Zekai Wen

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EDUCATION

Columbia University 2024.09 - 2025.12
MS in Electronic Engineering *New York, United States*

University of Electronic Science and Technology of China 2020.09 - 2024.06
BEng in Communication Engineering *Chengdu, China*

University of Glasgow 2020.09 - 2024.06
BEng (Honors) in Electronics and Electrical Engineering

PROJECTS

Takeaway System 2025.01 - 2025.02

- Uses JWT token technology to accomplish user login and authentication, verifying the token with the interceptor via ThreadLocal to determine whether the user is logged in or not
- Using Redis to cache dishes alleviates performance degradation caused by frequent database access in highly concurrent environments
- Through the WebSocket to achieve the client and the merchant side of the long connection, to achieve the incoming order reminder and customer reminder and other functions
- Use SpringTask to achieve the order status of the timed processing, timeout automatic cancellation of orders and other functions

Rotary Positional Encodings for Vision Transformer and Performer 2024.09 - 2024.12

- Investigates the application of Rotational Position Encoding (RoPE) in Visual Transformer (ViT) and Performer models, compares the effectiveness of RoPE compared to Absolute Position Encoding (APE) in the CIFAR100 dataset, and explores RoPE's different Transformer and Performer architectures for computational efficiency in different Transformer and Performer architectures
- Fast Attention via Orthogonal Random Features (FAVOR+) was used to approximate the Softmax attention computation in the Transformer model to reduce the computational complexity, reducing training time by 30% on average
- Adding RoPE into Performer to improve computational efficiency and classification accuracy for visual tasks using its linear attention mechanisms
- Extending RoPE to 2D space to optimise spatial position coding ensures that the attention mechanism is better able to understand spatial structures in images
- The Vit and Performer models using RoPE have a classification accuracy improvement of 12.3% and 9.7% over the model using APE on the CIFAR100 dataset, respectively

Detection of Vehicle's Abnormal Behaviors in Surveillance Video 2024.01 - 2024.04

- Using YOLOv5 target detection algorithm and DeepSORT tracking algorithm, and based on the mathematical modeling method, a detection system to monitor the abnormal behavior of vehicles in the video was implemented
- Organise the UA-DETRAC and VeRi-776 datasets, complete the annotation and optimise the quality of the training data using image enhancement techniques
- The accuracy rate of YOLOv5 model reaches 97.7%, the cross-loss entropy of DeepSORT model is 0.00473, and the Top-1 error is close to 0
- Using the vehicle's coordinate information, mathematical modelling is used to determine the speed and direction of the vehicle's movement as a means of identifying braking, lane changing and contra-vehicle travel, with a recognition accuracy of 95%

SKILLS & AWARDS

- **Programming Language:** Python , C , Java , SQL , MATLAB
- **Languages:** English (Fluent) , Mandarin (Native)
- **AWARDS:** 2023 UESTC Model Student Scholarship , 2022 UESTC Outstanding Student Scholarship , 2021 UESTC Outstanding Individual for Social Practice , 2021 UESTC Model Student Scholarship