Henrique O. Santos, D.Sc.

Citizenship
Brazil

Status in the U.S.
H-1B status, permanent residency (green card) petition filed

Education

D.SC. IN APPLIED INFORMATICS | 2018 | UNIVERSIDADE DE FORTALEZA
- Thesis: An Indicator-based Approach for Variable Alignment based on Knowledge Graphs
- Advisor: Prof. Vasco Furtado, D.Sc. | Co-Advisor: Paulo Pinheiro, Ph.D.
- Doctoral stage in Tetherless World Constellation at Rensselaer Polytechnic Institute under the supervision of Prof. Deborah L. McGuinness
    - Building and management of knowledge graphs for scientific data

M.SC. IN APPLIED INFORMATICS | 2012 | UNIVERSIDADE DE FORTALEZA
- Thesis: A Service-Oriented Architecture for Assisting the Authoring of Semantic Crowd Maps
- Advisor: Prof. Vasco Furtado, D.Sc.
- Keywords: crowd map; semantic web; wiki; RDF; OWL; linked open data

B.SC. IN COMPUTER SCIENCE | 2006 | UNIVERSIDADE FEDERAL DO CEARÁ

Skills & Abilities
- Semantic web: RDF, OWL, SPARQL, GeoSPARQL, Reasoners, triple stores
- Programming: Java, Javascript, C, C++, Python, C#
- Frameworks: Play!, Protobuf, Bootstrap, AngularJS, Node.js
- Systems: Windows, Debian-based linux, macOS
- Databases: SQLServer, MySQL, PostgreSQL, Apache Solr
- Revision control: Git

Experience

DIRECTOR, SEMANTIC APPLICATIONS RESEARCH | RENSSELAER POLYTECHNIC INSTITUTE | MAR/2022-CURRENT
- Technical lead of the DARPA Machine Common Sense project
    - Development of novel and theoretically-grounded machine commonsense tasks
- Technical lead of the CACI Dynamic Spectrum Access project
    - Enhancements to the Policy Framework (performance improvements and extensions)
- Researcher at the National Institute of Environmental Health Sciences (NIEHS) Human Health Exposure Analysis Resource (HHEAR) project
    - Semantic infrastructure for scientific data harmonization and knowledge graph building
- Researcher at the IBM Health Empowerment by Analytics, Learning, and Semantics (HEALS) project

- Foundations of knowledge graph building techniques for large surveys (National Health and Nutrition Examination Survey – NHANES)

RESEARCH SCIENTIST | RENSSELAER POLYTECHNIC INSTITUTE | SEP/2019-MAR/2022

- Technical lead of the DARPA Machine Common Sense project
  - Analysis and integration of machine commonsense benchmarks
  - Experiments about human agreement on commonsense prompts
  - Development of novel and theoretically-grounded machine commonsense tasks
- Technical lead of the National Spectrum Consortium's Dynamic Spectrum Access project
  - Designed and developed a novel approach for a radio spectrum access control policy framework, based on knowledge graphs, allowing for time-sensitive reasoning of spectrum access requests.
  - Identified and documented knowledge representation and implementation requirements, in collaboration with radio spectrum domain experts, in support of the National Spectrum Consortium's Dynamic Spectrum Access (DSA) Policy Development project.
  - Presentations to the DSA project's primary grant monitor and associated stakeholders on partial research results and future research directions.
- Prepared reports in multiple levels containing outstanding research and software development accomplishments and progress.
- Supervised undergraduate research position students (URPs) to perform research and produce research products.
- Co-advised master students in research activities
- Provided advice and counsel to senior researchers and principal investigators on scientific and other advanced computing methods.

SENIOR SOFTWARE ENGINEER | RENSSELAER POLYTECHNIC INSTITUTE | APR/2018-AUG/2019

- Co-designed, developed and maintained Rensselaer's semantic data framework and applications in support of semantic data projects.
- Lead designer and developer of semantic solutions in support of the DSA project.
- Delivered working prototypes for validating novel radio spectrum knowledge representation research approach, in coordination with the DSA primary grant monitor.

I.T. CONSULTANT | BANCO DO NORDESTE DO BRASIL | 2006-2018

- Designed and developed novel user authentication infrastructure for critical financial transactions based on cutting-edge cryptographic technology, including algorithms (AES-128, RSA, TDES, SHA-512) and hardware APIs.
- Leaded contracts for systems enhancements and development of new ones.
- Coordinated software deliveries and quality assurance.

SYSTEM DEVELOPER | XSEED SOFTWARE & CONSULTORIA | 2003-2006

- Major developer for a CASE application for migrating legacy code to newer technologies (Java, C#).

Teaching Experience

ARTIFICIAL INTELLIGENCE | UNDERGRAD COURSE | UNIVERSIDADE DE FORTALEZA

- Search algorithms, heuristics.
- Autonomous agents.
- Ontologies and the Semantic Web.

ALGORITHMS | UNDERGRAD COURSE | UNIVERSIDADE DE FORTALEZA

- Programming logic.
- Programming in Java and C/C++.

Experience as Reviewer of Other Works

- Frontiers in Big Data journal: Review Editor for Data Mining and Management.
- The 21st International Semantic Web Conference (ISWC-22) to be held in Hangzhou, China: Doctoral Consortium Program Committee member.
- The 20th International Semantic Web Conference (ISWC-21) held in Albany, NY: Posters & Demos Program Committee member.
- The Thirty-First AAAI Conference on Artificial Intelligence (AAAI-17) held in San Francisco, CA: Sub-reviewer.
- The Thirtieth AAAI Conference on Artificial Intelligence (AAAI-16) held in Phoenix, AZ: Sub-reviewer.

Scientific and Technological Production

ARTICLES IN SCIENTIFIC JOURNALS

- Kejriwal, M., **Santos, H.**, Mulvehill, A.M., McGuinness, D.L. 2022. Designing a Strong Test for Measuring True Commonsense Reasoning. In: *Nature Machine Intelligence* 4.
- **Santos, H.**, Kejriwal, M., Mulvehill, A.M., Forbush, G., McGuinness, D.L., 2021. An experimental study measuring human annotator categorization agreement on commonsense sentences. In: *Experimental Results 2*.
- Rashid, S.M., McCusker, J.P., Pinheiro P., Bax M.P., **Santos, H.**, Stingone, J.A., Das, A.K., McGuinness, D.L. 2020. The Semantic Data Dictionary–An Approach For Describing and Annotating Data. In: *Data intelligence 4*(2), pp.443-486.
- Furtado, V., Caminha, C., Ayres, L., **Santos, H.**, 2012. Open government and citizen participation in law enforcement via crowd mapping. *IEEE Intelligent Systems*, *27*(4), pp.63-69.

COMPLETE WORKS PUBLISHED IN CONFERENCE PROCEEDINGS

- **Santos, H.**, Mulvehill, A., Erickson, J.S., McCusker, J.P., Gordon, M., Xie, O., Stouffer, S., Capraro, G., Pidwerbetsky, A., Burgess, J., Berlinsky, A., Turck, K., Ashdown, J., McGuinness, D.L., 2020. A Semantic Framework for Enabling Radio Spectrum Policy Management and Evaluation. In: *The Semantic Web – ISWC 2020.*
- Pinheiro, P., Bax, M. P., **Santos, H.**, Rashid, S.M., Liang, Z., Liu, Y., McCusker, J. P., McGuinness, D. L., 2018. Annotating Diverse Scientific Data With HAScO. In *Seminar on Ontology Research in Brazil 2018*, São Paulo, SP, Brazil.

- **Santos, H.**, Dantas, V., Furtado, V., Pinheiro, P., McGuinness D.L., 2017. From Data to City Indicators: A Knowledge Graph for Supporting Automatic Generation of Dashboards. In *Proceedings of the 14th Extended Semantic Web Conference*, Portorož, Slovenia.
- **Santos, H.**, Furtado, V., Pinheiro, P., McGuinness, D.L., 2015. Contextual data collection for smart cities. In *Proceedings of the Sixth Workshop on Semantics for Smarter Cities*, Bethlehem, PA.
- Pinheiro, P., McGuinness, D.L., **Santos, H.**, 2015. Human-aware sensor network ontology: semantic support for empirical data collection. In *Proceedings of the 5th Workshop on Linked Science*, Bethlehem, PA.
- **Santos, H.**, Furtado, V., 2012. A Service-oriented architecture for assisting the authoring of semantic crowd maps. In *Advances in Artificial Intelligence-SBIA 2012* (pp. 32-41), Curitiba, PR, Brazil.
- Tavares, J., Furtado, V., **Santos, H.**, de Vasconcelos, E., 2012. D2RCrime: A Tool for Helping to Publish Crime Reports on the Web from Relational Data. In: *Proceedings of the 7th International Conference on Semantic Technologies for Intelligence, Defense, and Security*, Fairfax, VA.
- Tavares, J., Furtado, V., **Santos, H.**, de Vasconcelos, E., 2011. Open Government in Law Enforcement: Assisting the publication of Crime Occurrences in RDF from Relational Data. In: *AAAI 2011 Fall Symposium on Open Government Knowledge: AI Opportunities and Challenges*, Arlington, VA.

SHORT WORKS PUBLISHED IN CONFERENCE PROCEEDINGS

- **Santos, H.**, Pinheiro, P., McGuinness, D.L., 2022. Knowledge Graph Construction from Data, Data Dictionaries, and Codebooks: the National Health and Nutrition Examination Surveys Use Case. In *4th U.S. Semantic Technologies Symposium (US2TS)*.
- **Santos, H.**, McCusker, J. P., McGuinness, D.L., 2021. Geospatial Reasoning with Shapefiles for Supporting Policy Decisions. In *4th International Workshop on Geospatial Linked Data @ESWC-21*.
- Falkow, M., **Santos, H.**, McGuinness, D.L. Towards a Domain-Agnostic Computable Policy Tool. In: ESWC 2021 Posters & Demos.
- **Santos, H.**, Gordon, M., Liang, Z., Forbush, G., McGuinness, D.L., 2021. Exploring and Analyzing Machine Commonsense Benchmarks. In: *Commonsense Knowledge Graphs Workshop @AAAI-21.*
- **Santos, H.**, Mulvehill, A., Erickson, J.S., McCusker, J.P., Gordon, M., Xie, O., Stouffer, S., Capraro, G., Pidwerbetsky, A., Burgess, J., Berlinsky, A., Turck, K., Ashdown, J., McGuinness, D.L., 2020. The Dynamic Spectrum Policy Framework in Action. In: *ISWC 2020 Posters, Demos, and Industry Tracks.*
- Pinheiro, P., **Santos, H.**, Liang, Z., Liu, Y., Rashid, S.M., McGuinness, D. L., Bax, M. P., 2018. HADatAc: A Framework for Scientific Data Integration using Ontologies. In *The 17th International Semantic Web Conference, 2018, Monterey, CA*.
- **Santos, H.**, 2017. Enabling Data Analytics from Knowledge Graphs. In *Proceedings of the Doctoral Consortium at the 16th International Semantic Web Conference*, Vienna, Austria.

WORKS UNDER REVIEW

- **Santos, H.**, Shen, K., Mulvehill, A.M., Razeghi, Y., McGuinness, D.L., Kejriwal, M., 2022. A Theoretically Grounded Benchmark for Evaluating Machine Commonsense.
- **Santos, H.**, McCusker, J.P., Erickson, J.S., Mulvehill, A.M., Seneviratne, O., McGuinness, D.L., 2022. Towards Computable and Explainable Policies Using Semantic Web Standards.

Advising

MASTER THESES

- Mitchell Falkow. 2021. Towards a Computable Policy Tool Capable of Leveraging Domain Knowledge in Knowledge Graphs. (Co-advisor).
- Owen Xie. 2021. A Hybrid Approach to Developing Ontology-Driven Applications: A Case Study in Describing Radio Spectrum Usage Policies. (Co-advisor).

UNDERGRAD RESEARCH POSITIONS

- Richard Le. 2021. Semantic Characterization of the National Health and Nutrition Examination Survey. (Technical leader).
- Gregory Saini. 2021. Extracting Commonsense Knowledge Triples from GenericsKB. (Technical leader).
- Gretchen Forbush. 2021. Data analysis and Metrics Calculation of Commonsense Annotation Experiments. (Technical leader).
- Gretchen Forbush. 2020. Integrating Machine Common Sense Benchmarks Using Ontologies. (Technical leader).
- Sharon Lin. 2020. Serializing Radio Spectrum Policies Using Common Logic. (Technical leader).