

# Li S. Yifei

PH.D. STUDENT · UNIVERSITY OF PENNSYLVANIA

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**Domains:** Large Language Model, Multimodal, and Domain Knowledge (e.g. Medicine, Drug)

## Education

### University of Pennsylvania (UPenn)

Ph.D. in Computer and Information Science (Earned M.S.E. in Data Science); Advised by Prof. [Mark Yatskar](#)

Philadelphia, PA, USA

GPA: 3.97/4.0 | 2028\*

### Oklahoma State University (OSU)

B.S. in Computer Science, B.S. in Mathematics, and B.S.B.A. in Management

Stillwater, OK, USA

GPA: 3.8/4.0 | 2019

### Sun Yat-Sen University (SYSU)

B.M. in Management (Notes: International joint-degree program associated with OSU)

Guangzhou, China

GPA: 3.8/4.0 | 2019

## Publications

### PAPERS / MANUSCRIPTS [1]

Conceptor-Aided Debiasing of Large Language Models

Li S. Yifei, Lyle Ungar, João Sedoc

*Empirical Methods in Natural Language Processing (EMNLP)*

URL: <https://arxiv.org/abs/2211.11087>

2023

## Skills

### Coding Languages

Python, Java, MATLAB, R, C++, SQL, JavaScript, HTML/CSS

### Libraries and Tools

PyTorch, Hugging Face, OpenAI, Faiss, Spark, Shell, Git,  $\LaTeX$

### AI Models

GPT family, Llama, CLIP, BERT family, Stable Diffusion, MoCo, YOLO, SOLO, GAN family

## Research Projects

### Knowledge Discovery and Synthesis of Scientific Corpora

UPenn

Advised by Prof. Mark Yatskar and Prof. Jacob Gardner

Sep. 2023 - Present

- Applying LLM to reason and discover the scientific knowledge of large scientific corpora for the downstream tasks (e.g. drug repurposing)...
- Building the pipeline to automatically synthesize knowledge in a way of generating the survey paper given the scientific corpora...

### (Human) Feedback Bottleneck Model on Domain Knowledge

UPenn

Advised by Prof. Mark Yatskar

Sep. 2023 - Present

- Exploring to scale up the human feedback to inject domain knowledge (e.g. medicine) to large language models and calibrate the model reasoning ability via human-in-the-loop; then use bottleneck model to improve the efficiency of this process...

### Conceptor-Aided Debiasing of Large Language Models

UPenn

Advised by Prof. João Sedoc and Prof. Lyle Ungar - [Paper](#)

Jan. 2022 - Jul. 2022

- Use conceptors—a soft projection method—to identify and remove the bias subspace in contextual embeddings in BERT and GPT and reach SOTA performance. Two methods of applying conceptors are proposed: (1) bias subspace projection by post-processing; and (2) a new architecture, conceptor-intervened BERT (CI-BERT), which explicitly incorporates the conceptor projection into all layers during continued training.
- Demonstrate the optimal conceptor pipeline setting w.r.t. corpora, wordlists, and subspaces, the robustness of conceptor debiasing in different LLMs and layers, and the efficiency of intersectional debiasing – brought by conceptor logical NOT, AND, and OR operations.

### Neuro-Symbolic Dual-System on Task-Oriented Dialogue Generation

UPenn

Advised by Prof. Chris Callison-Burch and Dr. Lara Martin (Research Course Project) - [Report](#)

Mar. 2022 - May. 2022

- Adapt novel neuro-symbolic dual-system to improve the consistency and coherence in task-oriented dialog generation.
- Build a user belief state to ground human knowledge and domain-specific constraints, then fine-tune a GPT3 to generate utterance and another GPT3 to verify the consistency with belief states as a symbolic parser, repeat this process until it is consistent then update the belief states.

### Improving Text-to-Image Diffusion Generation via Large Language Models

UPenn

Advised by Prof. Chris Callison-Burch and Prof. Mark Yatskar (Master Thesis) - [Report](#)

Aug. 2022 - May. 2023

- Explore imagine-then-verbalize approach that leverages the imaginative abilities of language models such as GPT to provide additional details and contexts that enhance the persuasiveness of the descriptions; Propose sketch-then-draw method that utilizes the coding capacity of the language model to generate SVG code as a sketch for downstream diffusion generation, leading better numerical consistency.

## Probing CLIP Zero-Shot Ability

UPenn

Advised by Prof. Mark Yatskar (Independent Study)

Jan. 2022 - May. 2022

- Evaluate the zero-shot ability of CLIP on fine-grained datasets e.g. iNaturalist; Try to build a language utility to help users ask the right questions to CLIP: leverages the sentence-BERT to cluster different types of web texts, then compares and ranks their CLIP similarity scores.

## Gender Bias on Visual Self-Supervised Learning

UPenn

Advised by Prof. Mark Yatskar and Prof. Vicente Ordóñez

Aug. 2022 - May. 2023

- Find that self-supervised visual models like MoCo suffer is biased by gender even if pretrained on non-human images due to the implicit confounders; Debias by removing the biased training images by tracing the gradient from finetuning to pretraining via TraIn method.

## Professional Activities

2022-23 **EMNLP**, Reviewer

2022-23 Fa **CIS 5300 Natural Language Processing**, Teaching Assistant (Make assignments; supervise course projects)

UPenn

2022 Sp **CIS 522 Deep Learning**, Teaching Assistant (Lead recitation pods - [notes](#); supervise course projects)

UPenn

2021 Fa **CIS 520 Machine Learning**, Teaching Assistant (Lead recitation pods - [notes](#); supervise course projects)

UPenn

## Awards & Honors

2023 **Outstanding Teaching Award**, Significant contributions as teaching assistant in courses

UPenn

2016-19 **President's Honor Roll**, Maintain Excellent GPA

OSU

2018 **Emeritus Math Faculty Scholarship**, Mathematics Department, 1-2 Student(s) Each Year

OSU

**SST Scholarship**, Computer Science Department

OSU

2016 **Transfer Out-Of-State Achievement**, Top 15% GPA

OSU

## Course Projects

### Two-Stage Summarization with Pre-Trained Transformers

UPenn

Coursework - [GitHub](#), [Report](#)

2021

- Present a two-stage summarization model using pretrained transformers, concatenating an extractive model BERTSumEXT and an abstractive model, GPT2 or BART. By feeding the abstractor the extracted key information, this method can mitigate the disadvantages of both approaches and make the summaries more readable. It also reduces the need to truncate sentences for abstractive model due to the maximum token limit.

### NLP and Text-to-Image Generation for Gameplaying: Steins;Gate

UPenn

Coursework (funny) - [GitHub](#)

2022

- Build an interactive textual game powered by NLP and text-to-image GAN where the storyline would change based on the procedures controlled by the player. Here, the storyline is represented as graph, the interactive texts are generated by GPT3, and the cutscenes are rendered by pixray.

### SOLO and GRU for Hemostatic Plug Segmentation

UPenn

Coursework - [GitHub](#), [Report](#)

2021

- Segment the hemostatic plug instance in 3D biomedical images: modify the SOLO model (Segmenting Objects by Locations) with a customized ResNet50 backbone for binary classification, with an addition of GRU for Feature Pyramid Network output to encode the sequence of images.

### Product Match by Deep Learning in Computer Vision and Natural Language Processing

UPenn

Coursework - [GitHub](#), [Report](#)

2021

- Match the same e-commerce products in 70k test dataset by exploiting their titles (BM25, Doc2Vec, BRET, Faiss) and images (CNN, DNN, VGG19, ResNet152) in 32k training entities with the help of zero-shot learning, triplet loss function, and KNN embedding, reaching 97% accuracy.

### Hotel Cancellation Prediction Using 10+ Machine Learning Approaches

UPenn

Coursework - [GitHub](#), [Report](#)

2020

- Use 10+ machine learning models (e.g. AdaBoost, XGBoost, SVM, and an ensemble method combining tuned neural network, tuned random forest, and decision tree) with SMOTE rebalance technique to predict the hotel booking cancellation, leading to 97.52% accuracy.

### Inverse Reinforcement Learning on Gridworld

UPenn

Coursework - [GitHub](#), [Report](#)

2021

- Compare and explore the reinforcement learning and inverse reinforcement learning models on different gridworld environments.

## Miscellaneous

- Yifei worked in financial and technology consulting positions at several financial and accounting firms when he focused on business, then during his master's at UPenn, he developed a great passion for artificial intelligence and made a significant shift to AI academia :)