

## DEDICATION

This thesis is compiled with the support of my family. I praise GOD and thanks to all who have helped, directed, and supported this work. I dedicate the work to my beloved parents  
INDAMIR and ARMAIZA ANISTA ANAS.

Finally this thesis is dedicated to all informatics students in the world. I hope that this research may provide valuable contribution in Computer Science.

## ACKNOWLEDGMENTS

This thesis is compiled with the effort, help, and support from family, students, lecturers and employees. I would like to express my deepest gratitude and thanks to:

1. God Almighty, Allah S.W.T, for His mercy and grace, enabled me to complete this research successfully.
2. My beloved parents, H. Indamir, Hj. Armaiza Anista Anas, S. Pd and my most beautiful older siblings, Ns. Yulianista, S. Kep, Sri Rahayu, S. Pd, Suci Rahmadani, S. Km, Anggun Permata Sari, S. Hum, who never stopped praying for me and giving me support extraordinary, enabled me to survive until now.
3. My mentor and Co-mentor, Dr. Z K Abdurahman Baizal, S.Sc., M.Kom. And Gia Septiana Wulandari, PhD, has guided me even outside working hours. I got a lot of valuable knowledge from them.
4. My thesis examiner, Dr. Untari Novia Wisesty, S.T., M.T., Dr. Tjokorda Agung Budi Wirayuda, S.T., M.T., and Irma Palupi, Ph.D., who have provided constructive criticism and suggestions to improve my research.
5. All lecturers and employees of the Faculty of Informatics, Telkom University, for their knowledge and service during my master's studies at Telkom University.
6. My beloved Muhammad Rakha,S.T., M.Kom, who always provides support and motivation for working on this thesis.
7. My best friends Putri Nurika Adila, S.Kom., M.Kom, and Ayu Qatrunnada Istiqfarri, S.Kom., M.Kom, who always stand by each other's side, providing support in both joy and sorrow.
8. My comrades in arms in residency, a place to complain and always provide encouragement and motivation. Thank you to Kak Ifah, Kak Trya, Uni Ravika, Bang Ndit, Ridha, Bintang, Bella, Labib, Mas Singgih, Fian and my other residency friends.