# Junhua Liu

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## Education

- **The Chinese University of Hong Kong, Shenzhen** Shenzhen, China
  *Bachelor of Data Science and Big Data Technology* *Aug. 2020 – May. 2024*
  Anticipated Courses: Machine Learning, Deep Learning, Reinforcement Learning, Numerical Optimization

## Research Interest

- **Network and Multimedia System, Edge Intelligence, 3D Vision, Multimodal, Virtual Reality.**

## Publication

[1] Yili Jin, **Junhua Liu**, Fangxin Wang, "Ebublio: Edge Assisted Multi-user 360-Degree Video Streaming.", accepted as a poster by **IEEE VR 2022**, (CCF-A). **[poster][code]**
[2] **Junhua Liu***, Yili jin*, Fangxin Wang, Shuguang Cui, "Where Are You Looking? A Large-Scale Dataset of Head and Gaze Behavior for 360-Degree Videos and a Pilot Study.", **review by ACMMM**, (CCF-A).
[3] One paper prepared for **IEEE Internet of Things Journal** as **Second Author**, (Q1 journal).

## Manuscripts

[1] **Junhua Liu**, "Refined Recurrent Visual Attention and Reinforced Multimodal System for Vision-Language Navigation." Expansion of course paper on **DDA4230**. **Prepared for NeurIPS 2022.**
[2] **Junhua Liu**, Ruizhi Liao, "Smart Sanitation—Edge Assisted Smart Toilet System and Trash Can." Expansion of project on **GEB2503**. **Prepared for Journal of Smart City and Society.[Project Website]**

## Awards

- Reduced tuition admission scholarship Bowen Scholarship II Undergraduate Research Award

## Research Experience

- **Institute for Interdisciplinary Information Science, Tsinghua University** Online
  *Research Assistant Supervised by Huazhe Xu* *May. 2022 - Sep. 2022*
  - Topic: Compression of 3D reconstruction models in volumetric videos.
  - Try to propose a new volumetric video streaming algorithm, implement the algorithm "Local Implicit Grid Representations", tsdf and sdf for compression of 3D scenes.
  - Try to reduce the bandwidth requirement when transmitting by super-resolution or reconstruction.
  - Try to compress the point cloud data with normal vector by meshing, remeshing, smoothing and simplifying, and implement Possion Sovler.

- **Harvard CAMlab** Online
  *Research Assistant Supervised by Borou Yu.Work with Huazhe Xu,Chengan He,Jiashun Wang* *Mar. 2022 - May. 2022*
  - Topic: Artistic dynamic long-term 3D human motion generation; Preprocessed and adjusted the video content by the rhythm of the background music (AI for music and dance).
  - Processed the abstraction of Dunhuang Dance with Machine Learning and Deep Learning into dance sequences and multimedia visualization/sonifications.
  - Contributed a novel motion capture dataset on traditional Chinese dance as surface shapes, whose data was preprocessed and optimized jointly using deep learning.
  - The achievement will be **exhibited** in August 2022 at Harvard University.

- **Independent Study** Shenzhen, China
  *Supervisor: Baoxiang Wang, SDS, CUHKSZ* *Feb. 2022 - Present*
  - Topic: Asymmetric Actor-Critic Recurrent Visual Attention for Long-term Vision Language Navigation
  - Reduced computation by dynamically changing environment and high resolution of panoramic image.
  - Propose a super-resolution-based neural adaptive video streaming algorithm, which assists in maintaining high-quality video streaming in the unstable network environment.

- Solved problem of overfitting and optimized Recurrent Visual Attention with Asymmetric Actor-Critic.
- Initial topic: Optimization and design of multi-agent reinforcement learning algorithm → Failed because of the hardness of running and converging in the experiment

- **Future Network of Intelligence Institute, CUHKSZ** Shenzhen, China
  *Research Assistant supervised by: Fangxin Wang, SSE, CUHKSZ* *Dec. 2021 - Mar. 2022*
  - Topic: A Large-Scale Dataset of Head and Gaze Behavior for 360-Degree Videos and a pivot study
  - Built Unity project using openXR and openVR to track gaze data when watching different 360° video
  - Implemented automatic taxonomy by saliency map, video quality, ROI dispersion, and camera motion.
  - Contribute a 360° video dataset containing both users' head and gaze behaviors simultaneously, outperforming existing datasets with rich dimensions, large scale, substantial diversity, and high frequency.
  - Analyzed Relevance of Head and Gaze. Proved feasibility of gaze assisted prediction on FOV and caching with evaluation. Proposed a pivot study on User Identification and Psycho-analysis.

- **Future Network of Intelligence Institute, CUHKSZ. Peng Cheng Laboratory** Shenzhen, China
  *Research Assistant supervisored by Fangxin Wang, SSE, CUHKSZ* *Sep. 2021 - Dec. 2021*
  - Implemented **Flocking-based streaming**, a live shared prediction algorithm proposed by NYU.
  - Developed programs on cube-map conversion, frame stitching, object detection(YOLO3), spherical centroid object tracking, bitrate allocation in Different Chunk to assist in prediction.
  - Performed ARIMA time series model and online learning Passive-Aggressive algorithm to combine the prediction from the video content, historical trajectory, and shared FOVs based prediction.
  - Implemented and evaluated baseline: PanoSalNet, Cluster Viewport, NABA as ablation experiments.

- **Shenzhen Institute of Artificial Intelligence and Robotics for Society** Shenzhen, China
  *Research Internship* ***postponed midway because of coronavirus epidemic*** *Jan. 2022 - Feb. 2022*
  - Participated in the implementation of a new dialogue answering system.

## Courses

- Optimization: Optimization I, EE364a(Convex optimization).
- Machine learning: Machine learning [certificate], Deeplearning.ai Specialization [certificate], Andrew NG; Dive into Deep Learning, Mu Li; CS229, Andrew NG, CS224n, Chris Manning, CS231n, Feifei Li; Federated learning, Reinforcement learning, Shusen Li.
- Core courses: CMU15-213, CSAPP; CS144, TCP/IP in Computer Network; Data Structure: Junhui Deng; CS61B, Berkeley, GAMES101, GAMES203.
- Big data: Basic data analysis, Data Mining, CS246, Mining Massive Data Sets.

## Skills & Interests

- Programming Languages: Python, C++, C#, javascript, R, Julia
- Technologies: Overleaf, Markdown, Matlab, Pytorch, Shell, Jupyter, Linux, Git/Github, Vim, Docker
- Languages: Chinese, English
- Interests: Moba/RPG games, Animation, Swimming, Badminton, Baking, Coffee roasting, Travelling

## Research Services & Teaching

- Workshops: Held **LaTeX Workshop** in CUHKSZ: LaTeX applications on report, project and academic writing.
- Teaching: Teaching assistant(Qihang International Education) on DDA2001 and STA2002.

## Community Service & Leadership

- Leadership: Minister of ACG Club; Co-founder of School of Data Science Student Club
- Voluntary service: Official volunteer in Shenzhen city.
  Group Second Prize and Individual Second Prize in "Warm Homecoming Event" 2022 and 2021.