# CONTENTS

<table>
<thead>
<tr>
<th>List of Figures</th>
<th>Page no.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-2</td>
</tr>
<tr>
<td>List of Tables</td>
<td>3</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>4</td>
</tr>
<tr>
<td>CHAPTERS</td>
<td></td>
</tr>
</tbody>
</table>

**Chapter 1**  
**INTRODUCTION**  
1.1 Research Background  
1.2 Motivation  
1.3 Research goals  
1.4 Major contributions  
1.5 Organization of the thesis  

**Chapter 2**  
**BACKGROUND AND RELATED WORK**  
2.1 Background  
2.1.1 Basics of Fingerprint  
2.1.2 Basics of Iris  
2.1.3 Basics of Palmprint  
2.1.4 Fusion types  
2.1.5 Fusion techniques  
2.1.6 Identity verification using multilevel decision level fusion  
2.1.7 Optimization techniques for fusion of biometrics  
2.1.8 Discussion  

**Chapter 3**  
**FINGERPRINT CLASSIFICATION AND VERIFICATION**  
3.1 Introduction  
3.1.1 History of fingerprints  
3.1.2 Fingerprint as a biometric  
3.2 Prior related work  
3.3 Proposed Method of Fingerprint Classification and Verification  
3.3.1 Background of our work  
3.3.2 Proposed method
Chapter 4  IRIS RECOGNITION AND VERIFICATION  
4.1  Prior related work  
4.2  Background of the work  
   4.2.1  Image acquisition  
   4.2.2  Iris preprocessing  
   4.2.3  Encoding or Feature extraction  
   4.2.4  Iriscode comparison or matching  
4.3  Work done  
4.4  Performance Evaluation  
   4.4.1  Environment used  
   4.4.2  Datasets used  
   4.4.3  Experimental Result and analysis  
4.5  Discussion  

Chapter 5  PALMPRINT RECOGNITION AND VERIFICATION  
5.1  Prior related work  
5.2  Background of the work  
   5.2.1  Image acquisition  
   5.2.2  Palmprint preprocessing  
   5.2.3  Palmprint Feature extraction  
   5.2.4  Palmcode comparison or matching  
5.3  Motivation  
5.4  Palmprint recognition for personal verification: Proposed Method
5.4.1 Our method
5.4.2 Effective verification using classifier fusion

5.5 Performance evaluation
5.5.1 Environment used
5.5.2 Datasets used
5.5.3 Experimental results and analysis

5.6 Discussion

Chapter 6 BIOMETRIC VERIFICATION USING MULTIMODAL FUSION
6.1 Prior related work
6.2 Background of the work
6.2.1 ACO: An effective optimization technique
6.2.2 Particle Swarm Intelligence (PSO)
6.2.3 Simulated Annealing (SA)
6.2.4 Fusion and multimodal fusion
6.2.5 Discussion

6.3 Biometric verification using multimodal fusion
6.4 Multimodal decision level fusion of fingerprint and iris using BACO
6.5 Multimodal decision level fusion of fingerprint and iris using BPSO
6.6 Multimodal decision level fusion of fingerprint and iris using SA
6.6.1 Discussion

6.7 Multimodal decision level fusion of Fingerprint, Iris and Palmprint using BACO and SA
6.7.1 Fusion of Fingerprint and Iris biometrics using SA and BACO:
6.7.2 Fusion of Iris and Palmprint using SA and BACO
6.7.3 Fusion of Palmprint and Fingerprint using SA and BACO
6.7.4 Fusion of Iris, Palmprint and Fingerprint using SA for identity verification
6.7.5 Fusion of Iris, Palmprint and Fingerprint using BACO for
   identity verification 120
6.8 Performance Evaluation 121
6.9 Discussion 122

Chapter 7 CONCLUSION AND FUTURE WORK 125
  7.1 Conclusion 125
  7.2 Future Work 128
  Author’s Publication List 130
  Bibliography 131