# Final Project: Facial Recognition

**Executive Summary**

**Nik Baldis**

## Methodology

This project aimed to find a facial recognition package that balances effectiveness with context. The two packages we compare are an open-source package called “face\_recognition” and Amazon’s ReKognition API. To determine the best facial recognition package, we created two use cases that would stretch the power of both technologies. The first case was identity verification. We gave the packages two images, a headshot of a student and the same headshot with artificial aging, and asked the packages to create a similarity score. The accuracy, precision, and recall of the packages were calculated. The second use case applied to determining attendance. We gave the facial recognition images of students in class and asked the technology to match the candid class photo with the headshot photos. The packages would determine if the student was present in class and the match similarity. With the metrics from both use cases, we can decide what facial recognition package to use going forward.

## Key Findings

**Use Case 1:**

The ReKognition package had a slightly lower accuracy and recall than the open-sourced package “face\_recognition.” A likely cause of this was changing the similarity threshold within the recognition package to 60% instead of the default 50%. We wanted to have a stricter threshold for similarity to increase accuracy. Still, it seems that the 60% threshold within the package lowered the match similarity to exclude some headshots that could have been matched. An example of an expected match is Nik Baldis’s headshot. With ReKognition, the match similarity was 97.18%, and with the open-source face\_recognition package, the match similarity was 60.72%. An example of an expected non-match would be Alicia Bodoia’s headshot. Her aged headshot is nearly unrecognizable. AWS recognition gave a match similarity of 0%, and the face\_recognition package gave a match similarity of 20%.

**Use Case 2:**

This is where the AWS package shines, primarily if the company aims to use facial recognition for pictures with multiple people. A lot of the matches from the face\_recognition package are entirely incorrect. In image one, for example, there are only two correct matches, and the other eight predictions are altogether wrong or match the aged pictures of people who are also incorrect. Although AWS ReKognition matched the aged headshots to half the people in image 1, they are the correct people and have a high match similarity. For example, Eric Mayo, Mary Martha Milcoff, and Kyle Wiblishauser are 99% matches. Notice that Nik Baldis was successfully matched despite wearing a hat. The match similarity was expectedly lower (~84%), but having the ability to accurately recognize faces through obstructions could be very valuable. Also, please recognize that both the aged and normal headshots are commonly matched to the attendance picture, which affects the number of matched faces counted.

## Recommendations

Although Amazon had a slightly lower accuracy and recall than the open-source face\_recognition package in use case one, use case two is the more relevant if the company is concerned about employees returning to work. Amazon ReKognition truly stands out from face\_recognition in this case. The ability to take an image with multiple people and catalog who they are and if they are present with extremely high accuracy would benefit a work environment like an office or warehouse. Use case one is suitable for determining the interpolation skills of the different packages, and Amazon is slightly better in that sense. Still, the open-source face\_recognition package was incredibly inaccurate for the second use case. For that reason, we recommend moving forward with Amazon ReKognition, trusting the security of cloud computing and its incredible accuracy.

## Appendix

**Use Case 1:**

**A blue squares with white text

Description automatically generatedA blue squares with white text

Description automatically generatedConfusion matrices**

**AWS Face\_recognition**

**Tables of accuracy, precision, and recall**

|  |  |  |
| --- | --- | --- |
|  | **AWS ReKognition** | **facial\_recognition** |
| **Accuracy** | 0.897 | 0.902 |
| **Precision** | 1.0 | 0.98 |
| **Recall** | 0.86 | 0.88 |

**Use Case 2:**

A group of people sitting in a room

Description automatically generated**A group of people sitting in a room

Description automatically generated**A screenshot of a computer

Description automatically generated**A screen shot of a computer

Description automatically generatedFace\_Recognition:** A black background with white text

Description automatically generated

A group of men sitting at a table

Description automatically generated

A black background with white text

Description automatically generatedA group of men sitting at a table

Description automatically generatedA group of white letters on a black background

Description automatically generatedA group of people sitting in a room

Description automatically generated**A group of people sitting in a room

Description automatically generatedAWS ReKognition:A black background with white letters

Description automatically generated**