Lu Dong

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Deep Learning/Computer Vision

Academic Homepage & GitHub
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I'm currently pursuing my Ph.D. at SUNY Buffalo(UB) with advisor Prof. Ifeoma Nwogu. My research interests are Human Pose Estimation, Robotics physics simulation, Language-driven Motion, Sign Language Translation & Generation, and Video Understanding, primarily in developing CV, NLP, Reinforcement Learning, Statistic Machine Learning, and Mathematical Modeling to study different human dynamics and improve behavior understanding. Some early works are related to Speech Sentiment Analysis and Music Analysis with Machine Learning. I'm also experienced with Data Crawling, Pattern Mining, Information Retrieval, and Search Engine. I am a self-motivated and passionate person, good at communication and cooperation. Actively looking for Summer Intern position.

EDUCATION

Ph.D. Program in Computer Science and Engineering (GPA3.83), *State University of New York at Buffalo (UB), USA.* 08/2021-Now
Ph.D. Program in Computing and Information Sciences.(GPA4.0) , *Rochester Institute of Technology (RIT), USA.* 08/2020-05/2021
Master Degree in Computer Science and Technology (15/120), *Xi'an Jiaotong University (XJTU), CHINA.* 08/2013-05/2016
Bachelor Degree in Computer Science and Technology(10/150), *Northeast Electric Power University, CHINA* 08/2007-05/2011

RESEARCH EXPERIENCE

SignDict: From General Language to Sign Language Video   **09/2022–Now**
Position: Research Assistant, Advisor: Dr.Ifeoma Nwogu   *@UB, USA*

- Sign language generation plays an important role in mutual understanding between different communities and human-computer interaction. In this project, I delved into multiple models to first improve the accuracy of human pose estimation for upper body sign language scenarios. Then we designed a Transformer-based conditional generation model to promote the encoder and decoder of the information. Moreover, we use the latest released CLIP model to improve text understanding. Relevant experiments are still in progress.

AtomVAE: Towards Zero-Shot Text-to-Motion Synthesis   **02/2022–Now**
Position: Research Assistant, Advisor: Dr. Ifeoma Nwogu   *@UB, USA*

- In this project, I explored various motion generation models and focus on generation on open-set. To generate novel categories that are not seen during training, we proposed AtomVAE for zero-shot text-to-motion synthesis. The main idea is to decompose seen actions into a set of atomic actions and re-generate new motions with CVAE through semantic relationships.
- Masked motion autoencoder, diversity and sparsity constrain, classification loss, and disentangling latent variables have been used to optimize the model. The proposed end-to-end model achieves promising zero-shot results on NTU94 and UESTC Datasets. Compared with the state-of-the-art model, our results reduced FID from 128 to 42 and improved accuracy from 83% to 86%.

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

- I delved into various deep learning frameworks for sign language video-to-text translation to facilitate communication with the hearing-impaired community. During this research, I successfully extracted gesture, and expression-related features from each video frame and used the Transformer-based framework to generate the text translation. Meanwhile, I analyzed evaluation metrics in the text translation quality area and looked into some limitations of automatic translation.
- After that, I proposed and implemented a creativity model that introduced the idea of reinforcement learning and used the feedback of various indicators as the composite rewards to re-consider the selection of the word for translation, making the translation more fluent and in line with human understanding. My model surprisingly increases the BLEU score from 9.58 to 10.63.

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

- To better explore the MEME (genetic factors) of Chinese folk songs and address the scarcity Database Challenge, I started this research from scratch by auditing piano lessons, contacting authorities, and collecting library materials. Eventually, I contributed 200+ MIDI folk songs for the Chinese folk songs(1000+) database.
- After continuous research, I proposed and implemented a model that includes pattern mining and improved multi-layer melody clustering to explore the most representative structures of folk songs. In addition, I proposed and implemented a synthetic feature model containing both global and local perspectives to improve classification performance. Experiments demonstrated the superiority of our model and I made a presentation at the 12th SMC International Conference to showcase our achievements.

PROJECT EXPERIENCE

Information Retrieval Project -Covid19 & Vaccine Analysis Search Engine   09/2021-12/2021 @UB

- Using Python and Tweepy, I crawled 50,000 tweets data. The variety of data includes three languages, three countries, authorities, and the general public. The collection topics are related to covid and vaccines. I implemented the Google-like UI with HTML, CSS, Bootstrap, Javascript, Ajax; Flask as server, deployed on AWS EC2 cloud. My Back-end analyzed the authorities' trend along with the COVID19, attitudes towards vaccines, and impacts on the public.

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Reinforcement Learning Project –Multi-Agent Collaborative Reinforcement Learning   09/2021-12/2021 @UB
- I developed a system integrating multiple classic RL algorithms, including Q-Learning, SARSA, DQN, DDQN, Actor-Critic, and Actor-Critic variants. Besides, This system can successfully solved the multi-agent cooperation task, eg, pass the intersection. I designed and implemented a dynamic reward mechanism to adjust travel routes intelligently. The experimental results show the super-efficient of my design, which could double the convergence efficiency.

Computer Vision Project –Multiple Generative Adversarial Networks (GANs)   09/2020-12/2020 @RIT
- Using Pytorch, based on the Fashion-Mnist dataset, I implemented and compared various GANs, like Vanilla MSE GAN, Wasserstein GAN (WGAN), Least Square GAN to generate 10 classes of clothes, shoes, and bags. I also went deep into the Mode Collapse issue that generation is not uniform in GANs. To reduce this effect, I implemented the Unrolled GAN. In addition, I explored and implemented Conditional GAN to make the generation process more controllable and intelligent.

WORK EXPERIENCE

Research Internship   05/2022–08/2022
Oppo US Research Center   *@Palo Alto, CA, US*
- I was in charge of the Human Pose Estimation Research of the OPPO Health Lab Project. A big challenge of home fitness applications is the tough pose estimation that includes severe self-occlusion. After delving into the latest algorithms, I developed three pipelines for 3D pose estimation under different scenarios to solve the tough pose estimation issues. All achieved better performance by a large margin than the previous pipeline. Besides, I was also responsible for part of model optimization and model deployment.

Senior Data Analyst   09/2016–04/2020
Shaanxi Haina Electronic Technology Co.,LTD,   *@XI'An, CHINA*
- I was in charge of the research and development of Information Systems, proposed design solutions, integrated front-end and back-end code logic, and database storage to ensure the system's smooth operation.
- I was also responsible for the development and improvement of the Recommendation system. Specifically, combine collaborative filtering, query, and tags to generate candidate sets. Then, using ML techniques for fine scoring generates top N recommendations and multiple data visualizations. My related work made a big jump in customer satisfaction, improving from 70% to 85%.

PUBLICATION

[1] 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

Technical Skills	Python, PyTorch, C#, Anaconda, Matlab, Mathematical Modeling, MySQL, Apache Solr, AWS_EC2, Flask, Django, Bootstrap, JavaScript, Ajax, Complexity Analysis.
Language	English(fluency), Chinese (native), French (entry)
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.