



School of Electronic Engineering

CB54: Machine Learning Algorithms for EM Wave Scattering Problems

Appendix A: Literature Survey

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MEng in Electronic and Computer Engineering

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Declaration

I hereby declare that, except where otherwise indicated, this document is entirely my own work and has not been submitted in whole or in part to any other university.

Signed: Anthony James Mc Elwee

Date: 2023/08/20

Preface

This is the summary of changes to the Literature Review as submitted in January 2023.

- Minor corrections transforming the word “scatter” to “scatterer” were required.
- The problem specification of the project was changed from the Transverse Magnetic Scalar 2D problem to the Transverse Electric Vector problem. This is not reflected in the Literature Review due to time and space limitations. Instead please refer to the final IEEE conference style paper for the final problem specification.
- Minor changes to two neighboring sentences were required on page two where the words “matrix inversions, often” was changed to “matrix inversions or” and the words “accelerate the matrix inversions by Fast” was changed to “accelerate the matrix multiplications by Fast”.
- No other changes were required. Although many more references and sources were recovered during the duration of the project, most of these have been referred to in the Project Research Log, the main IEEE conference style paper and the various other appendices. There are comments regarding the literature review in the Project Research Log that complement the comments below.

Comments on Literature Review

At the time of submission of the final portfolio, the original Literature Review remains extremely relevant in terms of the direction that advanced model development could take in future work. Many of the advanced ideas presented in January remain unexplored due to time limitations. In light of the progress made around experimentation with data generation and U-net architecture stages, the student would include more advanced generative adversarial models and denoising architectures if a further review was required. Although this was mentioned, in terms of existing work directly dealing with electromagnetic scattering forward problems, the student would focus on papers dealing with the pure domain of denoising architectures so that recent developments could be transferred to the toy problem in order to achieve lower initial errors. The student would also focus more on the low-frequency high-contrast problem, as noted in the final IEEE-style conference paper submission. It is the student’s view, as reflected in the analysis of the testing and results section, that model development to a specific application of scattering should be prioritised before trying to test the ability of the model to generalise to unseen parameter ranges. These comments would inform the direction of a second stage literature review if the project was to be continued in the future.