List of Publications

Name: Hudanyun Sheng

Email: hudanyun.sheng@outlook.com

ORCID: 0009-0000-4946-5894

Summary of Research Experience

I have over five years of research experience at the intersection of data science, computer vision, and biological systems, with applications in plant phenotyping, tissue image analysis, and environmental response modeling. My academic foundation lies in physics and systems engineering, and I have developed strong expertise in applying machine learning and image analysis techniques to complex biological datasets.

My master's thesis focused on hyperspectral image classification of switchgrass genotypes. This work inspired my subsequent roles at the Donald Danforth Plant Science Center and later in the pharmaceutical and healthcare domains, where I contributed to projects involving plant image annotation acceleration, nucleus segmentation in histopathology images, and LLM-based compliance systems for drug labeling. I am proficient in Python-based machine learning workflows (NumPy, Pandas, PyTorch, OpenCV), with experience developing reproducible pipelines and working collaboratively in cross-functional scientific teams.

My publication record reflects a strong commitment to open science, reproducibility, and interdisciplinary collaboration. These experiences have shaped my research interests around interpretable machine learning, spatial data modeling, and tools that bridge computation and applied life sciences.

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1. **Rong, R.**, Sheng, H., Jin, K.W., Wu, F., Luo, D., Wen, Z., Tang, C., Yang, D.M., Jia, L., Amgad, M., & Cooper, L.A. (2023). A deep learning approach for histology-based nucleus segmentation and tumor microenvironment characterization. *Modern Pathology*, 36(8), 100196. https://doi.org/10.1016/j.modpat.2023.100196

2. **Panda, K.**, Mohanasundaram, B., Gutierrez, J., McLain, L., Castillo, S.E., **Sheng, H.**, … & Slotkin, R.K. (2023). The plant response to high CO_2 levels is heritable and orchestrated by DNA methylation. *New Phytologist*, 238(6), 2427–2439. https://doi.org/10.1111/nph.19013

3. Yu, G., Zare, A., **Sheng, H.**, Matamala, R., Reyes-Cabrera, J., Fritschi, F.B., & Juenger, T.E. (2020). Root identification in minirhizotron imagery with multiple instance learning.

Machine Vision and Applications, 31, 1–13. https://doi.org/10.1007/s00138-020-01078-7

4. **Sheng, H.**, Gutierrez, J., Schuhl, H., Murphy, K.M., Acosta-Gamboa, L., Gehan, M., & Fahlgren, N. (2023). Increasing the Throughput of Annotation Tasks Across Scales of Plant Phenotyping Experiments. *Authorea Preprints*. https://doi.org/10.22541/au.169028784.63193696/v1

5. **Sheng, H.**, Wang, S., et al. *MTIA: An open-source Python package for systematic multiplexed tissue image analysis*. (In preparation)