

Peixi Xiong

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Summary

A staff AI research scientist/engineer at Intel Labs specializing in visual understanding, multimodal learning, and agentic AI, with published work and applied research in cross-modal generation, retrieval-augmented generation, and privacy-preserving data desensitization for hybrid AI systems.

Research Interests

- **Agentic AI and Privacy-Preserving Systems:** Multi-agent architectures for complex knowledge work, including privacy-preserving hybrid pipelines that sanitize sensitive data before remote LLM inference while retaining task utility.
- **Retrieval-Augmented Generation (RAG):** Context-aware generation enhanced by structured retrieval, with applications to domain-specific documents and multimodal inputs.
- **Multimodal Learning:** Joint modeling of visual and linguistic modalities for tasks such as visual question answering (VQA), cross-modal retrieval, and text-to-image generation.
- **Visual Reasoning and Structured Understanding:** Learning structured representations (e.g., graphs, relational layouts) to support interpretable and logic-driven reasoning over visual inputs.

Education

- Northwestern University**, Ph.D. in Computer Vision Lab – Evanston, IL Sept 2018 – Aug 2022
- Terminal Year Fellowship Recipient
- Northwestern University**, M.S. in Electrical Engineering – Evanston, IL Sept 2016 – Jun 2018
- The University of Manchester**, B.Eng. in Electronic Engineering – Manchester, UK Sept 2013 – Jun 2016

Publications

- [1] *Context Is All You Need: Efficient Retrieval Augmented Generation for Domain Specific AI*, **Peixi Xiong**, Chaunte W. Lacewell, Sameh Gobriel, Nilesh Jain. *ICLR 2025 Workshop*.
- [2] *Textual-Visual Logic Challenge: Understanding and Reasoning in Text-to-Image Generation*, **Peixi Xiong**, Michael Kozuch, Nilesh Jain. *ECCV 2024*.
- [3] *Learning to Ask Denotative and Connotative Questions for Knowledge-based VQA*, Xiaoying Xing, **Peixi Xiong**, Lei Fan, Yunxuan Li, Ying Wu. *EMNLP 2024*.
- [4] *Visual Question Answering by Pattern Matching and Reasoning*, Huayi Zhan, **Peixi Xiong**, Xin Wang, Xin Wang, Lan Yang. *Neurocomputing*.
- [5] *TA-Student VQA: Multi-Agents Training by Self-Questioning*, **Peixi Xiong**, Ying Wu. *CVPR 2020 (Oral Paper)*.
- [6] *Visual Query Answering by Entity-Attribute Graph Matching and Reasoning*, **Peixi Xiong**, Huayi Zhan, Xin Wang, Baivab Sinha, Ying Wu. *CVPR 2019*.
- [7] *Adaptive Attention Model for Lidar Instance Segmentation*, **Peixi Xiong**, Xuetao Hao, Yunming Shao, Jerry Yu. *ISVC 2019 (Springer, Oral Paper)*.
- [8] *FLAR: A Unified Prototype Framework for Few-sample Lifelong Active Recognition*, Lei Fan, **Peixi Xiong**, Wei Wei, Ying Wu. *ICCV 2021*.
- [9] *Towards better driver safety: Empowering personal navigation technologies with road safety awareness*, Runsheng Xu, Shibo Zhang, **Peixi Xiong**, Allen Yilun Lin, Jiaqi Ma. *ITSC 2022*.
- [10] *Dask: Distribution Rehearsing via Adaptive Style Kernel Learning for Exemplar-Free Lifelong Person Re-Identification*, Kunlun Xu, Chenghao Jiang, **Peixi Xiong**, Yuxin Peng, Jiahuan Zhou. *AAAI 2025*.
- [11] *Learning Partonomic 3D Reconstruction from Image Collections*, Xiaoqian Ruan, Pei Yu, Dian Jia, Hyeonjeong Park, **Peixi Xiong**, Wei Tang. *CVPR 2025*.
- [12] *Modeling and Learning Multiple Hypotheses for Monocular 3D Object Detection*, Hyeonjeong Park, **Peixi Xiong**, Pei Yu, Wei Tang. *WACV 2026*.

Work Experience

Staff AI Research Scientist / Engineer, Intel Corporation – Hillsboro, OR Sep 2022 – Present

- Contributed to [Intel® AI Assistant Builder](#), a Hybrid AI platform for rapidly building custom AI assistants and agents grounded in proprietary data, alongside domain-specific AI systems powered by Retrieval-Augmented Generation and Agentic AI.
- Conducted applied research in retrieval-augmented generation and agentic AI for domain-specific applications, with a focus on privacy-preserving data desensitization for hybrid AI systems.
- Developed novel architectures and benchmark datasets for text-to-image generation and visual-language reasoning, addressing challenges in structural alignment and semantic interpretation.
- Contributed to multiple research publications and patents, advancing the state of the art in cross-modal AI systems and efficient foundation model applications.

Research Intern, Samsung Research – Mountain View, CA Jun 2021 – Aug 2021

- Proposed a novel hierarchical-based Transformer for VQA reasoning (MGA-VQA: Multi-Granularity Alignment for Visual Question Answering).
- Developed a decision fusion module to enable more effective collaboration between multiple Transformers.

Research Intern – Computer Vision, Microsoft Corporation – Redmond, WA Jun 2020 – Sep 2020

- Proposed a graph-based architecture to address VQA reasoning tasks (SA-VQA: Structured Alignment of Visual and Semantic Representations for Visual Question Answering).
- Incorporated multi-head attention mechanisms to enhance multimodal alignment.

Research Intern, SAIC Innovation Center – San Jose, CA May 2018 – Sep 2018

- Proposed a novel architecture for LiDAR-based autonomous driving that performs object detection and instance segmentation simultaneously.
- Enhanced the network with an attention mechanism to improve detection of small objects such as pedestrians and cyclists.

Recent Research / Project

Privacy-Preserving Hybrid Pipeline for Agentic AI Evaluation

Problem: Deploying agentic AI systems in regulated domains (e.g., finance and insurance) requires sending task data to remote LLMs, risking exposure of personally identifiable information (PII) embedded in domain documents.

Our Approach: Designed a multi-agent hybrid pipeline with a hardened privacy boundary: local agents extract and sanitize PII via regex, NER, feature embedding before any data reaches remote LLMs, while a deterministic restoration layer recovers original values in final deliverables.

Graph-based Retrieval-Augmented Generation (GraphRAG)

Current Challenges: Existing RAG pipelines struggle to balance retrieval precision and efficiency, especially in biomedical QA where exact terminology and relevance matter. Subgraph construction is sensitive to expansion and pruning heuristics.

Our Approach: Applied selective exact-match enhancement for biomedical terms and fused it conservatively with dense retrieval. Replaced 1-hop expansion with 2-path search and applied query-aware decay scoring to improve relevance and structural coherence.

Structured Alignment for Visual Question Answering (VQA)

Current Challenges: Conventional VQA methods often rely on object-word alignment but overlook underlying structural relations critical for reasoning.

Our Approach: Constructed modality-specific graphs for image and text, aligned them via a sequential encoder, and fused representations through adjacency-aware integration. Achieved strong results on GQA and VQA-v2 without pretraining.

Patents

- [1] *Retrieval-Augmented Generation for Domain-Specific Technical Documents*, US Patent Application No. 19/340,352, Jan 22, 2026. Inventors: **Peixi Xiong**, Chaunte Lacewell, Nilesh Jain, Sameh Gobriel.
- [2] *Multi-Granularity Alignment for Visual Question Answering*, US Patent No. 12210835, Jan 28, 2025. Inventors: **Peixi Xiong**, Yilin Shen, Hongxia Jin.
- [3] *Multi-Modality Reinforcement Learning in Logic-Rich Scene Generation*, US Patent Application No. 19/229,127, Sep 25, 2025. Inventors: **Peixi Xiong**, Nilesh Jain.
- [4] *Network for Structure-Based Text-to-Image Generation*, US Patent Application No. 18/400,561, Jun 6, 2024. Inventors: **Peixi Xiong**, Nilesh Jain.
- [5] *Semantic-Guided Transformer for Object Recognition and Radiance Field-Based Novel View*, US Patent Application No. 18/475,353, Jan 25, 2024. Inventors: **Peixi Xiong**, Nilesh Jain, Ravishankar Iyer, Mrutunjayya Mrutunjayya.

Professional Activities

- **Editorial Advisory Board Member:** Information Processing & Management (*Elsevier* journal)
- **Invited Reviewer:** CVPR, ICCV, ECCV, NeurIPS, ICLR, AACL, WACV, T-PAMI, IJCV, and other top-tier conferences and journals.
- **Invited Speaker:** AIM-2024 and AIM-2025.