JULIA B. NAKHLEH

jnakhleh@wisc.edu ◇ https://julianakhleh.github.io/

EDUCATION

University of Wisconsin-Madison *September 2021 - present*
Ph.D. in Computer Sciences *(in progress)*

Arizona State University *August 2015 - May 2019*
B.S. in Computer Science, B.A. in Spanish

- GPA: 4.0 / 4.0
- Honors thesis: *Learning Generalized Heuristics using Deep Neural Networks* [pdf] [slides]
- Honors thesis advisor: Dr. Siddharth Srivastava

RESEARCH INTERESTS

Machine learning (ML) theory and statistical foundations, esp. the design of robust, interpretable, and accurate machine learning methods for limited and/or noisy data. I am also interested in causal inference and uncertainty quantification, and their relationships to machine learning.

JOURNAL ARTICLES

[1] **J. B. Nakhleh**, M. G. Fernández-Godino, M. J. Grosskopf, B. M. Wilson, J. Kline and G. Srinivasan, "Exploring Sensitivity of ICF Outputs to Design Parameters in Experiments Using Machine Learning," in *IEEE Transactions on Plasma Science*, vol. 49, no. 7, pp. 2238-2246, July 2021, doi: 10.1109/TPS.2021.3090299.

[2] M. G. Fernández-Godino, M. J. Grosskopf, **J. B. Nakhleh**, B.M. Wilson., J. L. Kline and G. Srinivasan, "Identifying Entangled Physics Relationships through Sparse Matrix Decomposition to Inform Plasma Fusion Design," in *IEEE Transactions on Plasma Science*, vol. 49, no. 8, pp. 2410-2419, Aug. 2021, doi: 10.1109/TPS.2021.3098482.

CONFERENCE PRESENTATIONS

[1] **J. B. Nakhleh**, M. G. Fernández-Godino, M. J. Grosskopf, B. M. Wilson, J. Kline and G. Srinivasan. (2020). "Exploring ICF Experimental Relationships using Machine Learning." Poster session presented at *High Temperature Plasma Diagnostics Conference*. [slides]

[2] **J. B. Nakhleh**, M. G. Fernández-Godino, M. J. Grosskopf, B. M. Wilson, J. Kline and G. Srinivasan. (2020). "ICF Design Analysis using Machine Learning." Lightning talk given at *New York Summit on Data Science*. [slides]

[3] **J. B. Nakhleh**, M. G. Fernández-Godino, M. J. Grosskopf, B. M. Wilson, J. Kline and G. Srinivasan. (2020). "Using Machine Learning to Identify Physical Relationships and Quantify Uncertainties in ICF." Poster session presented at *ASME V&V Verification and Validation Symposium*. [slides]

- Student Presentation Award Winner (2^{nd} place)

RESEARCH EXPERIENCE

Post-baccalaureate researcher, Los Alamos National Laboratory *November 2019 - August 2021*
Applied Computer Science (CCS-7) and Verification & Analysis (XCP-8) groups

- Developed a reinforcement learning (RL) paradigm for learning optimized task mappings on distributed computing architectures.

- Designed and implemented a Variational Autoencoder (VAE)-based model to learn a causal graph from observational data given constraints on relationships between variables.
- Implemented random forest (RF) models to analyze data and quantify uncertainties in inertial confinement fusion (ICF) experiments, and performed sensitivity analyses using feature importance techniques (ALE, MDI, SHAP) to analyze experimental relationships.

Undergraduate researcher, Arizona State University *August 2018 - May 2019*
Autonomous Agents and Intelligent Robots (AAIR) lab

- Designed and trained deep neural networks (DNNs) capable of predicting optimal actions from "generalized" problem states, generating generalized plans capable of solving multiple problem instances.
- Developed code to automatically extract abstract/generalized problem states from concrete/standard states generated by the Fast-Forward (FF) planner.
- Demonstrated that neural networks, provided with only abstract states rather than concrete states, are capable of predicting optimal actions with high accuracy across a variety of planning domains.

Undergraduate researcher, Arizona State University *August 2018 - May 2019*
Virtualized Infrastructures, Systems, and Applications (VISA) lab

- Implemented neural networks that offload intermediate computations onto Field-Programmable Gate Arrays (FPGAs) using TVM, yielding up to 200x speedup on these computations.
- Developed and tested code in TVM to perform optimized matrix multiplications and other neural network computations on CPUs and GPUs, Intel Aria 10 FPGAs, and Android OS smartphones.

Undergraduate researcher, Los Alamos National Laboratory *May 2016 - August 2017*
Information Sciences (CCS-3) group

- Applied neural-based sparse coding algorithms to the analysis of EEG (Electroencephalography) data using the PetaVision neural simulation toolbox.
- Demonstrated that sparse coding is able to identify a dictionary of base waveforms necessary for reconstructing and classifying noisy EEG data, indicating a potential new method of EEG analysis for cognitive research and diagnosis.

TEACHING EXPERIENCE

Teaching assistant for CSE 310 (Data Structures & Algorithms), ASU *Fall 2018*
Teaching assistant for CSE 100 (Intro to C++), ASU *Spring 2018*
Math tutor (calculus I-III, linear algebra, discrete math, statistics), ASU *Fall 2016*

ACADEMIC SERVICE

Reviewer, Review of Scientific Instruments (RSI) Online *2021*

AWARDS & SCHOLARSHIPS

NSF Graduate Research Fellowship Program (GRFP), Honorable Mention *2021*
ASME Student Presentation Award Winner, 2^{nd} place *2020*
Phi Beta Kappa Honor Society *2019*
Fulbright Scholarship (Spain - Study/Research), Semi-Finalist *2019*
Marshall Scholarship, Finalist *2018*
National Merit Scholar *2015 - 2019*
New American University Scholar, Arizona State University *2015 - 2019*

SKILLS

Programming Languages: Python, C, C++, MATLAB, Java, SQL
Machine Learning Toolboxes: TensorFlow, PyTorch, Keras, Scikit-learn
Languages: English (native), Spanish (fluent - C1 DELE diploma), Portuguese (advanced)