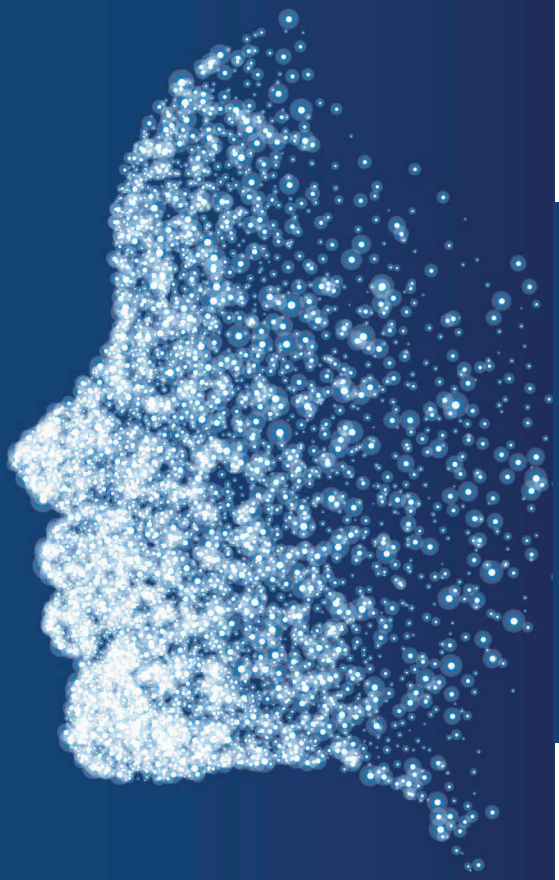
Enriched Face Recognition and Verification System for a Leading IT Services Company



About the Client

Our client is a leading provider of software package products, innovative software solutions and IT support services in Japan as well as internationally. Established in the year 1991, the company offers business solutions such as Customer Relationship Management, Merchandising systems, credit card solutions, accounting software and services for different business requirements. The client has their headquarters located in Tokyo, Japan and delivers IT Support Services such as application operating service, data centre service, system building service to customers across the globe.

Business Challenge

- The client required an innovative face recognition based attendance tracking system for their organisational purpose.
- They required the application to be web-based and to be able to access anywhere through cloud storage.
- The system should be able to record essential details such as the name, age & gender and the admin should be able to extract custom reports based on the requirements.

InApp's Solution

InApp used the Facenet technology that maps the input facial image into a 128-dimensional vector by training different object models. Facenet uses Deep Learning with Tensorflow libraries to distinguish unique facial features from unstructured information. The process of Face Embedding involves subjecting an image through multiple Convolutional Neural Networks (CNN) and converting it into a 128-dimensional vector. The workflow follows a procedure that involves training the CNN through images of employees/staffs in the company. Once the training has been completed, tasks such as face recognition, verification and clustering can be carried out through standard techniques.

The training of neural networks is done by collecting the images of all staffs in the organization and mapping the weights between different points in the 128-dimensional vector. The resultant facial embedding is mapped with the employee details and then stored in a secure database for live comparison later. Once the pre-trained Facenet system is ready and when the employee interacts with the face recognition camera, the picture is sent through the pre-trained neural networks. The 128-dimensional embedding from the output is then compared with the stored version using the distance between different points in the vector and through Gradient Descent. As for Facial Verification, gradient descent uses the triplet (Anchor, Positive, Negative) mechanism to align matching/non-matching face patches. The triplet loss minimises the distance between the Anchor & the Positive Image whereas increases the distance between the Anchor & Negative Image thus resulting in an error-free verification through facial embedding.

Technologies Used

- **Facenet Libraries:**

  Facenet is employed to train the system with the employee's pictures by converting it into a 128-dimensional vector and analysing/comparing the pattern with the live image. The pictures are subjected to forward propagation through multiple Convolutional Neural Networks that converts any image into a vector.

- **Deep Learning with TensorFlow:**

  Since training of neural networks involves dealing with several unstructured data, TensorFlow is one of the optimal libraries to implement Deep Learning technique which distinguishes the unique facial features from the rest of the information.

- **Gradient Descent:**

  The algorithm compares an Anchor (original) image with a Positive (Visually similar to anchor) and a Negative (completely different from anchor) image to determine the triplet loss and verify the input image. In a successful facial authentication, the distance between the anchor and positive is minimised whereas the distance between the anchor and negative image is increased to a greater extent.

Business Benefit

- Improved & accurate face recognition system that uses Facenet technique for image embedding/encoding.
- Advanced error correcting mechanism using the Gradient Descent algorithm which enhances the authentication factor and prevents any unauthorized access.
- Pre-trained Facenet libraries which make the process of Facial Recognition & Verification faster and accurate.
- Each image is converted into a 128-dimensional vector which makes Face Mapping more precise.