

KAIWEN XU

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EDUCATION

Vanderbilt University

September 2019 - (expected 2023 fall or 2024 spring)

Department of Computer Science

Ph.D. in Computer Science

Thesis: Association between Lung Cancer Risks and Phenotypes Identified on Lung Screening CT

Advisor: Professor Bennett A. Landman

Chinese Academy of Sciences

September 2013 - June 2016

Academy of Mathematics and Systems Science

M.Sc. in Computational Mathematics

Thesis: Expertise on Numerical Methods for Hyperbolic Conservation Laws on Unstructured Grids

Advisor: Professor Li Yuan

EMPLOYMENT HISTORY

Research Assistant (Medical Image Analysis)

September 2019 - Present

Department of Computer Science, Vanderbilt University

My research is mainly focused on AI research for automatic interpretation of clinical relevant incidental image data in routine lung cancer screening low-dose CT. Hands-on experiences with various domain-specific computer vision tasks, including 1) image registration, 2) anatomic landmark detection, 3) feature extraction, 4) semantic extension of restricted imaging field-of-view, 5) image segmentation, 6) harmonization between different imaging acquisition settings, as well as statistical modeling considering 1) time-to-event data, 2) longitudinal data, 3) missing data, 4) and competing risks. This research is conducted in collaborations with clinical experts from Vanderbilt University Medical Center. Research results are published or under consideration in highly competitive flagship journals and leading conferences in the field, e.g., Medical Image Analysis, Radiology, MICCAI, SPIE Medical Imaging, and AMIA.

Skills: PyTorch, Python, Docker / Singularity, R, Git / Github, Cloud Computing.

Award: IBM PhD Fellowship.

Algorithm Engineer

July 2016 - July 2019

The Film and Scatterometry Technology (FaST) Division, KLA Corporation

Led the development of a new generation of modeling engine for characterizing the three-dimensional shape of nano-scale structures in leading-edge integrated circuit (IC) design nodes. The algorithm was a key component in the optical critical dimension metrology production series for advanced IC manufacturing yield management. Primary efforts included the design of the software architecture, function implementation, user interface, documentation, performance optimization, training for the application team, and manuscripts for invention disclosure and patent submission.

Skills: C++, C#, Python, Design Pattern, Cloud Computing, 3D Modeling / Visualization.

SKILLS

- Proficient in data processing and visualization using Python (4+ years). Proficient in deep learning application development using PyTorch (3+ years). Hands-on experiences in statistical analysis using R (2+ year).
- Industry experiences of the design, development, and maintenance for large-scale scientific computing software using C++ (6+ years) and C# (3+ years).
- Git / Github, Docker / Singularity, Design Pattern, Cloud Computing, 3D Modeling / Visualization.

PUBLICATIONS

Journal Article

1. **Kaiwen Xu**, Mirza S. Khan, Thomas Z. Li, Riqiang Gao, James G. Terry, Yuankai Huo, Thomas A. Lasko, John Jeffrey Carr, Fabien Maldonado, Bennett A. Landman, Kim L. Sandler. *Fully Automated CT-based Body Composition Assessment in Lung Cancer Screening: An NLST Study*. Submitted to *Radiology*. Nov. 2022 (**In Revision**).
2. Riqiang Gao, Thomas Li, Yucheng Tang, **Kaiwen Xu**, Mirza Khan, Michael Kammer, Sanja L. Antic, Stephen Deppen, Yuankai Huo, Thomas A. Lasko, Kim L. Sandler, Fabien Maldonado, Bennett A. Landman (2022). *Reducing uncertainty in cancer risk estimation for patients with indeterminate pulmonary nodules using an integrated deep learning model*. *Computers in Biology and Medicine*. 150, 106113.
3. Thomas Z. Li, **Kaiwen Xu**, Riqiang Gao, Yucheng Tang, Thomas A. Lasko, Fabien Maldonado, Kim Sandler, Bennett A. Landman (2022). *Time-distance vision transformers in lung cancer diagnosis from longitudinal computed tomography*. arXiv preprint arXiv:2209.01676. Submitted to *European Journal of Radiology*. Nov. 2022.
4. **Kaiwen Xu**, Thomas Li, Mirza S. Khan, Riqiang Gao, Sanja L. Antic, Yuankai Huo, Kim L. Sandler, Fabien Maldonado, Bennett A. Landman (2022). *Body Composition Assessment with Limited Field-of-view Computed Tomography: A Semantic Image Extension Perspective*. arXiv preprint arXiv:2207.06551. Submitted to *Medical Image Analysis*. July 2022 (**In Revision**).
5. Ho Hin Lee, Yucheng Tang, **Kaiwen Xu**, Shunxing Bao, Agnes B. Fogo, Raymond Harris, Mark P. de Caestecker, Mattias Heinrich, Jeffrey M. Spraggins, Yuankai Huo, Bennett A. Landman (2022). *Multi-contrast computed tomography healthy kidney atlas*. *Computers in Biology and Medicine*, 146, 105555.
6. Praitayini Kanakaraj, Karthik Ramadass, Shunxing Bao, Melissa Basford, Laura M. Jones, Ho Hin Lee, **Kaiwen Xu**, Kurt G Schilling, John Jeffrey Carr, James Gregory Terry, Yuankai Huo, Kim Lori Sandler, Allen T. Netwon, Bennett A. Landman (2022). *Workflow Integration of Research AI Tools into a Hospital Radiology Rapid Prototyping Environment*. *Journal of Digital Imaging*, 35(4), 1023–1033.
7. Zhao-Jie Teng, Peng Wang, Xiu-Lan Chen, Richard Guillonneau, Chun-Yang Li, Song-Bao Zou, Jun Gong, **Kai-Wen Xu**, Lin Han, Chao Wang, David J. Scanlan, Yin Chen, Yu-Zhong Zhang. *Acrylate protects a marine bacterium from grazing by a ciliate predator*. *Nature Microbiology*, 6(11), 1351–1356. 2021
8. Riqiang Gao, Yucheng Tang, Mirza S. Khan, **Kaiwen Xu**, Alexis B. Paulson, Shelbi Sullivan, Yuankai Huo, Stephen Deppen, Pierre P. Massion, Kim L. Sandler, Bennett A. Landman. *Cancer Risk Estimation Combining Lung Screening CT with Clinical Data Elements*. *Radiology: Artificial Intelligence*, 3(6), 2021.

- Riqiang Gao, Yucheng Tang, **Kaiwen Xu**, Yuankai Huo, Shunxing Bao, Sanja L Antic, Emily S Epstein, Steve Deppen, Alexis B Paulson, Kim L Sandler, Pierre P Massion, Bennett A Landman. (2020) *Time-distanced gates in long short-term memory networks*. Medical Image Analysis, 101785.

Conference Paper

- Kaiwen Xu**, Mirza S. Khan, Thomas Li, Riqiang Gao, Sanja L. Antic, Yuankai Huo, Kim L. Sandler, Fabien Maldonado, Bennett A. Landman. *Stratification of Lung Cancer Risk with Thoracic Imaging Phenotypes*. Medical Imaging 2023: Image Processing. (Accepted as oral presentation).
- Thomas Z. Li, **Kaiwen Xu**, Riqiang Gao, Yucheng Tang, Thomas A. Lasko, Fabien Maldonado, Kim Sandler, Bennett A. Landman. *Time-distance vision transformers in lung cancer diagnosis from longitudinal computed tomography*. Medical Imaging 2023: Image Processing. (Accepted as oral presentation)
- Chenxi Dong, Thomas Z. Li, **Kaiwen Xu**, Zekun Wang, Fabien Maldonado, Kim Sandler, Bennett A. Landman, and Yuankai Huo. *Characterizing browser-based medical imaging AI with server less edge computing: towards addressing clinical data security constraints*. Medical Imaging 2023: Image Processing. (Accepted as poster).
- Kaiwen Xu**, Riqiang Gao, Yucheng Tang, Steve A. Deppen, Kim L. Sandler, Michael N. Kammer, Sanja L. Antic, Fabien Maldonado, Yuankai Huo, Mirza S. Khan, Bennett A. Landman. *Extending the value of routine lung screening CT with quantitative body composition assessment*. Medical Imaging 2022: Image Processing (p. 54). SPIE. (Oral presentation)
- Khan MS, **Xu K**, Deppen SA, Sandler KL, Landman BA. Image-based Phenotyping for Risk Stratification in the National Lung Screening Trial. In: American Medical Informatics Association 2021 Annual Symposium. Oct 30-Nov 3, 2021. San Diego, CA. (Oral presentation)
- Riqiang Gao, Yucheng Tang, **Kaiwen Xu**, Ho Hin Lee, Steve A. Deppen, Kim L. Sandler, Pierre P. Massion, Thomas A. Lasko, Yuankai Huo, Bennett A. Landman. *Lung Cancer Risk Estimation with Incomplete Data: A Joint Missing Imputation Perspective*. MICCAI 2021. (Oral presentation)
- Riqiang Gao, Yucheng Tang, **Kaiwen Xu**, Michael N. Kammer, Sanja L. Antic, Steve Deppen, Kim L. Sandler, Pierre P. Massion, Yuankai Huo, Bennett A. Landman. *Deep Multi-path Network Integrating Incomplete Biomarker and Chest CT Data for Evaluating Lung Cancer Risk*. SPIE Medical Imaging, 2021 (Oral presentation)
- Kaiwen Xu**, Riqiang Gao, Mirza S. Khan, Shunxing Bao, Yucheng Tang, Steve A. Deppen, Yuankai Huo, Kim L. Sandler, Pierre P. Massion, Mattias P. Heinrich, Bennett A. Landman. *Development and characterization of a chest CT atlas*. SPIE Medical Imaging, 2021. (Oral presentation)
- Ho Hin Lee, Yucheng Tang, **Kaiwen Xu**, Shunxing Bao, Agnes B. Fogo, Raymond Harris, Mark P. de Caestecker, Mattias P. Heinrich, Jeffery M. Spraggins, Yuankai Huo, Bennett A. Landman. *Construction of a Multi-Phase Contrast Computed Tomography Kidney Atlas*, SPIE 2021 Medical Imaging, 2021. (Oral presentation)
- Chang Yu, Yue Liu, Leon Y. Cai, Cailey I. Kerley, **Kaiwen Xu**, Katherine S. Aboud, Warren D. Taylor, Hakmook Kang, Andrea T. Shafer, Lori L. Beason-Held, Susan M. Resnick, Bennett A. Landman, Ilwoo Lyu. *Validation of Group-wise Registration for Surface-based Functional MRI Analysis*. SPIE Medical Imaging, 2021. (Poster)
- Can Luo, James Terry, Yucheng Tang, **Kaiwen Xu**, Pierre Massion, Bennett A. Landman, Jeffrey Carr, Yuankai Huo. *Measure partial liver volumetric variations from paired inspiratory-expiratory chest CT scans*. SPIE Medical Imaging, 2021. (Poster)

Patent

1. Aaron J. Rosenberg, Jonathan Iloreta, Thaddeus G. Dziura, Antonio Gellineau, Yin Xu, **Kaiwen Xu**, John Hench, Abhi Gunde, Andrei Veldman, Liequan Lee, Houssam Chouaib (2020). *Visualization of Three-Dimensional Semiconductor Structures*. US20200393386A1.

Technical Report

1. Riqiang Gao, Mirza S. Khan, Yucheng Tang, **Kaiwen Xu**, Steve Deppen, Yuankai Huo, Kim L. Sandler, Pierre P. Massion, Bennett A. Landman. *Technical Report: Quality Assessment Tool for Machine Learning with Clinical CT*. Technical Report. 2021