Sola S. Shirai

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EDUCATION

- **Rensselaer Polytechnic Institute (RPI)** — Troy, NY
  Ph.D. in Computer Science - Advised by Prof. Deborah L. McGuinness : GPA 4.0/4.0 — *Aug. 2019 – Present*
- **Worcester Polytechnic Institute (WPI)** — Worcester, MA
  B.S. with High Distinction in Computer Science, Minor in Data Science: GPA 3.9/4.0 — *Aug. 2015 – May 2019*

RESEARCH INTERESTS

Applying semantic technologies and natural language processing to develop knowledge-driven AI systems.

RESEARCH EXPERIENCE

- **Research Assistant** — Aug. 2019 - Present
  RPI — *Troy, NY*
  - Researcher under IBM-RPI's HEALS (Health Empowerment by Analytics, Learning, and Semantics) project.
  - Lead and collaborator in projects that apply resources such as ontologies, knowledge graphs, and NLP tools to support personal health applications, especially surrounding food and eating habits.

- **Knowledgebase Intern** — May. 2021 - Aug. 2021
  Robert Bosch LLC. — *Remote (Sunnyvale, CA)*
  - Research intern with Bosch's Human-Machine Interaction research group.
  - Proposed and conducted a research project involving flow graph construction and embedding methods applied to procedural instruction text.

RESEARCH PROJECTS

- **Defining and Using "Context" in Knowledge-Driven Systems** — Oct. 2021 - Present
  HEALS Research Project — *Troy, NY*
  - Ongoing project to explore how the concept of "context" is framed and utilized in knowledge graph research.
  - Investigating methods to identify "interesting" and "useful" context information to support explainable AI.

- **Procedural Instruction Modification using Flow Graphs** — May. 2021 - Oct. 2021
  Intern Project with Robert Bosch LLC. — *Remote (Sunnyvale, CA)*
  - Generated flow graphs from cooking recipe text using dependency parsing tools and domain ontologies.
  - Developed strategy to embed flow graphs to support the use case of automatic ingredient substitution.
  - **Publications:** Patent application filed. Research-track paper under submission to ESWC 2022.

- **Framework for Recommendations with Explanations** — Jul. 2020 - Mar. 2021
  HEALS Research Project — *Troy, NY*
  - Developed a lightweight pipeline framework for explainable recommendations using knowledge graphs [1]
  - Supports object-oriented programming workflows using data from RDF data sources and ontology modeling
  - **Publications**: ISWC 2021 Poster&Demo Session, "Healthy Food Recommendation and Explanation Generation using a Semantically-Enabled Framework"

- **Ingredient Substitution using a Knowledge Graph of Food** — Dec. 2019 - Jun. 2020
  HEALS Research Project — *Troy, NY*
  - Devised a heuristic model to identify good ingredient substitutions to empower patients to make healthier meals
  - Utilized a knowledge graph of food and word embeddings to capture explicit and latent semantic information
  - **Publications:** Frontiers in Artificial Intelligence Journal, "Identifying Ingredient Substitutions Using a Knowledge Graph of Food". ISWC 2020 Poster&Demo Session, "Semantics-Driven Ingredient Substitution in the FoodKG"

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[1]FREx github: https://github.com/solashirai/FREx – Additional FREx documentation: https://tetherless-world.github.io/FREx/

- **Presentations:** AI & Food and Nutrition at AMLD EPFL 2021, "Utilizing a Food Knowledge Graph for Healthy Ingredient Substitutions"

Personal Health Knowledge Graphs (PHKG)
HEALS Research Project

Feb. 2020 - Apr. 2020
Troy, NY

- Investigated existing literature and identified key challenges to develop PHKGs.
- Assisted in organizing and presenting at the PHKG workshop at the 2020 Knowledge Graph Conference.
- **Publications:** PHKG Workshop at KGC 2020, "Applying Personal Knowledge Graphs to Health"

Generating Surrogate Facial Images for Crowdsourcing
WPI Undergraduate Capstone Project

Aug. 2018 - Mar. 2019
Worcester, MA

- Developed generative adversarial networks to generate fake facial images that retained facial expressions.
- Utilized surrogate images with crowdsourcing, enabling annotation while preserving the privacy of the original images.
- **Publications:** CV-COPS Workshop at CVPR 2019, "Privacy-Preserving Annotation of Face Images Through Attribute-Preserving Face Synthesis"

ASSISTments Open-Response Automatic Grading
WPI Undergraduate Research Project

May 2018 - Aug. 2018
Worcester, MA

- Applied NLP methods for automatic grading of open-response math questions.
- **Publications:** Contributed to a Poster presented at AIED 2019.

ADDITIONAL EXPERIENCE

DBpedia Hackathon - Knowledge-Graph Shiritori Application
DBpedia Autumn Hackathon Project

Sep. 2020
Troy, NY

- Developed a game of "shiritori" with the goal of making connections between entities and facts.
- Used Diffbot's APIs to parse user input, extract entities and facts, and identify connections [2].

Student Software Engineer - ASSISTments
Student Software Engineer

May 2016 - Nov. 2018
Worcester, MA

- Performed various maintenance and improvements for front-end systems and interaction with student data.
- Contributed to development of ASSISTments SDK for transitioning the system into Java.
- Lead project to develop new user interfaces for teachers to create course content.

Big Data in Denmark's Waste Management Sector
WPI Interdisciplinary Project with Dansk Affaldsforening

Fall 2017
Copenhagen, Denmark

- Assessed big data collection, management, and usage in Denmark's waste management industry.
- Interviewed field experts and traveled to various municipalities to conduct on-site observations.
- Project report: "Preparing for the Use of Big Data in Denmarks Waste Management Sector"

edX Internship
Research Science Institute Summer Internship

Summer 2014
Cambridge, MA

- Developed a course component for edX to enable crowdsourcing of hints for student homework questions.

SKILLS

- **Programming:** Python > Java > C# > Javascript > C/C++

- **Misc. Tech.:** SPARQL, RDF, Ontologies[3], SQL, Git, Docker, Prolog, LaTeX, TensorFlow, Keras

- **Languages:** Native speaker of Japanese and English

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[2] Short demo video available at https://www.youtube.com/watch?v=BtSgWrNE7M8
[3] Example ontology for course recommendation: https://rpi-ontology-engineering.netlify.app/oe2020/course-recommender/ontology