Wenxiao Xiong

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Education

Sun Yat-sen University, BS in School of Computer Science 09/2021 - 07/2025
Major: Information and Computing Science, GPA: 3.5/4.0

Courses: Deep Learning 92, Data Structures and Algorithms Laboratory 94, Artificial Intelligence Laboratory 93

Publications

AI-Driven Learning and Regeneration of Analog Circuit Designs from Academic Papers (Revision Submitted)

FrGNet: A Fourier-Guided Weakly-Supervised Framework for Nuclei Instance Segmentation (Submitted)

Machine Learning Based Dynamic Optimization Framework for Analog Circuit Sizing (Under Revision)

Understanding Positive Customer Engagement: The Impact of Cognition and Emotion on Behavior (Revision Submitted)

Experiences

AI-Driven Learning and Regeneration of Analog Circuit Designs, SYSU (Preprint available)
Supervisor: Prof. Xiangyu Meng 08/2023 - 08/2024

Overview:

Developed an AI-based framework for learning and regenerating analog circuits from academic literature.

Framework Components:

· Circuit Extractor: Utilized deep learning (Faster R-CNN) for object detection to extract devices, textual descriptions, and interconnections.

· Table Extractor: Extracted parameters from image-based and text-based tables using OCR and advanced table extraction methods (Tabula, Camelot).

· Text Extractor: Applied Optical Character Recognition (OCR) and LLM-based extraction for supplementary information from the text.

· Simulation Executor: Employed Bayesian optimization to conduct simulations and optimize circuit performance.

Key Achievements:

· Achieved an average accuracy of 97% in target detection within the circuit extractor module.

· Developed an automated process for extracting multimodal circuit design information, contributing to the generation of a dataset for AI-generated circuits (AIGC).

· Improved the efficiency and accuracy of analog circuit simulation through optimization techniques, resulting in enhanced performance metrics such as phase margin, bandwidth, and unit gain frequency, while maintaining minimal discrepancies in power consumption and gain.

FrGNet: A Fourier-Guided Weakly-Supervised Framework for Nuclei Instance Segmentation, SYSU
With: Dr. Peng Ling 01/2024 - 09/2024

Overview: Proposed a weakly-supervised deep learning framework for nuclei instance segmentation in histopathologic images, focusing on improving accuracy while reducing the need for extensive manual annotations.

Framework Components:

· Fourier Guidance Module (FG): Utilized Fourier transform to generate guidance masks that provide a priori information about nuclear locations, effectively aiding the segmentation task under both fully-supervised and weakly-supervised settings.

· Guide-based Instance Level Contrastive (GILC) Module: Designed an instance-level contrastive learning module to enhance the feature representation of nuclei, improving the model's ability to distinguish between different instances.

· Feature Extraction Module: Extracted multi-level features from pathology images to better capture details at different scales, which were further processed through the FG and GILC modules.

Key Achievements:

· Developed a novel framework that outperformed current state-of-the-art methods in both fully-supervised and weakly-supervised experiments on public datasets, achieving superior segmentation performance.

· Demonstrated the framework's ability to generalize effectively on a private dataset without any annotations, showing strong performance even without pre-training.

· Reduced the requirement for fully-annotated training data by introducing Fourier-based guidance, enabling the model to maintain high accuracy with minimal labeled data.

Trustworthy Multi-Modal Benchmark for Medical Large Vision Language Models (Med-LVLMs), PSU

Supervisor: Prof. Suhang Wang 06/2024 - Present

Overview:

Developing a new benchmark for evaluating the trustworthiness of Medical Large Vision Language Models (Med-LVLMs). The benchmark addresses various dimensions of model trustworthiness, such as trustfulness, safety, robustness, fairness, and privacy, aiming to provide a comprehensive evaluation framework that is more advanced than existing benchmarks.

Benchmark Components:

· Trustfulness: Designing tasks to evaluate the model's ability to provide accurate and reliable information, especially focusing on mitigating misleading inputs and errors due to inherent deficiencies.

· Safety: Evaluating the model's resistance to jailbreaking and the generation of toxic or inappropriate responses. Specific tasks are designed to test overcautiousness, toxicity, and adherence to medical guidelines.

· Robustness: Investigating the model's performance in out-of-distribution (OOD) scenarios, including handling low-quality images, ambiguous data, and adversarial attacks.

· Fairness: Assessing performance variations across different demographic groups and ensuring the model provides equitable medical recommendations without bias.

· Privacy: Ensuring that the model can detect and manage private information in medical contexts appropriately, with tasks designed to evaluate privacy leakage risks and protection measures.

Key Achievements:

· Implemented several attack and defense methods to evaluate model robustness and developed evaluation tasks to ensure reliable responses in clinical scenarios.

· Curated datasets and constructed diverse tasks to comprehensively evaluate the models' trustworthiness across multiple modalities and dimensions.

· Enhanced collaboration within the team to ensure the integration of evaluation metrics and datasets, facilitating a standardized and rigorous assessment of Med-LVLMs.

Large Language Models for SVG Flowchart Generation, UVa

Supervisor: Prof. Sheng Li 07/2024 - Present

Overview:

The project aims to develop a framework for generating SVG flowcharts from textual descriptions using Large Language Models (LLMs). These flowcharts represent model frameworks or workflows, similar to those used in academic papers, and require the generation of complex, editable SVG code that accurately conveys the structure and sequence of processes.

Framework Components:

· Text-to-Flowchart Generation: Leveraging LLMs to convert abstract text descriptions into structured flowcharts in SVG format. The focus is on accurately capturing workflow steps, relationships, and dependencies.

· Data Collection and Preparation: Collecting datasets by extracting flowchart diagrams from academic papers and converting them into SVG format. This includes generating detailed annotations for each flowchart element to train LLMs for accurate flowchart generation.

· Annotation Generation: Using models such as LLaVA and GPT-4 to generate detailed annotations for flowchart elements, which serve as an intermediate step in converting textual descriptions into visual flowchart representations.

· Baseline Models and Evaluation Metrics: Establishing baselines like Stable Diffusion and DiagrammerGPT, and evaluating the generated flowcharts using metrics such as structural alignment, readability, and human evaluations.

Key Achievements:

· Designed a pipeline to convert textual descriptions into SVG flowcharts through LLMs, ensuring that generated diagrams accurately reflect the described processes.

· Collected a new dataset of flowcharts extracted from top-tier conference papers, providing a valuable resource for training and evaluating text-to-flowchart models.

· Implemented and tested baseline methods for SVG flowchart generation, demonstrating the feasibility and advantages of using LLMs for producing detailed, scalable flowcharts.

Automatic Labeling of Metal Blocks in GDS Layout Using Large Language Models, SYSU

Supervisor: Prof. Xiangyu Meng 05/2024 - Present

Overview:

The project focuses on using large language models (LLMs) to automatically label metal blocks in GDS layouts based on their positions and connections. The goal is to utilize a large dataset labeled by engineers to fine-tune an LLM, which can then assign appropriate labels to metal blocks in new GDS layouts. Each metal block's label is determined by complex relationships involving its position and connectivity.

Framework Components:

· Data Collection and Preparation: Gathered a large dataset of labeled metal blocks from GDS layouts, with each CSV file representing a GDS layout. These files contain detailed information for each block, such as connections, layer, type, and coordinates.

· Model Training: Fine-tuned the Meta-Llama-3-8B model using the collected dataset. Each CSV file is processed individually, and a detailed prompt is designed to describe the task of labeling each metal block based on its attributes and connections.

· Label Generation Process: Employed the LLM to label each metal block by considering its surrounding context within the GDS layout, allowing for sequence labeling akin to a circuit's connectivity sequence.

Key Achievements:

· Successfully developed a dataset processing pipeline that converts each GDS layout's CSV representation into input sequences compatible with LLMs, facilitating effective model training.

· Fine-tuned the Meta-Llama-3-8B model capable of accurately labeling metal blocks in new GDS layouts, demonstrating significant potential for automating electronic design processes.

· Improved the overall efficiency and accuracy of metal block labeling compared to traditional manual labeling, reducing the workload of engineers.

Machine Learning Based Dynamic Optimization Framework for Analog Circuit Sizing, SYSU

Supervisor: Prof. Xiangyu Meng 06/2023 - 03/2024

Overview:

The project focuses on developing a machine learning-based framework to dynamically optimize the sizing of analog circuits. The goal is to create a flexible optimization system that can adapt to changing design requirements and constraints, ensuring optimal circuit performance.

Framework Components:

· Parameter Space Exploration: Designed efficient strategies to explore the analog circuit design parameter space using advanced optimization algorithms. This ensures rapid convergence on optimal solutions that meet strict performance criteria.

· Dynamic Adaptation Module: Developed a module that adapts the optimization process in response to evolving design constraints, enhancing the framework's ability to handle diverse requirements and improving circuit design flexibility.

Key Achievements:

· Developed a dynamic optimization framework that effectively adapts to changing design requirements, significantly improving the efficiency of analog circuit sizing.

· Gained substantial practical skills in model selection, parameter tuning, and algorithm optimization, which contributed to achieving stringent design goals with improved performance.

Understanding Positive Customer Engagement: The Impact of Cognition and Emotion on Behavior

Supervisor: Prof. Luning Zang 10/2023 - 02/2024

Overview:

The project explores how cognitive and emotional factors influence positive customer engagement. Leveraging AI and deep learning, the research aims to analyze customer behavior through natural language processing (NLP) techniques.

Framework Components:

· Preliminary Research: Conducted an in-depth review of psychology literature and studied the application of AI, deep learning frameworks, and NLP techniques in data analysis.

· BERT Framework: Identified the advantages of using the BERT deep learning framework for its superior understanding of text, making it ideal for handling complex NLP tasks.

· Deep Learning Application: Applied deep learning methods innovatively to psychological research, utilizing them for the effective multi-label text classification of customer reviews.

Key Achievements:

· Successfully utilized the BERT framework to achieve approximately 92% accuracy in multi-label text classification tasks on manually prepared training and test sets, demonstrating the potential of AI in understanding customer engagement.

Skills

Software: PyCharm, Anaconda, VMware Workstation Pro, Draw.io

Programming: Python, JavaScript, C++, C, MATLAB, SQL

Awards

· Mathematical Contest In Modeling Meritorious Winner (TOP 10 %) 07/2023

· CSP-JS Non-professional Software Capability Certification Advanced Level Round 2, Second Prize 2019, 2020

· National College Student Mathematical Modeling Competition (Guangdong Province) Third Prize 10/2022