Liu He

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EDUCATION

Purdue University (*Ph.D. Candidate in Computer Science*, GPA: **3.94/4.0**)   *06/2019 – est.2024, West Lafayette, IN*
- RA in CGVLab (Computer Graphics and Visualization Lab) since 2019
- Honors: 2024 Purdue *Merit Recognition Award* ($1500, for high-profile research)

University of North Carolina at Chapel Hill (*M.A. in Geography*)   *08/2017 – 05/2019, Chapel Hill, NC*
- RA in Remote Sensing and Ecological Modeling Lab

Wuhan University (*B.E. in Remote Sensing*, GPA: **3.75/4.0**, Top: **2%**)   *09/2013 – 06/2017, Wuhan, P.R.C.*
- Honors: *Microsoft* Scholarship (**1/248**); Best graduation thesis (Top: **1%**)

INTERNSHIP

Multi-modal LLM Agent for 3D World Synthesis   *03/2024 – 06/2024*, Baidu Research, USA
- Proposed vision LLM (**VLLM**) agentic workflow for 3D generation, simulation, and animation given multi-modal prompts.
- Designed **multi-agent reflection** and **collaboration** for complex instructions of 3D Engine tool usage (Blender, etc.).
- Finetuned advanced VLLM agents for video, image, and text understanding and comprehensive evaluation of synthesis.

Diffusion-Based Document Layout Generation   *05/2022 – 08/2022*, Azure Cognitive, Microsoft Research
- Proposed a **diffusion** model (**DM**) with **Transformer** backbone for document layout synthesis.
- Designed extendable model structure for simultaneous generation of layout and text content for multilingual verticals.
- Discovered the user guidance by prompts obtained by pre-trained **CLIP** for controllable generation given real document images.

RESEARCH

Infinite and Scalable Context-Sensitive Layout Synthesis   *06/2023 – 03/2024*, Purdue Univ.
- Established graph-based Masked Autoencoder (**MAE**) of infinite 3D urban layout synthesis given any prompts.
- Unified a canonical graph representation by scalable **Vector Quantization** of arbitrary layouts for context-aware synthesis.
- Released comprehensive 3D city layout dataset for 330+ cities in the North America.

Arbitrary-Shaped Urban Layout Generation   *06/2021 – 05/2023*, Purdue Univ.
- Designed generative Graph Attention Network (**GAT**) to generate realistic 3D building layouts given arbitrary road networks.
- Proposed a generalized canonical geometric representation of layout designs independent to arbitrary-shaped canvas.
- Implemented city-scale urban simulation and social-climate risk prediction for 330+ cities in the North America.

Globalwise Styled-Controlled Building Modeling by Staged GANs   *06/2019 – 05/2021*, Purdue Univ.
- Designed staged **GANs** for large-scale building segmentation with extreme upsampling refinement (**10x**).
- Utilized learned priors as style control to generate footprints with plausible instance-level metric. Beat SOTA by at least **15%**.
- Deployed a cross-platform interactive GUI with **Google Cloud** for crowd-source data collection, processing and distributing.

Multi-Modal Continental Land Cover Segmentation   *08/2017 – 05/2018,* UNC at Chapel Hill
- Accomplished **U-Net**-based segmentation to continental-scale land cover monitoring of entire Southeastern U.S.
- Implemented dense segmentation across prevailing satellite constellations, achieved over **80%** average precision.

Rule-Based Recognition and 3D modeling of Pole-Shaped Objects (Project Leader)   *05/2015 – 06/2017*, Wuhan Univ.
- Implemented multi-modal calibrations of camera, LiDAR, and IMU for mobile **SLAM** system. (Patent No. 201511000640.3)
- Integrated in **Unity** GUI to enable "one-click" **rule-based** 3D reconstruction of urban poles with over 90% accuracy.

HIGHLIGHTED PUBLICATIONS

He, L., & Aliaga, D. (2024). Context-Sensitive City-Scale Urban Layout Generation using Graph Masked Autoencoder. (Under Review)

He, L., & Aliaga, D. (2023). GlobalMapper: Arbitrary-Shaped Urban Layout Generation. In *Proceedings of the IEEE/CVF International Conference on Computer Vision* (pp. 454-464).

He, L., Lu, Y., Corring, J., Florencio, D., Zhang, C. (2023). Diffusion-Based Document Layout Generation. (Oral) *Document Analysis and Recognition - ICDAR 2023. Lecture Notes in Computer Science*, vol 14187. Springer, Cham.

He, L., Shan, J., Aliaga, D.(2023). Generative Building Feature Estimation from Satellite Images. *IEEE Transactions on Geoscience and Remote Sensing.*

Patel, P., Kalyanam, R., **He, L.**, Aliaga, D., & Niyogi, D. (2023). Deep Learning based Urban Morphology for City-scale Environmental Modeling. *PNAS Nexus*, pgad027.

Zhang, X., Ma, W., Varinlioglu, G., Rauh, N., **He, L.**, & Aliaga, D.(2022). Guided pluralistic building contour completion. *The Visual Computer*, 1-12.

Bhatt, M., Kalyanam, R., Nishida, G., **He, L.**, May, C., Niyogi, D., & Aliaga, D. (2020). Design and Deployment of Photo2Building: A Cloud-based Procedural Modeling Tool as a Service. In *Practice and Experience in Advanced Research Computing* (pp. 132-138).

Wang, L., Huang, Y., Shan, J., & **He, L.**(2018).MSNet: Multi-Scale Convolutional Network for Point Cloud Classification. *Remote Sensing*,10(4), 612.

SKILL

Languages: C++ | **Python** | C | JAVA | Matlab | R   **Libraries: Pytorch** | **OpenCV** | **OpenGL** | Qt | Tensorflow | Pthread
Tools & OS: Linux | Git | LLVM | Google Cloud | Unity | Google Earth Engine