Lu Dong

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AI /Computer Vision / Generative Models

Homepage & GitHub
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I'm pursuing my Ph.D. at SUNY Buffalo (UB), advised by Prof. Ifeoma Nwogu. My research interests are Generative Models, 3D Human Pose Estimation, Robotics Physics Simulation, Language-driven Video Generation, and Sign Language Synthesis, primarily in developing Computer Vision, Natural Language Processing, Reinforcement Learning, Statistic Machine Learning, and Mathematical Modeling to study different human behaviors and make generative models more effective in serving human needs. I'm also experienced with Data Science, Pattern Mining, Information Retrieval, and Search Engine. Open to opportunities as a Research Intern.

Education

Ph.D. Program in Computer Science and Engineering (GPA3.83), *State University of New York at Buffalo (UB), USA.* 2021-Now
Ph.D. Program in Computing and Information Sciences.(GPA4.0) , *Rochester Institute of Technology (RIT), USA.* 2020-2021
Master's Degree in Computer Science and Technology (Top 15/120), *Xi'an JiaoTong University (XJTU), CHINA.* 2013-2016
Two Bachelor's Degrees in CS and Electrical Engineering and Automation, *Northeast Electric Power University, CHINA.* 2007-2011

Research Experience

SignDiffusion: Sign Language 3D Motion Diffusion Model **10/2023–Now**
Position: Research Assistant, Advisor: Dr.Ifeoma Nwogu *@UB, USA*

- We presented SignDiffusion, a classifier-free diffusion-based model that generates diverse, realistic, and syntax-matched 3D sign language avatars from semantic input. It accommodates multiple types of signals (audio, text, image, video) as conditions.
- SignDiffusion utilized a transformer encoder and hierarchical conditions, which encompass motion semantics and motion syntax descriptions, effectively improving the grammatical accuracy of sign language motion and rectifying pose estimation errors.
- We demonstrated that SignDiffusion surpasses existing approaches in its field. Furthermore, we contributed the ASLGLoss100 dataset, the largest SMPLX-based collection currently available for 3D sign language motion research.

SignAvatar: Sign Language 3D Motion Reconstruction and Generation **01/2023–Now**
Position: Research Assistant, Advisor: Dr.Ifeoma Nwogu *@UB, USA*

- We introduced SignAvatar, a pioneering framework for synthesizing 3D sign language avatars from videos, text, and images.
- SignAvatar employed a Transformer-based VAE, CLIP, and the curriculum training strategy to enhance generative performance.
- By combining reconstruction and generation tasks within one framework, we showcased SignAvatar's superiority, setting the new baseline in this field. Additionally, we contributed the ASLGLoss30 dataset, which is based on 3D SMPLX, for academic research.

Language-guided Human Motion Synthesis with Atomic Actions **05/2022–05/2023**
Position: Research Assistant, Advisor: Dr. Ifeoma Nwogu *@UB, USA*

- We introduced ATOM for language-guided human motion synthesis, mitigating limitations in generalizing to novel actions.
- We disentangled complex human motions into atomic actions during learning, and used them to assemble novel motions. We applied a gradually increasing mask ratio in our motion modeling to facilitate atomic action learning.
- We further illustrated its superiority in synthesizing plausible and coherent text-guided human motion and on benchmark datasets like KIT, HumanML3D, HumanAct12, and UESTC, while also highlighting its ability for open-set generation on NTU94.

Reinforcement Sign Language Translation (SLT) Research **02/2021–02/2022**
Position: Research Assistant, Advisor: Dr.Ifeoma Nwogu *@UB+RIT, USA*

- We introduced ReinforcedSTL, a translation model designed to tackle the challenges of sign language video-to-text translation.
- ReinforcedSTL uses a Transformer-based framework, reinforcement learning, and multiple channels (body, hand, and facial expressions) to improve word selection and enhance semantic understanding.
- We showcased that ReinforcedSTL outperforms state-of-the-art methods across various metrics in extensive experiments.

General Characteristics and Classification of Chinese Folk Songs with Machine Learning **09/2014-05/2016**
Position: Research Assistant, Advisor: Dr. Xinyu Yang. *@XJTU, CHINA*

- We introduced a framework to analyze genetic traits in Chinese folk songs from various regions that enable their longevity.
- Our framework incorporated pattern mining and multi-layer melody clustering to identify the most typical song structures. We also introduced a synthetic feature model that considered both global and local perspectives to improve classification.
- To address the database's limitations, we furnished the inaugural MIDI-based digital compilation of Chinese folk songs. Our findings were validated through comprehensive experiments and received recognition in expert evaluations.

Project Experience

Information Retrieval Project -Covid19 & Vaccine Analysis Search Engine [Page Link] **09/2021-12/2021 @UB**

- Regarding COVID and Vaccines, I collected a dataset of 50,000 tweets from diverse languages, various countries, authorities, and the general public using Tweepy. The front-end utilizes a Google-like user interface with HTML, CSS, Bootstrap, JavaScript, and Ajax techniques. The back-end using the Flask server, deployed on AWS EC2 cloud, employs statistical models and semantic-based language analysis to track trends among authorities related to COVID-19, public attitudes toward vaccines, and their impacts.

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Reinforcement Learning Project –Multi-Agent Collaborative Reinforcement Learning **09/2021-12/2021 @UB**

- The RL Learning system was developed based on the OpenAI Gym Environment, incorporating various RL algorithms, including Q-Learning, SARSA, DQN, DDQN, Actor-Critic, and notably PPO. In addition, it excels in addressing multi-agent cooperation tasks, such as solving intersection navigation challenges. A dynamic reward mechanism was introduced to facilitate intelligent adjustments in travel routes. The experimental results clearly showcase the efficiency of the design, leading to a twofold increase in convergence efficiency.

Natural Language Processing Project- Medical Tutoring ChatBot **09/2021-12/2021 @UB**

- This project supports a non-profit organization's mission to enhance medical knowledge in underdeveloped regions of India. We tackled challenges like database creation from PDFs, user-friendly chatbot implementation, delivering high-quality results, and ensuring user engagement and retention. The chatbot serves as an educational tool to boost medical literacy and, ultimately, save lives. Details can be found at the ChatBot Project

Work Experience

Research Internship - Multi-Person Motion Generation **06/2023–08/2023**
Oppo US Research *@Seattle, WA, US*

- During this internship, my main objective was to generate text-driven motion for multiple individuals under situations where we had limited 3D annotated motion data for multiple people. We aimed to control the number of people, the specific motion, and ensure they appeared reasonable and realistic.
- To overcome these challenges, we introduced a classifier-free diffusion model, trained on single-person motion data and multi-person static data. Our work set a new benchmark in the multiple motion generation field. We also provided a dataset of static multiple-person poses by extracting 3D SMPL poses from the LAION400M dataset and conducting rigorous quality control.

Research Internship - Human Pose Estimation **05/2022–08/2022**
Oppo US Research *@Palo Alto, CA, US*

- During my internship, my focus was on enhancing human pose estimation performance in scenarios with blurry input and severe self-occlusion conditions, with the aim of supporting smartphone deployment and fitness app integration.
- I made two significant contributions: a lightweight Graph Convolution Network (GCN) pipeline for smartphone deployment and a Transformer-based multi-layer information fusion pipeline to improve pose estimation. The experimental results have surpassed state-of-the-art performance on benchmark datasets, in-house data, and data collected in real-world settings.

Senior Data Analyst **09/2016–04/2020**
Shaanxi Haina Electronic Technology Co.,LTD, *@XI'An, CHINA*

- As the lead researcher and developer for Information Systems, my responsibilities included proposing design solutions, integrating front-end and back-end code, and managing database storage to ensure smooth system operation. During my tenure, we improved the project's progress rate by 20%.
- I also led the development and enhancement of the Recommendation system, which involved combining collaborative filtering, query, and tags to generate candidate sets. This led to high-quality, multi-dimensional recommendation results and various visualizations that not only exceeded client expectations but also increased customer satisfaction from 70% to 85%.

Publication

[1] **Lu Dong**, Lipisha Nitin Chaudhary, Fei Xu, Xiao Wang, Mason Lary, Ifeoma Nwogu. "SignAvatar: Sign Language 3D Motion Reconstruction and Generation." (under review)
[2] Fei Xu, Lipisha Nitin Chaudhary, **Lu Dong**, Srirangaraj Setlur, Venu Govindaraju, Ifeoma Nwogu. "A Study of Video-based Human Representation for American Sign Language Alphabet Generation." (under review)
[3] Zhai, Yuanhao, Mingzhen Huang, Tianyu Luan, **Lu Dong**, Ifeoma Nwogu, Siwei Lyu, David Doermann, and Junsong Yuan. "Language-guided Human Motion Synthesis with Atomic Actions." arXiv preprint arXiv:2308.09611 (ACM MM2023).
[4] J. LI, **Lu DONG**, J-H DING, X-Y YANG; Exploring the General Melodic Characteristics of XinTianYou Folk Songs [C], 12th Sound and Music Computing Conference, Maynooth, Ireland. 2015:393-399.

Skills and Others

Honors	"Excellent Postgraduate Student", "Excellent Student Cadre", "Excellent Undergraduate Student"
Awards	Outstanding Leadership Award, National Graduate Academic Scholarship, National Encouragement Scholarship, Academic Scholarships.
Activities	Judge for 2022 UB Hacking Competition, Captain of Undergraduate Women Basketball Team, Silver Metal of University Women's Hurdle; Second Prize in College Debate Competition.