# Changpeng Yang

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## EDUCATION EXPERIENCES

**Peking University** **Beijing, China**

*Master of Mechanical Engineering, Cell Mechanics Lab* *Sep. 2021 – June 2024 (Expect)*

- **Key Courses:** Machine Learning(A-), Cell Mechanics(B+), Applied Mathematics in Biomedicine(A), Engineering Data Analytics(A), Multi-omics Artificial Intelligence Methods(A+).

**University of Shanghai for Science and Technology** **Shanghai, China**

*Bachelor of Information Management and Information System* *Sep. 2016 – June 2020*

- **Key Courses:** Management Science(94), Production Management(99), Operating System(97), Computer Network(90), Course Design of Database (99), Web-Design Technology(92).

## RESEARCH INTERESTS

- **Computer Vision Algorithms for Cellular Image Analysis:** Creating and refining algorithms to interpret cellular imaging data, aiding in biological research.
- **Multi-Omics Data Analysis with Deep Learning:** Utilizing AI techniques to dissect large-scale biological data from multi-omics reveal complex biological dynamics.
- **Lab Automation and High-Throughput Drug screen:** Merging cutting-edge automation equipment and artificial intelligence tools to enhancing the efficiency and precision of experimental workflows.
- **LLM-Agent Integration for Biological Research:** Combining LLM to develop agent models that integrate the above tools to empower research in the biological field.

## RESEARCH EXPERIENCES

**A High-throughput Drug Screening System Based on Deep Learning. (Patent Pending)**

*Visiting Student, Institute of Biomaterials, Chinese Academy of Science* *Oct. 2022 – Jul. 2023*

**Project1: High-Throughput Drug Screening System Based on Segmentation of Multi-cellular Collagen Gel**

- Validate the efficacy of collagen gel contraction experiments for drug screening compared with MTT assays.
- Explore semantic segmentation algorithms to improve the efficiency of collagen gel segmentation.
- Validate the effectiveness, universality, and flexibility of the entire system in different cell types and drug screenings, including anti-tumor, anti-myocardial fibrosis, and asthma drugs.
- Utilize a 3D printer to fabricate a high-throughput array of collagen gels.

**Project2: High-throughput Drug Screening System with Micro-patterned Agarose Stamp at Cellular Scale.**

*Visiting Student, Institute of Biomaterials, Chinese Academy of Science* *Jul. 2023 – Oct. 2023*

- Explored multi-cellular agarose gel pattern deformation for drug screening for asthma drugs screening.
- Conducted analysis on single-cell agarose gel micro-pattern deformation and validated its effectiveness in drug screening.
- Emphasized the effectiveness through benchmarking with traction microscopy.
- Improve fine-grained algorithms to accurately segment the micro-pattern.

**Multimodal Single-Cell Data Analysis**

*Peking University* *Dec. 2023 – Present*

**Project1: Modality Prediction based on variational auto-encoder**

- Reconstruct Modality: Utilize the model to reconstruct source modality, obtaining an encoder that captures modality-shared information.
- Predict Modality: Using decoder to reconstruct the target modality with the modality-shared information like the central-dogma.

**Project2: Enhancing Modality Match through Yoked Contrastive Pretraining with Feature Disentanglement**

- Acquire Encoders: Employ the same methodology to derive different encoders for various modality.
- Modality Matching: Utilize both pretrained encoders for modality matching, employing the analogous framework of the CLIP.

## INTERNSHIP EXPERIENCES

**4Paradigm** **Beijing, China**

*Large Language Model & Computer Vision Algorithm Intern* *Nov. 2023 – Present*

- Develop an auto assistant to facilitate prompt engineering.
- Analyze raw data characteristics and construct a high-quality corpus with the developed assistant.
- Initially finetune a large language model for a specific domain based on retrieval augmented generation.
- Integrated an LLM agents with a series of object detection algorithms on various senarios.

**4Paradigm** **Beijing, China**

*Computer Vision Algorithm Intern* *Apr. 2022 – Sep. 2022*

**Project1: Image Segmentation Algorithm for Image Tampering Region Recognition.**

- Generate a real-time dynamic tampering dataset for model training, encompassing four forgery methods.
- Through data analysis, it was found that images in real-world scenarios mainly employ the JPEG format then implemented a strategy of random JPEG compression.
- Exploring various backbones and significantly enhances the model's effectiveness.

**Project2: Content Based Image Retrieval**

- Exploring the effectiveness of global retrieval using three lightweight ViT-based backbones.
- Enhancing model performance by incorporating and comparing Curricular face loss and Arcface loss as contrastive training loss functions.
- Implement Image retrieval by contrast learning based on Siamese network.

**Deepwise** **Beijing, China**

*Medical Image Algorithm Intern* *Nov. 2021 – Mar. 2022*

**Cerebral Vertebral Vessel Segmentation**

- 2.5D Segmentation used Unet with Convnext tiny backbone, replaced BatchNorm and ReLU to GroupNorm and GELU.
- Used focal loss, dice loss, boundary loss for loss function.
- Since blood vessels are supposed to be connected, extract small chunks with DFS and remove them.
- Resample and visualize the 3D CT image, projecting it onto a 2D plane using the vessel centerline as a basis for reconstructing curved surfaces.

## HONORS AND AWARDS

**Hongcai Scholarship**, Peking University *Jul. 2022*

**Outstanding Graduate**, University of Shanghai for Science and Technology *Jul. 2020*

**Outstanding Student**, University of Shanghai for Science and Technology *Jul. 2019*

**Outstanding Volunteer**, University of Shanghai for Science and Technology *Jul. 2018*

## EXTRACURRICULAR EXPERIENCES

Enactus Social Enterprise Competition: First Prize in the East China Competition, Third Prize Nationally. *Sep. 2019*

China University Business Elite Challenge: National first place award. *Jun. 2019*

Project manager of You & Me, A Public Benefit Program on Spiritual Accompaniment. *Sep. 2017 –Sep. 2019*

Leader of Summer Volunteer Teaching Team. *Jul. 2018 –Sep. 2018*

## SKILLS AND CERTIFICATIONS

**Skills:** Web Lab Skills, Python, Pytorch/Lightning, Object Detection, Semantic Segmentation, LangChain, OpenCV, C++, Matlab.

**Language:** Chinese(Native), English(IELTS 7.0).

**Interests:** Volunteering, Photography, Cycling.