Mushroom Classifier

By Teah Markstone and Madeline Grace McLaughlin

Our Project

For our deep learning project we decided to create an image classifier for mushrooms that would predict which of the 6 most common genuses a mushroom belonged to.

Previous Solutions + Related Works

- Both of the following papers showed examples of machine and/or deep learning research papers that focused on classifying mushrooms as edible, poisonou, etc

- These include *Classification of multicategory edible fungi based on the infrared spectra of caps and stalks* and *Mushroom data creation, curation, and simulation to support classification tasks*

- Based on other related works as well as our own brainstorming, our model would be best paired with a mobile application and extended to identify edible and/or poisonous mushrooms in the wild

The Dataset

- We used a dataset of the most common North European mushroom genuses (via @CatoDogo on Kaggle), with between 300 and 1500 individual examples of each mushroom genus.

- The genuses included are Agaricus, Amanita, Boletus, Cortinarius, Entoloma, Hygrocybe, Lactariusm, Russula, and Suillus.

Model

- Pre-trained EfficientNetB7 model
- Sequential Model
  - EfficientNetB7 + final Dense layer
- EarlyStopping
- ReduceLROnPlateau
- 100 epochs

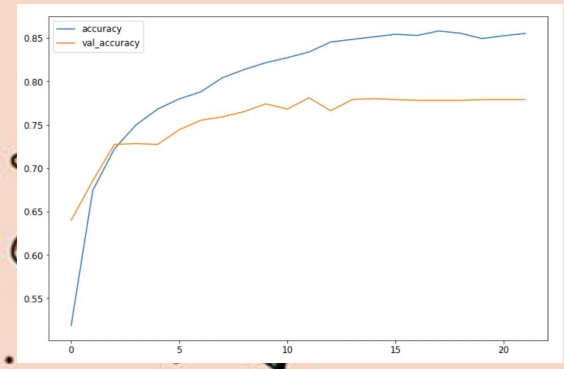
Evaluation Method

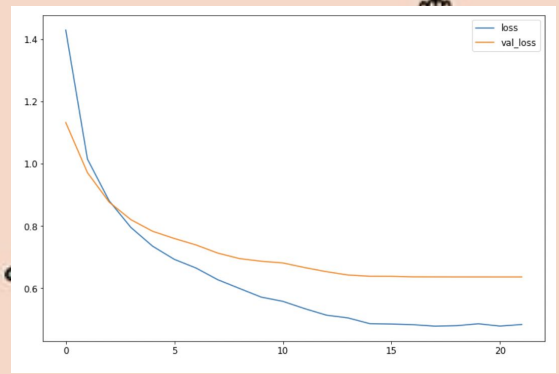
- graph the training loss + accuracy and the validation loss + accuracy over the epochs
- classification report function from sklearn to display the precision, recall, and f1-score for each class
- Confusion matrix

Results

- Early stopping stopped training after 22 epochs
- Our model performance on test images showed a total of 79.734% accuracy and 65.015% loss

- Training the new model over 22 epochs showed our validation accuracy increased from roughly 63% to 77.91%





Classification Report

	precision	recall	f1-score	support
Agaricus	0.71	0.56	0.63	36
Amanita	0.83	0.84	0.83	75
Boletus	0.91	0.94	0.93	108
Cortinarius	0.78	0.75	0.76	84
Entoloma	0.76	0.78	0.77	37
Hygrocybe	0.96	0.81	0.88	32
Lactarius	0.75	0.81	0.78	157
Russula	0.76	0.78	0.77	115
Suillus	0.73	0.59	0.66	32
accuracy			0.80	676
macro avg	0.80	0.76	0.78	676
weighted avg	0.80	0.80	0.80	676

Confusion Matrix

```
[[ 20   5   1   2   0   0   3   4   1]
 [  5  63   1   2   1   0   1   2   0]
 [  0   2 102   0   0   0   0   2   2]
 [  0   1   2  63   2   0  10   3   3]
 [  1   0   0   3  29   1   0   3   0]
 [  0   0   0   0   2  26   3   1   0]
 [  2   4   2   3   4   0 127  14   1]
 [  0   0   1   3   0   0  21  90   0]
 [  0   1   3   5   0   0   4   0  19]]
```

Discussion

- 80% accuracy for classifying mushrooms
- 71% precision Agaricus genus of mushrooms
- 96% precision Hygrocybe genus
  - fairly long stem and a waxy top, usually bright green or red
- Argaricus + other genuses: mix of brown or white mushrooms that look like they could belong to multiple other genuses
- To improve accuracy, additional dataset