Acknowledgments

I would like to thank my advisor Prof. Siu On Chan for many valuable suggestions and his long-term support and guidance. I would like to thank Prof. Siu On Chan for providing a stable and open environment for research, without which I would not have the valuable opportunity to explore the directions that I am truly interested in. I would like to thank Prof. Andrej Bogdanov for giving me many valuable opportunities and his generous encouragement. I would like to thank Prof. Chandra Nair and Prof. Pascal O. Vontobel for their kind assistance when I get in trouble. I would like to thank Prof. Guy Kindler for sharing with me two interesting problems. I would like to thank Prof. Shengyu Zhang and Prof. Si-Min He for their belief in my research ability and their appreciation of my potential in mathematics.

I would like to thank all the members of my thesis committee: Prof. Siu On Chan, Prof. Nick Gravin, Prof. Ho-fung Leung, and Prof. John Chi Shing Lui. Their interest in my work and their valuable suggestions greatly promote the completion of this thesis.

I would like to thank my collaborators for many valuable discussions and supports: Prof. Andrej Bogdanov, Prof. Siu On Chan, Chaowen Guan, Xiangyu Guo, Chung-Wei Lee, Prof. Pinyan Lu, Prof. Haipeng Luo, Gautam Prakriya, Juspreet Singh Sandhu, Chao Tao, Chen-Yu Wei, Mengxiao Zhang, Prof. Shengyu Zhang, Honglei Zhuang, Prof. Yuan Zhou. I would like to thank Yan-Nan Wang and Krishnamoorthy Dinesh for providing many valuable suggestions during theory lunch. I would like to thank Prof. Yitong Yin for hosting me when I was a fresh student in the field of TCS.

I sincerely appreciate Prof. Qiang Yang for his valuable supports. His passion, wisdom, and generosity in life and academics impressed me deeply. It is my great pleasure to have the opportunity to work under his guidance.

I would like to thank all my friends for their company during my struggling time.

I would like to thank my parents for their invaluable love and supports. They are the best parents in my mind. Their love for me let me have a strong feeling of the incredible power of love. Their supports for most of my decisions enables me to follow my heart. They never criticize me when I get a low score, but they will teach me a lesson when they think I do not show enough respect to others. They unconsciously influence my interests as well as my confidence in math and physics. Their appetites in basketball, ping-pong, writing, calligraphy, math, and piano cultivate me as a person with a wide range of interests. Their generosity, liberality, kindness, gratitude, and integrity guide me to be better and better.

TO BE CONTINUE.