Jacob T. Emmerson

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EDUCATION

University of Pittsburgh, Pittsburgh Campus (08/2021 - 05/2024)
School of Computing and Information

- B.Sc. Computer Science; *summa cum laude*
  Major GPA: 3.91/4.00
- Applied Statistics Minor

Graduate Coursework: Foundations of A.I., Advanced Topics in A.I.

EXPERIENCE

Research Assistant, PI: Ryan Shi (07/2024 - Current)
University of Pittsburgh

- Leveraged GPT-4 to identify domain-specific areas for integration of automated systems in non-profits.
- Developed a retrieval-augmented generation framework with Semantic Scholar's API to assist in problem identification and promote deeper idea generation.

Research Assistant, PI: Adriana Kovashka (05/2024 - 08/2024)
University of Pittsburgh

- Investigated attention-level biases of cross-lingual vision-encoders through retrieval differences, entropy, and Jensen–Shannon distance.
- Evaluated the domain adaptability of VLMs (LlaVa, CLIP) through in-context learning.
- Proposed fine-tuning approach leveraging triplet-loss to adjust the cultural/semantic understanding of language models.

Machine Learning Developer (08/2022 - Current)
Signature Diagnostics

- Increased model accuracy 2-5% using Bayesian ensemble approaches for non-invasive prenatal disease classification.
- Developed genetic ratios to create features resistant to batch-effects; enabled efficient searching of related genes.

SKILLS & INTERESTS

Interests: A.I. for social good (AI4SG), natural language processing (NLP), reasoning in vision language models, machine commonsense, equitable and explainable A.I.

Programming Languages: Python (PyTorch, PyG, PyBBN), R, C/C++, Java

Technical Skills: Machine learning, deep learning, large language models, state-space models, neuro-symbolic systems, graph neural networks, data science

PAPERS & PUBLICATIONS

Emmerson, J., & Hinson, C. (2024). *Adjusting transit networks for undeserved communities using evolutionary algorithms* (Unpublished). https://github.com/jacobemmerson/Genetic-Algorithm-ENS

PROJECTS

Genetic Algorithm for Equitable Neighborhood Service (03/2024)
Python
- Encodes localized information (grocery stores, retail stores, distances) obtained from Google Map's API using a multi-layered perceptron.
- Optimizes a weighted transit network using evolutionary algorithms and the encoded states at each bus stop.

Quantum Hadamard Edge Detector (04/2023)
Qiskit
- An edge detection algorithm for image analysis utilizing quantum gates implemented for comparison against classical alternatives; developed and tested remotely using IBM's Quantum Computers.
- https://github.com/jacobemmerson/QHED

Textual Entailment Model for Question Answering (12/2023)
Python
- An RTE-based model for answering multiple-choice questions about a given set of text; trained and evaluated on the publicly available MC500 dataset.
- https://github.com/jacobemmerson/CS1671/tree/main/MCTest

ORGANIZATIONS

Rainbow Alliance, Board Member (11/2021 - 04/2022)

Student Government, Judicial Committee Member (04/2022 - 12/2022)