Face Mask Detection

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Description (Q3):

Design an algorithm that most accurately determines whether an individual is wearing a mask, not wearing a mask, or wearing a mask incorrectly. Given the suddenness of the current COVID-19 pandemic, relatively few research papers that address face mask coverage are available. It should be noted however, that the machine learning models currently available, while minimal, yield promising results.

Currently, the paper, "A hybrid deep transfer learning model with machine learning methods for face mask detection in the era of the COVID-19 pandemic," does not account for wearing masks incorrectly (Loey, M et al., 2021). We plan to address this third classification in our research and use our findings to build our own face-detection-model that accounts for this category. To accomplish this 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. We will also add in a few more classifiers not used in the original study such as KNN and different types of CNN to gauge which models are the best predictors. We hope to use these insights to create our own face-detection model.

Contribution (Q4):

Shania will be in charge of determining how to fit the Mask/No Mask/Improper Wear of Mask dataset using a KNN Classifier and a Decision Trees Model. The goal will be to find the most optimal settings for these models based on our accuracy and error analysis metrics (ex: best 'k' for KNN). The models that are most comparable to our baseline study's accuracy of 99.64% will be analyzed and considered in the construction of our own final model (Loey, M et al., 2021). It should be noted that the study mentioned ran their model against three different datasets, achieving 100% accuracy over one of the three.

Xuejin will be learning and reading more on the different types of CNN(CNN, R-CNN, Fast R-CNN) and applying these models to the Face Mask Dataset. The objective is to find a model that has a low computational time with really good accuracy. After determining the best algorithm for CNN's, discuss with teammates on how to optimize to get better performances.

Michelle will be collecting and cleaning the image dataset, adding facial landmark features, and implementing/analyzing SVM and Deep Learning models.

Describe Dataset (Q5):

We will use mask v. no mask image dataset provided by Kaggle, which are already separated into two folders(mask and no mask). We plan on adding features to the dataset by extracting facial landmarks (nose, mouth, jaw) from the images with dlib, OpenCV, and Python. The facial landmarks will be binary columns, where the value of 1 equates to that facial landmark being present in the image. We will combine this dataset with another one provided by Cornell that provides correct v. incorrect wear of a mask.

Evaluation (Q8):

We will use the performance metrics gathered on the SVM, KNN, CNN, Naive Bayes, Deep Learning, and Decision Trees Models to create our own face-mask detection model. After analyzing our face-mask detection model's performance metrics, we will compare it to our baseline research model's accuracy of 99.64% and use that to evaluate the effectiveness of our findings in the project (Loey, M et al., 2021).

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