

# Chenshu Liu

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## Short Bio

I want to foster "**patient-centric**" healthcare ecosystems that combine **artificial intelligence** (AI), **human-machine interaction** (HMI), and **wearable technologies** that empower people's health autonomy from the following topics:

- **Descriptive:** Conduct continuous and unobtrusive health status monitoring and interpretation using advanced wearable technologies, telecommunications, and multimodal AI.
- **Empathic:** Develop affective AI systems that can perceive human emotion, provide patient-centric decision support, and dynamically respond to the conscious needs of individuals.
- **Interpretive:** Enhance the reliability of AI-driven decision support systems by mitigating hallucination through integrating domain-specific knowledge graphs (KG) and retrieval-augmented generation (RAG) architectures.

## Education

|           |   |                        |
|-----------|---|------------------------|
| <b>MS</b> | <b>University of California, Los Angeles</b> , Bioengineering   | Sept 2022 – Dec 2023   |
|           | <ul style="list-style-type: none"> <li>• <b>Coursework:</b> Computational Medical Imaging, Signal Processing, Database Management and Security, Knowledge Representation and Inference</li> </ul>   |                        |
| <b>BS</b> | <b>University of California, Los Angeles</b> , Dual major in Statistics and Neuroscience  | Sept 2018 – March 2022 |
|           | <ul style="list-style-type: none"> <li>• <b>Coursework:</b> Linear Models, Data Mining, Optimization, Monte Carlo Methods, Computational Statistics and Consulting, Neuroanatomy, Cell and Systems Neuroscience, Molecular and Developmental Neuroscience, Behavioral and Cognitive Neuroscience, Neurophysiology, Neurophysics</li> <li>• 11 times Dean's Honors list</li> </ul> |                        |

## Publications

(\* denotes corresponding author)

### 2025

Chan Wang, Jiaqi Zhang, **Chenshu Liu**, Michael Raphael Panganiban, Xiaodong Wu, Yiyuan Yang, Yuxin Liu\*. (2025). Hydrogel-actuated microfluidic wearable system for in situ detection of solid-state epidermal macromolecules. *Advanced Materials* (Under Review)

Yuting Cai, Chenguang Zhang, Pengrui Dang, **Chenshu Liu**, Yuxuan Du, Reihaneh Haghniaz, Jiechen Wang, Safoora Khosravi, Bingbing Li, Peyman Servati, Lili Chen, James S Wolffsohn, Ali Khademhosseini, Yangzhi Zhu\*. (2025). All Polymer Therapeutic Smart Contact Lens for Monitoring and Programmable Self-Administration of Intraocular Pressure. *Science Translational Medicine* (Under Revision)

Haolin Fan, **Chenshu Liu**, Neville Elieh Janvisloo, Shijie Bian, Jerry Ying Hsi Fuh, Wen Feng Lu, Bingbing Li\* (2025). MaViLa: Unlocking New Potentials in Smart Manufacturing through Vision Language Models. *Journal of Manufacturing Systems*, doi: <https://doi.org/10.1016/j.jmsy.2025.02.017>

Siying Li, Yi Tang\*, Xiaojun Ning, Yuting Zhao, Yifan Zhang, Siran Lv, **Chenshu Liu**. Flood Risk Prediction for 2030 in the Beijing-Tianjin-Hebei Agglomeration Using Remote Sensing and Explainable Machine Learning. *Data Science and Management*, doi: <https://doi.org/10.1016/j.rsase.2025.101742>

Qingxia Meng, **Chenshu Liu**, Chongwen Liu, Qian Jiao, Shuangshuang Li, Haolin Fan, Songbin Ben\*. A Hydrogel-based Deacidification and Reinforcement Agent for Paper-based Artifact Preservation. *Journal of Cultural Heritage* (Under Review), doi: <https://dx.doi.org/10.2139/ssrn.5236171>

**Chenshu Liu**, Yijing An, Pinyi Yang, Tong Zhou, Wei Cao\*. Signal Integrity Assessment of Smart Textile Sensors under Repeated Laundering Cycles. *The Journal of The Textile Institute* (In Preparation)

Haolin Fan, Xinyu Liu, Zhen Fan, **Chenshu Liu**, Jerry Ying Hsi Fuh, Wen Feng Lu, Bingbing Li\*. MetalMind: A Knowledge Graph-Based Retrieval Framework for Enhanced Human-Machine Interaction in Metal Additive Manufacturing. *npj Advanced Manufacturing*. doi: <https://doi.org/10.1038/s44334-025-00038-9>

**Chenshu Liu**, Haolin Fan, Tong Zhou, Pinyi Yang, Lingdi Zhao, Yiran Wang, Ziyuan Che, Yangzhi Zhu\*, Bingbing Li\*. Decentralizing Healthcare: The Synergy of Electronic Skin and Multidomain AI. *Small* (Under Review)

**Chenshu Liu**, Hyo-Jeong Choi, Chenguang Zhang, Pengrui Dang, Wangjie Chen, Yongju Lee, Bingbing Li, Meyer Dawn, Pete Kollbaum, Hyeok Kim\*, Ali Khademhosseini\*, Yangzhi Zhu\*. OPTMISE: Ocular Platform with Telemetric Mechano-Electro-Chromic Intelligent Sensing Ecosystem. *Nature Biomedical Engineering* (under revision). github: [github.com/OPTMISE](https://github.com/OPTMISE)

Haolin Fan, **Chenshu Liu**, Shijie Bian, Changyu Ma, Xuan Liu, Marshall Doyle, Thomas Lu, Lianyi Chen, Jerry Ying Hsi Fuh, Wen Feng Lu, Bingbing Li\* (2024). New Era Towards Autonomous Additive Manufacturing: A Review of Recent Trends and Future Perspectives. *International Journal of Extreme Manufacturing*, doi: [10.1088/2631-7990/ada8e4](https://doi.org/10.1088/2631-7990/ada8e4)

## 2024

Yiran Wang, **Chenshu Liu**, Yunfan Li, Sanae Amani, Bolei Zhou, Lin Yang\*. Hyper: Hyperparameter Robust Efficient Exploration in Reinforcement Learning. *25th International Conference on Machine Learning (ICML)*. (poster presentation). arxiv: <https://arxiv.org/abs/2412.03767v1>

**Chenshu Liu\***, Songbin Ben\*, Chongwen Liu, Xianchao Li, Qingxia Meng, Yilin Hao, Qian Jiao, Pinyi Yang (2024). Web-based diagnostic platform for microorganism-induced deterioration on paper-based cultural relics with iterative training from human feedback. *Heritage Science*, 12(1), 148, doi: [10.1186/s40494-024-01267-5](https://doi.org/10.1186/s40494-024-01267-5)

Yi Tang\*, **Chenshu Liu**, Xiang Yuan (2024). Recognition of bird species with birdsong records using machine learning methods. *Plos One*, 19(2), e0297988, doi: [10.1371/journal.pone.0297988](https://doi.org/10.1371/journal.pone.0297988)

**Chenshu Liu\***, Songbin Ben\*, Pinyi Yang, Jiayi Gong, Yin He (2024). A practical evaluation of online self-assisted previewing architecture on rain classroom for biochemistry lab courses. *Frontiers Education*, Vol. 9, p. 1326284, doi: [10.3389/educ.2024.1326284](https://doi.org/10.3389/educ.2024.1326284)

## 2023

Qingxia Meng, Xianchao Li, Junqiang Geng, **Chenshu Liu\***, Songbin Ben\* (2023). A biological cleaning agent for removing mold stains from paper artifacts. *Heritage Science*, 11(1), 243, doi: [10.1186/s40494-023-01083-3](https://doi.org/10.1186/s40494-023-01083-3)

**Chenshu Liu\***, Chongwen Liu, Allison Wall (2023). Ai-Assisted Classification of Microorganism Strains on Paper-Based Cultural Relics. *Art Bio Matters Conference (Oral Presentation)*. Presentation abstract: [artbiomatters.org/chenshu-liu](https://artbiomatters.org/chenshu-liu). Presentation recording: [recording](#)

## Experience

**Liu Lab, National University of Singapore**

Visiting Scholar

Singapore, SG  
April 2025 – Present

- Supervised by Prof. [Yuxin Liu](#)
- Developed an Android application enabling full I/O integration with a custom PCB to acquire and process real-time sensor data.
- Uncover mathematical relationship between multimodal biomarkers through symbolic regression, genetic programming, and sparse regression.
- Devise signal processing procedures to clean and analyze dual-channel glucose and lactate recording to reduce effect of motion artifacts and sensor instability.
- Implemented real-time bi-directional prediction algorithm based on Transformer-based variational autoencoder to predict glucose and lactate concentrations.
- Configured PDE for glucose and lactate interaction to enable bio-inspired neural network that bi-directionally predict glucose and lactate in real-time with high fidelity.
- Deployed computer vision algorithms for characterization and functional as-

assessment of wearable devices, such as a microfluidic patch for C-reactive protein detection.

- Assisted in designing wearable PCB device to read biomarker values from specially designed wearable sensors.

### **Terasaki Institute of Biomedical Innovation** [🔗](#)

Research Intern

- Supervised by Prof. [Yangzhi Zhu](#) [🔗](#) and Prof. [Chongming Jiang](#) [🔗](#)
- Configured triboelectric nanogenerator (TENG) -powered colorimetric sensing system in the OPTMISE lens for eyelid pressure measurement.
- Implemented real-time tracking of the colorimetric sensor on the OPTMISE lens and trained multilinear regression model to predict pressure changes according to the RGB values, achieving consistent 80%+ prediction accuracy under different ambient lighting conditions.
- Designed contact lens that delivers endogenous electric field (EF) using TENG to accelerate corneal damage restoration.
- Implemented real-time tracking algorithm for an IOP-based eyelid pressure identification contact lens. Video demo can be accessed via [Youtube](#) [🔗](#)
- Finetuned different BERT models, including BERtrand and ProtTrans, for immunogenicity prediction for short epitope sequences.

Los Angeles, CA  
Dec 2022 – Present

### **CSUN Autonomy Research Center for STEAHM (ARCS)** [🔗](#)

Research Intern

- Supervised by Prof. [Bingbing Li](#) [🔗](#)
- Constructed domain-specific KG and implemented RAG to enable interactive technical support in Additive Manufacturing (AM) processes.
- Designed and validated a novel vision language model (VLM) specifically for manufacturing scenarios. The model consistently outperforms other benchmark models in image captioning, reasoning, and knowledge retrieval accuracy.
- Developed recurrent neural network (RNN)-based models to identify machine states by analyzing energy consumption patterns, achieving over 85% classification accuracy in complex laboratory machine systems.
- Investigated the role of reinforcement learning (RL) in enhancing the efficiency of autonomous AM tasks.

Los Angeles, CA  
Dec 2022 – Feb 2025

### **NSF I-Corps** [🔗](#)

Regional Qualifier, Team Captain

- Supervised by Dr. [Meliha Bulu-Taciroglu](#) [🔗](#).
- Proposed and refined start-up business project, "ConseRxiv", that constructs a knowledge-driven decision support system for cultural heritage conservation practices ([Talk on Youtube](#) [🔗](#)).
- Prototyped the domain-knowledge-enhanced multimodal decision support system for paper-based cultural artifact conservation via Streamlit: [Biodegrade Diagnostics](#) [🔗](#)
- Conducted client interviews and surveys to iterate business models for optimal user outcome and business performance.

Los Angeles, CA  
Oct 2023 - Jan 2024

### **School of Life Sciences, Liaoning University** [🔗](#)

Research Fellow

- Initiated and currently leading a research project on integrating AI and additive manufacturing (AM) for cultural heritage conservation.
- Designed an AI-driven framework to automate artifact diagnosis using computer vision, identifying structural damage and material composition.

Shenyang, LN  
June 2022 - Present

- Led the development of algorithms for region segmentation and optimized path planning in AM processes.
- Formulated customized hydrogel-based conservation materials tailored for artifact restoration and preservation.
- Pioneered a data-driven approach to enhance the precision, efficiency, and scalability of heritage conservation efforts. Addressed traditional limitations in manual artifact restoration through innovative, AI-assisted automation.

#### W.M.Keck Center for Neurophysics, UCLA [↗](#)

Research Assistant

Los Angeles, CA  
Dec 2020 - April 2022

- Supervised by Prof. [Mayank Mehta](#) [↗](#).
- Designed and developed and created virtual reality mazes (8-shape, diamond, hexagon, octagon, pentagon mazes, etc.) for rats.
- Perfected C# parsing code for Unity virtual reality creating to handle the creation of a wider variety of mazes.
- Handled and trained rats to perform tasks in virtual reality environments.

#### Guo's Lab, UCLA [↗](#)

Research Assistant

Los Angeles, CA  
Dec 2019 - June 2020

- Supervised by Prof. [Zhefeng Guo](#) [↗](#)
- Designed DNA primer for mutagenesis and performed sequencing analysis.
- Performed protein purification, Mutagenesis, Inoculation, DNA transformation, Expression, and Electron Paramagnetic Resonance to investigate molecular mechanics for protein aggregation in neurodegenerative diseases.

## Teaching

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**LS 23L** Introduction to Laboratory and Scientific Methodology

UCLA  
2023 Spring, 2023 Fall

- Course Website: [LIFESCI 23L](#) [↗](#)
- Instructing three three-hour lab sessions per week for biology laboratory techniques, including using polyacrylamide gel for protein subunit analysis, agarose gel electrophoresis for DNA segment analysis, bioinformatics for genotyping, epidemiology, physiology, cell biology, etc.

## Technologies

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**Programming Languages:** Python, C++, C#, JavaScript, CSS, HTML, Kotlin

**Machine Learning Packages:** Pytorch, NumPy/SciPy, Ollama, NLTK, Open-CV, Pandas, TensorFlow, Librosa, MediaPipe

**Skills:** Fusion360 CAD Modeling, Onshape CAD Modeling, Arduino, EasyEDA (PCB prototyping), Matlab (physics simulation), Adobe Illustrator (2D graphics design), Android APP Development, Adobe Lightroom, Adobe Dimension (3D modeling), Blender (3D modeling),  $\text{\LaTeX}$ (formatting)