

# Dewen Zeng

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## Education

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**University of Notre Dame**

*Notre Dame, USA*

*Ph.D. in Computer Science and Engineering*

*August 2019 - March 2025 (Expected)*

**Huazhong University of Science and Technology**

*Wuhan, China*

*M.S. in Electronic Engineering*

*September 2016 - June 2019*

**Huazhong University of Science and Technology**

*Wuhan, China*

*B.S. in Optoelectronic Information Engineering*

*September 2012 - June 2016*

## Research Interest

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**Large Language Model (LLM), Self-supervised Learning, Image Recognition,  
Federated Learning, On-device Learning**

## Experience

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**Pinterest**

*May 2024 - August 2024*

*Data Science Intern*

*Remote, IN*

- Developed an Automatic Prompt Engineering (APE) framework for generating prompts used in data labeling. This framework utilizes an LLM to create initial prompts based on a given training set, gathers feedback and analyzes errors, offers suggestions for prompt improvement, and iteratively generates refined prompts based on these recommendations.
- The APE framework delivers performance comparable to or even superior to human-crafted prompts across various production datasets. It also reduces prompt iteration time from months to just a few hours and cuts labeling costs by 30% by generating concise prompts with fewer tokens.

**Google Brain**

*June 2022 - March 2023*

*Student Researcher*

*Mountain View, CA*

- Developed an LLM framework for allocating varying levels of computation to individual tokens within a large language model during pre-training, resulting in a 25% performance gain in 1-shot learning with minimal additional computational overhead compared to standard GPT.
- Designed a differentiable routing mechanism that enables the selective skipping of certain self-attention and FFN layers, offering precise control over performance and computation.
- Implemented this method in JAX to dynamically gather and scatter non-skipped tokens, resulting in an 18% training speed enhancement on TPUs.

**Allen Institute for Cell Science**

*May 2021 - August 2021*

*Machine Learning Research Intern*

*Seattle, WA*

- Explored various uncertainty estimation methods for nucleus segmentation in 3D cell images.
- Developed a segmentation failure detection system with a 0.9 F1 score based on the patch-based entropy uncertainty to automatically detect and locate potential segmentation failures.

**Boston Children's Hospital**

*October 2020 - May 2021*

*Visiting Scientist*

*Boston, MA*

- Developed a temporal contrastive learning framework to learn representations from unlabeled chest X-rays to improve the performance of lung and heart segmentation models with limited labels.
- Designed a technique to automatically extract lung water information from segmented chest X-rays captured at various time points, facilitating continuous health monitoring.

## *Technical skills*

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|------------------------------------|---|
| <b>Programming Languages/Tools</b> | Python, Java, C/C++, Matlab, Javascript, L <sup>A</sup> T <sub>E</sub> X, Pytorch, Tensorflow, Scikit-Learn, Git, AWS Cloud |
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## *Awards*

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|-------------|---|
| <b>2023</b> | Second prize, Tiny and Fair ML Design Contest at ESWEEK                 |
| <b>2023</b> | CSE Outstanding RA, University of Notre Dame                            |
| <b>2020</b> | Top Winning Award, IEEE SERVICES Hackathon                              |
| <b>2016</b> | Outstanding undergraduate, Qiming College, HUST                         |
| <b>2015</b> | Second prize, National Undergraduate Electronics Design Contest (NUEDC) |

## *Selected publications*

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- **Zeng, D.**, Wu, Y., Hu, X., et al. “Contrastive Learning with Synthetic Positives.” The European Conference on Computer Vision (**ECCV**), 2024.
- **Zeng, D.**, Du, N., Wang, T., et al. “Learning to skip for language modeling.” arXiv, 2023.
- **Zeng, D.**, Wu, Y., Hu, X., et al. “Additional Positive Enables Better Representation Learning for Medical Images.” International Conference on Medical Image Computing and Computer-Assisted Intervention (**MICCAI**), 2023.
- Wu, Y., **Zeng, D.** (equal contribution), Xu, X., et al. “Fairprune: Achieving fairness through pruning for dermatological disease diagnosis.” International Conference on Medical Image Computing and Computer-Assisted Intervention (**MICCAI**), 2022.
- **Zeng, D.**, Wu, Y., Hu, X., et al. “Positional contrastive learning for volumetric medical image segmentation.” International Conference on Medical Image Computing and Computer-Assisted Intervention (**MICCAI**), 2021.
- **Zeng, D.**, Li, M., Ding, Y., et al. “Segmentation with multiple acceptable annotations: A case study of myocardial segmentation in contrast echocardiography.” Information Processing in Medical Imaging: 27th International Conference (**IPMI**), 2021.
- **Zeng, D.**, Kheir, J. N., Zeng, P., et al. “Contrastive learning with temporal correlated medical images: A case study using lung segmentation in chest x-rays.” International Conference On Computer Aided Design (**ICCAD**), 2021.
- **Zeng, D.**, Jiang, W., Wang, T., et al. “Towards cardiac intervention assistance: hardware-aware neural architecture exploration for real-time 3D cardiac cine MRI segmentation” International Conference On Computer Aided Design (**ICCAD**), 2020.
- Wu, Y., Wang, Z., **Zeng, D.**, et al. “Synthetic data can also teach: Synthesizing effective data for unsupervised visual representation learning.” In Proceedings of the **AAAI** Conference on Artificial Intelligence, 2023.
- Wu, Y., **Zeng, D.**, Wang, Z., et al. “Distributed contrastive learning for medical image segmentation.” **Medical Image Analysis**, 2022.
- Hu, X., **Zeng, D.**, Xu, X., et al. “Semi-supervised contrastive learning for label-efficient medical image segmentation.” International Conference on Medical Image Computing and Computer-Assisted Intervention (**MICCAI**), 2021.