

Daily Log Project M.Sci. COMM032 or ECMM428

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Project Name: Experimenting with the QAOA on the TSP problem

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1 entry per month with main improvements

Daily Log of Activity

Date	Activity	Outcomes	Comments
Oct	<ul style="list-style-type: none">• Explored current research in the TSP and Quantum Solutions.• Putting together a rough layout of the literature review.	<ul style="list-style-type: none">• Found multiple different methods for formulating and encoding the TSP.• Found lots of different classical algorithms for solving the TSP• Researched several different methods for solving the TSP using a quantum approach.• Started bullet pointing sections and their contents for the literature review.	
Nov	<ul style="list-style-type: none">• Expanded the TSP section of the literature review.• Expanded the Quantum Section of the literature review.• Finished developing a project plan.• Reviewed and submitted the literature review and project plan.	<ul style="list-style-type: none">• Fully researched and discussed as much relevant information regarding the TSP, it's formulations and classical methods for solving it.• Fully researched potential quantum solutions to solving the TSP. Decided that some had to be omitted to keep the literature within the allotted length.• Developed a plan for the project based on the findings of the literature review. Looking to focus the research on the QAOA and how the TSP can be run on it.• Submitted the full document.	
Dec	<ul style="list-style-type: none">• Started working on the prototype.• Developed a list of potential methods for utilising real quantum systems.	<ul style="list-style-type: none">• Mainly just getting used to the IBM quantum systems and starting to look at how the QAOA might be run on them.• Produced and used a list of different quantum systems to	

		decide the best to use for my project was IBMQ	
Jan	<ul style="list-style-type: none"> Finished developing prototype. Used results from prototype development to start implementing the final system 	<ul style="list-style-type: none"> During prototyping found some problems with running the QAOA on IBMQ. This needs to be addressed by further understanding the QAOA algorithm and look at how it can be decomposed for the IBMQ systems. 	
Feb	<ul style="list-style-type: none"> Started writing final report. Continued to develop the final system. Started implementing the Native QUBO formulation. 	<ul style="list-style-type: none"> Written up part of the literature review section of the final report. Continued to research the QAOA algorithm and methods for decomposition. Started putting together a list of potential experiments to complete. 	
Mar	<ul style="list-style-type: none"> Finished writing the literature review section of the report. Started writing up the Design, Methods and Implementation section. Decided to implement a general QUBO formulation class Finished implementing the QUBO formulation Started Implementing the GPS QUBO Formulation Started implementing the QAOA algorithm 	<ul style="list-style-type: none"> The report is about ¼ finished The Native formulation implementation is finished so now I can run tests on it I've started implementing the GPS formulation and QAOA algorithm. 	
Apr	<ul style="list-style-type: none"> Finished implementation of the GPS formulation Reworked Native formulation to lower the number of variables Finished implementing the QAOA algorithm 	<ul style="list-style-type: none"> Finished the implementation of the main aspects of the project. Completed majority of the testing on different formulations and the QAOA. Completed most of the report. 	

	<ul style="list-style-type: none"> • Started testing the QUBO formulations and QAOA algorithm. • Finished implementation section of report • Started testing and conclusion section of report • 		
May	<ul style="list-style-type: none"> • Finished collecting experimental data • Finished and submitted final report • Finished and submitted presentation 	<ul style="list-style-type: none"> • All aspects of the project have been finished • Tests have been mostly completed, although some were taking too long to be included in the report. • The report and presentation were submitted. 	