

# Yuxin Yao

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## EDUCATION

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### University of Cambridge

PhD in Engineering

Cambridge, UK

September 2023 - Present

- Research about Human Pose Estimation problems.

### University College London

4th-Year MEng Mathematical Computation

London, UK

September 2019 - June 2023

- First Class Honours

## RESEARCH EXPERIENCE

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### Unsupervised Visual Relocalization - Deep Learning

September 2022 - May 2023

University College London

Department of Computer Science

*Supervised By: Dr. Simon Julier*

- Mastered in models of transformation, including SE3 transformation of 3D points cloud. Inferred 3D world points with RGB image, the depth map and extrinsic matrix using pinhole camera model.
- Generated dataset with CARLA. Collected the RGB images, depth images, and camera intrinsic and extrinsic. Inferred the pixel-wise depth map from the depth images, and the relative transformation between collected images.
- Constructed U-Net inferring feature maps and saliency maps of 2D images, extracting important features and masking out moving objects occluding the features.
- Utilized direct image alignment to find the relative transformation between the query image and reference images. Employed the Gauss-Newton method in searching optimized transformations between the feature maps of the query and reference image.

### Human Motion Prediction on Egocentric Dataset 🌀

July 2022 - August 2022

ETH Zurich

Computer Vision and Learning Group

*Supervised By: Dr. Siyu Tang*

- Familiarized and used smpl-x and smpl model. Applied AMASS and Egobody dataset to GAMMA model for a body regressor and marker predictor, which uses conditional VAE with DLow method, and GRU.
- Skilled in 3D body visualization with Open3d, Blender and Mesh Lab.
- Canonicalized the body model according to the first frame in each sequence of motion, ensuring each motion sequence starts with body's pelvis at origin, and body facing to positive y-axis.
- Added extra markers on the hand of body model according to GRAB dataset, enhancing the prediction of hand motions.
- Trained a motion prior of the egocentric dataset EgoBody which recorded the first person perspective video with Holo-lens under social interaction scenario. Predicted the motion for future 8 or 9 frames given the body model of the first 1 or 2 frames.
- Applied roll-out training process with longer motion sequences, improving the stability of motion prior on longer motion generation.
- Reprojected the predicted 3D body model onto the image plane. Found the best-fit latent variable by imposing a loss between ground-truth openpose keypoints and the keypoints of predicted body model, thus finding the best match body pose.

### Semantics Segmentation in Manga Images 🌀

June 2021 - August 2021

University College London

Department of Computer Science

*Supervised by: Dr. Lewis Griffin*

- Implemented a software that allows users to select the words for translation and background infilling on manga with DeepFill v2, Tensorflow, Google OCR and translation API, OpenCV and tkinter.

- Developed semantic segmentation models with Pytorch, recognising the region of words on manga pages through utilising various deep learning models such as U-Net, transformers, etc.
- Created my own dataset including manga and the mask on the words. Resolved overfitting issue caused by the small-sized dataset by image augmentation techniques, for instance applying image distortion.
- Improved performance of model on binary cross entropy with multiple optimization methods, such as adaptive learning rate, batch normalization, etc.

### Multiple Object Tracking - Deep Learning

Tsinghua University

August 2021 - September 2021

School of Vehicle and Mobility

*Supervised By: Dr. Buolin Gao*

- Contributed insightful literature review on SOTA neural network and transformer models such as Center-Net in multiple object tracking.
- Applied ablation experiments in different models to analyse different optimization techniques used in Center-Net models.
- Familiarized with mainstream MOT datasets including MOT2017, KITTI Tracking, nuScenes, etc

### Covid-19 Prediction with Large Scale Dataset

University College London

June 2020 - August 2020

Department of Computer Science

*Supervised By: Dr. Kevin Bryson*

- Predicted Covid-19 test results according to clinical data by utilising a range of machine learning models including random forest, logistic regression, X-boost, etc. Model achieved AUROC 0.83.
- Organised clinical data on thousands of patients efficiently with vectorization, achieving a 90% speed-up data preprocessing.
- Generated new features using polynomial features. Selected the features having the greatest correlation with results using pearson coefficient and  $\chi^2$ .
- Deployed and containerised scripts successfully for testing and submitting using Docker
- Wrote a project report demonstrating the methods used in the model and compared the results with different techniques in the model.
- Won a Machine Learning Challenge hosted by Dream Challenge as a team with Dr.Bryson, and model is included in the paper published by JAMA Network Open.

## PROJECTS

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### Agent Playing Atari Tennis - Reinforcement Learning

August 2021

- Designed an reinforcement learning model that plays Atari game "Tennis" utilizing DDQN algorithm.
- Improved model performance and accelerated the training process with pre-trained Seresnet with no harm to accuracy.

## PUBLICATIONS

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- Yan, Y., Schaffter, T., Bergquist, T., ... **Yao, Y.**,... DREAM Challenge Consortium. (2021). A Continuously Benchmarked and Crowdsourced Challenge for Rapid Development and Evaluation of Models to Predict COVID-19 Diagnosis and Hospitalization. JAMA network open, 4(10), e2124946-e2124946.
- Chen, H., Li, Z., **Yao, Y.** (2022, November). Multi-agent reinforcement learning for fleet management: a survey. In 2nd International Conference on Artificial Intelligence, Automation, and High-Performance Computing (AIAHPC 2022) (Vol. 12348, pp. 611-624). SPIE.

## TECHNICAL SKILLS

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**Languages:** Python, Java, Haskell, MySQL, C

**Developer Skills:** Pytorch, Opencv, Open3D, smplx, Cloud GPUs, Anaconda, Git, Django, Docker, Google OCR and translation APIs.