We developed lots of theoretical tools in the first chapter. We introduced differential forms, singular homology and Hilbert complexes to provide the necessary tools to prove the existence and uniqueness of the magnetostatic problem on a non-trivial exterior domain.

In the second part, we looked at the 2D magnetostatic problem with curve integral constraint. We derived a convenient variational formulation for it and proved well-posedness and a-priori estimate. The numerical estimates reach the theoretically derived convergence rates.

One immediate possibility to extend these results in on more complicated topologies with different topological constraints. For example the first Betti number could be a higher number combined with more curve integral. This generalization should be straightforward.

The well-posedness of the magnetostatic could be put into abstraction using the exterior derivative and the codifferential (cf [)] and then posed on arbitrary Riemannian manifolds. This would be another possible direction to go to.