Daily Log Project M.Sc. ECMM453

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Student Number:

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Project Name:

Performance Comparison of Reversible Vision Transformer Models

Internal Supervisor:

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Daily Log of Activity

Date	Activity	Outcomes	Comments
22/1/2024	MEETING	Discussed and explored the general direction and background of the research with the supervisor.	Gained a basic understanding of the research topic and began considering how to proceed with the project.
28/1/2024	MEETING	Confirmed the research direction on reversible neural networks as the topic of study.	
8/3/2024	MEETING	Sought advice from the supervisor on the fundamental theories and concepts of reversible neural networks, potential research directions, and the key aspects to consider in designing and writing the project proposal.	Clarified the direction for the literature review that needs to be conducted prior to starting the research.
22/3/2024	MEETING	My supervisor asked me questions to assess my understanding of reversible neural networks and some computer vision models. I also sought clarification from my supervisor on unclear and confusing aspects of the articles I encountered during the recent literature review.	Identified gaps in my understanding and continued to lay the groundwork for the upcoming research.
23/3/2024-19/4/2024	LITERATURE REVIEW and PROPOSAL	On average, I thoroughly read two to three papers each week, focusing on the structure of reversible neural networks. This includes studying how to implement forward and backward propagation, understanding and replicating the mathematical formulas mentioned, and the methods involving differential equations, while considering which network structures can be made reversible.	Decided to study the reversible structure of the Vision Transformer model and further explore the optimization of reversible models by attempting to introduce momentum.
20/4/2024-25/4/2024	LITERATURE REVIEW and PROPOSAL	Wrote the project proposal and developed a timeline for future research.	
26/4/2024	MEETING	Discussed the feasibility of the research timeline with my supervisor and clarified the next steps.	

1/5/2024	PROPOSAL	Completed the writing and revisions of the proposal, and submitted the project proposal.	
2/5/2024-17/5/2024	RESULTS REPRODUCTION	Reproduced the methods, code, and results from relevant literature and analysed the basic structure of the Vision Transformer model.	Due to illness, the completion time exceeded the estimated timeline by three days.
20/5/2024-5/6/2024	CODE IMPLEMENTATION	Gradually debugged the Momentum Residual Neural Network and Vision Transformer models, adjusted parameters, and deepened my understanding of their structural principles.	Aimed to find a way to combine the two networks, achieve reversibility in the Vision Transformer, and explore how to incorporate momentum into the Vision Transformer.
7/6/2024	MEETING	Sought guidance from my supervisor on issues encountered while reproducing the results of the base model and on areas of the model's structure that I did not fully understand.	
7/6/2024-26/6/2024	CODE IMPLEMENTATION	Successfully implemented the reversible Vision Transformer model, but encountered issues when introducing momentum into the model.	During the experiments, I found that using momentum, whether only in the forward propagation model or in the reversible model, caused unpredictable effects on the gradient propagation and led to errors in the model's weights during validation.
28/6/2024-2/7/2024	CODE DEBUGGING	Gradually debugged the code, attempting to identify the cause of the issue.	
3/7/2024-8/7/2024	LITERATURE REVIEW	Reviewed related articles and identified the reasons why momentum affects model training and validation.	Discovered that introducing momentum into the Vision Transformer model may require significant structural modifications, as the transformer's self-attention mechanism might conflict with momentum, affecting the correctness of the training.
10/7/2024	MEETING	Discussed the current issues with my supervisor and sought feedback on modifications for further research.	After discussion, decided to slightly modify the research topic, continuing to compare the performance of reversible Vision Transformer models. The focus will first be on studying the BDIA model,

			followed by further research on the momentum model.
11/7/2024-24/7/2024	CODE IMPLEMENTATION	Completed the modifications of three Vision Transformer models.	The performance of the reversible model was suboptimal.
25/7/2024	ONLINE DISCUSSION	Sought guidance from my supervisor on the issues encountered during debugging.	Received relevant ideas for problem-solving.
26/7/2024-27/7/2024	CODE DEBUGGING	Continued to debug the code step by step, modifying the logic in the backward propagation.	Resolved issues in the backward propagation, improving validation accuracy.
28/7/2024	ONLINE DISCUSSION	Discussed the validity and reliability of the experimental results with my supervisor.	Identified additional performance comparison metrics that need to be considered.
27/7/2024-1/8/2024	MODEL TRAINING	Finalized the model code and conducted multiple training sessions on different datasets for each of the three models to obtain experimental results.	Training on large datasets takes approximately 9 hours per session, while training on small datasets takes about 1 hour per session.
1/8/2024-8/8/2024	PRESENTATION & REPROT	Compiled experimental data, summarized the results, and began preparing the presentation while writing the paper.	Submitted the project presentation.
9/8/2024	MEETING	Discussed the experimental results and analysis with my supervisor, sought feedback on the paper revisions, and explored potential directions for further optimization and the introduction of other methods.	Identified and discussed the principles and methods from new literature.
9/8/2024-14/8/2024	REPORT MODIFICATION	Continued revising and refining the report, and organized the code.	
15/8/2024	REPROT	Submitted the project report.	