Yake WEI/卫雅珂

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EDUCATION

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Renmin University of China

Ph.D Candidate in Artificial Intelligence

Advisor: Prof. Di Hu

Beijing, China Sep. 2021 - Present

Carnegie Mellon University

Visiting Scholar

Advisor: *Prof.* Fernando De la Torre Frade

Pittsburgh, USA

Dec. 2023 - Aug. 2024

University of Electronic Science and Technology of China

B.E. in Computer Science and Technology

Chengdu, China Sep. 2017 - Jun. 2021

SLECTED AWARDS AND SCHOLARSHIPS

- Baidu Scholarship (10 Ph.D students worldwide), 2024.
- China National Scholarship for Ph.D student (highest student honor in China), 2024.
- Outstanding Graduate Award (highest honor for graduates set by Sichuan province), 2021.
- Outstanding Graduate of University of Electronic Science and Technology of China, 2021.

RESEARCH INTERESTS

Interested in the inherent learning mechanism of perceiving, formulating, and understanding the environment with heterogeneous information from multiple modalities, e.g., vision, sound, text.

In the paper presented at CVPR 2022 (ORAL), introduce the research topic of "Balanced Multimodal Learning" for the first time. Highlight a pervasive issue in multimodal learning, where information utilization of certain modality can be undesirably suppressed by others.

Then conduct a series of systematic studies to alleviate this issue, covering empirical observations, algorithms, and theoretical analysis.

Balanced Multimodal Learning Algorithms Observations Theoretical Analysis Modalities has imbalanced Optimization-aware: Alleviate optimization imbalance via Modality Cooperation: Inspired by the on-the-fly gradient modulation (CVPR 22 ORAL) and biconcept of Shapley-value, propose to optimization degree directional modulation (T-PAMI 24); Or considering the evaluate and strengthen the fine-grained (CVPR 22 ORAL) intrinsic limitation within modalities, break the reliance cooperation among modalities at sampleon preferred modality by soft re-learning (ECCV 24). Or level (CVPR 24). Learning imbalance has recover suppressed information acquisition with the sample-level discrepancy guidance of Fisher Information Matrix (CVPR 25). Suppressed information acquisition: (CVPR 24) Utilize Fisher Information Matrix to assess **Data-aware**: Observe fine-grained modality imbalance and recovered the dominated information by Shapley-value based evaluation, and ease such an acquisition process by information-Unimodal information imbalance by targeted re-sample strategy (CVPR 24). sufficient modality (CVPR 25). acquisition has discrepancy Learning objective-aware: Introduce Pareto optimality to (CVPR 25) solve conflicts between unimodal and multimodal Uni-/Multimodal Conflicts: Apply the objectives (ICML 24); Analyze the robustness limitation concept of Pareto optimality to resolve imposed by modality imbalance, and improve Unimodal and multimodal conflicts between unimodal and multimodal robustness by targeted designed learning multimodal objectives, avoiding negative objectives have conflicts impact of unimodal assistance (ICML 24) (ICML 24)

PUBLICATIONS

- [1] Yake Wei, Di Hu, Henghui Du, and Ji-Rong Wen. On-the-fly modulation for balanced multimodal learning. *IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI)*, 2024.
- [2] Yake Wei and Di Hu. Mmpareto: boosting multimodal learning with innocent unimodal assistance. In *International Conference on Machine Learning (ICML)*, 2024.
- [3] Yake Wei, Ruoxuan Feng, Zihe Wang, and Di Hu. Enhancing multimodal cooperation via sample-level modality valuation. In *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2024.
- [4] Yake Wei, Siwei Li, Ruoxuan Feng, and Di Hu. Diagnosing and re-learning for balanced multimodal learning. In *European Conference on Computer Vision (ECCV)*, 2024.
- [5] Xiaokang Peng*, Yake Wei*, Andong Deng, Dong Wang, and Di Hu. Balanced multimodal learning via on-the-fly gradient modulation. In *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022. (* equal contribution, ORAL).
- [6] Chengxiang Huang*, Yake Wei*, Zequn Yang, and Di Hu. Adaptive unimodal regulation for balanced multimodal information acquisition. In *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2025. (* equal contribution).
- [7] Guangyao Li*, Yake Wei*, Yapeng Tian*, Chenliang Xu, Ji-Rong Wen, and Di Hu. Learning to answer questions in dynamic audio-visual scenarios. In *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022. (* equal contribution, ORAL).
- [8] Di Hu, Yake Wei, Rui Qian, Weiyao Lin, Ruihua Song, and Ji-Rong Wen. Class-aware sounding objects localization via audiovisual correspondence. *IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI)*, 2021. (First student author).
- [9] Zequn Yang, Yake Wei, Ce Liang, and Di Hu. Quantifying and enhancing multi-modal robustness with modality preference. In The Twelfth International Conference on Learning Representations (ICLR), 2024.
- [10] Ruotian Peng, Haiying He, Yake Wei, Yandong Wen, and Di Hu. Patch matters: training-free fine-grained image caption enhancement via local perception. In *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2025.
- [11] Zequn Yang, Han Zhang, Yake Wei, Zheng Wang, Feiping Nie, and Di Hu. Geometric-inspired graph-based incomplete multi-view clustering. *Pattern Recognition (PR)*, 2024.

Surveys

- [1] Yake Wei, Di Hu, Yapeng Tian, and Xuelong Li. Learning in audio-visual context: A review, analysis, and new perspective. arXiv preprint arXiv:2208.09579, 2022.
- [2] Qingyang Zhang, Yake Wei, Zongbo Han, Huazhu Fu, Xi Peng, Cheng Deng, Qinghua Hu, Cai Xu, Jie Wen, Di Hu, et al. Multimodal fusion on low-quality data: A comprehensive survey. arXiv preprint arXiv:2404.18947, 2024.

Invited Presentations

- "Balanced Multimodal Learning" Invited talk at Global PhD Gathering, Pujiang AI Conference, 2024.
- "Balanced Multimodal Learning" Invited talk at Virginia Tech, 2024.
- "Balanced Multimodal Learning" Invited talk by *TechBeat*, 2024.
- "Exploration of Audio-visual Scene Understanding and Multimodal Learning Mechanisms" Invited talk at *BAAI Conference*, 2022.

PROFESSIONAL SERVICE

Journal Reviewer:

- IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI)
- IEEE Transactions on Circuits and Systems for Video Technology (T-CSVT)
- \bullet IEEE Transactions on Multimedia (T-MM)

Conference Reviewer:

- IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2022-2025
- IEEE International Conference on Computer Vision (ICCV), 2023
- European Conference on Computer Vision (ECCV), 2022/2024
- The AAAI Conference on Artificial Intelligence (AAAI), 2023-2025