Lei Gao

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Research interests

I'm focusing on Human-Computer Interaction (HCI), especially in creating new interactive systems using advanced methods like Acoustic Levitation. I'm also interested in Haptics, VR/AR/XR systems, and using data-driven methods to develop effective applications.

Work Experience

- **University College London** *2024 - Now*
  Postdoctoral Research Fellow London, UK
  - Funded by Royal Academy of Engineering Chair in Emerging Technologies Grant of Prof. Sriram Subramanian

Education

- **University College London** *2020 - 2024*
  PhD of Computer Science in HCI London, UK
  - Supervisor: Prof. Sriram Subramanian, Associate Prof. Diego Martinez Plasencia
  - Funded by UCL Research Studentship (EU Horizon 2020)
- **Xidian University** *2017 - 2020*
  Master of Engineering in Computer Technology Xi'an, China
  - Supervisor: Prof. Bo Wan
- **Shandong University** *2013 - 2017*
  Bachelor of Engineering in Digital Media Jinan, China

Research experiences

- **Designing and Prototyping Applications Using Acoustophoretic Interfaces (PhD thesis)** *2020 - 2024*

  It addresses both technical challenges of acoustic levitation and provides innovative implementation solutions for multimodal applications in the real-world Human-Computer Interaction.

  Key contributions include:

  - To enhance the stability and robustness of real-world applications, I build **StableLev**, a data-driven pipeline for the detection and amendment of instabilities in multi-point acoustic levitation.
  - Combining with data physicalization, I develop and present **DataLev**, a design framework and building platform that enables mid-air data physicalizations with enriched materiality, multi-modal interactions, and mixed-reality animations.
  - Combining with digital gastronomy, I propose three novel techniques enabled by programming acoustophoretic interface that enables computational food processing and fabrication by precise control food materials.

- **Multi-user interactions in Augmented Reality (Master thesis)** *2019 - 2020*

  - Propose multi-user interaction model in Augmented Reality (AR) and develop a collaborative AR system enabling multimodal interactions, showcasing advancements over conventional collaboration methods.

- **Culture learning in Virtual Reality** *2018 - 2020*

  - Compare the culture learning performance (knowledge, behavior, attitude) in VR and non-VR scenarios through quantitative studies.

- **Code classification for C programming assignments** *2017 - 2019*

  - Design a neural network-based algorithm to detect code similarity and develop a clustering method that categorizes solutions for programming assignments

Full Paper Publications

1. **Lei Gao**, Giorgos Christopoulos, Prateek Mittal, Ryuji Hirayama, and Sriram Subramanian. 2024. StableLev: Data-Driven Stability Enhancement for Multi-Particle Acoustic Levitation. In Proceedings of the CHI Conference on Human Factors in Computing Systems **(CHI'24)**. DOI: https://doi.org/10.1145/3613904.3642286.
2. **Lei Gao**. 2024. Designing and Prototyping Applications Using Acoustophoretic Interfaces. In Extended Abstracts of the 2024 CHI Conference on Human Factors in Computing Systems **(CHI EA'24)**. DOI: https://doi.org/10.1145/3613905.3651135.
3. Giorgos Christopoulos, **Lei Gao**, Diego Martinez Plasencia, Marta Betcke, Ryuji Hirayama, Sriram Subramanian. Temporal acoustic point holography. ACM SIGGRAPH 2024 Conference Papers **(SIGGRAPH'24)** DOI: https://doi.org/10.1145/3641519.3657443.
4. **Lei Gao**, Pourang Irani, Sriram Subramanian, Gowdham Prabhakar, Diego Martinez Plasencia, and Ryuji Hirayama. 2023. DataLev: Mid-air Data Physicalisation Using Acoustic Levitation. In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems **(CHI'23)**. DOI: https://doi.org/10.1145/3544548.3581016.
5. Xianbing Zhao, Yixin Chen, Wanting Li, **Lei Gao**, and Buzhou Tang. "MAG+: An Extended Multimodal Adaptation Gate for Multimodal Sentiment Analysis." In IEEE International Conference on Acoustics, Speech and Signal Processing **(ICASSP 2022)**, pp. 4753-4757. IEEE, 2022. DOI: https://doi.org/10.1109/ICASSP43922.2022.9746536
6. **Lei Gao**, Bo Wan, Gang Liu, Guojun Xie, Jiayang Huang, and Guanglan Meng (2021). Investigating the effectiveness of virtual reality for culture learning. International Journal of Human–Computer Interaction **(IJHCI)** 37.18 (2021): 1771-1781. DOI: https://doi.org/10.1080/10447318.2021.1913858
7. **Lei Gao**, Bo Wan, Cheng Fang, Yangyang Li, and Chen Chen (2019). Automatic Clustering of Different Solutions to Programming Assignments in Computing Education. In Proceedings of the ACM Conference on Global Computing Education **(CompEd '19)**. ACM, New York, NY, USA, 164-170. DOI: https://doi.org/10.1145/3300115.3309515

Short papers, Demos, and Workshops

1. **Lei Gao**, Yutaka Tokuda, Shubhi Bansal, Sriram Subramanian. Computational Gastronomy and Eating with Acoustophoresis. In Companion Publication of the 26th International Conference on Multimodal Interaction **(ICMI'24 Companion)**. DOI: https://doi.org/10.1145/3686215.3686218.
2. **Lei Gao**, Pourang Irani, Sriram Subramanian, Gowdham Prabhakar, Diego Martinez Plasencia, and Ryuji Hirayama. 2023. DataLev: Mid-air Data Physicalisation Using Acoustic Levitation. **(CHI'23 Interactivity demo)**
3. **Lei Gao**. Domain-specific data physicalisations enabled by DataLev (CHI'23 Workshop on physicalisation from Theory to Practice)
4. **Lei Gao**, James Hardwick, Diego Martinez Plasencia, Sriram Subramanian, and Ryuji Hirayama. 2022. DATALEV: Acoustophoretic Data Physicalisation. In Adjunct Proceedings of the 35th Annual ACM Symposium on User Interface Software and Technology **(UIST'22 Demo)**. DOI: https://doi.org/10.1145/3526114.3558638

Invited talks, symposium

- StableLev: Data-Driven Stability Enhancement for Multi-Particle Acoustic Levitation. 2024 South West UK Pre-CHI in Bristol
- StableLev: Data-Driven Stability Enhancement for Multi-Particle Acoustic Levitation. 2024 Cockney Kai in London
- DataLev: Mid-air Data Physicalisation Using Acoustic Levitation. 2023 in Institute of Software, Chinese Academy of Sciences
- Modern Magic Tricks: Mid-air displays using acoustic levitation. 2022 in Xidian University
- 2023 CHI Workshop on physicalisation from Theory to Practice in Hamburg
- 2023 Post-CHI XR summer school in Copenhagen
- 2023 UIST Workshop on XR and AI: AI-Enabled Virtual, Augmented and Mixed Reality in San Francisco

Teaching experiences

- COMP0160 Perception and Interfaces (23-24), University College London
- PSYC0095 Future Interfaces (22-23), University College London
- COMP0113 Virtual Environments (21-22), University College London
- COMP0021 Interaction Design (20-21), University College London

ACADEMIC SERVICES

- Peer reviewer for conferences including CHI 2023, ISS 2023, Chinese CHI 2023, and TEI 2024, as well as journals such as Ultrasonics and the International Journal of Human-Computer Studies.
- Volunteer: ICRA 2023, London