

Xinshuo Wang

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Education

Xi'an University of Electronic Science and Technology, Xi'an, China Sept 2023 – Jun 2026

M.Eng, New Generation Electronic Information Technology

- GPA: 85.7/100
- Key Course: Entrepreneurship practice case course, Matrix Theory

Hebei University of Technology, Tianjin, China Sept 2019 – Jun 2023

B.Eng, *Computer Science and Technology*

- GPA: 3.88/4.0
- Key Course: Advanced Mathematics, Discrete Mathematics, Algorithm Design and Analysis, Data Structure

Academic Papers

- Y. Liu, **X. Wang**, X. Gao, J. Han and L. Shao, "Fusion and Adversarial Multimodal Embedding for Compositional Zero-Shot Learning," in Proceedings of the AAAI Conference on Artificial Intelligence. (Under Review)
- Y. Liu, **X. Wang**, X. Gao, J. Han and L. Shao, "Hybrid Discriminative Attribute-Object Embedding Network for Compositional Zero-Shot Learning," in IEEE Transactions on Image Processing. (Under Review)
- Y. Liu, **X. Wang**, X. Gao, J. Han and L. Shao, "Semi-Negative Contrastive Subclass Discriminative Network for Compositional Zero-Shot Learning," in IEEE Transactions on Image Processing. (Major Revision)

Publications

- Y. Liu (advisor), **X. Wang**, X. Gao, J. Han and L. Shao, "Multi-level Contextual Prototype Modulation for Compositional Zero-shot Learning," in *IEEE Transactions on Image Processing*, vol. 34, pp. 4856-4868, 2025, doi: 10.1109/TIP.2025.3592560.
- Y. Liu (advisor), **X. Wang**, X. Gao, J. Han and L. Shao, "Concept-Aware Graph Convolutional Network for Compositional Zero-Shot Learning," in *IEEE Transactions on Neural Networks and Learning Systems*, vol. 36, no. 6, pp. 10394-10406, June 2025, doi: 10.1109/TNNLS.2025.3528885.

Research Experience

Fusion and Adversarial Multimodal Embedding for Compositional Zero-Shot Learning

Principal Investigator | Advisor: *Dr. Liu*

Jan 2025 - Present

- Proposed a novel adversarial learning framework to decouple and recombine visual primitives (attributes and objects) under open-world and closed-world CZSL settings.
- Introduced an adversarial combination loss to enhance compositional reasoning by simulating unrealistic combinations and learning more robust representations.
- Implemented a fixed threshold mechanism to improve model stability across rare and non-canonical compositions, reducing the overfitting risk caused by dynamic decision boundaries.
- Integrated external semantic knowledge from ConceptNet to assess compositional plausibility and filter semantically invalid pairs.

Hybrid Discriminative Attribute-Object Embedding Network for Compositional Zero-Shot Learning

Principal Investigator | Advisor: *Dr. Liu*

Sept 2024 - Present

- Proposed a hybrid visual-semantic embedding framework based on Vision Transformer features and GloVe-initialized attribute/object prototypes to address the generalization gap in unseen compositions.
- Designed a multi-branch architecture with disentangled attribute and object encoders trained end-to-end via contrastive loss, incorporating bias calibration to balance seen/unseen performance.
- Implemented bidirectional image-text retrieval by computing cross-modal similarity between learned image and

attribute-object textual embeddings.

Semi-Negative Contrastive Subclass Discriminative Network for Compositional Zero-Shot Learning

Principal Investigator | Advisor: *Dr. Liu* Aug 2024 - Present

- Designed a semi-negative sampling strategy that adaptively selects informative contrastive pairs to improve subclass-level visual discrimination.
- Developed a subclass-disentangled embedding module that decouples attribute and object semantics using parallel embedding streams and mutual contrastive loss.
- Implemented bidirectional image-text retrieval by computing cross-modal similarity between learned image and attribute-object textual embeddings without using CLIP pretraining.

Multi-level Contextual Prototype Modulation for Compositional Zero-shot Learning

Principal Investigator | Advisor: *Dr. Liu* Mar 2024 - Jun 2025

- Designed a hierarchical transformer network to extract multi-level contextual features, enabling joint modeling of attributes and objects through layered cross-modal attention and token fusion.
- Developed a subclass-aware prototype modulation module that learns discriminative sub-prototypes by partitioning attribute/object concepts into finer-grained clusters, improving intra-class compactness and inter-class separability.
- Introduced a Minority Attribute Enhancement strategy to synthesize virtual samples by mixing underrepresented attribute features across real images, mitigating the long-tail bias in joint label distribution.

Concept-Aware Graph Convolutional Network for Compositional Zero-Shot Learning

Principal Investigator | Advisor: *Dr. Liu* Mar 2023 - Sept 2024

- Developed a concept-aware graph convolutional network (CA-GCN) that integrates attribute and object embeddings into a joint graph structure to model complex compositional interactions for zero-shot learning.
- Designed a feasibility score estimation module computing cosine similarity between image visual features and compositional embeddings to construct a weighted adjacency matrix guiding graph convolutional message passing.
- Introduced Earth Mover’s Distance based regularization on attention maps to constrain concept focus during training and improve generalization to unseen attribute-object pairs.

Honors & Awards

Scholarship for Freshmen	2023
Outstanding Graduate	2023
Third-Class School Scholarship	2023
First-Class School Scholarship	2021 & 2022
Merit Student	2021 & 2022
Encouragement Scholarship	2020 & 2021
Third Prize of National Mathematics Competition	2020
Excellent League Membe	2020

Skills

Languages: Mandarin Chinese (native), English (conversational)

Technologies: Python, MATLAB, Java, Html, Css, JavaScript