1.1 Summary of thesis

This thesis is regarding the comparative diagnostics of different adaptive Markov chain Monte Carlo (MCMC) methods. The focus will be on two algorithms: The first is an adaptive Metropolis-Hastings algorithm using multiple copies proposed by Griffin and Walker (2013), while the second is an adaptive MCMC method with sequential state substitution proposed by Chan and Lai (2015). Section 2 begins with an overview of MCMC and provides some motivation for its adaptive counterpart, then summarises the key ideas of the two papers by Griffin and Walker, and Chan and Lai respectively. I also provide detailed proofs for the standard Metropolis-Hastings algorithm, as well as for the two algorithms from their respective papers. Section 3 is a comparison of those two algorithms via various diagnostics and illustrations in **R** (R Core Team, 2014). Section 4 gives my concluding remarks and also recommendations for further work. Lastly, Section 5 credits all the references used.

1.2 Author's contributions

I extended the proof for the traditional MCMC algorithm to the adaptive MCMC and substitution MCMC algorithms in Sections 2.3 and 2.4, pages 11-12 and 18-21 respectively via a proposition of equality of joint densities to imply stationarity, which were not provided in the original papers. In addition, I have also written all the **R** codes required to run the algorithms and diagnostics such as: Trace plots, Density plots, Running Means plots, Autocorrelation plots, Gelman and Rubin plots (Gelman and Rubin, 1992), Summary statistics, Acceptance rates and Execution times, as well as obtained and evaluated the results from these diagnostics in **R**, as mentioned in Section 3, pages 23-43.