn, Angelos D. Keromytis, and Jason Polakis. “*Evaluating the Privacy Guarantees of Location Proximity Services*”. In ACM Transactions on Privacy and Security (TOPS) (formerly known as TISSEC).
- J2 Marios Pomonis, **Theofilos Petsios**, Angelos D. Keromytis, Michalis Polychronakis, Vasileios P. Kemerlis. “*Kernel Protection against Just-In-Time Code Reuse*”. In ACM Transactions on Privacy and Security (TOPS) (formerly known as TISSEC).

OTHER PUBLICATIONS

- O1 **Theofilos Petsios**, “*Compiler-assisted Adaptive Software Testing*”, PhD Thesis, April 2018.
- O2 **Theofilos Petsios**, Adrian Tang, Dimitris Mitropoulos, Salvatore Stolfo, Angelos D Keromytis, Suman Jana. “*Tug-of-War: Observations on Unified Content Handling*”, arXiv preprint arXiv:1708.09334, August 2017.
- O3 Marios Pomonis, **Theofilos Petsios**, Angelos D. Keromytis, Michalis Polychronakis, Vasileios P. Kemerlis. “*kR^X: Comprehensive Kernel Protection against Just-In-Time Code Reuse*”. Black Hat USA Conference, July 2017.
- O4 George Argyros, **Theofilos Petsios**, Dimitris Mitropoulos, Yunhui Zheng, Angelos D. Keromytis, and Junfeng Yang. “*Towards Scalable Symbolic Execution in Interpreted Languages*”, in RSAC Security Scholar Poster Exhibition, RSA Conference, February 2017.