Shiyu Yuan

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Education

Doctoral study in processing *Stevens Institute of Technology*
Doctoral degree program: Systems Engineering *Aug 2021 - present*
Current GPA:3.934
Courses taken: CS559 Machine Learning: Fundamentals and Applications (A), CS584 Natural Language Processing (A-), CS 583 Deep Learning (A), SYS624 Data Exploration and Informatics (A), SYS626 Applied AI & Machine Learning for Systems and Enterprises (A), SYS611 Simulation and Modeling (A), SYS501 Probability and Statistics for Systems Engineering (A)

Master of Science in Gerontology *University of Southern California*
Master's degree program *Aug 2016 - May 2018*
This is a program focusing on aging-related research, with a particular emphasis on neurodegenerative diseases, including Alzheimer's and Huntington's disease studies.

Research Experience

Multimodal Shared Latent Space Learning and Latent Property Analysis *Aug. 2024 - Present*
Ph.D. Candidate *Hoboken, NJ*

- Multimodal shared latent representation learning through different learning scheme
- Evaluation property of multimodal shared representation

Multimodal Latent Space with EBM Prior and MCMC Inference *Feb. 2024 - Present*
Ph.D. Candidate *Hoboken, NJ*

- Built on our previous work: 'Learning Multimodal Latent Generative Models with an Energy-Based Prior.' In training the EBM, we utilized a variational inferred posterior as a jumpstart and employed Markov Chain Monte Carlo (MCMC) inference with Langevin Dynamics to more closely approximate the true posterior.

Multimodal Latent Generative Models with Energy-Based (EBM) Prior *Aug 2023 - Mar 2024*
Ph.D. Candidate *Hoboken, NJ*

- Used mixture of expert scheme to aggregate shared information among different modalities.
- Proposed expressive prior (energy-based prior) for variational autoencoder (VAE)-based multimodal generative model to better capture the complexity of multimodal data space.
- Conducted extensive experiments in different setting of multimodalities to valid our proposed model.

Text-based Trend Extrapolation (TTE) Analysis *Feb. 2024 - Present*
Ph.D. Candidate *Hoboken, NJ*

- Conduct literature review on previous trend extrapolation techniques applied to both continuous and discrete variables.
- Analyze the advantages and disadvantages of current methods to identify gaps in trend extrapolation using text data.
- Conduct case studies on trend extrapolation techniques across various fields to examine both successful and unsuccessful applications.

- Propose and develop a text-based trend extrapolation (TTE) framework with a focus on generalization and stability.
- Apply the proposed TTE framework to a specific field to validate the method.

Formal Analysis with 5G Communication Protocol using Joint Model (DARPA Sponsored: SSE-MACC Lab) *Jun.2023 - Jul.2023*
Ph.D. Candidate *Hoboken, NJ*

- Undertook a comprehensive research initiative, employing rigorous formal analysis on complex communication protocols, including 5G RRC documents, by leveraging advanced Natural Language Processing techniques.
- Engaged in an intensive study to extract specific identifiers within these communication protocols, contributing to a deeper understanding of their structure and function.
- Developed transformer-based model that jointly trains the latent representation of identifiers and their corresponding relations, promoting a more efficient and nuanced comprehension of the system.

Domain Adaptation and Transfer Learning (SSE-CCSE Lab) *Mar.2023 - May.2023*
Ph.D. Candidate *Hoboken, NJ*

- Conducted research focused on enhancing parameter fine-tuning techniques for domain adaptation in pre-trained language models.
- Studied the transfer behavior of parameters between vanilla pre-trained language models and adapted models.
- Investigated the performance of multi-task fine-tuning in adapted language models.

Information Extraction through Heuristic and Data-driven Approach (SSE-CCSE Lab)
Mar.2022 - Dec.2022
Ph.D. Student *Hoboken, NJ*

- Conducted information extraction, including named entities and semantic roles, from both generic and domain-specific documents.
- Examined the impact of document length on the effectiveness of information extraction tasks.
- Employed both heuristic and data-driven methodologies to identify the optimal solutions for information extraction across various document genres.

Neurodevelopmental Patterns in Preterm Infants' Brains (Laboratory of NeuroImaging (LONI)-USC) *Jul.2018 - Sep.2021*
Research Assistant Intern *Los Angeles, CA*

- Leveraged enhanced MRI signals (T1/T2) to explore the myelination development of the human brain in the early phase.
- Conducted a longitudinal study to understand the impact of the preterm period scale on cognitive development.
- Utilized machine learning methodologies for investigating the developmental trajectory of the human brain in its early stages.
- Developed a comprehensive MRI-based Brain Atlas for preterm infants.
- Actively involved in designing predictive models to identify potential anomalies in preterm infants' brain development.

Research Publications (Google Scholar Link)

Shiyu Yuan, Jiali Cui, Hanao Li, Tian Han **'Learning Multimodal Latent Generative Models with Energy-Based Prior'** **ECCV2024 Oral**

Shiyu Yuan, Carlo Lippizi, Tian Han **'Learning Multimodal Latent Space with EBM Prior and MCMC Inference'** **CVPR2024 workshop: Generative Models for Computer Vision**

Shiyu Yuan, Jingda Yang, Carlo Lipizzi, Ying Wang **'From Ambiguity to Explicitness: Towards Building Trustworthy NLP based Specification Abstraction for Formal Analysis'** **IEEE CloudNet2023**

Shiyu Yuan, Mengting Liu, Sharon Kim, Jingda Yang, Anthony James Barkovich, Duan Xu, Hosung Kim **Cyto/myeloarchitecture of cortical gray matter and superficial white matter in early neurodevelopment: multimodal MRI study in preterm neonates** **Cerebral Cortex (2023)**

Mengting Liu, Minhua Lu, Sharon Y Kim, Hyun Ju Lee, Ben A Duffy, **Shiyu Yuan**, Yaqiong Chai, James H Cole, Xiaotong Wu, Arthur W Toga, Neda Jahanshad, Dawn Gano, Anthony James Barkovich, Duan Xu, Hosung Kim **Brain age predicted using graph convolutional neural network explains neurodevelopmental trajectory in preterm neonates** **European Radiology (2023)**

Shiyu Yuan, Carlo Lipizzi **'Information Extraction in Domain and Generic Documents: Findings from Heuristic-based and Data-driven Approaches'** **IEEE/ACM Transactions on Audio, Speech, and Language Processing (under review 2023)**

Mengting Liu, Claude Lepage, Sharon Kim, Ben Duffy, **Shiyu Yuan**, James H. Cole, W. Toga, Neda Jahanshad, Anthony James Barkovich, Duan Xu, Hosung Kim **Robust Cortical Thickness Morphometry of Neonatal Brain and Systematic Evaluation Using Multi-Site MRI Datasets** **Frontiers in Neuroscience (2021)**

Shiyu Yuan, Jingda Yang, Mengting Liu, Duan Xu, Hosung Kim **Mapping developmental trajectories of the cortex and its adjacent white matter for preterm neonates using DTI** **ISMRM2020**

Mengting Liu, Claude Lepage, Seun Jeon, Trevor Flynn, **Shiyu Yuan**, Justin Kim, Arthur W. Toga, A. James Barkovich, Duan Xu, Alan C. Evans, Hosung Kim **A Skeleton and Deformation Based Model for Neonatal Pial Surface Reconstruction in Preterm Newborns** **IEEE International Symposium on Biomedical Imaging (2019)**

Teaching Assistant Experience

SYS/EM 624 Data Exploration and Informatics *2022 Fall Semester - 2024 Fall Semester*
Teaching Assistant *SSE*

- Assisted professor in developing and delivering course content for SYS/EM 624.
- Conducted weekly tutorial and code explanation, reinforcing key concepts and aiding in the understanding of course material.
- Assisted in grading assignments, tests, and quizzes, providing constructive feedback to students.
- Utilized MOSS (Measure Of Software Similarity) software for efficient detection of code plagiarism in student assignments and exams, ensuring academic integrity and fairness.

Technical Skills

Programming Languages	Python, Matlab
Deep Learning Tools	Pytorch, Jax, Tensorflow, Huggingface
Other Tools	Lucidchart, LaTeX

Language Proficiencies

English	Fluent in academic communication and writing through various mediums, including research papers, reports, presentations, and collaborative discussions.
Chinese	Native

Honors

Provost's Doctoral Fellowships(Stevens)	2021
Overseas study travel scholarship (USC)	2017
Leonard and Sophie Davis Endowed Scholarship (USC)	2016, 2017