Shun Liu

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Education

- **Shanghai University of Finance and Economics (*Project 211*)** *September 2021 - June 2025*
  B.E., Computer Science Shanghai, China
  - **Relevant Coursework**: Machine Learning, Deep Learning, Social Network Analysis (91), Algorithm Design and Analysis (90), Python (90), Linear Algebra, Discrete Mathematics (99), Advanced Mathematics
  - **Research Interests**: Multi-model Learning, Medical Artificial Intelligence, Automated Machine Learning, Interpretable Computer Vision

Research Experiences

- **Self-Supervised Alignment for Abnormality-aware Electrocardiogram Interpretation** *Oct 2024 - Present*
  Outlet: [Ongoing Journal Manuscript] [GitHub]
  Supervisor: Prof. Cynthia Rudin, Dr. Cheng Ding
  - **Overview**. This study proposes a self-supervised EKG alignment method to extract anomalous features from unlabeled data, reconstructing waveforms using a variational autoencoder.
  - **Expected Outcome.** This method leverages self-supervised learning to identify and align anomalous EKG subsequences, effectively capturing structural features in unlabeled data. It also introduces "anomaly interpretation," enabling the generation of interpretable signal representations for specific anomalies.

- **A Versatile Framework for Large-Scale Referring Surgical Image Segmentation** *09/2024 - 11/2024*
  Outlet: CVPR'25 (under review) | ***RA at University at Buffalo (SUNY)]*** [GitHub]
  Supervisor: Prof. David Doermann, Dr. Xuan Gong
  - **Task Definition:** Introduced a text-prompt-based segmentation framework for surgical images under text supervision, composed of various fine-grained attributes, and instruction complexities.
  - **Benchmark Development:** Built a large-scale dataset (66K images, 242K masks, 1M instructions) with fine-grained annotations (e.g., color, size, location) from scratch and construct a holistic categorization over 76 classes to map with anatomical structures.
  - **Generalization:** Showcased strong cross-dataset generalization and open-vocabulary segmentation capabilities over competitive baselines like GroundedSAM.

- **A Large-scale Vision-Language Dataset for Endoscopic Surgery Understanding** *04/2024 - 08/2024*
  Outlet: ICLR'25 (under review) | ***RA at University at Buffalo (SUNY)]*** [GitHub]
  Supervisor: Dr. Xuan Gong
  - **Dataset Creation:** Collected surgery videos from open sources (YouTube, MedTube) and annotated video frames with clinical Q&A data with the largest scales and the professional questions are aligned with endoscopy experts.
  - **Experimental Performance:** Finetuned LLaVA on the new dataset, achieving SOTA performance on biomedical tasks like zero-shot classification and text-image retrieval, such as Kvasir, Hyper-Kvasir, GastroVision, NBI-Inframes.

- **DAG-Driven Protein Sequence Representation and Function Prediction** *Jul 2023 - Dec 2023*
  Outlet: Gold Medal (Top 15/1625 teams) | *Challenge Announcement* [GitHub]
  Solo Team
  - **Overview.** Developed directed acyclic graphs (DAG) for Gene Ontology (GO) to represent biological processes, cellular components, and chemical functions of proteins, uncovering semantic associations.
  - **Proposed Approach.** Mapped DAG subsets to specific protein functions, integrating ProFun, QuickGO, and SPROF codes to enhance GO graph reconstruction over sequence-based methods.

- **Value System and Potential Group-Dependent Bias in LLMs** *10/2023 - 01/2024*
  Outlet: Conference Manuscipt | ***RA at Dartmouth College*** [GitHub]
  Supervisor: Prof. Sorough Vosoughi

- **LLM Stereotyping Biases**. This study explores biases in large language models (LLMs) across five key attributes: fairness, reliability, robustness, privacy, and interpretability, examining how LLMs' attitudes toward different groups are influenced by human values.
- **Qualitative Analysis**. Qualitative experiments on multilingual LLMs test theoretical assumptions about group-dependent values and conduct ablation studies on RLHF, raising promising research questions.

- **A Real-time Yet Memory-Efficient Medical Imagery Detection Model** *09/2023 - 11/2023*
  Outlet: Preprint at arxiv [GitHub]
  Supervisor: Prof. Teok Teik Toe
  - **Real-Time Multi-Object Detector**. Based on the insufficiency of YOLOv8 algorithm in multi-scale target detection, a dynamic adaptive detection head is proposed to solve the variability of object sizes.
  - **Class Imbalance**. Combined with the DFL loss, the phenomenon of uneven-distributed medical images in BCCD dataset is handled, results have proven the effectiveness (mAP@50 above 0.90) and its extensive performances on remote-sensing fields, evaluated by MAR20 benchmark.

PUBLICATIONS

C=CONFERENCE, J=JOURNAL, P=PREPRINT, S=IN SUBMISSION, W=WORKING PAPER

[W.1] Cheng Ding, **Shun Liu**, Cynthia Rudin. **Self-Supervised Subsequence Alignment for Abnormality-aware Electrocardiogram Interpretation**. ***Journal***.

[S.1] **Shun Liu**, Nan Xi, Yang Liu, Tianyu Luan, Chenwei Wu, Yunjie Tian, Xuan Gong, David Doermann. **A Versatile Framework for Referring Segmentation with Large-Scale Surgical Endoscopy Images**. ***CVPR'25***.

[S.2] Xuan Gong, Balu Harshavardan Koduru, Yuanhao Zhai, **Shun Liu**, Nan Xi, Xi Tang, Yuan Zhang, Tenzin Lhakpa, Yunjie Tian, Yuxuan Sun, Tianyu Luan, Ziqing Xue, Junsong Yuan, David Doermann. **EndoAssistant: A Large-scale Vision-Language Dataset for Endoscopic Surgery Understanding from Open-Source Videos**. ***ICLR'25***.

[C.1] Nguyen Minh Thao Phan*, Cong-Tinh Dao*, Chenwei Wu, Jian-Zhe Wang, **Shun Liu**, Jun-En Ding, David Restrepo, Feng Liu, Fang-Ming Hung, Wei-Chih Peng. **MedFuse: Multimodel EHR Data Fusion with Masked Lab-Test Modeling and Large Language Models**. ***CIKM'24 (Short Research Paper Track, accept rate 27%)***.

[S.3] Weicheng Ma, Ethan Gearey, James Quirk, **Shun Liu**, Lili Wang, Soroush Vosoughi. **Exploring Language and Model-Specific Biases in LLM Stereotyping Behaviors**. ***EMNLP'24***.

[P.1] **Shun Liu**, Jianan Zhang, Ruocheng Song, Teik Toe Teoh. **ADA-YOLO: Dynamic Fusion of YOLOv8 and Adaptive Heads for Precise Image Detection and Diagnosis**. Preprint available at arxiv.

[P.2] **Shun Liu**. **Model-Agnostic Interpretation Framework in Machine Learning: A Comparative Study in NBA Statistics**. Preprint available at arxiv.

INDUSTRY EXPERIENCES

- **Cardinal Operations** [globe] *03/2024 - 06/2024*
  Research Intern (Group of Large Language Models Technologies) Shanghai, China
  - **LLM-Driven Forecasting Systems:** Designed a semi-supervised feature engineering pipeline for heterogeneous high-dimensional tabular data with LLMs for forecasting tasks across retail, manufacturing, and energy industries.
  - **Performance Impact:** Achieved best WMAPE scores in time-series forecasting tasks across multiple industrial datasets, including the forecasting over sales, house prices, manufacturing parameters.

- **Zhejiang Lab** [globe] *08/2023 - 01/2024*
  Research Intern (Institute of Artificial Intelligence) Hangzhou, China
  Supervisor: Dr.Hongsheng Wang & Prof. Shengyu Zhang
  - **Academic Writing:** Contributing to the patent and academic drafting, studied the fundamental knowledge of human joint rotation distribution model (exemplar: Kinetic Tree).
  - **Research Training:** Conducted cutting-edge researches on diffusion-guided human mesh recovery and flow-based motion reconstruction within private rehabilitation data sampled from local hospitals.

SKILLS

- **Programming Languages:** Python (Proficient), C++ (Intermediate), MATLAB (Beginner)
- **Tools:** Git, LaTeX (Overleaf), Linux Shell (Bash/Zsh)
- **Languages:** English (IELTS: 6.5/9, Duolingo: 130/160)

Challenges and Awards

- **CAFA 5 Protein Function Prediction** *2023*
  Ranked 15/1625 (Top 0.9%), Gold Medal (Solo) [🌐]
  - Decompose protein structures using graph representation and Gene Ontology (GO) domain knowledge, then make accurate and robust function prediction.
  - Outperformed over 99% of teams in designing GO graph representation for robust protein function prediction.
- **Large Language Models for Science Exams** *2023*
  Ranked 50/2664 (Top 1.9%), Silver Medal [🌐]
  - Finetune small LLMs using RAG techniques to better answer STEM-related queries.
- **Linking Writing Processes to Writing Quality** *2023*
  Ranked 144/1876 (Top 7.6%), Silver Medal [🌐]
  - Model and connect personal typing habits with essay quality assessment.