

# Yuheng Liu

Chengdu, Sichuan Province, China

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## Education

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**Southwest Jiao Tong University and University of Leeds (UK)**

**Chengdu, China**

BSc in Computer Science, Level One (Year Two) **GPA 3.81 / 4.0 (1%)**

Sep 2020 – Jul 2024

- Expected First Class Student
- **Level One (Year Two) Rank:** 1 / 72
- **Semester One GPA of Level Two (Year Three):** 4.0 / 4.0 (1%)
- **Courses:** Web Application Development (100), Programming for Web (100), Introduction to Web Tech (100), Programming Project (99), Introduction to Discrete Mathematics (98), Database, Operating System, Algorithms.

## Research Experience

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**Southwest Jiao Tong University**

**Chengdu, China**

*The Power of Hierarchical Learning on 3D Points Cloud Data Parsing*

– Team Leader

Mar 2022 – Now

- In my capacity as team leader, collaborated with Prof. Chongshou Li from *SWJTU* and Dr. Xinke Li from *NUS* to conduct research on semantic segmentation of 3D point cloud data.
- Mentored two graduate students in conducting research experiments and analyzing resulting statistics.
- Took a leading role in designing and developing experimental content, contributing to theoretical analysis of research, and collaborating with my supervisor to analyze experimental results. Additionally, optimized model network structure and Loss Function for improved performance.

### **Project Profile:**

Proposed and developed a hierarchical learning model for visual segmentation, focusing on a single-label visual dataset and utilizing label hierarchy techniques based on semantic information. Created a technology to address the category imbalance problem in 3D point cloud segmentation.

### **Innovation:**

- Coherence / Consistency Theorems for hierarchical learning.
- End-to-End hierarchical learning for Point Cloud.
- Unsupervised learning generated hierarchy.

### **Research Progress:**

- **Preliminary Preparation:** Formulate mathematical theories related to the research topic using probability theory and Bayesian theory. Employed *tSNE* and *PCA* for dimension reduction and *k-means* clustering to validate the research direction based on output target label semantics and other results from the word embedding model.
- **Experimental progress:** Performed experimental testing using the *ResUNet* network on the *Campus3D* dataset (a large-scale point cloud dataset from Prof. Li Chongshou's previous project) and the *Semantic-Kitti* dataset (a well-known point cloud dataset) at multiple levels.

### **Encountered Difficulties:**

- **Hierarchical label consistency:** The primary challenge in the research process lies in elucidating

the mathematical relationship between multi-level labels.

- **Addressing the challenge of parallel computing with large data sets:** During the experiment, three extensive point cloud data sets were utilized and subsequently processed through parallel calculation, resulting in the successful completion of their analysis.

#### ***Future Endeavors:***

Conduct theoretical testing of the research on more large-scale datasets and prepare a conference paper.

## **Selected Projects**

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### ***Bonfire***

***Chengdu, China***

#### ***Personal Project***

*Nov 2022 – Dec 2022*

- Independently developed Bonfire, an interest-based community platform in a span of two weeks. Incorporated comprehensive features, including community management, posting, commenting, joining, and other relevant functionalities, while ensuring a user-friendly experience.
- Created a web application capable of running on multiple platforms, including mobile, PC, and tablet devices, within a brief timeline.
- Individually oversaw the complete development cycle of *Bonfire*, involving architecture, interface, and database design, as well as front-end and back-end development and deployment.
- **Technical Skills:** Restful, Session, Unit Test, HTML5, CSS3, JQuery, Version Control, Python3, Ajax, Flask
- **URL:** <https://bonfire.bilgin.top>
- **GitHub:** <https://github.com/Yuheng-SWJTU/Bonfire>

### ***Freewheelin' – A video player***

***Chengdu, China***

#### ***Team Project – Team Leader***

*Dec 2022*

- Led an agile development team in designing a desktop video player utilizing Qt framework.
- **Technical Skills:** C++, Qt, Version Control, Agile Development, Git and so on.
- **Soft Skills:** Time Management, Teamwork, Group Presentation, Report Writing
- **Demo Video:** <http://47.243.41.0:8888/down/zsYiscyHaJES>
- **Organization:** <https://github.com/orgs/FreewheelinDev/repositories>

## **Awards**

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- College Special First Prize Scholarship (Full scholarship, and 1%) *2021 – 2022*
- College Comprehensive Third Prize Scholarship *2020 – 2021*
- The 15th China College Student Computer Design Competition (Team Leader) *Jun 2022*  
**National Second Prize**
- The 13th China College Students Service Outsourcing Innovation and Entrepreneurship Competition **National Third Prize** *Mar 2022*

## **Additional Info**

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- **Programming Skills:** Python, PyTorch, C, C++, Java, HTML5/CSS3
- **Technical Skills:** Linux (Ubuntu/CentOS), Unix-like CLIs (Bash/Zsh), LaTeX, Docker
- **Research Interests:** Deep Learning, Computer Vision, Point Cloud, Driverless, Robotics
- **Language:** English (CET-6 A+) and awaiting the release of my IELTS score, all English lessons.