

# Yunxiang Liu

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Temporary Resident: Canberra, Australia

## EDUCATION

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- **Australian National University** Canberra  
*Master of Machine Learning and Computer Vision (In progress) ; GPA: 6.2/7.0* *Jul 2020 - Now*  
Expected Graduating time: Jul 2023
- **Civil Aviation University of China** Tianjin  
*Bachelor of Engineering - Electronic Information Engineering ; GPA: 3.63/4.00* *Sep 2016 - Jun 2020*

## SKILLS SUMMARY

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- **Language:** Python, C
- **Frameworks:** Pytorch, Jax, MMClassification, Detectron2
- **Platforms:** Linux, Windows

## RESEARCH AND PROJECTS

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- **Matser Research Project (takes 25% overall units)** Ongoing  
*Morphological Characterisation of the Human Knee Joint X-ray Images*
  - **Supervisor:** [Dr. Nicolo Malagutti](#)
  - **Bone Segmentation:** I segmented the lower-limb X-rays to obtain femur and tibia masks and designed a coarse-to-fine model structure based on U-Net, which predicts the lower-resolution mask first. Additionally, I used the point-rend head to resample the pixels with high uncertainty scores and obtain a high-resolution mask.
  - **Signed Distance supervision:** I trained a signed distance function (SDF) that takes the segmentation mask predicted by the model as input and outputs the signed distance between each pixel and its nearest edges.
  - **Post-processing Algorithm:** I propose a post-processing algorithm that adheres to the definition of morphological characterization and extracts the lower limb features of interest, such as the mechanical axes and joint surface tangents of femurs and tibias. Then, I calculate the HKA and PA between these pairs.
  - **Impact (Currently):** The mean squared error of HKA between the algorithm prediction and doctors' record (ground truth) decreases from 1.83 (vanilla U-Net) to 1.32.
- **Summer Research Project - Generalised Novel View Synthesis** Nov 2022 - Apr 2023  
*An research project in cooperation with my PhD in progress roommate*  
A Generalised Novel View Synthesis based on Multi-view stereos.
  - **Novel Feature Interpolation Strategy:** We developed a novel interpolation strategy. Interpolating features with the nearest depth values for every sample point on rays.
  - **Opacities inference:** Get the initial opacities of sample points via Laplacian distribution of TSDF with their nearest depth, and refine them by MLP
  - **Feature Merging:** Only keep the features of the source view with the largest opacity value
- **Computer Vision in Deep Learning Project - HOI Detection ([Code](#))** Jul 2022 - Nov 2022  
*A Human-Object-Interaction (HOI) detector based on Transformer.* *High Distinct Score (90/100)*
  - **Adaptive Queries:** Inspired by GroupViT, we merge the image features (output from the encoder) with the embedding vectors to get priors which is adaptive to input images. And use them to decode the HOI instances.
  - **Multi-Modal Information:** In the decoding stage, we fused the queries with the word vectors which are trained from the collection of all actions in the training dataset. Moreover, we add an additional head that predicts the word vector of each HOI action.
  - **Impact:** The mAP shows some degree of increase on Rare examples (The action rarely happened in the dataset) on HICO-DET dataset.
- **Advanced Computer Vision Project - Lane Detection ([Code](#))** Jul 2022 - Nov 2022  
*Lane detection algorithm based on Bezier curve modeling* *High Distinct Score (82/100)*

- **Large Kernel Enhanced Attention Module:** We Propose a large kernel-enhanced attention module, which takes feature-map from the backbone as input, and combines the large depth-wise convolution kernel (11x11) and a self-attention encoder, enhancing the global information extraction of the model without much computational cost.
- **Random Lane masking:** To avoid over-fitting problems, we propose an augmentation method that masks the images with either horizontal or vertical masks, where the horizontal masks aim at simulating natural wear and vertical masks mimic car occlusion and dashed lines.
- **Impact:** The algorithm achieved very competitive performances on several benchmarks, i.e. No.4 on the LLAMAS test set and No.1 on the CULane and the TuSimple dataset among all curve-based methods.

#### • **Internship Project at SenseTime research - Table recognition Algorithm**

Mar 2022 - Jun 2022

*A table recognition algorithm that parses the table structure*

- **Decoding table structure via Position Vector:** I propose a cell position representation based on a 4-dim Fourier transform, using it to decode the logical position of each cell.
- **Multi-task supervision:** I introduced multi-task supervision. For each cell, classify the discrete locations meanwhile regress the final location by the weight-sum soft-max score of locations. Proposing a cell position representation based on a 4-dim Fourier transform, using it to decode the logical position of each cell.
- **Post-processing Algorithm:** I made improvements to the post-processing algorithm that generates the table lines based on a model prediction by recursive alignment.
- **Impact:** The TEDs score of table recognition increased from 94.26% to 95.82%

### INTERNSHIPS

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#### • **Sensetime Research**

Dec 2021 - Jun 2022

*Algorithm researcher*

- **Duty:** Research for OCR algorithms, specifically for the table detection and recognition algorithms.
- **Main experiences:** Table detection algorithm fine-tune to a few failed examples, Table Recognition Algorithm development.

#### • **Aiwinn**

Jul 2021 - Nov 2021

*Algorithm Engineer of Computer Vision*

- **Main experiences:** Indoor pet detection algorithm based on YoloV5-S, Car branch recognition algorithm.