Joanna C. S. Santos

Assistant Professor
Department of Computer Science and Engineering
University of Notre Dame (ND)

joannacss@nd.edu
https://joannacss.github.io
https://linkedin.com/in/joannacss

Professional Experience

Assistant Professor — Aug. 2021 – Present
University of Notre Dame (ND) — *Notre Dame, IN. USA*

Systems Analyst — Jan. 2014 – Aug. 2014
ACONE - Assessoria e Consultoria Empresarial LTDA — *Aracaju, SE. Brazil*

Education

Ph.D. in Computing and Information Sciences — Aug. 2016 – July 2021
Rochester Institute of Technology (RIT) — *Rochester, NY. USA*
Dissertation: *Understanding and Identifying Vulnerabilities Related to Architectural Security Tactics*
Advisor: *Dr. Mehdi Mirakhorli*

M.Sc. in Software Engineering — Aug. 2014 – May 2016
Rochester Institute of Technology (RIT) — *Rochester, NY. USA*
Thesis: *Toward Establishing a Catalog of Security Architecture Weaknesses*
Advisor: *Dr. Mehdi Mirakhorli*

B.Sc. in Computer Engineering — Jan. 2009 – Oct. 2013
Federal University of Sergipe (UFS) — *São Cristóvão, SE. Brazil*
Undergraduate Thesis: *JOnline: An Online Judge for Teaching Programming*
Advisor: *Dr. Admilson R. L. Ribeiro*

Honors & Awards

Distinguished Reviewer Award at ESEC/FSE 2023
In recognition of outstanding work done throughout the review process.

Research Pitch Competition at JOBS Workshop 2020
Won Research Pitch competition at JOBS Workshop (co-located with 53rd IEEE/ACM International Symposium on Microarchitecture - MICRO 2020).

Best Paper Award at ICSA 2017
Award to the paper *"Understanding Software Vulnerabilities Related to Architectural Security Tactics: An Empirical Investigation of Chromium, PHP and Thunderbird"*

Science Without Borders Scholarship (CAPES)
Scholarship granted by CAPES (Coordination for the Improvement of Higher Education Personnel) to pursue a masters degree at RIT (2014-2016).

Published paper ranked at 3rd place in WTICGBASE - XIII ERBASE, 2013
Paper: *A Location Service using the HTML5 Geolocation API. (Original title: "Serviço de localização utilizando a API de geolocalização do HTML5")*

Grants

- Leveraging the Power of LLMs to Generate Security Tests for Mobile Apps Apr. 2024 – May 2025.
  Prime Sponsor: Google (Research Scholar Program).
  Amount: U$60,000.00.
  Role: solo PI.
- Quantum-Enabled Software Exploit Synthesis to Detect Object Injection Vulnerabilities May 2024 – May 2025.
  Sponsor: Purdue University
  Prime Sponsor: NSF/IUCRC Center for Quantum Technologies (CQT)
  Amount: U$ 52,651.
  Role: solo PI.

Publications

Advisees are denoted follows: (*) for undergraduates, (@) for graduate students, and (+) for postdoctoral fellows.

Refereed Journal Articles

⟨J4⟩ TSE 2023
A. Okutan, P. Mell, M. Mirakhorli, I. Khokhlov, **J. C. S. Santos**, D. Gonzalez, and S. Simmons. "Empirical Validation of Automated Vulnerability Curation and Characterization". In: *IEEE Transactions on Software Engineering (TSE)*. (Submitted: Oct. 2021, Major Revision Decision: May 2022, Submitted for Major Revision: Aug 2022. Submitted for Minor Revision: Jan. 2023. Accepted: Feb 2023). {**Impact Factor**: 9.322}

⟨J3⟩ JSS 2019
J. C. S. Santos, K. Tarrit, A. Sejfia, M. Mirakhorli, and M. Galster. "An empirical study of tactical vulnerabilities". *Journal of Systems and Software*. Vol. 149, pp. 263–284. (Received Oct. 2017, Revised Sep. 2018, Accepted Oct. 2018, Available online Oct. 2018.) {**Impact Factor**: 3.5}

⟨J2⟩ JSS 2016
I. J. Mujhid, **J. C. S. Santos**, R. Gopalakrishnan, and M. Mirakhorli. "A search engine for finding and reusing architecturally significant code". *Journal of Systems and Software (JSS)*. Vol. 130, pp. 81–93. (Received Feb. 2016, Revised Aug. 2016, Accepted Nov. 2016, Available online Nov. 2016). {**Impact Factor**: 3.5}

⟨J1⟩ EMSE 2016
W. Zogaan, I. J. Mujhid, **J. C. S. Santos**, D. Gonzalez, and M. Mirakhorli. "Automated training-set creation for software architecture traceability problem". *Empirical Software Engineering (EMSE)*. Vol. 22, Issue 3. pp. 1028–1062. (Received Nov. 2015, Accepted Oct. 2016, Available online Nov. 2016) {**Impact Factor**: 4.1}

Refereed Conference Papers (Research Track)

⟨C13⟩ SCAM 2024
M. L. Siddiq(@), B. Casey(@), **J. C. S. Santos**. "FRANC: A Lightweight Framework for High-Quality Code Generation". *24th IEEE International Conference on Source Code Analysis and Manipulation (SCAM 2024)*.

⟨C12⟩ SCAM 2024
M. L. Siddiq(@), **J. C. S. Santos**, S. B. Dristi(*), J. Saha(*). "The Fault in our Stars: Quality Assessment of Code Generation Benchmarks". *24th IEEE International Conference on Source Code Analysis and Manipulation (SCAM 2024)*.

⟨C11⟩ EASE 2024

M. L. Siddiq[@], **J. C. S. Santos**, R. H. Tanvir[*], N. Ulfat[*], F. A. Rifat[*], V. Lopes[@]. "Using Large Language Models to Generate JUnit Tests: An Empirical Study". *International Conference on Evaluation and Assessment in Software Engineering (EASE 2024)*.

⟨C10⟩ ICPC 2024

M. L. Siddiq[@], J. Zhang[*], **J. C. S. Santos**. "Understanding Regular Expression Denial of Service (ReDoS): Insights from LLM-Generated Regexes and Developer Forums". *International Conference on Program Comprehension (ICPC 2024)*.

⟨C9⟩ OOPSLA 2024

J. C. S. Santos, M. Mirakhorli, A. Shokri. "Seneca: Taint-Based Call Graph Construction for Java Object Deserialization". *International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA 2024)*.

⟨C8⟩ SCAM 2022

M. L. Siddiq[@], S. H. Majumder[*], M. R. Mim[*], S. Jajodia[*], **J. C. S. Santos**. "An Empirical Study of Code Smells in Transformer-based Code Generation Techniques". *22nd IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM 2022)*. Limassol, Cyprus. {**Acceptance Rate**: 27%}

⟨C7⟩ ICSA 2021

A. Shokri, **J. C. S. Santos**, and M. Mirakhorli. "ArCode: Facilitating the use of application frameworks to implement tactics and patterns". In: *IEEE International Conference on Software Architecture (ICSA 2021)*. {**Acceptance Rate**: 26.7%}

⟨C6⟩ SCAM 2020

S. Moshtari, **J. C. S. Santos**, M. Mirakhorli and A. Okutan. "Looking for software defects? First find the nonconformists". In: *2020 IEEE 20th International Working Conference on Source Code Analysis and Manipulation (SCAM 2020)*, Virtual (due to COVID-19), pp. 75–86.

⟨C5⟩ ESEC/FSE 2019

J. C. S. Santos, A. Sejfia, T. Corrello, S. Gadenkanahalli, and M. Mirakhorli. "Achilles' heel of plug-and-Play software architectures: a grounded theory based approach". In: *27th ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2019)*, Tallinn, Estonia, pp. 671-682. {**Acceptance Rate**: 24.4%}

⟨C4⟩ ICSA 2017

J. C. S. Santos, A. Peruma, M. Mirakhorli, M. Galster, J. V. Vidal and A. Sejfia. "Understanding software vulnerabilities related to architectural security tactics: An empirical investigation of chromium, php and thunderbird". In: *2017 IEEE International Conference on Software Architecture (ICSA 2017)*, Gothenburg, Sweden, pp. 69–78. **Best Paper Award** {**Acceptance Rate**: 22%}

⟨C3⟩ MSR 2017

D. Gonzalez, **J. C. S. Santos**, A. Popovich, M. Mirakhorli and M. Nagappan. "A large-scale study on the usage of testing patterns that address maintainability attributes: Patterns for ease of modification, diagnoses, and comprehension". In: *2017 IEEE/ACM 14th International Conference on Mining Software Repositories (MSR 2017)*, Buenos Aires, Argentina, pp. 391–401. {**Acceptance Rate**: 31%}

⟨C2⟩ ITNG 2016

F. M. Ribeiro, T. Rocha, **J. C. S. Santos**, and E. D. Moreno. "A model-driven solution for automatic software deployment in the cloud". In: *Information Technology: New Generations (ITNG 2016)*, Las Vegas, USA, pp. 591–601. {**Acceptance Rate**: 35%}

⟨C1⟩ EATIS 2012

A. R. Ribeiro, M. T. Chella, L. M. M. Santos, **J. C. S. Santos**, and W. R. Melo. "ERLab: a middleware for remote access electronic laboratories". In: *Proceedings of the 6th Euro American Conference on Telematics and Information Systems (EATIS 2012)*, Valencia, Spain, pp. 199–205. {**Acceptance Rate**: Not Disclosed}

Refereed Short Conference Papers & Workshop Papers

[W14] MSR Mining Challenge 2024
M. L. Siddiq[(@)], L. Roney[(*)], J. Zhang[(*)], **J. C. S. Santos**. "Quality Assessment of ChatGPT Generated Code and their Use by Developers ". *21st International Conference on Mining Software Repositories – Mining Challenge Track (MSR-Mining Challenge 2024)*. Lisbon, Portugal.

[W13] ICSE NIER 2024
M. L. Siddiq[(@)], J. Zhang[(*)], L. Roney[(*)], **J. C. S. Santos**. "Re(gEx|DoS)Eval: Evaluating Generated Regular Expressions and their Proneness to DoS Attacks". *46th International Conference on Software Engineering – NIER Track (New Ideas and Emerging Results)*. Lisbon, Portugal.

[W12] NLBSE 2023
M. L. Siddiq[(@)], A. Samee[(*)], S. R. Azgor[(*)], M. A. Haider[(*)], S. I. Sawraz[(*)]. **J. C. S. Santos**. "Zero-shot Prompting for Code Complexity Prediction Using GitHub Copilot". *2nd International Workshop on Natural Language-based Software Engineering (co-located with ICSE'23)*. Melbourne, Australia.

[W11] MSR4P&S 2022
M. L. Siddiq[(@)], **J. C. S. Santos**. "SecurityEval Dataset: Mining Vulnerability Examples to Evaluate Machine Learning-Based Code Generation Techniques". *1st International Workshop on International Workshop on Mining Software Repositories Applications for Privacy and Security (co-located with ESEC/FSE'22)*. Singapore.

[W10] MSR4P&S 2022
J. C. S. Santos, X. Zhang, M. Mirakhorli. "Counterfeit Object-Oriented Programming Vulnerabilities: An Empirical Study in Java ". *1st International Workshop on International Workshop on Mining Software Repositories Applications for Privacy and Security (co-located with ESEC/FSE'22)*. Singapore.

[W9] NLBSE 2022
M. L. Siddiq[(@)], **J. C. S. Santos**. "BERT-Based GitHub Issue Report Classification ". *1st International Workshop on Natural Language-based Software Engineering (co-located with ICSE'22). Tool Demo*. Pittsburgh, PA, USA.

[W8] DeMeSSA'22
J. C. S. Santos, S. Suloglu, N. Catano, and M. Mirakhorli "A Methodological Approach to Verify Architecture Resiliency". In: *2nd International Workshop on Designing and Measuring Security in Software Architecture (co-located with ECSA'22)*. Prague, Czech Republic. 2022.

[W7] SOAP'21
J. C. S. Santos, R. A. Jones, C. Ashiogwu, and M. Mirakhorli. "Serialization-Aware Call Graph Construction". In: *10th ACM SIGPLAN International Workshop on the State of the Art in Program Analysis (SOAP)*. Virtual Conference. 2021.

[W6] FTfJP 2020
J. C. S. Santos, R. A. Jones, and M. Mirakhorli. "Salsa: Static analysis of serialization features". In: *Proceedings of the 22nd ACM SIGPLAN International Workshop on Formal Techniques for Java-Like Programs (FTfJP 2020)*, Virtual (due to COVID-19), pp.18–25.

[W5] EnCyCriS 2020
J. C. S. Santos, S. Suloglu, J. Ye, and M. Mirakhorli. "Towards an automated approach for detecting architectural weaknesses in critical systems". In: *Proceedings of the IEEE/ACM 42nd International Conference on Software Engineering Workshops – 1st International Workshop on Engineering and Cybersecurity of Critical Systems (EnCyCriS 2020).*, Virtual (due to COVID-19), pp. 250–253.

[W4] ICSA 2020
J. C. S. Santos, S. Moshtari and M. Mirakhorli. "An Automated Approach to Recover the Use-case View of an Architecture". In: *2020 IEEE International Conference on Software Architecture Companion (ICSA-C 2020)*, Virtual (due to COVID-19), pp. 63–66. ICSA 2020 NEMI Track.

[W3] WoSoCer 2020
J. C. S. Santos, A. Shokri, and M. Mirakhorli. "Towards Automated Evidence Generation for Rapid and Continuous Software Certification". In: *Proceedings of the 2020 IEEE International Symposium on Software Reliability Engineering Workshops (ISSREW) – 10th IEEE International Workshop on Software Certification (WoSoCer 2020)*, Virtual (due to COVID-19), pp. 287–294.

[W2] ICSAW 2017 — **J. C. S. Santos**, K. Tarrit and M. Mirakhorli. "A Catalog of Security Architecture Weaknesses". In: *Proceedings of the 2017 IEEE International Conference on Software Architecture Workshops (ICSAW 2017)*. Gothenburg, Sweden, pp. 220–223. (ICSA 2017 - Early Career Track).

[W1] WICSA 2016 — **J. C. S. Santos**, M. Mirakhorli, I. Mujhid, and W. Zogaan. "BUDGET: a Tool for Supporting Software Architecture Traceability Research". In: *Proceedings of the 13th Working IEEE/IFIP Conference on Software Architecture (WICSA 2016)*, Venice, Italy, pp. 303-306. Tool Demo.

Refereed Tutorials

[T1] ESEC/FSE 2022 — **J. C. S. Santos**, Dolby, J. "Program analysis using WALA". In: *30th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE)*. Singapore.

Refereed Publications in Brazilian Conferences and Workshops

These publications are written in Portuguese. Original titles and venue names are shown in parentheses.

ERBASE 2013 — **J. C. S. Santos**, S. C. P. Hoentsch, R. A. Nascimento, and A. R. L. Ribeiro. "A Location Service using the HTML5 Geolocation API. (Serviço de localização utilizando a API de geolocalização do HTML5)". In: *13th Regional School of Computing of the States of Bahia, Alagoas and Sergipe - Scientific Initiation and Undergraduate Works Workshop (XIII Escola Regional de Computação dos Estados da Bahia, Alagoas e Sergipe - Workshop de Trabalhos de IC e de Graduação - ERBASE 2013 - WTICG)*. Aracaju, Brazil. pp. 60–69. **Paper ranked in 3rd place**.

ERBASE 2012 — S. C. P. Hoentsch, A. R. L. Ribeiro, **J. C. S. Santos**, L. L. B. Menezes. "A Mobile Social Network Approach for Research and Education. (Uma Proposta de Site de Rede Social Móvel para Pesquisa e Educação)". In: *12th Regional School of Computing of the States of Bahia, Alagoas and Sergipe - 10th Workshop on Education and Informatics Bahia-Alagoas-Sergipe (XII Escola Regional de Computação dos Estados da Bahia, Alagoas e Sergipe - X Workshop de Educação e Informática Bahia, Alagoas, e Sergipe - ERBASE 2012 - X WEIBASE)*. Juazeiro, Brazil. pp. 26–33.

SBIE 2011 — **J. C. S. Santos** and A. R. L. Ribeiro. "JOnline: a preliminary approach of an online judge for teaching computer programming. (JOnline: Proposta preliminar de um juiz online didático para o ensino de programação)". In: *22nd Brazilian Symposium on Computers in Education (Simpósio Brasileiro de Informática na Educação-SBIE)*. Aracaju, Brazil. pp. 964–967.

ENINED 2011 — **J. C. S. Santos** and A. R. L. Ribeiro (2011). "An online judge approach for teaching computer programming. (Uma proposta de um juiz online didático para o ensino de programação)". In *2nd National Meeting on Informatics and Education (II Encontro Nacional de Informática e Educação - ENINED)*. Cascavel, Brazil. pp. 332–341.

ENINED 2011 — A. R. Ribeiro, M. T. Chella, L. M. M. Santos, **J. C. S. Santos**, and W. R. Melo. "LEW: Web Engineering Laboratory for teaching, research and extension. (LEW: Laboratório de Engenharia Web para ensino, pesquisa e extensão)". *2nd National Meeting on Informatics and Education (II Encontro Nacional de Informática e Educação - ENINED)*. Cascavel, Brazil. pp. 359–368.

ENINED 2011 — S. C. P. Hoentsch, A. R. L. Ribeiro, and **J. C. S. Santos**. "SocialNetLab - A Social Networking Site for Education. (SocialNetLab - Uma Proposta de Site de Rede Social para Educação)". In: *2nd National Meeting on Informatics and Education (II Encontro Nacional de Informática e Educação - ENINED)*. Cascavel, Brazil. pp. 77–84.