CHAPTER – 1
INTRODUCTION

1.1 OVERVIEW OF THE TOPIC

World is growing every single day and the development of technology has affected all the surfaces of growth. Technology has benefited in the expansion of all scientific areas like physics, chemistry, biology, finance, medicine, data analysis etc. With the advancements of technology people come to know that it could bring ease to their daily course of activities. This need motivated the software programmers to develop softwares which could be used to incorporate ease at work and bring effectiveness in the potential of individual. This drastic boom in computer industry resulted in developing graphical user interface applications in the field of computer methodologies. But main concern for these graphical user interfaces is to provide complete security to the users. Mainly authentication process is significantly used for strong security and privacy of the users.

Authentication is possible with various identity authentication parameters but biometrics based authentications are not vulnerable to attacks by the intruders. Biometrics based graphical user interfaces provide burly security when employed in security critical applications of computer vision also. This focused upon two main challenges in front of programmers: one is to design a system for image processing which could work on vectors and matrix and could have more interactivity and second is to provide strong security and privacy to the legitimate users in the public insecure network.

Creation of tools like MATLAB, Khoros, Afni, MRICro, MrGray etc and with implementation of various identity authentication parameters like passwords, smart cards, fingerprint, iris, speech, face recognition etc resulted in achieving these challenges. But further challenge is to choose the best tool and identity authentication parameter for strongest security and privacy for the legitimate user.

MATLAB allows easy matrix manipulation, plotting of data and functions, creating graphical user interfaces so this tool is used in the thesis for designing a system for image processing and it substantiates its qualitative approach using image processing for
identity authentication. So thesis focuses upon identifying best identity authentication scheme with strong security and privacy to the users. Thesis contributes into two major ACM (Association for computing Machinery) Classifications: Security and Privacy as main focus on security services with authentication through biometrics and Computing Methodologies as main focus on computer vision with tasks through biometrics [1].

1.2 HYPOTHESIS OF THE STUDY

The main supposition or proposed explanation made in the thesis on the basis of limited evidence as a starting point for further investigation is i.e Hypothesis of study: Public Network is the most insecure network. While legitimate user communicates through the public network there is problem in sustaining security and privacy as intruders could apply various attacks to impersonate the identity. So there is need to have Ideal Authentication Scheme which should be derived through a new algorithm which results in diminution of errors for the enhancement in the authentication and identification process of legitimate user over the public network. Result would be advancing science with respect to pattern recognition and contributing for security and privacy through authentication and computing methodologies with tasks through biometrics.

1.3 OBJECTIVES OF THE STUDY

The objectives of the thesis are as follows:

— Advancing science with respect to pattern recognition in the areas of security and privacy and computer methodologies
— Deriving a New Fingerprint Hash Algorithm (RNA-FINNT) with diminution in the percentage or approximation of error resulting in Ideal Authentication Scheme
— Augmentation of security and privacy of legitimate user by improving the overall recognition accuracy of the identity authentication parameter

1.4 SCOPE OF THE STUDY

Thesis focuses upon subject matter of biometrics in security and privacy and computer methodologies by main focus on authentication and computer vision through biometrics respectively. As per the ACM classification on computing systems following is the scope of thesis [1]:

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1. **Security and Privacy:** The biometrics based authentications are significantly used for user authentication. Thesis proposes a biometric based graphical user interface which could withstand various attacks when employed in security critical applications and is not vulnerable to security requirements illustrated with fingerprint authentication [2]. Thesis contributes in the security and privacy classification of computer by ACM in the form of authentication through biometrics.

2. **Computer Methodologies:** Methodologies mainly focus upon the application areas of computation. Thesis contributes in the computer vision application area through biometrics. Computer vision analyzes high dimensional data by extracting, processing and understanding the images in order to produce some information. Thesis contributes in the computer methodologies classification of computer by ACM in the form of computer vision through biometrics.

3. **Intersection of Computing Classification Systems:** Thesis intersects two main computer system classifications of ACM security and privacy and computer methodologies by authentication and computer vision through biometrics.

![Figure 1: Scope of the Thesis](image)

**1.5 FLOW OF METHODS AND TECHNIQUES**

One of the purposes of the thesis is to learn new information about image processing, implementation of new fingerprint algorithm (RNA-FINNT) through MATLAB and validation of algorithm by verifying conditional requirements so there are many ways to
support this learning process. Structured and unstructured data gathering processes e.g helping tools, written materials, research papers on previous topics, internet, Mathworks tool both are followed for deriving the information. Complete literature review is done and decision on the application part of the learning is done in the thesis. Review includes technologies and techniques for fingerprint authentication, experimentation and result analysis of comparative study of technologies and techniques for fingerprint authentication, fingerprint algorithms, deriving a new fingerprint hash algorithm (RNA-FINNT) and making fingerprint match more authentic than the existing on the basis of performance indicators like False Matching Rate, Equal Error Rate, Threshold Value, False Acceptance Rate, False Reject Rate, False Non Match Rate and Error Percentage. Advancing science in the field of pattern recognition is the application part of the thesis. In order to validate the application Graphical User Interface with ideal authentication parameter has been designed for identity authentication and verification. This complete process is executed with the help of MATLAB tool. After preparing the menu bar complete coding is done in MATLAB, details of possible constraints and errors faced are also mentioned in the thesis. Complete process of developing the application for enhancing pattern recognition using MATLAB for identity authentication and verification is followed by experiments on different fingerprints and results are mentioned. Comparative analysis of existing fingerprint algorithms and techniques is done and augmentation of pattern recognition is proved by embedded new algorithm (RNA-FINNT) through experiments and results. Analysis of fingerprint algorithms on the basis of performance indicators like False Matching Rate, Equal Error Rate, Threshold Value, False Acceptance Rate, False Reject Rate, False Non Match Rate and Error Percentage substantiates augmented pattern recognition with RNA-FINNT. Thesis concludes that analysis of fingerprint algorithms proved diminution in error percentage or approximation in RNA-FINNT and thesis points out the areas of the future development and expansion. Finally thesis contributes in the security and privacy and computer methodologies classification of computers by ACM with main focus on authentication and computer vision through biometrics.