

# Li Sun

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## RESEARCH INTERESTS

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

## EDUCATION

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<b>Boston University</b> <i>Ph.D. student in Computer Engineering</i> GPA: 4.0/4.0, advisor: Prof. Kayhan Batmanghelich	<i>Jan 2023 - May 2024 (Expected)</i> Boston, MA
<b>University of Pittsburgh</b> <i>Ph.D. student in Intelligent Systems (Transferred to BU)</i> <i>M.Sc. in Intelligent Systems (Artificial Intelligence)</i> GPA: 3.9/4.0, advisor: Prof. Kayhan Batmanghelich	<i>Aug 2019 - Dec 2022</i> Pittsburgh, PA

## SELECTED PUBLICATIONS

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**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)*.

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*

Xu, Y.#, **Sun, L.#**, Peng, W.#, Visweswaran, S., & Batmanghelich, K. (2023). MedSyn: Text-guided Anatomy-aware Synthesis of High-Fidelity 3D CT Images. Under review in *IEEE Transactions on Medical Imaging*.

## WORK EXPERIENCE

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<b>Meta</b> <i>Research Scientist Intern, manager: Dr. Philip Bontrager</i> <ul style="list-style-type: none"><li>- Worked on leveraging large language models for improved visual representation learning.</li><li>- Developed a token-level visualization method for explanation of large multi-modal models.</li><li>- Studied the robustness and generalizability of visual representation from large multi-modal models.</li></ul>	<i>May 2023 - Sept 2023</i> New York, NY
<b>Microsoft</b> <i>Research Intern, manager: Dr. Dinei Florencio</i> <ul style="list-style-type: none"><li>- Designed and implemented a hierarchical language model for open-vocabulary</li></ul>	<i>June 2022 - Aug 2022</i> Bellevue, WA

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

*Research Intern, manager: Dr. Eric I-Chao Chang*

- 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

*Mar 2019 - Aug 2019*

*Beijing, China*

## TECHNICAL SKILLS

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**Languages:** Python, R, Shell, Java, C++

**Softwares:** PyTorch, Tensorflow

## RESEARCH EXPERIENCE

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### 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)