LARANA, INC.

FINAL YEAR PROJECT

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CONTENT

INTRODUCTION

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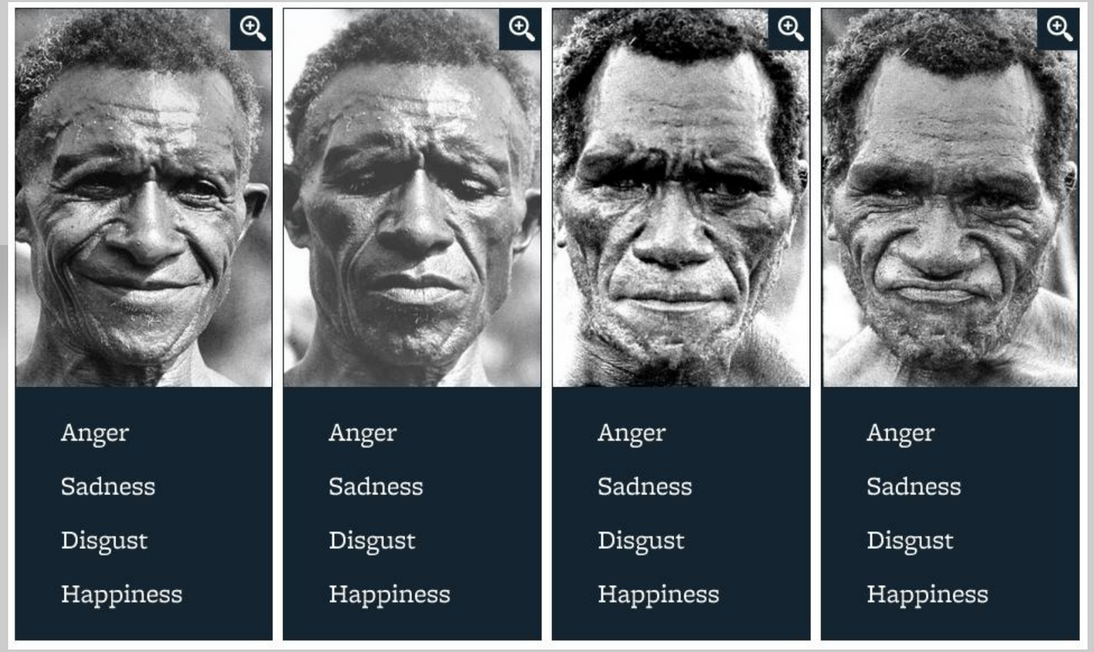
"A Comparative Analysis of Emotion Detection Accuracy in AWS Rekognition and Luxand FaceSDK: Balancing Performance and Cost"



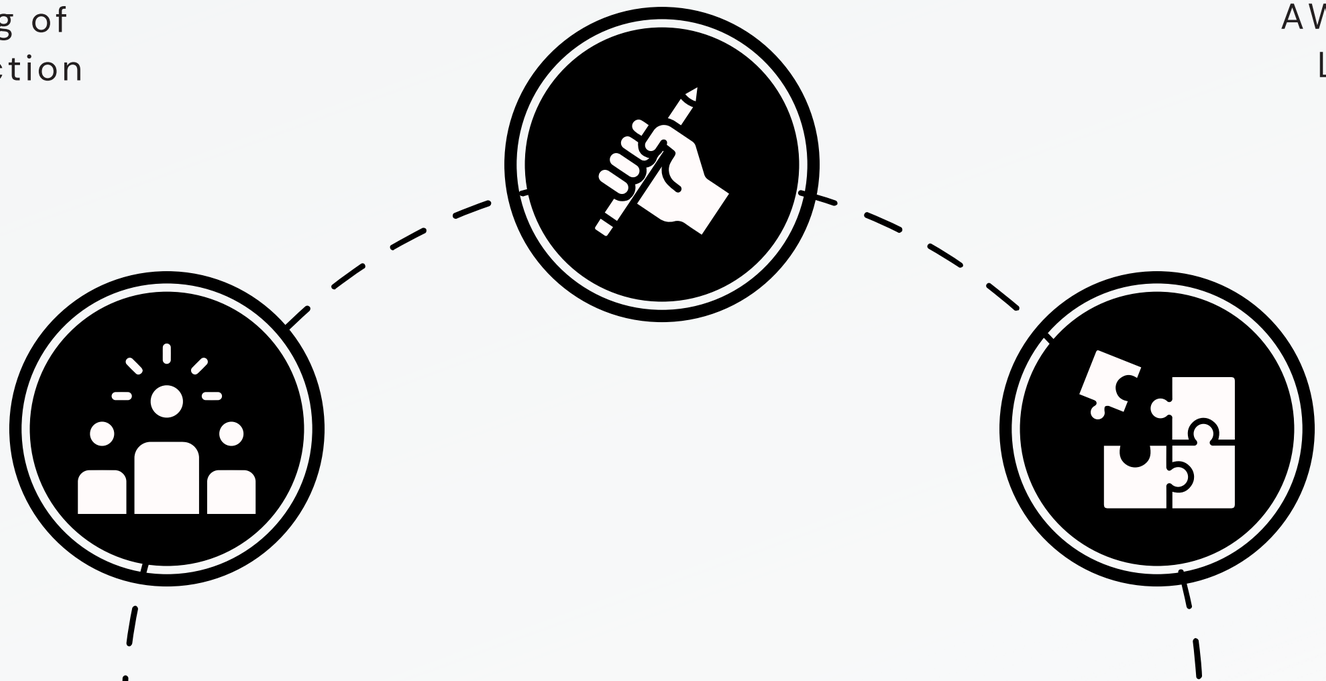
PROJECT OVERVIEW

Target Audience

- Researchers
- Developers
- Professionals
- Anyone with an understanding of emotion detection

Problem Statement

By comparing the performance of two prominent API's, the project aims to provide insight into their effectiveness and identify areas of improvement.



Differentiation

This project is different from other similar analyses as is focuses on a comprehensive analysis of AWS Rekognition and Luxand Face SDK.

APPROACH

By using multiple datasets and applying statistical analysis, the project provides an in-depth understanding of the performance, strengths, and limitations of AWS Rekognition and Luxand FaceSDK.

EMOTION DETECTION APIS

The project utilizes two emotion detection APIs, namely AWS Rekognition and Luxand FaceSDK. These APIs provide pre-trained models and algorithms for detecting and classifying emotions from facial expressions.

DATASETS

The project analyzes three different datasets: Cohn-Kanade (CK), Expressions in the Wild (ExpW), and Facial Expression Recognition (FER). These datasets cover a wide range of facial expressions and emotions, allowing for a comprehensive evaluation of the APIs' performance.

DATA PRE-PROCESSING

The project applies data preprocessing techniques to ensure the consistency and quality of the datasets. This includes resizing images, removing noise, and organizing the data for analysis.

METRICS

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The project measures the confidence levels provided by the APIs when identifying the dominant emotion in an image. This metric helps evaluate the APIs' certainty in their predictions.

CONFIDENCE LEVELS

The project calculates binary accuracy by comparing the API's highest confidence prediction with the actual dominant emotion label. This metric assesses the APIs' ability to correctly classify emotions.

BINARY ACCURACY

The project employs statistical analysis techniques to compare the performance of AWS Rekognition and Luxand FaceSDK. Mean confidence and binary accuracy are calculated for each emotion and dataset, allowing for a quantitative comparison.

STATISCAL ANALYSIS

RESULTS

MEAN CONFIDENCE vs. BINARY ACCURACY Cohn-Kanade (CK) Dataset using AWS Rekognition		
	MEAN CONFIDENCE	BINARY ACCURACY
HAPPY	94.37	97.58
SURPRISE	94.20	93.57
FEAR	24.54	20.00
SADNESS	77.01	77.38
ANGER	62.85	69.63
DISGUST	41.69	42.05
MEAN	65.78	66.70

Average Confidence Levels by Emotion in Cohn-Kanade (CK) Dataset using AWS Rekognition								
	AWS RESULT							
CK LABEL	HAPPY	SURPRISED	FEAR	SAD	ANGRY	DISGUSTED	CONFUSED	CALM
HAPPY	94.37	8.27	6.07	2.23	0.44	1.37	0.49	0.70
SURPRISE	0.23	94.20	11.25	2.79	0.38	0.45	0.40	2.39
FEAR	0.81	14.10	24.54	44.72	5.03	24.89	1.05	6.26
SADNESS	0.59	7.11	6.58	77.01	9.95	14.19	1.88	7.11
ANGER	0.43	7.92	6.12	7.36	62.85	4.86	8.95	15.55
DISGUST	0.36	6.49	6.04	3.95	53.00	41.69	1.86	0.64
CONTEMPT	12.58	10.06	6.07	9.17	3.09	9.54	1.77	62.53

DEMONSTRATION

Q&A

1.DISCUSS THE MOST DIFFICULT ASPECT OF YOUR PROJECT WITH PARTICULAR EMPHASIS ON THE ANALYSIS OF YOUR DATA

- Analysis of the data, interpreting and comparing the results from the different API's. It required careful consideration of multiple factors such as confidence levels, accuracy rates and overall API performance.
- Dealing with variations of Data Quality, this affected the evaluation of API performance. Also, limited availability of some emotion groups impacted the accuracy assesment.
- Comparison of Mean Confidence and Binary Accuracy. It was initially difficult to grasp the concept of what they represented and also deciding what the result meant for the API performance.

2. DISCUSS THE MOST INNOVATIVE ASPECT OF YOUR PROJECT

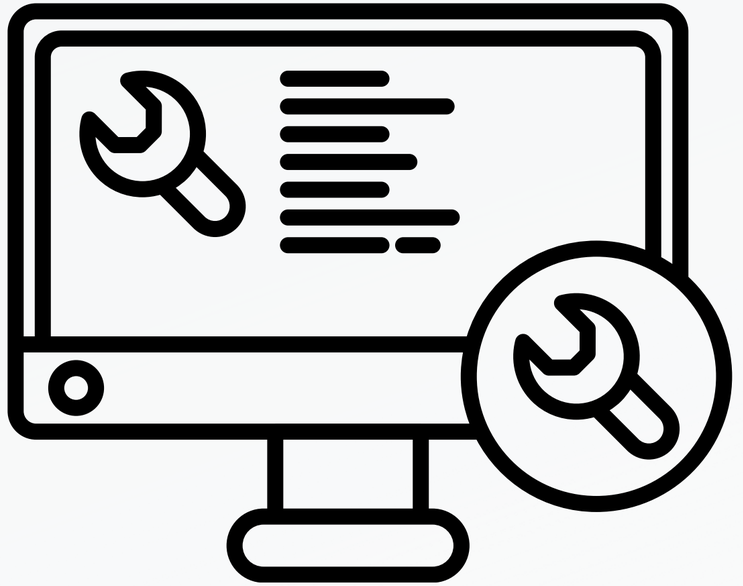
- The comprehensive evaluation and comparison of the two APIs, AWS Rekognition and Luxand FaceSDK. While previous studies have examined the performance of individual APIs or focused on specific datasets, this project took a broader approach by systematically analyzing the performance of these APIs across different datasets and emotions.
- The use of multiple metrics to asses the API's performance led to a more nuanced understanding of capabilities.
- The project also addressed the limitations and challenges associated with emotion detection.

3.WITH RESPECT TO YOUR AIMS AND OBJECTIVES AS SET OUT IN YOUR PROJECT PROPOSAL, HOW HAVE THESE SINCE CHANGED AND WHAT IMPACT HAS THIS HAD ON THE COMPLETENESS OF YOUR PROJECT?

- In the project proposal, the aims and objectives were focused on investigating algorithmic bias in public cloud service facial recognition algorithms, comparing their structure and output, and understanding measures taken to minimize bias. However, as the project progressed, it became evident that obtaining detailed information about algorithmic bias and the steps taken to mitigate it was challenging due to limited transparency from the algorithm providers.
- While the project may not have fully addressed the initial objectives regarding algorithmic bias, it still provided valuable insights into the performance and capabilities of the facial recognition algorithms. The analysis of the datasets shed light on the strengths and weaknesses of the algorithms, allowing for a comprehensive evaluation of their accuracy and confidence levels.

4.DESCRIBE IN DETAIL, YOUR APPROACH TO TESTING

- Analyse three different datasets: the Cohn-Kanade (CK) dataset, Expressions in the Wild (ExpW) dataset, and Facial Expression Recognition (FER) dataset. Two popular emotion detection APIs, AWS Rekognition and Luxand FaceSDK, were employed to evaluate the performance of the algorithms on these datasets.
- The testing process consisted of measuring the average confidence levels and binary accuracy of the algorithms in detecting dominant emotions in the datasets. The results were analyzed and compared across different emotions and datasets to assess the algorithms' performance and identify any potential biases or limitations.



5.IF YOU WERE TO START YOUR PROJECT AGAIN WOULD YOU CHANGE ANY OF THE DECISIONS YOU MADE? FOR EXAMPLE, IN RELATION TO DATA PROCESSING, DATA PRIVACY, ANALYSIS TECHNIQUES, TECHNOLOGIES ETC.

- Data Processing: Depending on the availability and suitability of datasets, alternative or additional datasets could be explored to further enhance the analysis. This would provide a more diverse range of data for evaluating the algorithms' performance and addressing potential biases.
- Data Privacy: Given the sensitivity of facial recognition data and the concerns around privacy, it would be important to ensure strict adherence to data privacy regulations and ethical considerations. Additional measures could be implemented to anonymize or protect personal information during data processing and analysis.

5.IF YOU WERE TO START YOUR PROJECT AGAIN WOULD YOU CHANGE ANY OF THE DECISIONS YOU MADE? FOR EXAMPLE, IN RELATION TO DATA PROCESSING, DATA PRIVACY, ANALYSIS TECHNIQUES, TECHNOLOGIES ETC.

- Analysis Techniques: While the analysis techniques employed in the project were suitable for evaluating the algorithms' performance, incorporating advanced statistical methods or machine learning techniques could potentially provide deeper insights into algorithmic biases and enhance the accuracy of the findings.
- Technologies: As technology evolves rapidly, it would be beneficial to stay updated with the latest advancements in facial recognition algorithms and APIs. This would involve regularly reviewing and considering new technologies and APIs that may offer improved performance, accuracy, and bias mitigation measures.

THANK'S FOR WATCHING