Li Sun

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RESEARCH INTERESTS

Machine learning:	Un-/Self-supervised learning, Multi-modal learning, Diffusion models
Natural language processing:	Large language model, Model robustness

EDUCATION

Boston University　　　　　　　　　　　　　　　　　　　　*Jan 2023 - Aug 2024*
Ph.D. student in Computer Engineering　　　　　　　　　　　　　　Boston, MA
GPA: 4.0/4.0, advisor: Prof. Kayhan Batmanghelich

University of Pittsburgh　　　　　　　　　　　　　　　　　　*Aug 2019 - Dec 2022*
Ph.D. student in Intelligent Systems (Transferred to BU)　　　　　Pittsburgh, PA
M.Sc. in Intelligent Systems (Artificial Intelligence)
GPA: 3.9/4.0, advisor: Prof. Kayhan Batmanghelich

SELECTED PUBLICATIONS

Sun, L., Luisier, F., Batmanghelich, K., Florencio, D., & Zhang, C. (2023). From Characters to Words: Hierarchical Pre-trained Language Model for Open-vocabulary Language Understanding. In *Proceedings of the Annual Meeting of the Association for Computational Linguistics (ACL)*. **Best Papers Honorable Mention**

Robinson, J., **Sun, L.**, Yu, K., Batmanghelich, K., Jegelka, S., & Sra, S. (2021). Can contrastive learning avoid shortcut solutions? In *Advances in Neural Information Processing Systems (NeurIPS)*.

Sun, L.#, Yu, K.#, & Batmanghelich, K. (2021). Context Matters: Graph-based Self-supervised Representation Learning for Medical Images. In *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*.

Xu, Y., **Sun, L.**#, Peng, W., Jia, S., Morrison, K., ... & Batmanghelich, K. (2024). MedSyn: Text-guided Anatomy-aware Synthesis of High-Fidelity 3D CT Images. In *IEEE Transactions on Medical Imaging*.

Saeedi, A., Utsumi, Y., **Sun, L.**, Batmanghelich, K. & Lehman L. (2022). Knowledge Distillation via Constrained Variational Inference. In *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*.

Sun, L., Chen, J., Xu, Y., Gong, M., Yu, K., & Batmanghelich, K. (2022). Hierarchical Amortized GAN for 3D High Resolution Medical Image Synthesis. In *IEEE journal of biomedical and health informatics*

Yu, K.#, **Sun, L.**#, Chen, J., Reynolds, M., Chaudhary, T., & Batmanghelich, K. (2024). DrasCLR: A self-supervised framework of learning disease-related and anatomy-specific representation for 3D lung CT images. Medical Image Analysis, 92, 103062.

WORK EXPERIENCE

Meta　　　　　　　　　　　　　　　　　　　　　　　　　*May 2023 - Sept 2023*
Research Scientist Intern, PyTorch Team　　　　　　　　　　　　New York, NY
- Worked on leveraging large language models for improved visual representation learning.
- Developed a token-level visualization method for explanation of large multi-modal models.
- Studied the robustness and generalizability of visual representation from large multi-modal models.

Microsoft   *June 2022 - Aug 2022*
Research Intern, Microsoft Azure AI   Bellevue, WA
- Designed and implemented a hierarchical language model for open-vocabulary
language understanding
- Experiments demonstrated that our model outperforms baselines, and it is more
robust to textual corruptions and domain shifts
- Manuscript accepted by ACL

Microsoft   *Mar 2019 - Aug 2019*
Research Intern, Microsoft Research Asia (MSRA)   Beijing, China
- Developed fine-grained model that makes use of anatomical structure for chest
radiograph interpretation
- Achieved improved results on thoracic diseases that are subtle and require close observation
- Developed reinforcement learning model for interpretable life support device detection

TECHNICAL SKILLS

Languages: Python, R, Shell, Java, C++
Softwares: PyTorch, Tensorflow

RESEARCH EXPERIENCE

Diffusion Model for 3D Medical Image Synthesis   *Oct 2022 - Sep 2023*
Mentor: Prof. Kayhan Batmanghelich, Boston University
- Built a two-stage denoising diffusion model for generating high-resolution 3D CT
scans, in a memory-efficient way.
- Developed a method for synthesizing images guided by textual prompts and
anatomical components.

Avoiding Shortcut Solutions in Contrastive Learning   *Nov 2020 - May 2021*
Mentor: Prof. Suvrit Sra, MIT & Prof. Kayhan Batmanghelich, University of Pittsburgh
- Analyzed feature suppression in contrastive learning, and explained why feature
suppression can occur when optimizing the InfoNCE loss
- Proposed implicit feature modification, a simple and efficient method that reduces
the tendency to use feature suppressing shortcut solutions and improves generalization
- Highlighted by World Economic Forum and MIT News

Context-aware Self-supervised Learning for Medical Images   *May 2020 - Sept 2020*
Mentor: Prof. Kayhan Batmanghelich, University of Pittsburgh
- Proposed a self-supervised representation learning method for volumetric medical
images that accounts for anatomical context
- Proposed method that provides task-specific explanation for the predicted outcome
- Short version accepted by Medical Imaging meets NeurIPS workshop (Oral), long
version paper accepted by AAAI

Hierarchical Amortized GAN for 3D High Resolution Medical Image Synthesis *Jan 2020 - Nov 2020*
Mentor:Prof. Kayhan Batmanghelich, University of Pittsburgh
- Proposed a novel end-to-end GAN architecture that can generate high-resolution
volumetric images while being memory efficient
- Discovered that moving along certain directions in latent space results in explainable
anatomical variations in generated images
- Paper accepted by IEEE journal of biomedical and health informatics

Brain Tumor Segmentation and Survival Prediction with Deep Learning   *May 2018 - Aug 2018*
Mentor:Prof. Lin Luo, Peking University
- Developed an ensemble model to segment brain tumor from multimodal MRI scans,
and predict patients' overall survival

- Ranked 2nd place and 5th place out of 60+ teams in 2018 MICCAI BraTS challenge on survival prediction task and segmentation task respectively, received prize from Intel AI
- Paper accepted by MICCAI BrainLes 2018 workshop (Spotlight)