MACHINE-VISION-BASED AUTHENTICATION SYSTEM

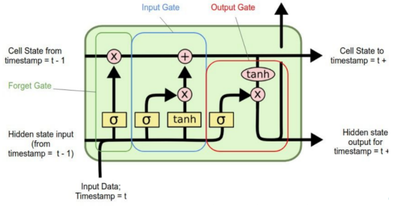
Long Short-Term Memory Recurrent Neural Network

LSTM (Long Short-Term Memory) is a type of Recurrent Neural Network (RNN) architecture that is commonly used for processing sequential data, such as time series prediction.

LSTM networks are designed to handle the problem of vanishing gradients in traditional RNNs by using memory cells to store information from previous time steps and control gates to regulate the flow of information into and out of the cells. This allows LSTM networks to effectively capture long-term dependencies in sequential data and perform well on tasks requiring a large amount of context.

Action Detection

LSTMs are used in action detection to classify human actions in videos by processing sequential data. They can capture temporal dynamics and handle variable-length sequences, and are often combined with CNNs to extract features from visual data. The LSTM generates a sequence of hidden states that capture the temporal information of the action for classification.



SYSTEM ARCHITECTURE

Face Recognition

Gadget used MTCNN, stands for Multi-Task Cascaded Convolutional Networks and is a deep learning model for face detection that includes face proposal detection, alignment, and recognition. It is known for its high accuracy and computational efficiency. The face Recognition model used is this project is the VGGFace2 which is trained on a large-scale face recognition dataset. Images are downloaded from Google Image Search and have large variations in pose, age, illumination, ethnicity and profession.

Mediapipe Holistic

MediaPipe Holistic is a multi-stage framework for human pose estimation that utilizes a machine learning pipeline to identify and track the positions of key points on a person's body in real-time. It is designed to be flexible, modular, and scalable, making it suitable for a wide range of use cases, including augmented reality, sports analysis, and health monitoring. The output of the framework includes the estimated 2D and 3D positions of key points on a person's body, which can then be used for various applications such as gesture recognition, posture analysis, and human-computer interaction.

Tensorflow Framework

TensorFlow is an open-source software library for data flow and differentiable programming across a range of tasks. It is a symbolic math library and is mainly used for machine learning and deep learning applications such as neural networks. TensorFlow provides a high-level API for building and training machine learning models, and has a large community for both research and development.

Keras API

Keras is an open-source software library that provides a Python interface for ANNs (Artificial Neural Networks). It acts as an interface for the TensorFlow library. Keras was developed to enable deep learning engineers to build and experiment with different models very quickly. It has a user-friendly API that makes it easy to quickly prototype deep learning models. Keras supports convolutional and recurrent neural networks, and is capable of running on top of multiple backends including TensorFlow, Microsoft Cognitive Toolkit, and Theano.

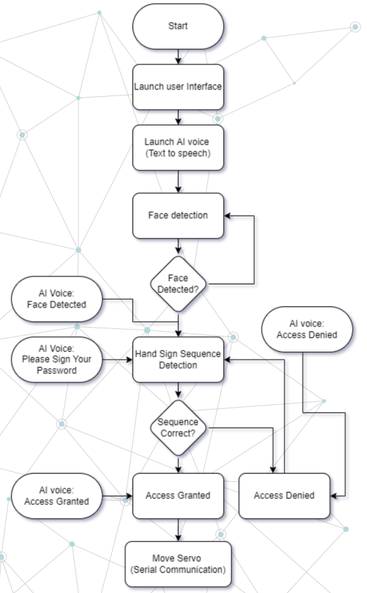
Tkinter Python GUI

Tkinter is a built-in GUI (Graphical User Interface) library in Python, it provides a set of tools to develop GUI applications in Python. It is a thin object-oriented layer on top of the Tcl/Tk GUI toolkit. It provides a simple way to create windows, dialogs, buttons, and other GUI elements for desktop applications in Python.

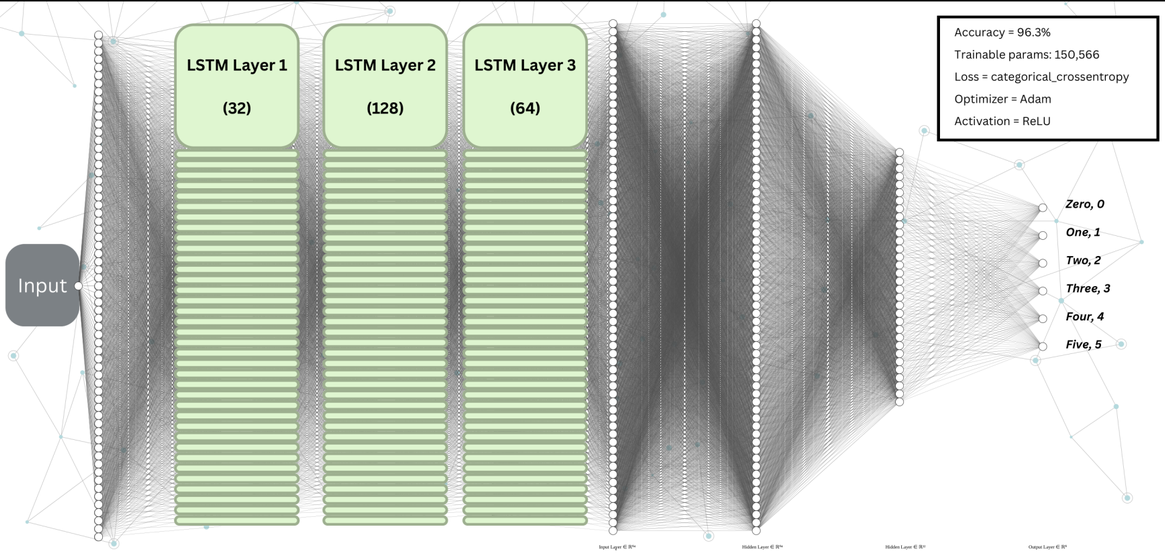
Text To Speech

Library utilized Pyttsx3 that is a text-to-speech library for Python that converts text into speech using pre-installed or cloud-based voices. It is simple and easy to use with support for multiple languages and voices.

FLOW CHART



NEURAL NETWORK ARCHITECTURE



CONTRIBUTION

Dataset Collection

All dataset used were gathered/created by the group members.

Customized Facial Recognition Model

The system created is unique and private to the group members, making it more efficient.

Meaningful-integrated Authentication System

Succeeded in creating/integrating a smart authentication system that has a meaningful outcome.

Group Members

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