

Diogo Barradas

Research Interests

My research is focused on network security and privacy, with particular emphasis on statistical traffic analysis and Internet censorship circumvention. I take additional interest in digital forensics.

Academic Experience

- 2022–Present **Assistant Professor**,
Cheriton School of Computer Science, University of Waterloo, Waterloo, ON, Canada.
Interim Associate Director, Waterloo Cybersecurity and Privacy Institute (CPI), as of March 2024
Member of the CrySP research group
- 2021 **Postdoctoral Fellow**,
Oct. – Nov. *Department of Computer Science, Rice University, Houston, TX, USA.*
Advisor: Ang Chen
- 2020 **Short-Term Research Scholar**, *Carnegie Mellon University, CyLab Security & Privacy Institute.*
Feb – Aug Advisor: Nicolas Christin
- 2017 **Research Intern**, *University of Texas at Austin.*
Jul – Aug Advisor: Lili Qiu.

Education

- 2016–2021 **Ph.D. in Information Systems and Computer Engineering**,
Instituto Superior Técnico, Universidade de Lisboa, Portugal.
Advisors: Luís Rodrigues, Nuno Santos
Thesis: Unobservable Multimedia-based Covert Channels for Internet Censorship Circumvention
Pass with Distinction and Honour
- 2014–2016 **M.Sc. in Information Systems and Computer Engineering**,
Instituto Superior Técnico, Universidade de Lisboa, Portugal.
Advisors: Luís Rodrigues, Nuno Santos
Thesis: Unobservable Covert Streaming for Internet Censorship Circumvention
- 2011–2014 **B.Sc. in Information Systems and Computer Engineering**,
Instituto Superior Técnico, Universidade de Lisboa, Portugal.

Publications

Refereed Journal Articles

- PACMNET '23 Vítor Nunes, José Brás, Afonso Carvalho, **Diogo Barradas**, Kevin Gallagher, Nuno Santos, *Enhancing the Unlinkability of Circuit-Based Anonymous Communications with k-Funnels*, Proceedings of the ACM on Networking, 2023, (presented at the CoNEXT '23 conference).
- PoPETS '23 Alexander Veicht, Cedric Renggli, **Diogo Barradas**, *DeepSE-WF: Unified Security Estimation for Website Fingerprinting Defenses*, Proceedings on Privacy Enhancing Technologies, Volume 2023 (2), 2023, (presented at the PETS '23 conference).

- COSE '18 **Diogo Barradas**, Tiago Brito, David Duarte, Nuno Santos, Luís Rodrigues, *Forensic Analysis of Communication Records of Messaging Applications from Physical Memory*, Computers & Security, Elsevier, Volume 86, 2018.
- PoPETS '17 **Diogo Barradas**, Nuno Santos, Luís Rodrigues, *DeltaShaper: Enabling Unobservable Censorship-resistant TCP Tunneling over Videoconferencing Streams*, Proceedings on Privacy Enhancing Technologies, Volume 2017 (4), 2017, (presented at the PETS '17 conference).

Refereed Conference Publications

- ICC '24 Bohan Zhang, Peng Hu, Ahmad Akbari Azirani, Mohammad A. Salahuddin, **Diogo Barradas**, Noura Limam, Raouf Boutaba, *Secure and Efficient Group Handover Protocol in 5G Non-Terrestrial Networks*, Proceedings of the IEEE International Conference on Communications, Denver, CO, USA, 2024.
- NDSS '24 Daniela Lopes, Jin-Dong Dong, Daniel Castro, Pedro Medeiros, **Diogo Barradas**, Bernardo Portela, João Vinagre, Bernardo Ferreira, Nicolas Christin, Nuno Santos, *Flow Correlation Attacks on Tor Onion Service Sessions with Sliding Subset Sum*, Proceedings of the 31st Network and Distributed System Security Symposium, San Diego, CA, USA, 2024.
- Oakland '24 Patrick Kon, Aniket Gattani, Dhiraj Saharia, Tianyu Cao, **Diogo Barradas**, Ang Chen, Micah Sherr, Benjamin Ujcich, *NetShuffle: Circumventing Censorship with Shuffle Proxies at the Edge*, Proceedings of the 45th IEEE Symposium on Security and Privacy, San Francisco, CA, USA, 2024.
- AsiaCCS '22 Gabriel Figueira, **Diogo Barradas**, Nuno Santos, *StegoZoo: Enhancing WebRTC Covert Channels with Video Steganography for Internet Censorship Circumvention*, Proceedings of the 2022 ACM Asia Conference on Computer and Communications Security, Nagasaki, Japan, 2022.
- WebConf '21 Raymond Rambert, Zachary Weinberg, **Diogo Barradas**, Nicolas Christin, *Chinese Wall or Swiss Cheese? Keyword filtering in the Great Firewall of China*, Proceedings of the 30th The Web Conference, Ljubljana, Slovenia, 2021.
- NDSS '21 **Diogo Barradas**, Nuno Santos, Luís Rodrigues, Salvatore Signorello, Fernando Ramos, André Madeira, *FlowLens: Enabling Efficient Flow Classification for ML-based Network Security Applications*, Proceedings of the 28th Network and Distributed System Security Symposium, Virtual Event, USA, 2021.
- CCS '20 **Diogo Barradas**, Nuno Santos, Luís Rodrigues, Vítor Nunes, *Poking a Hole in the Wall: Efficient Censorship-Resistant Internet Communications by Parasitizing on WebRTC*, Proceedings of the ACM SIGSAC Conference on Computer and Communications Security, Virtual Event, USA, 2020.
- USENIX Security '18 **Diogo Barradas**, Nuno Santos, Luís Rodrigues, *Effective Detection of Multimedia Protocol Tunneling using Machine Learning*, Proceedings of the 27th USENIX Security Symposium, Baltimore, MD, USA, 2018.
- SECRYPT '17 **Diogo Barradas**, Tiago Brito, David Duarte, Nuno Santos, Luís Rodrigues, *Forensic Analysis of Communication Records of Web-based Messaging Applications from Physical Memory*, Proceedings of the 14th International Conference on Security and Cryptography, Madrid, Spain, 2017.

Refereed Workshop Publications

- SpaceSec '24 Prabhjot Singh, **Diogo Barradas**, Tariq Elahi, Noura Limam, *Connecting the Dots in the Sky: Website Fingerprinting in Low Earth Orbit Satellite Internet*, Proceedings of the 2nd Workshop on the Security of Space and Satellite Systems (co-located with NDSS), San Diego, CA, USA, 2024.
- WPES '23 Prabhjot Singh, Shreya Arun Naik, Navid Malekghaini, **Diogo Barradas**, Noura Limam, *A First Look at Generating Website Fingerprinting Attacks via Neural Architecture Search*, Proceedings of the 22nd Workshop on Privacy in the Electronic Society (co-located with CCS), Copenhagen, Denmark, 2023.
- WPES '23 Daniela Lopes, Daniel Castro, **Diogo Barradas**, Nuno Santos, *TIGER: Tor Traffic Generator for Realistic Experiments*, Proceedings of the 22nd Workshop on Privacy in the Electronic Society (co-located with CCS), Copenhagen, Denmark, 2023.

- FOCI '23 Kevin Gallagher, **Diogo Barradas**, Nuno Santos, *Rethinking Realistic Adversaries for Anonymous Communication Systems*, Free and Open Communications on the Internet (co-located with PETS), Lausanne, Switzerland, 2023.
- STAST '23 Wei Hu, **Diogo Barradas**, *Work in Progress: A Glance at Social Media Self-Censorship in North America*, Proceedings of the 13th Workshop on Socio-Technical Aspects in Security (co-located with Euro S&P), Delft, Netherlands, 2023.
- WPES '22 Asim Waheed, Sara Qunaibi, **Diogo Barradas**, Zachary Weinberg, *Darwin's Theory Of Censorship: Analysing the Evolution of Censored Topics with Dynamic Topic Models*, Proceedings of the 21st Workshop on Privacy in the Electronic Society (co-located with CCS), Los Angeles, CA, USA, 2022.
- CPSIoTSec '22 Patrick Tser Jern Kon, **Diogo Barradas**, Ang Chen, *Stargaze: A LEO Constellation Emulator for Security Experimentation*, Proceedings of the 4th Workshop on CPS & IoT Security and Privacy (co-located with CCS), Los Angeles, CA, USA, 2022.
- LASER '21 **Diogo Barradas**, Nuno Santos, Luís Rodrigues, Salvatore Signorello, Fernando Ramos, André Madeira, *The Nuts and Bolts of Building FlowLens*, Proceedings of the Learning from Authoritative Security Experiment Results Workshop (co-located with NDSS), Virtual Event, USA, 2021.
- DICG '20 **Diogo Barradas**, Nuno Santos, *Towards a Scalable Censorship-Resistant Overlay Network based on WebRTC Covert Channels*, Proceedings of the 1st International Workshop on Distributed Infrastructure for Common Good (co-located with Middleware), Delft, Netherlands, 2020.
- EuroDW '18 **Diogo Barradas**, *Assessing the Feasibility of Machine Learning to Detect Network Covert Channels*, EuroSys Doctoral Workshop, Porto, Portugal, 2018.

Refereed National Conference Publications

- INForum 2019 André Madeira, **Diogo Barradas**, Nuno Santos, Luís Rodrigues, *Identificação de Canais Encobertos no Skype usando Esboços em SDNs*, Actas do Enésimo Simpósio de Informática, INForum 2019, Minho, Portugal, **Best Paper Award**.
- INForum 2016 **Diogo Barradas**, Nuno Santos, Luís Rodrigues, *Síntese de Vídeo para Evasão de Censura na Internet*, Actas do Oitavo Simpósio de Informática, INForum 2016, Lisboa, Portugal.

Posters and Technical Reports

- Preprint Cheng Tang, **Diogo Barradas**, Urs Hengartner, Yue Hu, *On the Feasibility of Fingerprinting Collaborative Robot Traffic*, [arxiv preprint](#).
- Preprint Michael Wrana, **Diogo Barradas**, N. Asokan, *The Spectre of Surveillance and Censorship in Future Internet Architectures*, [arxiv preprint](#).
- CCS '22 Daniela Lopes, Pedro Medeiros, Jin-Dong Dong, **Diogo Barradas**, Bernardo Portela, João Vinagre, (poster) Bernardo Ferreira, Nicolas Christin, Nuno Santos, *User Sessions on Tor Onion Services: Can Colluding ISPs Deanonymize Them at Scale?*, Proceedings of the ACM SIGSAC Conference on Computer and Communications Security, Los Angeles, CA, USA, 2022.

Teaching

Instructor Experience

Courses taught while at University of Waterloo, Waterloo, ON, Canada.

2024 **Instructor**, CS489/698 - Privacy, Crypto, Data Security.
Spring Term

2024 **Instructor**, CS798 - Digital Forensics and Incident Response.
Winter Term

2023 **Instructor**, CS458/658 - Computer Security and Privacy.
Spring Term

- 2023 **Instructor**, *CS858 - Internet Censorship and Surveillance*.
Winter Term
- 2022 **Instructor**, *CS458/658 - Computer Security and Privacy*.
Spring Term
- 2022 **Instructor**, *CS858 - Internet Censorship and Surveillance*.
Winter Term

Courses taught while at Instituto Superior Técnico, Universidade de Lisboa, Portugal.

- 2018 – 2019 **Teaching Assistant**, *Forensics Cyber Security*, Course Unit Quality grade: 8.5/9.
Fall Semester
- 2017 – 2018 **Teaching Assistant**, *Network and Computer Security*, Course Unit Quality grade: 8.69/9.
Fall Semester

Course Development Experience

CS 798 - Digital Forensics and Incident Response: I developed the syllabus, slides, and assignments for a new lecture-based course focused on digital forensics. The assignments follow a sequence of three main steps in the scope of a dummy digital investigation case. In each assignment, students exercise their know-how with different forensic tools towards uncovering pieces of evidence for solving the case. In order, the assignments focus on a) file forensics and steganography, b) disk and network forensics, and c) memory forensics and reverse engineering.

Student Supervision

Current Students

PhD students and post-doc fellows:

- 2022 - Michael Wrana, Ph.D. – University of Waterloo (co-advisor: N. Asokan)
- 2023 - Uzma Maroof, Post-Doc Fellow – University of Waterloo (co-advisor: N. Asokan)

Master's students:

- 2022 - Shreya Arun Naik, MMath – University of Waterloo
- 2023 - Sina Kamali, MMath – University of Waterloo
- 2024 - Hesam Sarkhosh, MMath – University of Waterloo

Undergraduate students:

- 2024 - Steven Li, URA – University of Waterloo
- 2024 - Eeshita Dayani, URA – University of Waterloo
- 2024 - Yixing Zhang, URA – University of Waterloo
- 2024 - Gurjot Singh, Research Intern – Thapar Institute of Engineering & Technology

Past Students

Master's students:

- 2022 - 2024 Prabhjot Singh, MMath – University of Waterloo
- 2022 - 2024 Adrian Cruzat La Rosa, MMath – University of Waterloo
- 2022 - 2023 Norhan Abbas, MMath – University of Waterloo (co-advisor: Mei Nagappan)
- 2021 - 2022 Afonso Carvalho, M.Sc. – Instituto Superior Técnico, U. Lisboa (co-advisor: Nuno Santos)
- 2021 - 2022 Francisco Silva, M.Sc. – Instituto Superior Técnico, U. Lisboa (co-advisor: Nuno Santos)
- 2021 - 2022 José Brás, M.Sc. – Instituto Superior Técnico, U. Lisboa (co-advisor: Nuno Santos)

Undergraduate students:

- 2023 Angel Liu, RA Volunteer – University of Waterloo
- 2023 Rujing Li, URA – University of Waterloo
- 2023 Daniel Phan, URA – University of Waterloo

2023 Scott Sum, URA – University of Waterloo

High-school volunteers:

2024 Thanosan Prathifkumar, Central Peel Secondary School

2023 Martin Sit, St. Augustine Catholic High School

Professional Service

Program Co-chair

2022 Workshop on Formal Foundations and Security of Programmable Network Infrastructures (FFSPIN)
(co-located with ACM SIGCOMM)

Vice Program Chair

2025 Privacy Enhancing Technologies Symposium (PETS)

Program Committee

2025 IEEE Symposium on Security and Privacy (S&P)

2024 ACM Conference on Computer and Communications Security (CCS)

2024 Free and Open Communications on the Internet (FOCI)

2024 ACM Web Conference (WebConf)

2023 ACM Conference on Computer and Communications Security (CCS)

2023 Privacy Enhancing Technologies Symposium (PETS)

Rated Excellent Reviewer

2023 Free and Open Communications on the Internet (FOCI)

2023 International Symposium on Research in Attacks, Intrusions and Defenses (RAID)

2023 International Conference on Network and System Security (NSS)

2023 International Conference on Metaverse Computing, Networking and Applications (MetaCom)

2023 IEEE Conference on Dependable and Secure Computing (DSC)

2022 Privacy Enhancing Technologies Symposium (PETS)

Rated Excellent Reviewer

2022 International Conference on Security and Cryptography (SECRYPT)

2022 International Conference on Information and Communications Security (ICICS)

2021 Privacy Enhancing Technologies Symposium (PETS)

2021 International Conference on Security and Cryptography (SECRYPT)

2021 International Conference on Information and Communications Security (ICICS)

Shadow Program Committee

2021 IEEE Symposium on Security and Privacy (S&P)

Grant Review Panels

2023 New Investigator Award – Engineering and Physical Sciences Research Council (EPSRC), UK

2023 Discovery Grant – Natural Sciences and Engineering Research Council of Canada (NSERC), Canada

Thesis Dissertation, Advisory, and Reading Committees

PhDs: Elham Azirani (U. Waterloo, 2023), Arthur Grisel-Davy (U. Waterloo, 2023), Sajin Sassy (U. Waterloo, 2022)

Masters: Adam Campbell (U. Waterloo, 2023), Wei Hu (U. Waterloo, 2023), Saif Zabarah (U. Waterloo, 2022), Lindsey Tulloch (U. Waterloo, 2022), Inês Macedo (U. Porto, 2022)

Internal Service

2023 – 2024 Member, Graduate Committee, *University of Waterloo.*
(Sep – Jul)

2023 Member, Graduate Recruiting Committee, *University of Waterloo.*
(Jan – Sep)

2022 Member, Graduate Committee, *University of Waterloo*.
(Jan – Jul)

Funding

- 2024-2026 **Cyber Security Innovation Network**, *National Cybersecurity Consortium*.
CAD \$288,099 [25% share, co-applicant]
- 2023-2025 **Next Generation User Fingerprinting for Fraud Detection**, *Mastercard Canada*.
CAD \$90,000 [100% share]
- 2023-2028 **Discovery Grant**, *Natural Sciences and Engineering Research Council of Canada*.
CAD \$155,000 + \$12,500 ECR supplement [100% share]
- 2023-2024 **Seed Grant**, *Waterloo Cybersecurity and Privacy Institute & RoboHub*.
CAD \$15,200 [33% share, co-applicant]
- 2022-2027 **Startup Grant**, *University of Waterloo*.
CAD \$120,000 [100% share]
- 2022-2025 **Innovation for Defence Excellence and Security (IDEaS)**, *Department of National Defence*.
CAD \$1,499,923 [3% share, co-applicant]
- 2022-2024 **NSERC Research Incentive Fund**, *University of Waterloo*.
CAD \$30,000 [100% share]
- 2022 **Pluggable Transports Small Grants Program**, *Internews*.
Eur \$34,000 [0% share, co-applicant]

Invited Talks

- 2024 **De-anonymizing Tor Onion Services with Flow Correlation Attacks**.
INRIA Centre Bordeaux, INRIA-UW-UB Workshop (Feb. 2024)
- 2022 **Are We Safe in the “Internet from Space”?**.
University of Waterloo, Cybersecurity and Privacy Institute Annual Conference (Oct. 2022)
- 2021 **Evading Internet Censorship with Multimedia-based Covert Channels**.
Rice University (Nov. 2021)
ETH Zurich (Mar. 2021)
Aalto University (Mar. 2021)
Rochester Institute of Technology (Feb. 2021)
University of Waterloo (Jan. 2021)
- 2018 **A Brief Overview of the Censorship Arms Race**.
BarcampLx, hosted at IdeaHub, Palacio de Sotto Mayor (Nov. 2018)

Awards

- ISOC.PT **Best Research Paper and Internet Impact Acknowledge Mention**, *Diogo Barradas*, *Nuno Santos*, *Luís Rodrigues*, *On the unobservability of multimedia-based covert channels for Internet censorship circumvention*, Applied Network Research Workshop – Internet Society Portugal Chapter.
- ANRW 2020
- GSD 2018 **Doctoral Student Merit Award**, *Diogo Barradas*, Distributed Systems Group (GSD), INESC-ID, Instituto Superior Técnico, Universidade de Lisboa.