Problem Statement

Over the past decade there have been numerous advances within the banking industry in the use of technology, especially facial recognition. This revolution brings a new level of security within business transactions with authorized access. BECU, working together with the University of Washington ECE Department, would like to bring facial recognition technology to 50+ Neighborhood Financial Center (NFC) locations and 1,000+ ATMs. This new facial recognition software would be deployed with hopes of preventing malicious actors from impersonating BECU customers, thus creating a more secure banking experience.

Requirements

- The system needs to perform computation and facial recognition non-locally in Microsoft Azure.
- The system should utilize IP-based security video camera technology provided by Verkada.
- The system should be able to scale to handle 1,000+ ATMs and 50+ NFCs with over a million customers.
- The system needs to achieve accurate facial recognition in real-time.
- The system should be able to record all facial recognition results as transactions in a SQL server.
- The system will train Azure Cognitive Services (ACS) model on one headshot picture for each customer i.e., the customer’s driver’s license picture.
- Depending on whether the system is deployed on an ATM or an NFC, the preprocessing subsystem and postprocessing subsystem are designed differently.

Overall System Implementation

- Our system is completely deployed on Microsoft Azure.
- Our system takes input from the video stream of the IP camera mounted either on BECU ATMs or Financial Centers and logging the visit information of BECU customers to the SQL database.
- The subsystems are containerized as a docker image that is deployed on Azure VM.
- Preprocessing subsystem, recognition subsystem, Azure Storage Queue and post-processing subsystem are scaled up to be deployed on every ATM and NFC.
- Depending on whether the system is deployed on an ATM or an NFC, the preprocessing subsystem and postprocessing subsystem are designed differently.

Different Design Parameters

<table>
<thead>
<tr>
<th></th>
<th>ATM</th>
<th>NFC</th>
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<tbody>
<tr>
<td>Motion Trigger</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Number of Frames Processed per Second from Stream</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Number of Intermediate Logs Processed per Second</td>
<td>Low</td>
<td>High</td>
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<tr>
<td>Minimum Transaction / Visit Time</td>
<td>High</td>
<td>Low</td>
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Testing & Results

We tested our system by feeding the system pre-recorded videos of team members walking towards a camera, stimulating video inputs of customers approaching ATMs and NFCs.

Future Work & Acknowledgments

- Handle more edge-cases in post-processing such as a person whose facial data is unavailable.
- Develop a more sophisticated Siamese Model to replace the current use of ACS.
- Fully utilize the Verkada Security Camera (its security settings are incompatible with our current system).

We would like to thank Jim Jenkins and his team as well as Professor Rania Hussein for their guidance on this project.