

CLASSIFICATION OF FACIAL EXPRESSIONS USING CNN

THINKFUL DATA SCIENCE FINAL CAPSTONE PRESENTATION
FERGUSON

BY MARK

THE TASK

- **TO TRAIN A CNN TO RECOGNIZE CERTAIN FACIAL CHARACTERISTICS**
 - Determine the sex from a photo of the face
 - Distinguish the facial expression from a photo of the face

THE DATASET

- **10K US ADULT FACES DATABASE**
- **~ 300 SCRAPED IMAGES**

ORIGINAL DATASET



- Muted facial expressions
- Neutral, Happy, Sad, Angry, Surprised, Disgusted
- Class imbalance in favor of neutral, happy

THE WEB SCRAPER



- **BEAUTIFUL SOUP**

Use search strings in various languages

'<https://images.search.yahoo.com/search/images.....>'

sadness_url =

miserable_url =

surprise_url =

visage_surpris_url =

angry_url =

cara_de_enojado_url =

SCRAPED IMAGES



- More exaggerated facial expressions
- Large variation in image size, quality

THE MODEL



- **VGG16**

- Built for Imagenet Competition 2014
- Employ Transfer Learning
- 1000 outcome classes
- Remove last layer and add layer for own output classes
- All layers 'trainable=False' except final layer
- Data Augmentation
- Dataset split into training, validation and test sets

MALE VS FEMALE

55%



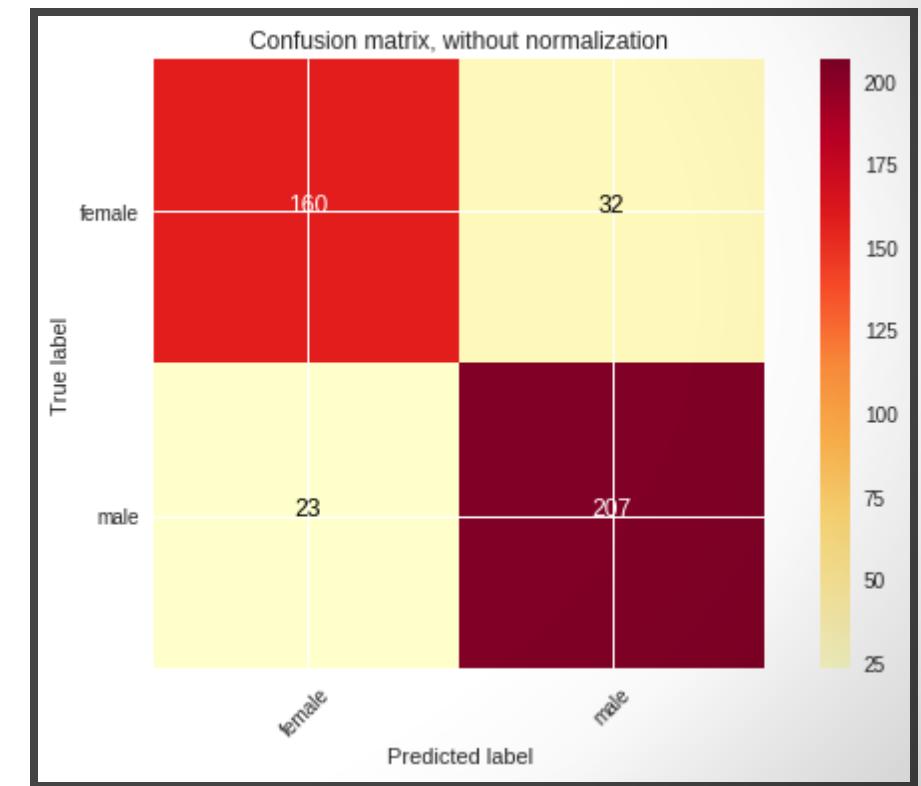
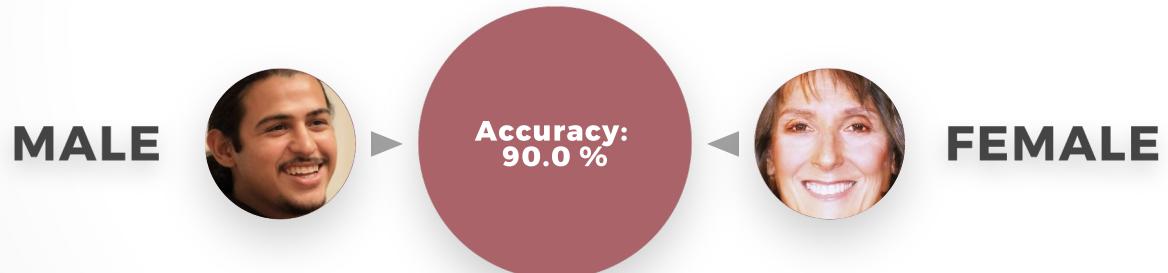
MALE

45%

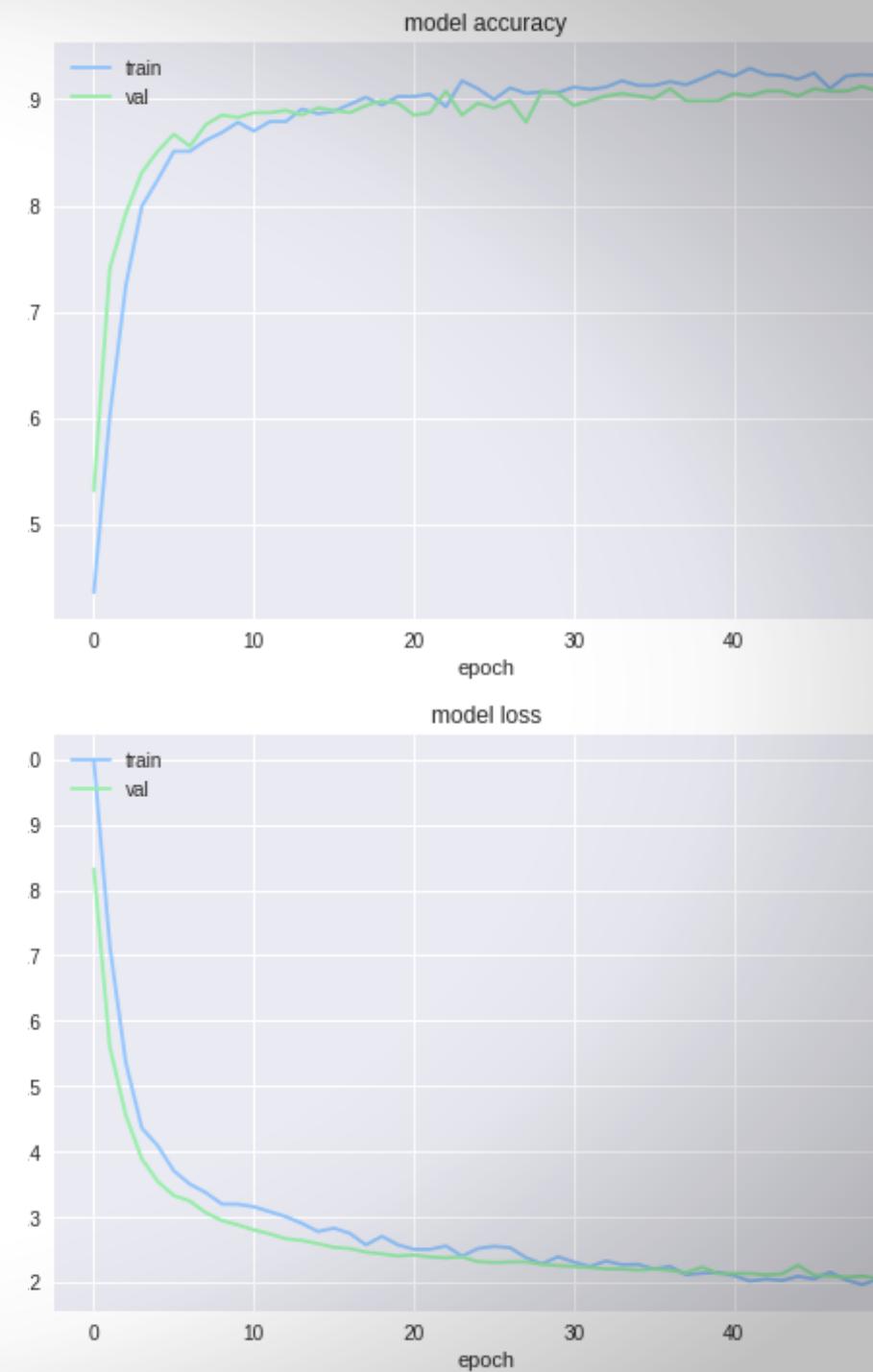
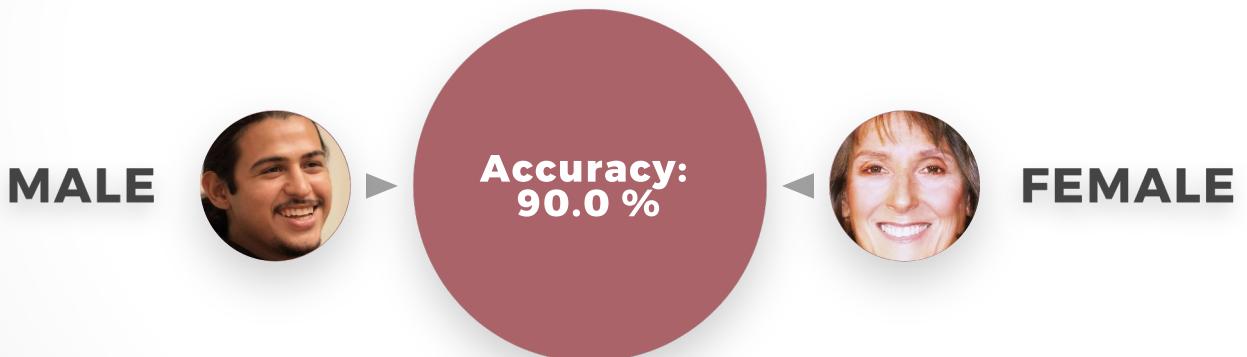


FEMALE

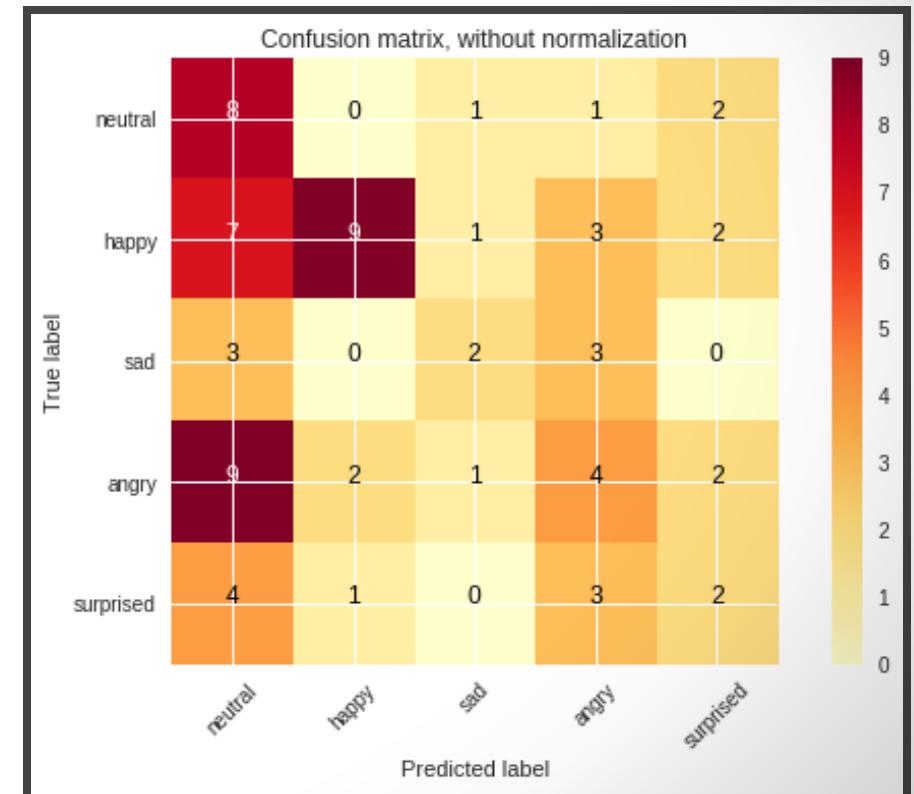
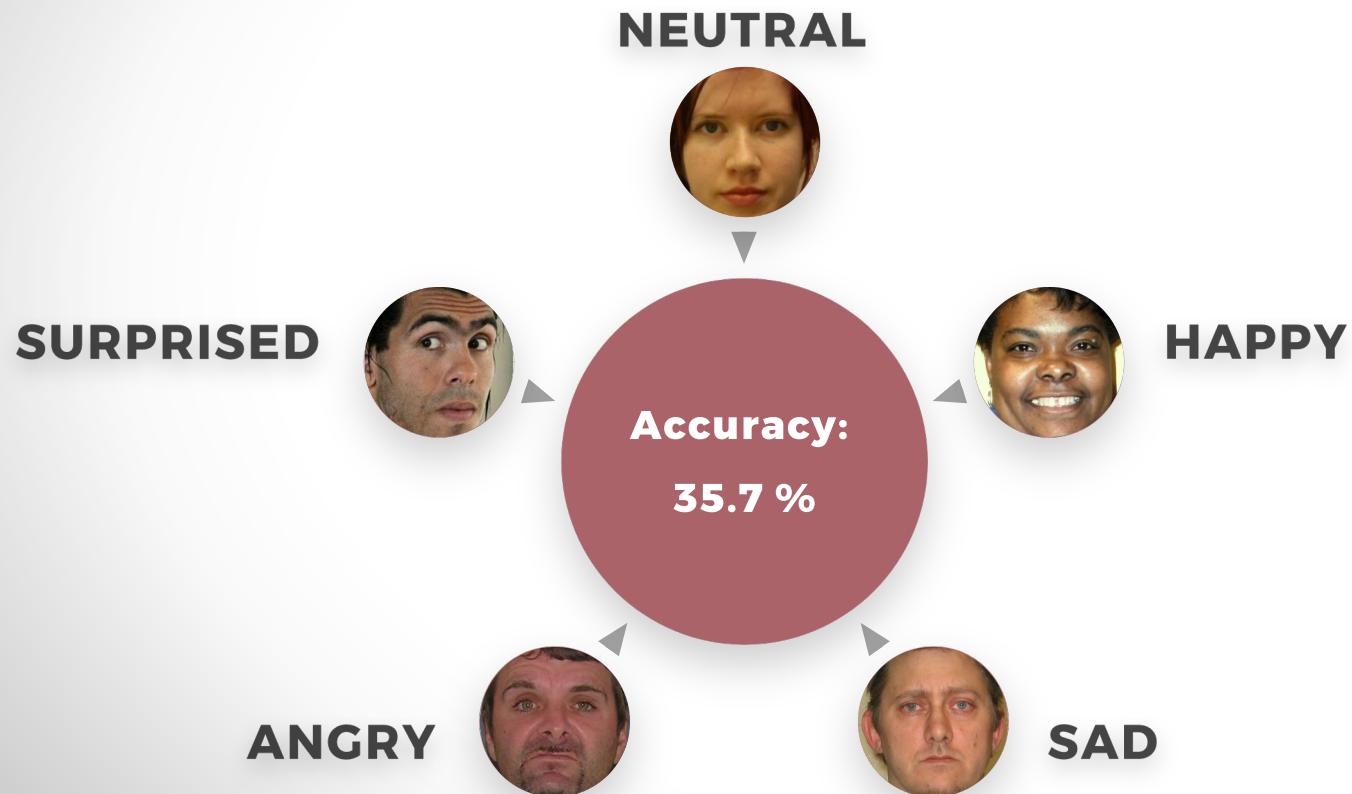
FACIAL EXPRESSION



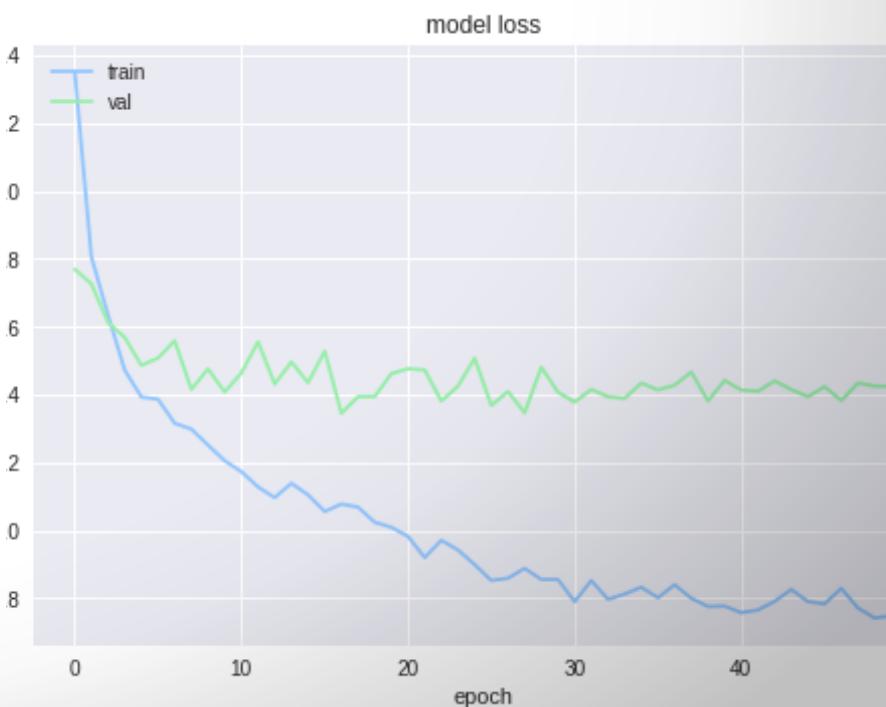
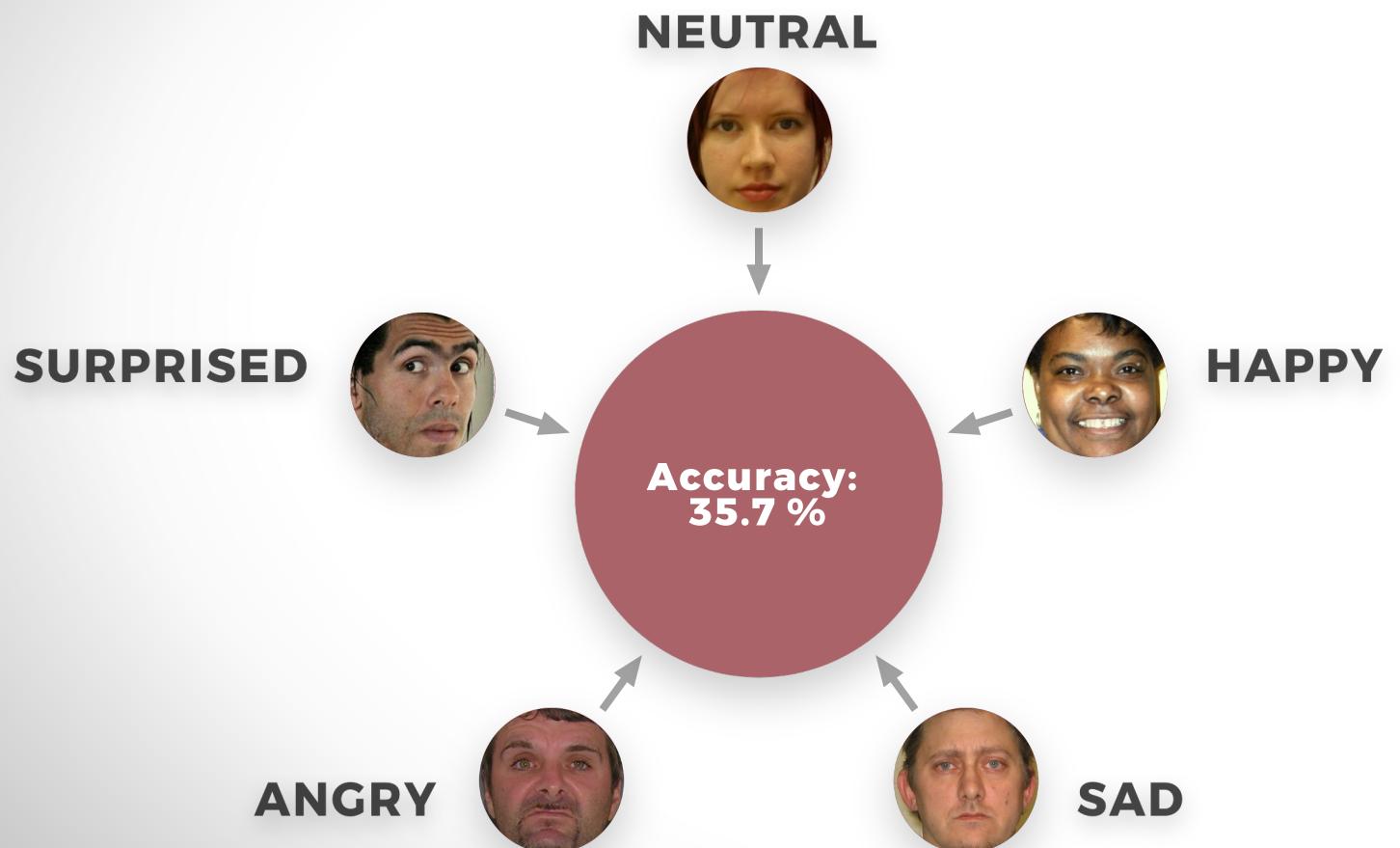
FACIAL EXPRESSION



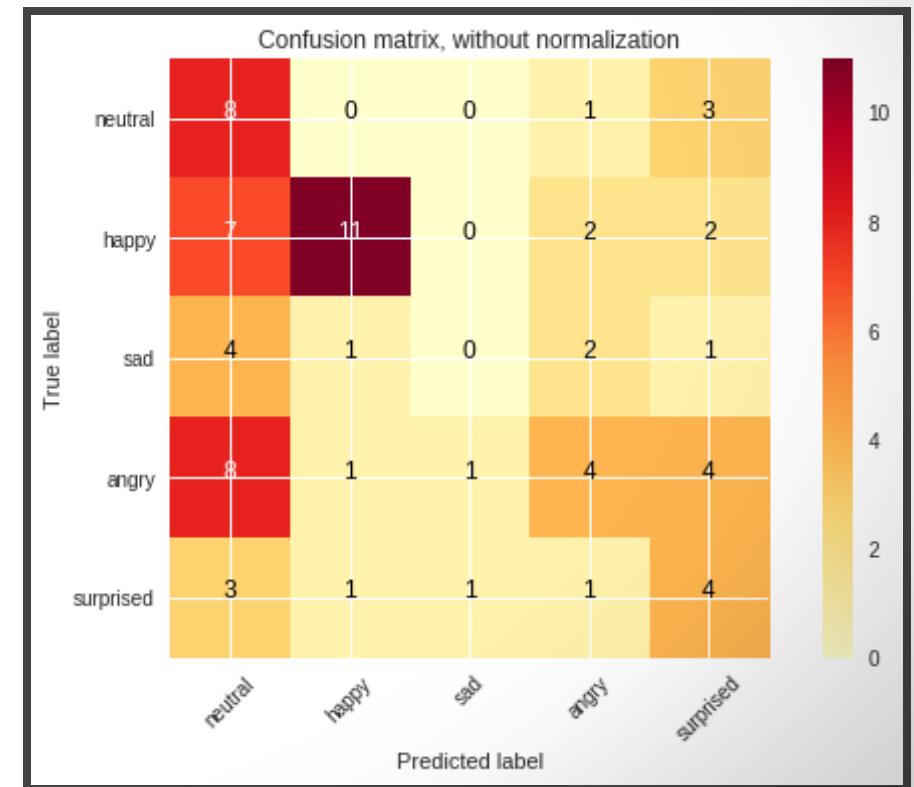
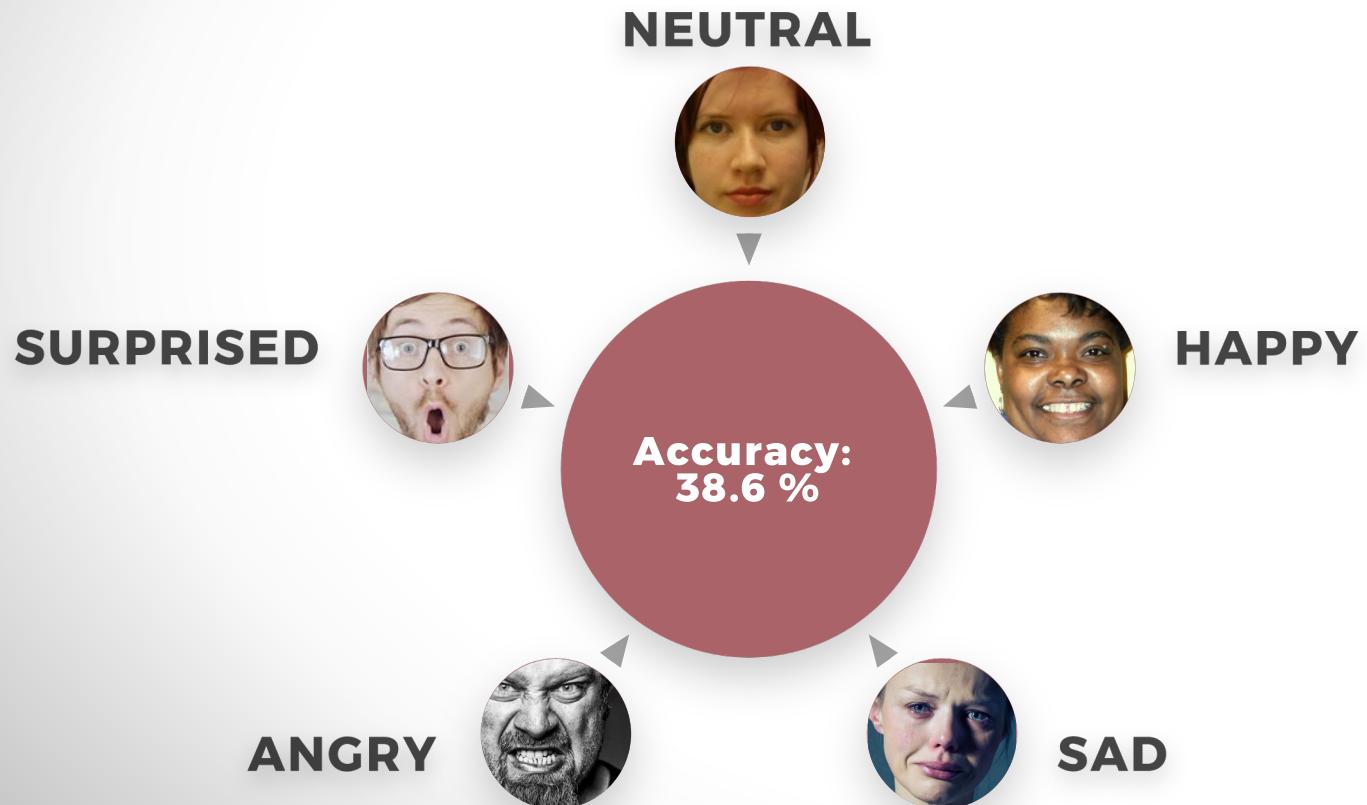
FACIAL EXPRESSION



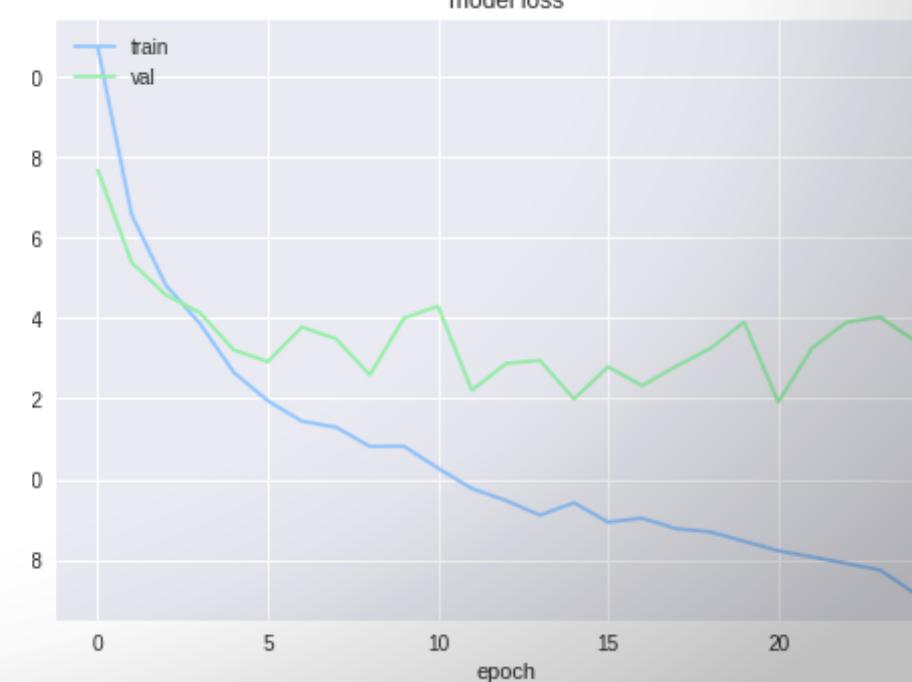
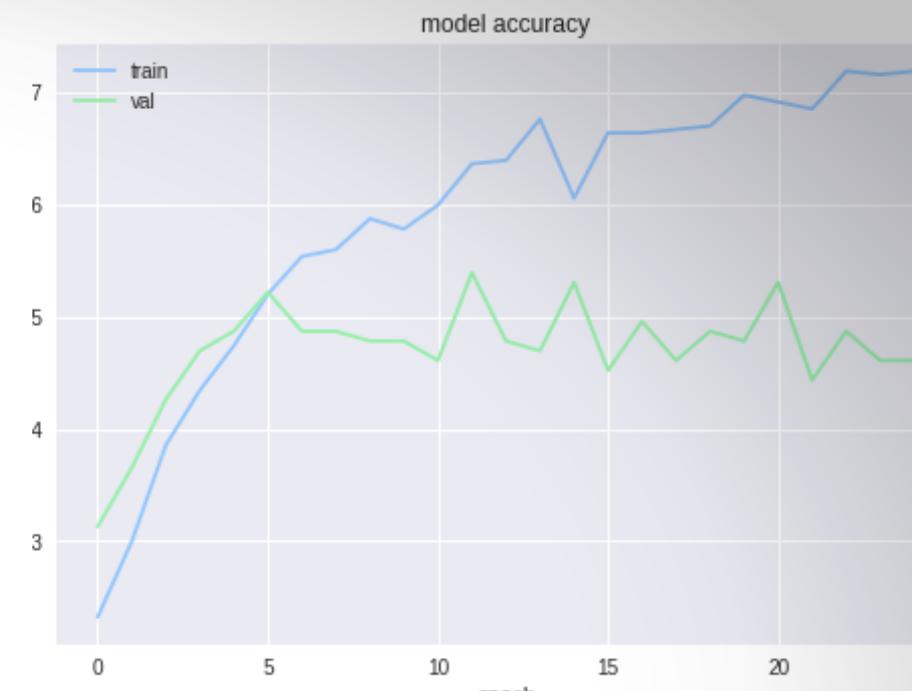
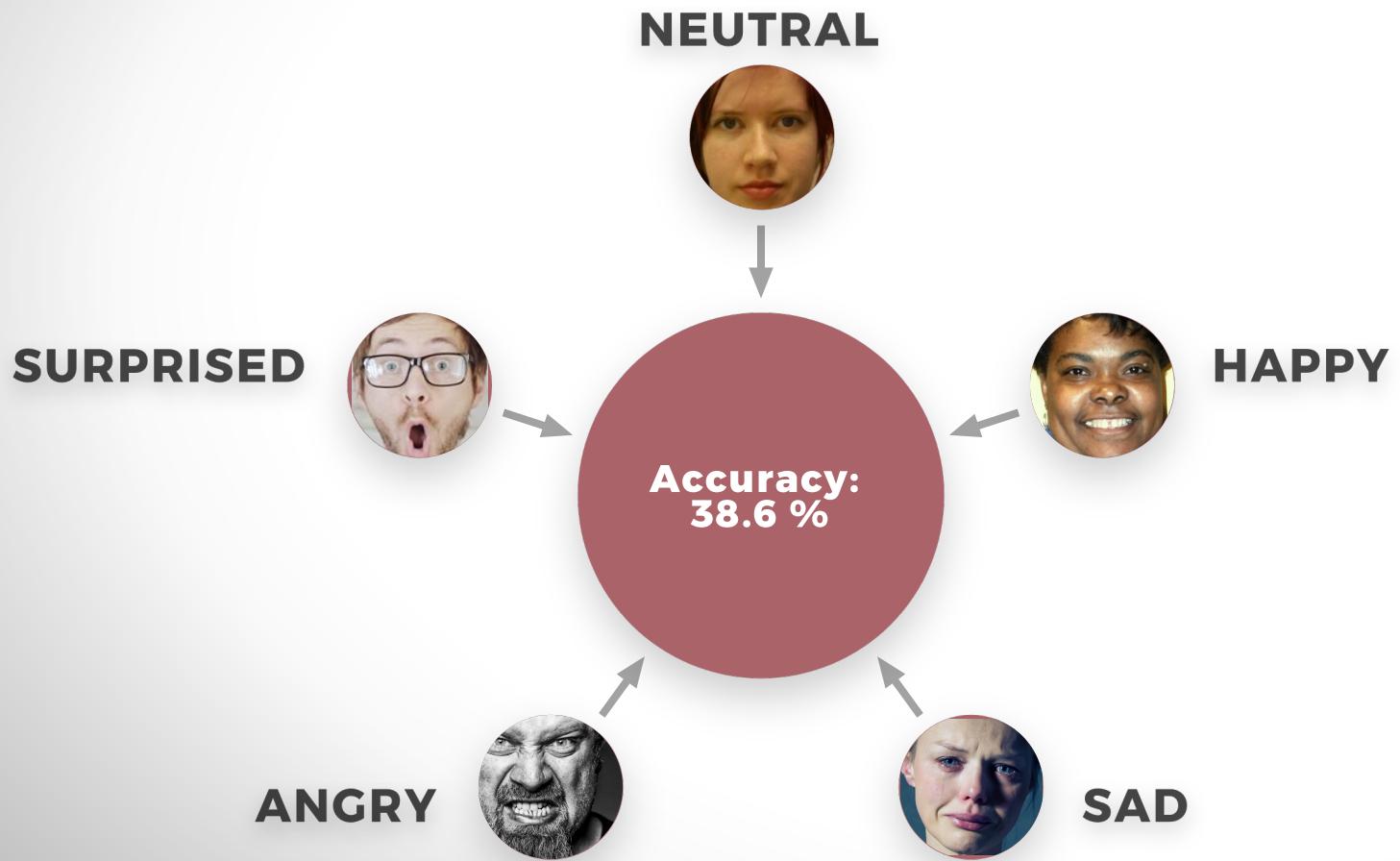
FACIAL EXPRESSION



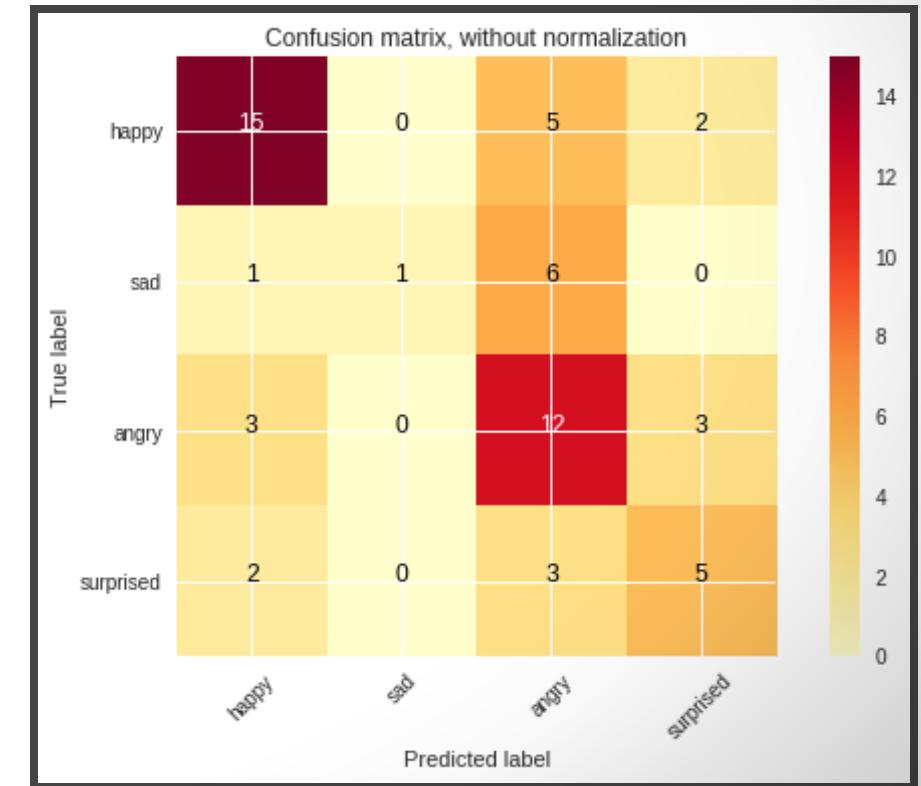
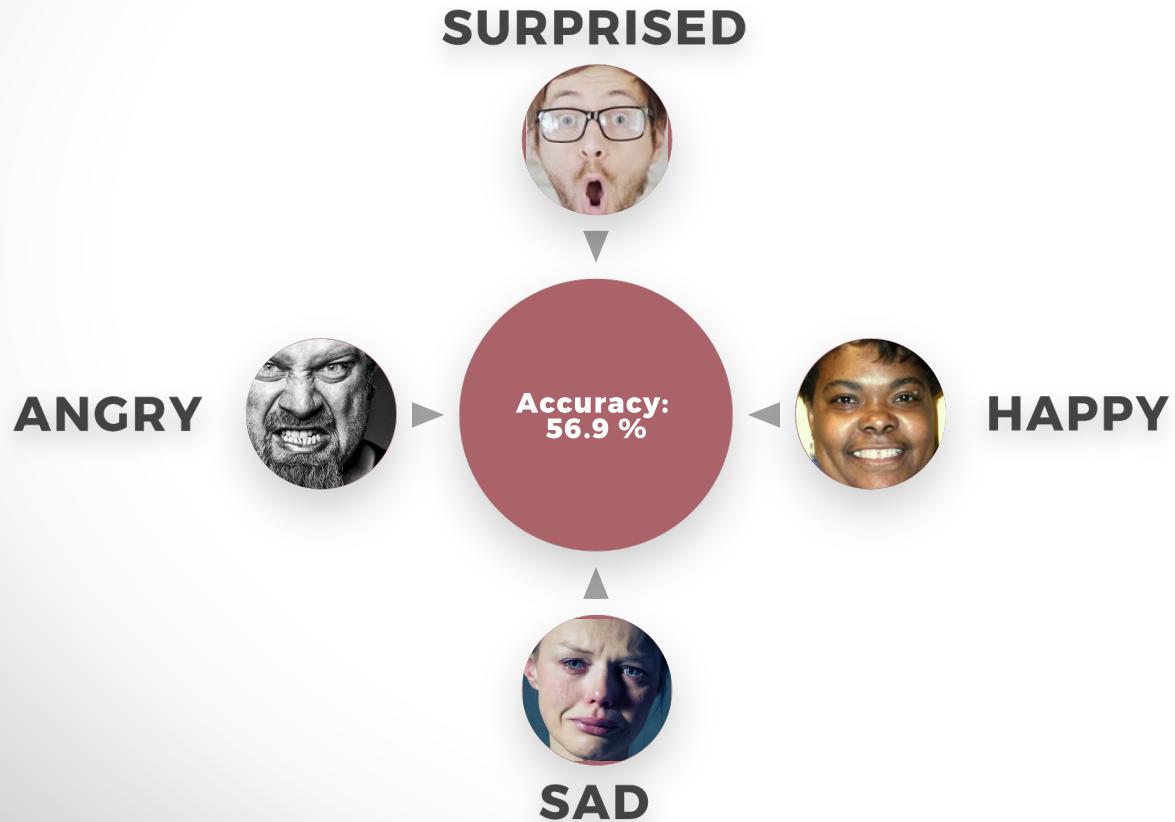
FACIAL EXPRESSION - INCL. SCRAPED IMAGES



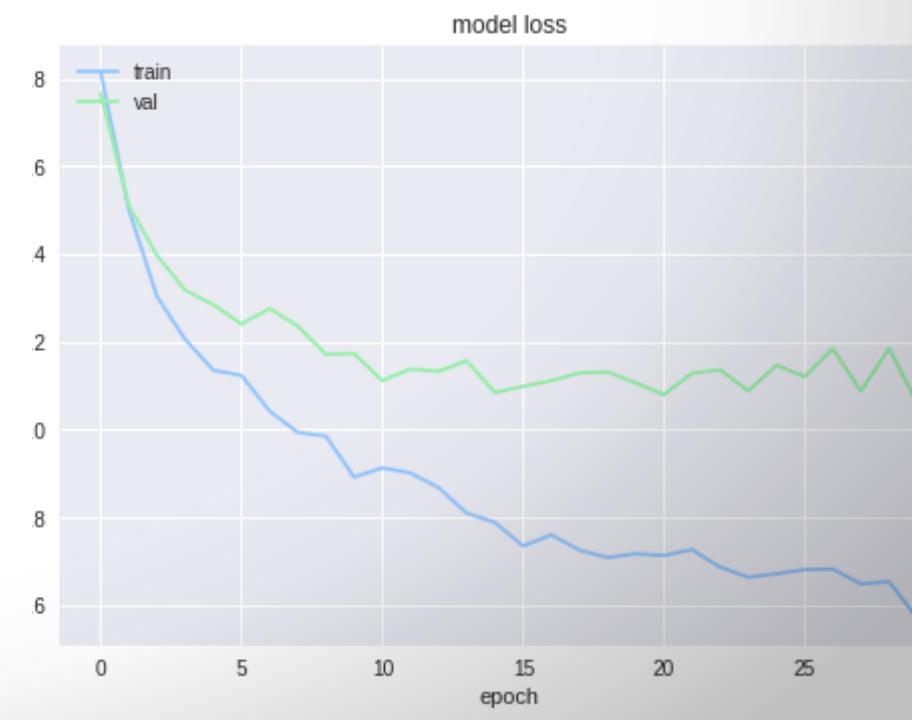
FACIAL EXPRESSION - INCL. SCRAPED IMAGES



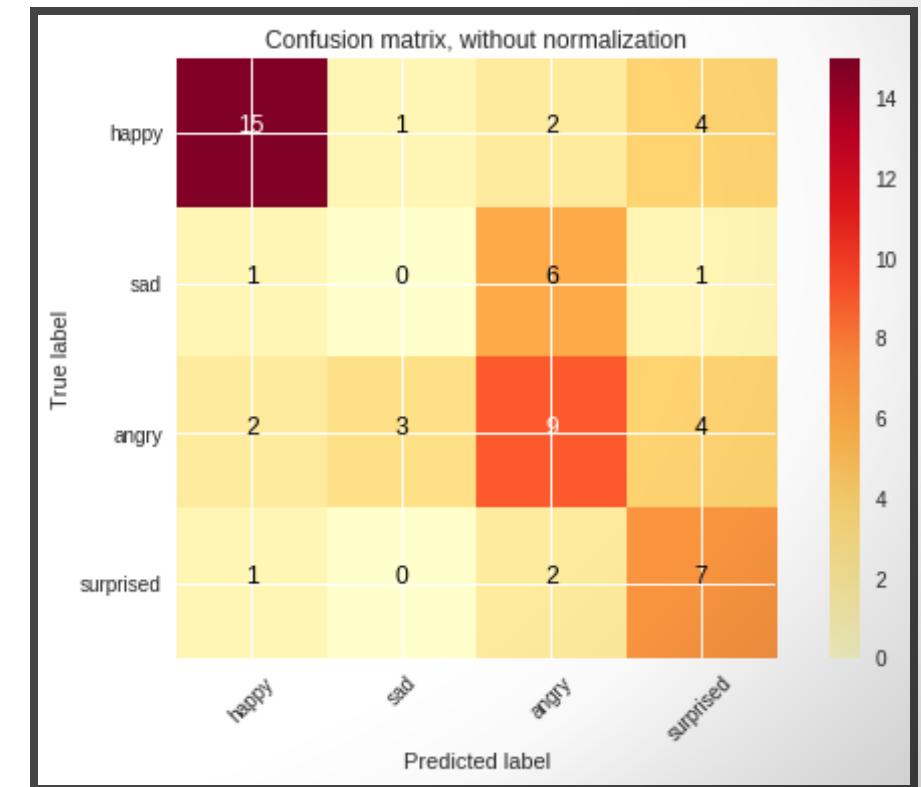
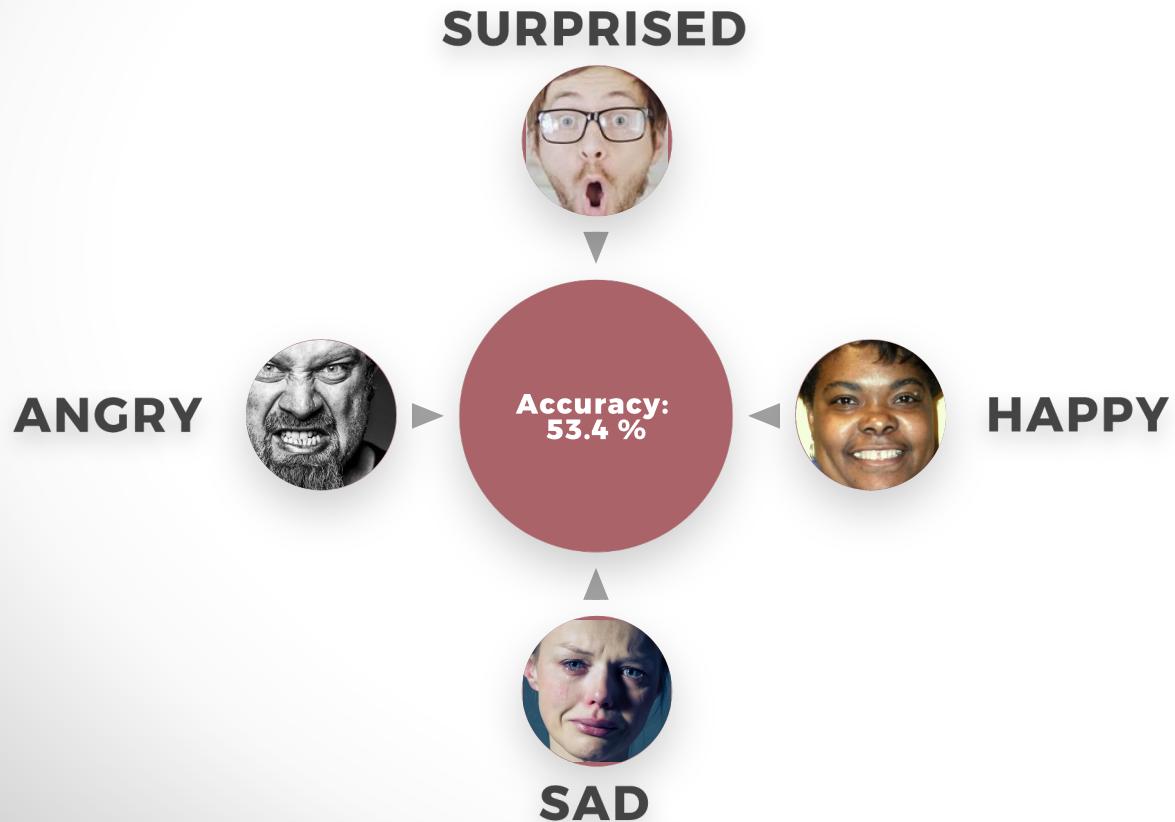
FACIAL EXPRESSION - NO NEUTRAL CLASS



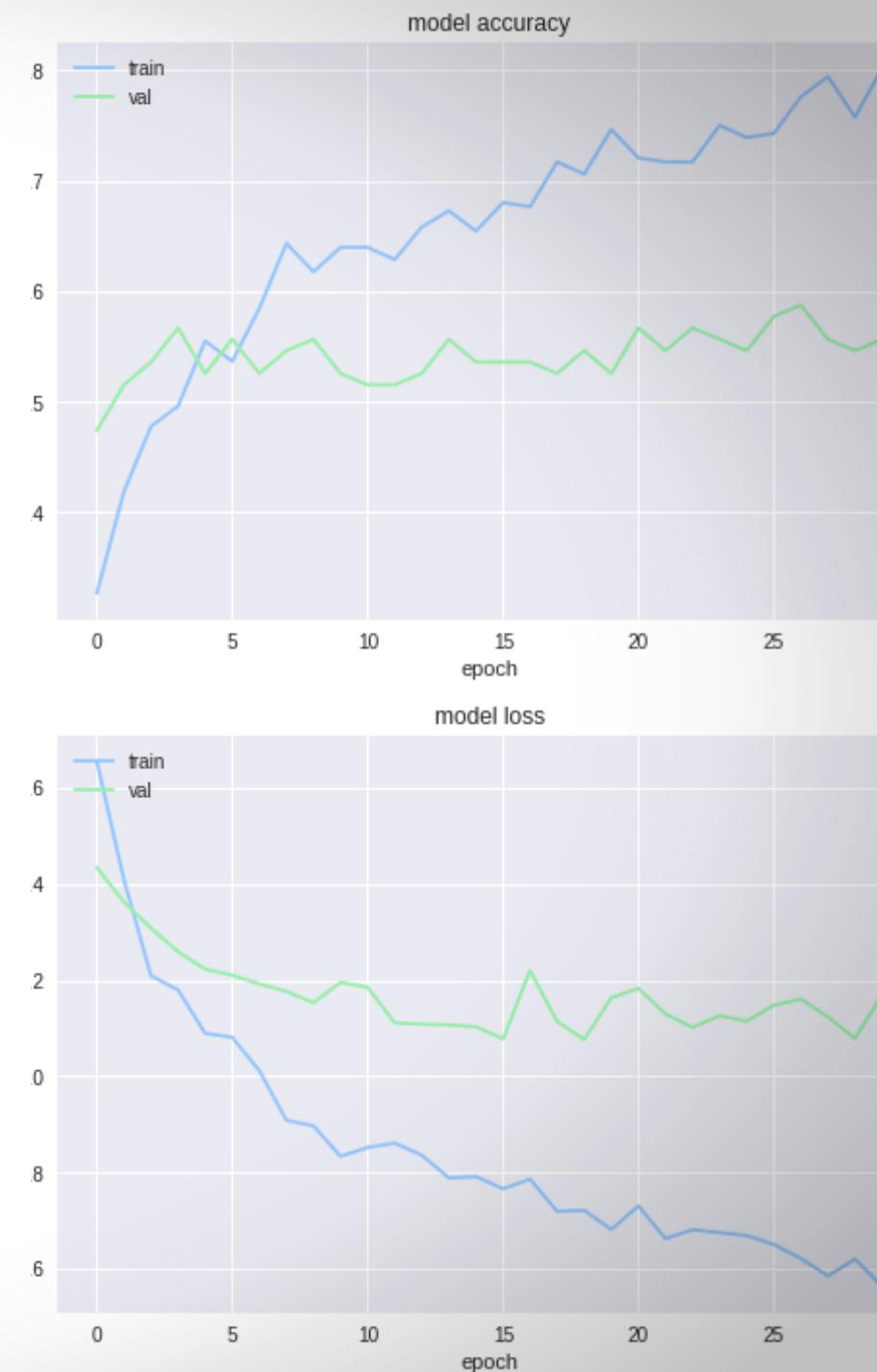
FACIAL EXPRESSION - NO NEUTRAL CLASS



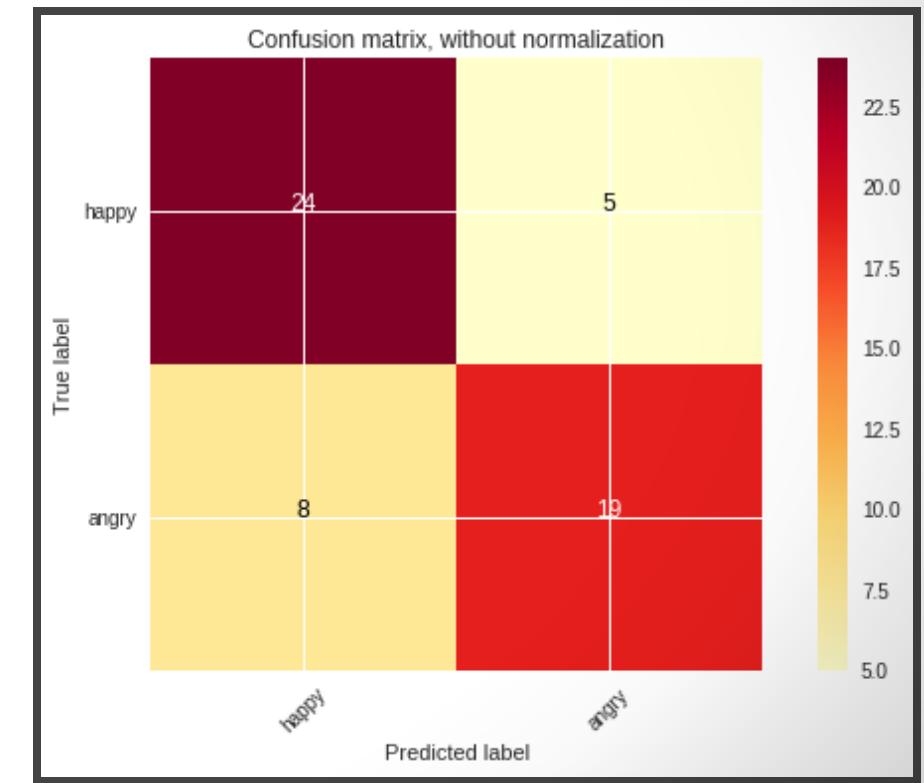
FACIAL EXP. (VGG19) - NO NEUTRAL CLASS



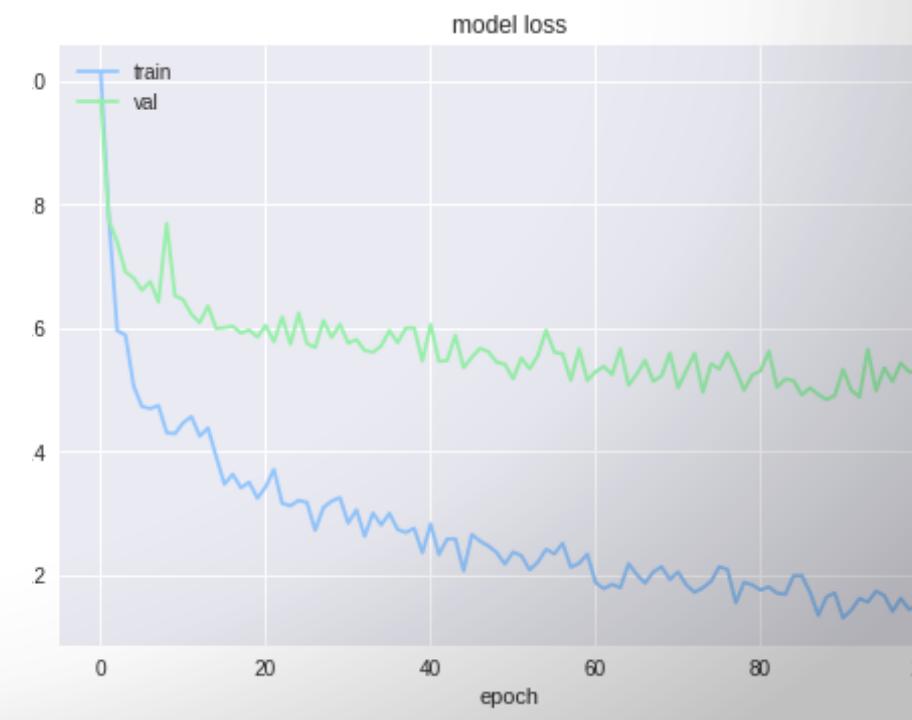
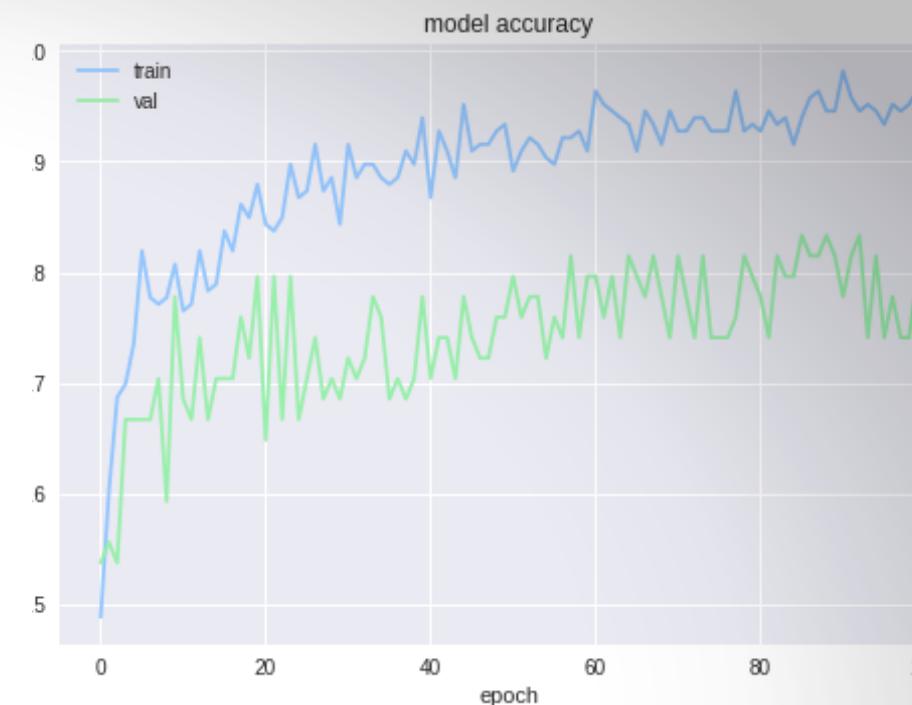
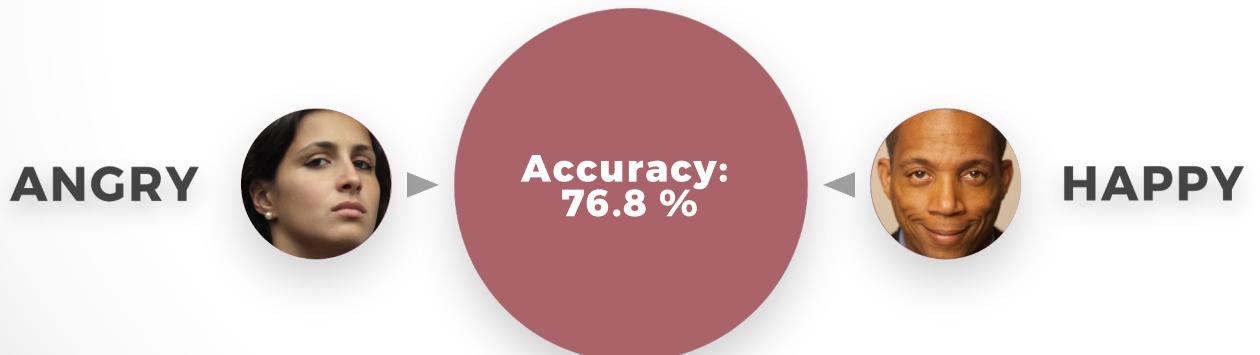
FACIAL EXP. (VGG19) - NO NEUTRAL CLASS



FACE-OFF: HAPPY VS. ANGRY



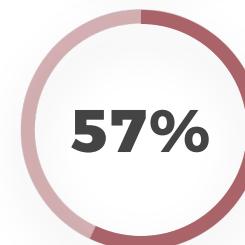
FACE-OFF: HAPPY VS. ANGRY



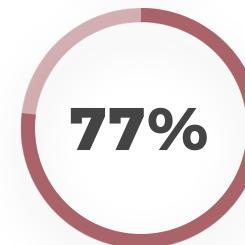
RESULTS SUMMARY



**SEX CLASSIFICATION
ACCURACY**



**FACIAL EXPRESSION
ACCURACY - 4 CLASSES**



**FACIAL EXPRESSION
ACCURACY - 2 CLASSES**

NEXT STEPS

- EXPLORE THE USE OF OTHER PRE-TRAINED MODELS TO IMPROVE ACCURACY AND PERHAPS REDUCE OVERFITTING
- RE-TRAIN MODEL ON MORE EXTREME EXEMPLARS, I.E. USE ONLY WIDEST SMILES OR ANGRIEST FACES
- FURTHER EXPLORE PARAM TUNING

Thank You

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<https://github.com/maf5509>