Face-Mask Detection

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Problem Description

Mask Restrictions in public areas

Contact Tracing for COVID-19

Design an algorithm that determines whether an individual is:

- Wearing a mask
- Not wearing a mask
- Wearing a mask incorrectly.

Using CNNs, KNN, and a few of the original classifiers from our base study

State of the Art/Related Work

"A hybrid deep transfer learning model with machine learning methods for face mask detection in the era of the COVID-19 pandemic" (Loey, M., Manogaran, G., Taha, M., & Khalifa, N., 2021)

Does not account for *wearing masks incorrectly*

Does not use *different CNN models* and *provide KNN metrics*

Has up to a 100% accuracy across one of the three tested datasets

Approach

We plan to use a combination of different datasets available to create a new dataset that is labelled ***for mask v. no mask v. incorrect wearing of a mask.***

- KNN
- Different types of CNN to gauge which models are the best predictors.

We hope to create our own face-detection model.

Member	Role	CSCI 353 Related Topics, Questions/Solution Approaches
Shania	KNN and Decision Tree Models, Performance Metrics	KNN Classifier, sFold, Decision Trees, Classification (What class does each image belong to), Supervised Learning, Binary V. Multi Classification
Xuejin	Different CNN Models	Neural Networks, CNN, Naive Bayes, comparing performance measures
Michelle	Data Preprocessing, SVM and Deep Learning	Cleaning Datasets, SVM, Deep Learning, error analysis across algorithms (F1 score, accuracy, precision, recall)

Evaluation

“99.64% accuracy, with up to 100% accuracy on one of the three different datasets used in the baseline research.”

We will use the performance metrics gathered on the:

- SVM
- KNN
- CNN
- Naive Bayes
- Deep Learning
- Decision Trees Models

To make our own ML Model and compare it to our baseline study.

Timeframe	Goals	Issues
Nov. 8th-14th	- Naive Bayes classifier - Conduct appropriate error analysis on it Naive Bayes - CNN - Conduct error analysis on CNN - SVM - Conduct error analysis on SVM - ****Try to combine the best models to create our own face-mask detection algorithm**	We expect to see differences in our performance measures compared to the baseline study because we use a different method for feature extraction. The paper uses ResNet residual neural network feature extraction and we use **PIL.**
Nov. 15th-21st MVP	- Decision tree algorithm - Conduct appropriate error analysis on it Decision tree - Implement Deep Learning - Conduct error analysis on Deep Learning	
Nov. 22th-Dec. 5th	- Wrapping up our findings - Start preparing for final deliverables	
Dec. 6th -Dec 12th [Final Presentation]	Present our final model as well as the findings from the models we tested above (KNN, CNN, Naive Bayes, Decision Trees, SVM, Deep Learning) and how each model's performance metrics compare against our baseline in the following studies: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7386450/pdf/main.pdf .	

The End

References

Loey, M., Manogaran, G., Taha, M., & Khalifa, N. (2021). A hybrid deep transfer learning model with machine learning methods for face mask detection in the era of the COVID-19 pandemic. *Measurement : journal of the International Measurement Confederation*, *167*, 108288. https://doi.org/10.1016/j.measurement.2020.108288