SJIF Impact Factor (2025): 8.688| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 10 | Issue: 7 | July 2025 - Peer Reviewed Journal

REALTIME FACIAL EMOTION RECOGNITION SYSTEM

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ABSTRACT
Face detection has been around for ages. The main objective of face recognition is to authenticate and identify the countenance. Taking a step forward, human emotion detection is the need of the hour so that modern artificial intelligent systems can get reactions from face. Facial emotion detection can be used to understand the human behavior, detection of mental disorders and synthetic human expressions. This can be done by using machine learning algorithms used in facial recognition for accurate identification and detection. However, the countenance are captured in Realtime and processed using hear cascade detection.

The project work is defined in three different phases where within the first phase, Face is detected from the camera and within the second phase, the captured input is analyzed using the features with support of keras convolutional neural network model. Within the last phase, Face is authenticated to classify the emotions of human as happy, neutral, angry, sad, disgust, fear and surprise. The proposed work presented is simplified in three phases such as detection of face, recognition and classification of emotion. In this project Open CV library, Keras, Tensorflow, Pandas, Numpy, Dataset, Jupyter Notebook and Python Programming is used.

KEYWORDS: *Countenance, Machine learning algorithm, Keras, Haar cascade detection, Open CV library,happy, sad, neutral, angry, disgust, fear, surprise.*

CHAPTER 1
INTRODUCTION

Trying to interpret a person's emotion in nonverbal type, typically needs decryption his/her facial features. Many times, body languages and particularly facial expressions, tell us about one's state of mind. Facial emotion detection and recognition were introduced by researches with human observers. Automatic recognition and also the study of the facial emotional status represent substantial suggestions for the approach in which someone performs. Emotions usually mediate and facilitate interactions among personalities. Thus, understanding emotions often brings context to social communication.

1.1.Background

On a daily basis humans usually acknowledge emotions by characteristics features, displayed as a region of a facial expression. For example happiness is undeniably associated with a smile or associate degree upward movement ofthe corners of the lips. Similarly different emotions are characterized by different deformations typical to a specific expression. Analysis into automatic recognition of facial expressions addresses the problems encompassing the illustration and categorization of static or dynamic characteristics of these deformations of face pigmentation.

1.2.Objectives

The system that is designed for automatic analysis of facial expression is typically referred as facial emotion recognition system. Our primary goal is to predict the emotions of human face in real time as quick and as accurate as possible.

This goal are going to be realized through the subsequent objectives:

- To advance the knowledge on facial emotions recognition system.
- To develop a facial emotion recognition system.
- To experiment machine learning algorithmic rule in computer vision fields.
- To detect emotion thus facilitating Intelligent Human-Computer Interaction.

CHAPTER 2
SURVEY OF TECHNOLOGY

2.1. Available Technologies

Following are the technologies available for this project.

FRONT END/ GUI TOOLS	HTML/CSS, .NET Technology, Java
DBMS/ BACK END	Oracle, SQL Plus, MySQL, SQL Server,Flask
LANGUAGES	C#, Python ,Java
SCRIPTING LANGUAGES	PHP, JavaScript

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FRONT END/GUI TOOLS

JAVA

Java is an object-oriented programming language with its runtime environment. It is a combination of features of C and C++ with some essential additional concepts. Java is well suited for both standalone and web application development and is designed to provide solutions to most ofthe problems faced by users of the internet era.

Prons and Cons of Java

The following are the advantages and disadvantages of Java Programming;

ADVANTAGES

- Simple
- Object oriented
- Platform independent
- Distributed computing
- Secure
- Multithreaded

Disadvantages

- Performance
- Single-Paradigm Language
- Memory Management

LANGUAGES

C#:

It is a general-purpose, modern, object-oriented programming language created by Microsoft that runs on the .NET Framework. C# has roots from the C family, and the language is close to other popular languages like C++ and Java. The first version was released in year 2002. The latest version, **C# 8**, was released in September 2019.

C# is used for

- Mobile applications
- Desktop applications
- Web applications
- Web services
- Web sites
- Games
- VR
- Database applications

SCRIPTING TECHNOLOGY

JAVASCRIPT:

JavaScript is a very powerful client-side scripting language. JavaScript is used mainly for enhancing the interaction of a user with the webpage. In other words, you can make your webpage more lively and interactive, with the help of JavaScript. JavaScript is also being used widely in game development and Mobile application development.

LANGUAGES

PYTHON

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Created by Guido van Rossum and first released in 1991 and further developed by the Python Software Foundation. It was designed with an emphasis on code readability, and its syntax allows programmers to express their concepts in fewer lines of code. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

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CHAPTER 3
REQUIREMENTS AND ANALYSIS

3.1.Problem definition

In the beginning, facial expression analysis was essentially a research topic for psychologists. However, recent progresses in image processing and pattern recognition have motivated significantly research works on automatic facial expression recognition. In the past, a lot of effort was dedicated to recognize facial expression in still images. For this purpose many techniques have been applied: neural networks, Gabor wavelets and active appearance models. Automatic recognition of facial expressions can be an important component of natural human- machine interfaces; it may also be used in behavioral science and in clinical practices. A real time facial emotion recognition system needs to solve the following problems: detection, facial feature extraction, and facial expression classification.

3.2.Requirements Specification:

A software requirements specification (SRS) is a description of a software system to be developed. It is modeled after business requirements specification, also known asa stakeholder requirements specification. To derive the requirements, the developer needs to have clear and thorough understanding of the products under development. This is achieved through detailed and continuous communications with the project team and customer throughout the software development process.

SOFTWARE REQUIREMENTS

- **Programming Language** : Python
- **Front End** : HTML/CSS
- **Back End** : Flask
- **Operating System**: Microsoft Windows 7/8/10 (32- or 64-bit)
- **Database** : MySQL
- **Software** : Anaconda

HARDWARE SPECIFICATION

- **Processor** : 2GHz Intel Core i3
- **Hard Disk** : 2 GB or more
- **Memory (RAM) :** 4 GB
- **Webcam**

Use Case diagram is given below

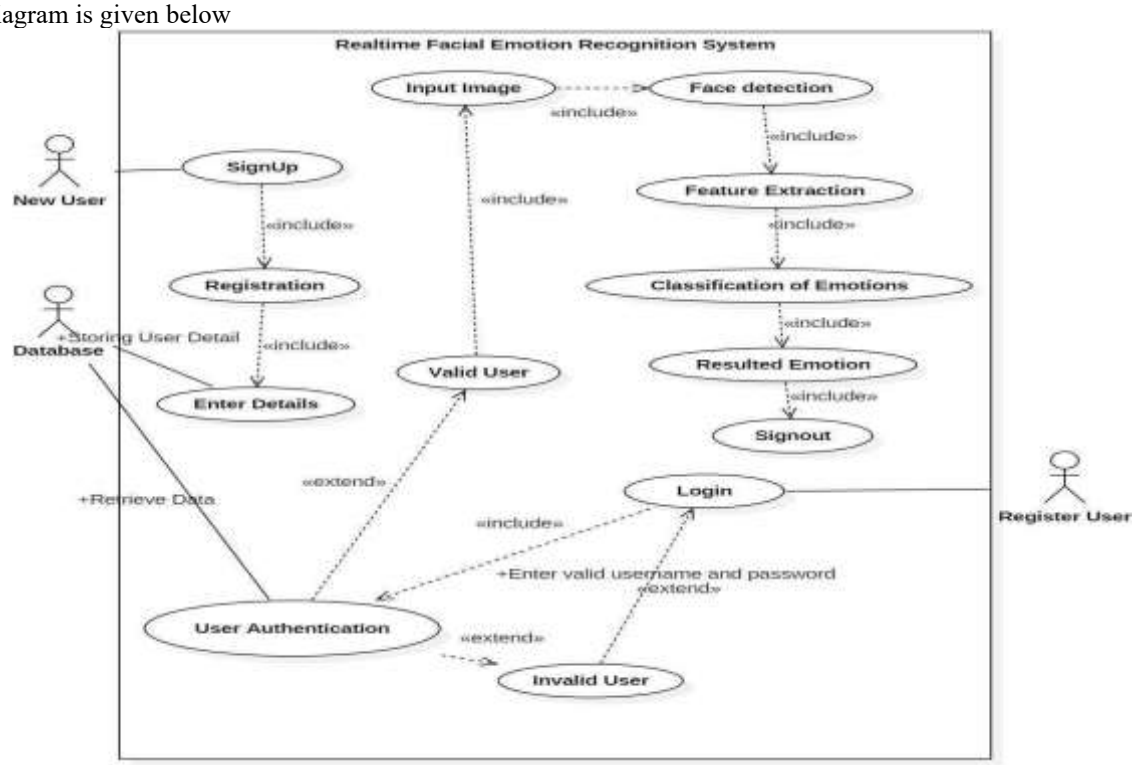


Figure-Use Case Diagram

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CHAPTER 4
SYSTEM DESIGN

Basic Modules

What is module?

In software, a module is a part of a program. Programs are composed of one or more independently developed modules that are not combined until the program is linked. A single module can contain one or several routines. An enterprise-level software application may contain several different modules, and each module serves unique and separate business operations. Modules make a programmer's job easy by allowing the programmer to focus on only one area of the functionality of the software application. Modules are typically incorporated into the program (software) through interfaces.

Database Development Life Cycle:

The database development life cycle (DDLC) is a process of designing, implementing and maintaining a database system to meet strategic or operational information needs of an organization or enterprise such as:

- Improved customer support and customer satisfaction.
- Better production management.
- Better inventory management.
- More accurate sales forecasting.

The Database Life Cycle (DBLC) contains six phases: database initial study, database design, implementation and loading, testing and evaluation, operation, and maintenance and evolution.

What is a Database Management System (DBMS)?

A Database Management System (DBMS) is software designed to store, retrieve, define, and manage data in a database. DBMS software primarily functions as an interface between the end user and the database, simultaneously managing the data, the database engine, and the database schema in order to facilitate the organization and manipulation of data.

Logic Diagram

Logic diagrams represent systematic flow of procedure that improves its comprehension and helps in implementation. Logic diagrams have many uses. A logical data flow diagram focuses on the business and how the business operates. A control- flow diagram (CFD) is a diagram to describe the control flow of a business process, process or review. A control-flow diagram can consist of a subdivision to show sequential steps, with if- then-else conditions, repetition, and/or case conditions. Suitably annotated geometrical figures are used to represent operations, data, or equipment, and arrows are used to indicate.

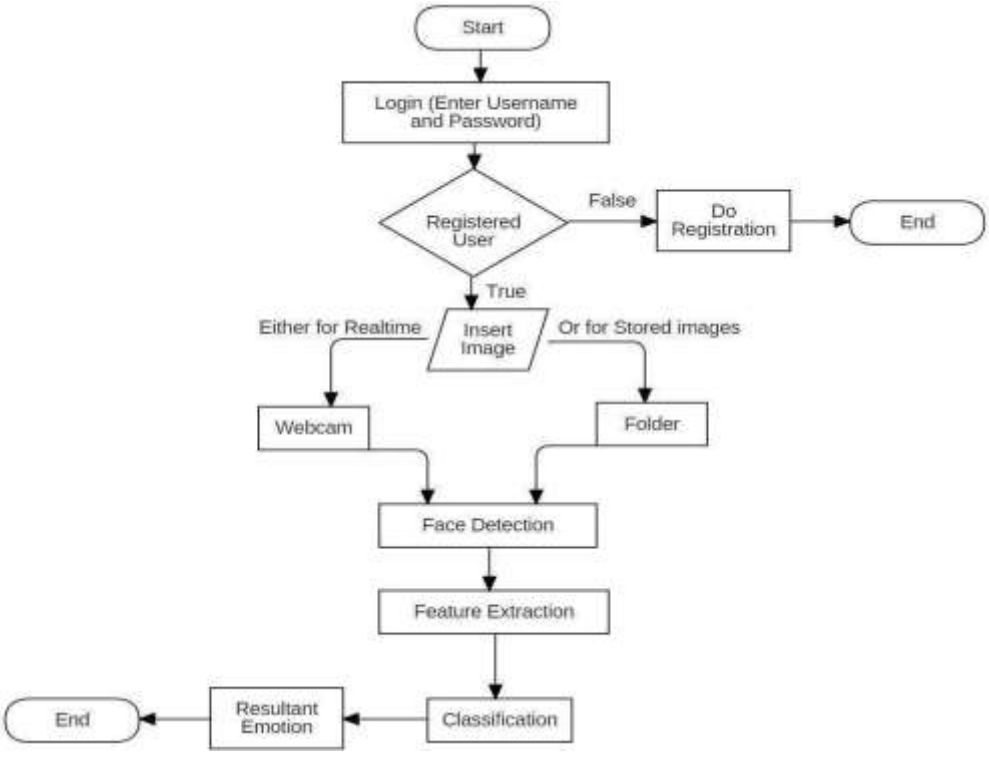


Figure-Control Flow Diagram

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CHAPTER 5
CONCLUSIONS

I had trained my model on 35887 images in which 28821 images are belonging totrain folder and 7066 images belonging to validation folder. I have successfully implemented the Realtime Facial Emotion Recognition System with the Training accuracy of 96.78% andvalidation accuracy of 67.03%. I have implemented all above test cases successfully. I achieved clean interfaces that further enhance the user experience. User can identify their emotions efficiently. Some Activities according to emotion will be suggested to user so that user can do that activity and feel good. The activity link is provided.

So we can conclude that by using this application user can find their emotions andmake themselves free from stress, tension and depression. For example if user is sad than they can write their feelings into diary, if user is angry then they can do some meditations, if user is happy than they can perform some dance move so on. In this way user can spend some time for themselves.

Significance of the System

- User can use this application efficiently to detect the emotions.
- User security is maintained, only user can know there password.
- Whenever user enter password that password will be encrypted and that encryptedpassword is store in database so admin is also unaware of user password.
- Activity is suggested according to emotions of user.

Future Scope of the Project

Following are some features that can be added into the application.

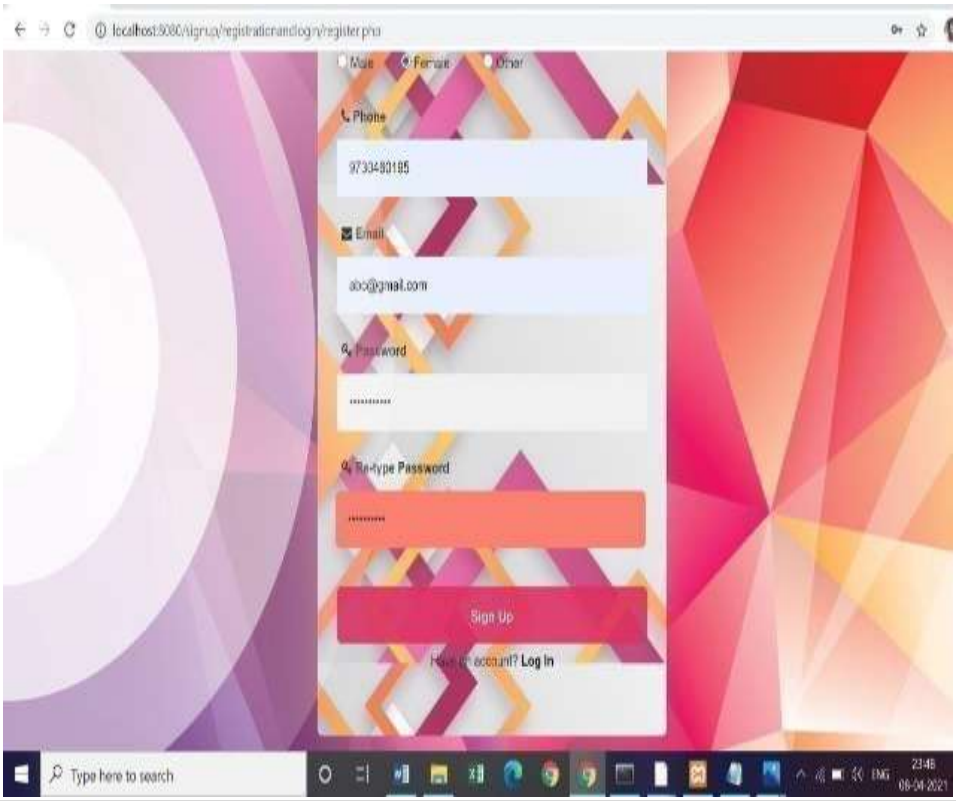
- More accuracy can be improve busing much more human images with good varianceamong them
- Facial expressions can be labelled by using emoticons.

CHAPTER 6
IMPLEMENTATION AND TESTING

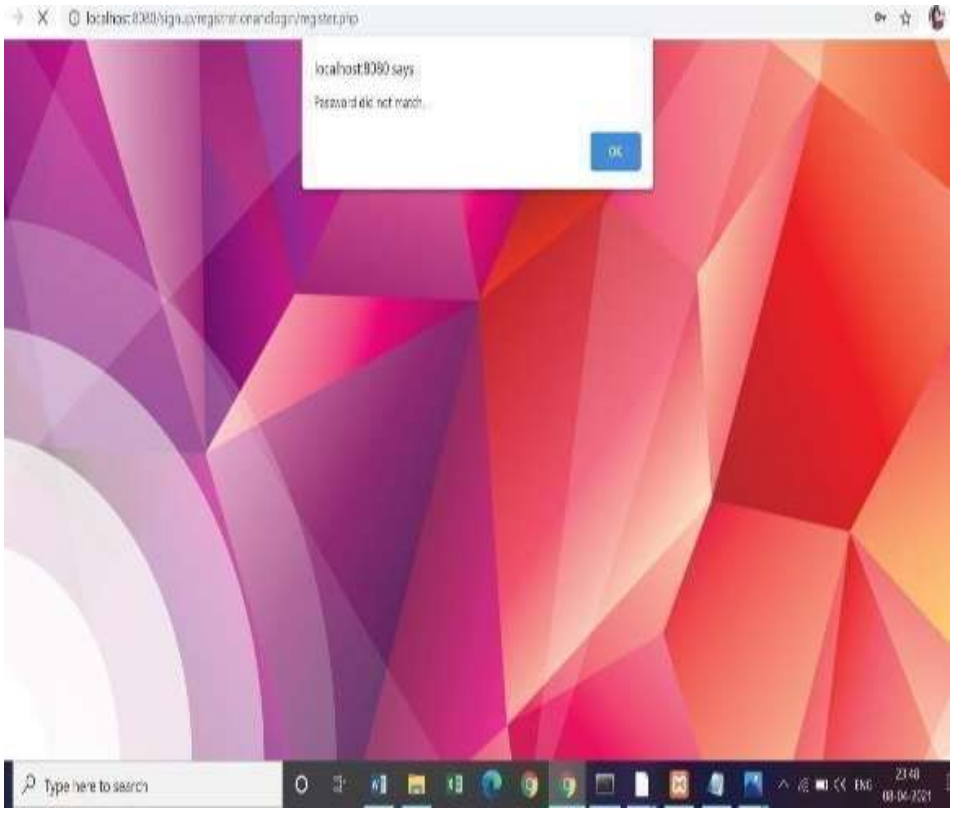
Implementation Approaches

A product software implementation method is a systematically structured approach to effectively integrate a software based service or component into the workflow of an organizational structure or an individual end-user. During implementation, the project team creates the actual product. Product implementation can be an exciting phase for the customer, because their idea for the project becomes something tangible. Project developers begin building and coding the software. Implementation is not an event. It is a mission-oriented process involving multiple decisions, actions, and corrections designed to make full and effective use of effective innovations in education settings.

Registration Test Case Result



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CHAPTER 7
RESULTS

Test Reports

This section covers the various tests, including validations that were conducted to ensure the proper working checking for the validity. By means of these testing results one can analyze the measures to further improve the performance ofthe application.

Tests were also carried out to ensure that the proper error messages are displayed to the user whenever he/she is not authenticated. In case a user (admin or faculty) enters a wrong password, then a message box is displayed with an “Invalid Login” message is displayed.

User Documentation

Realtime Facial Emotion Recognition System is web application design for detecting the emotions in Realtime. This application is developed using python, machine and deeplearning algorithms. Flask is used in backend for creating this web application. This application is easy to use for both beginners and advanced users. It features a familiar and well thought-out, an attractive user interface.

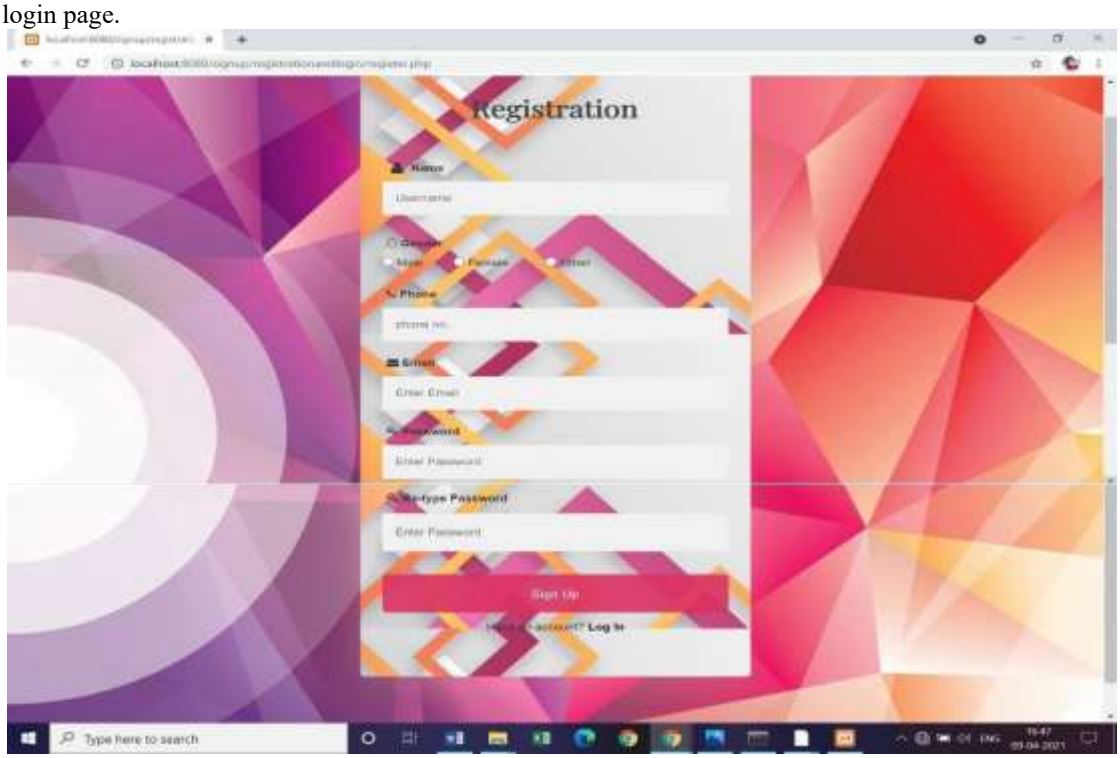
The first page of this application is homepage which have particles in the background which makes the homepage attractive. This page has a button which will redirect user to login page.

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Homepage



For using this application first user needs to create an account by filling the registrationform which is provided through a button 'Sign up' on login page.



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Some guidelines for registration form:

1. All fields are mandatory.
2. Username can onlycontain alphabets and white space.
3. Phone should have 10 digits.
4. Email-Id must be in the format 'abc@gmail.com'.
5. Password must contain at least 8 characters.
6. Password should be combination of alphabets, numbersand special characters such as @, ! ,_, $ etc.
7. Enter the same password in Re-type password field.

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