ACKNOWLEDGEMENT

I have walked a long and arduous journey to present this doctoral thesis.

I was born in a remote mountain village in Guanling County, Guizhou Province. In my childhood, there was no electricity, roads, or shops in the village. We lived in poverty, and the farthest place I had been to was the town 20 km away from my home. When I was in fourth grade, a teacher named Ms. Liu Feixia came to our village from the town. She told us in class that the world outside was wonderful and encouraged us to study hard and break out of the mountains. It was the first time in my life that the seed of a dream sprouted. Before that, I did farm work every day after school, such as mowing grass and herding cattle. In sixth grade, I transferred to a school in the town, beginning my hellish life experiences.

Because I had to walk for an hour along a mountain road to catch the bus to the neighboring village, I used to wake up at 4:30 in the morning, wash up, and rush to the bus stop before six o'clock. I remember many times when it was pouring rain, and I was worried about getting my shoes dirty, so I tied the laces around my neck and arrived, and washed my feet clean before putting on my shoes at the bus stop. At 4 a.m., I walked alone through dense forests and graveyards. Birds whose names I couldn't call out cried like ghosts, making my hair stand on end with fear, and sweat soaked my back. I walked this path from sixth grade to my undergraduate graduation.

During my time in the town, I didn't feel as excited as I had imagined. I am from an ethnic minority and couldn't speak the local dialect of Guizhou. It took me about five years to become fluent in it. Later, when I went to university, I couldn't speak Mandarin either. It took me about six years to become fluent in Mandarin. Now, in Thailand, I've spent three years and still can't speak English. When I learn a new language, many people mock my accent and non-standard pronunciation. I often feel inferior and hesitant to communicate with others. Therefore, some classmates thought I was mute during school. Coming from a rural area with poor academic performance and simple, rustic clothing, I faced discrimination from many people, including classmates, teachers, and members of society. This situation persisted until I pursued my graduate studies. Of course, I also made many friends during my academic journey at various stages.

I lived with my grandmother since I was young. She expressed her desire to witness my wedding and carried a lot of firewood back home, saying it could be used to make a fire for my wedding. However, when I was in my third year of graduate school, she suddenly passed away, leaving me with deep pain. I felt she wasn't prepared to leave, and I couldn't accept it. I often dream of her, as if she were still alive, speaking to me. During my first year of doctoral studies, my father also passed away. Since then, memories and emotions of that small mountain village have abruptly fragmented, and even the cherry blossoms blooming at the doorstep feel somewhat melancholic and mournful.

Thanks for this challenging journey. Including it in the acknowledgments of my thesis serves as a constant reminder to keep striving and never forget my original intentions, especially when facing difficulties.

I express gratitude to my mother (Ms. Wumei Xu), who supported me through all my journeys with her blood and tears. I am thankful to Mr. Jianhong Cao for his tireless efforts and silent support.

Special thanks to my doctoral advisors, Associate Prof. Dr. Pramote Paengkoum, and Dr. Siwaporn Paengkoum, for their guidance and enlightenment during my doctoral studies.

I am grateful to my master's advisor, Associate Prof. Dr. Shengchang Chen, for providing living expenses, and funding during my doctoral studies. I appreciate the care and assistance from Prof. Surintorn Boonanuntanasar during my doctoral studies.

Special thanks to experts on the defense committee: Assoc. Prof. Dr. Amonrat Molee, Asst. Prof. Dr. Pakanit Kupittayanant, Asst. Prof. Dr. Pipat Lounglawan.

I appreciate all the staff members of the laboratory for their contributions.

Lastly, I want to thank our great motherland, China, for instilling in me an immense sense of pride no matter when or where.