Leaf Classification

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TEAM 5

Business Scenario

- Startup company developing an app to identify different plants upon taking a photo
- Target customers: girl/boy scout groups, hikers, rangers, hobbyist, etc.
- Premium vs. Free services
  - Free service: plant leaf recognition will be limited to 3 classifications: tomato, raspberry, poison ivy
  - Premium Service: We're back with an upgrade: expanded plant image recognition! Now featuring potato and bell pepper plants

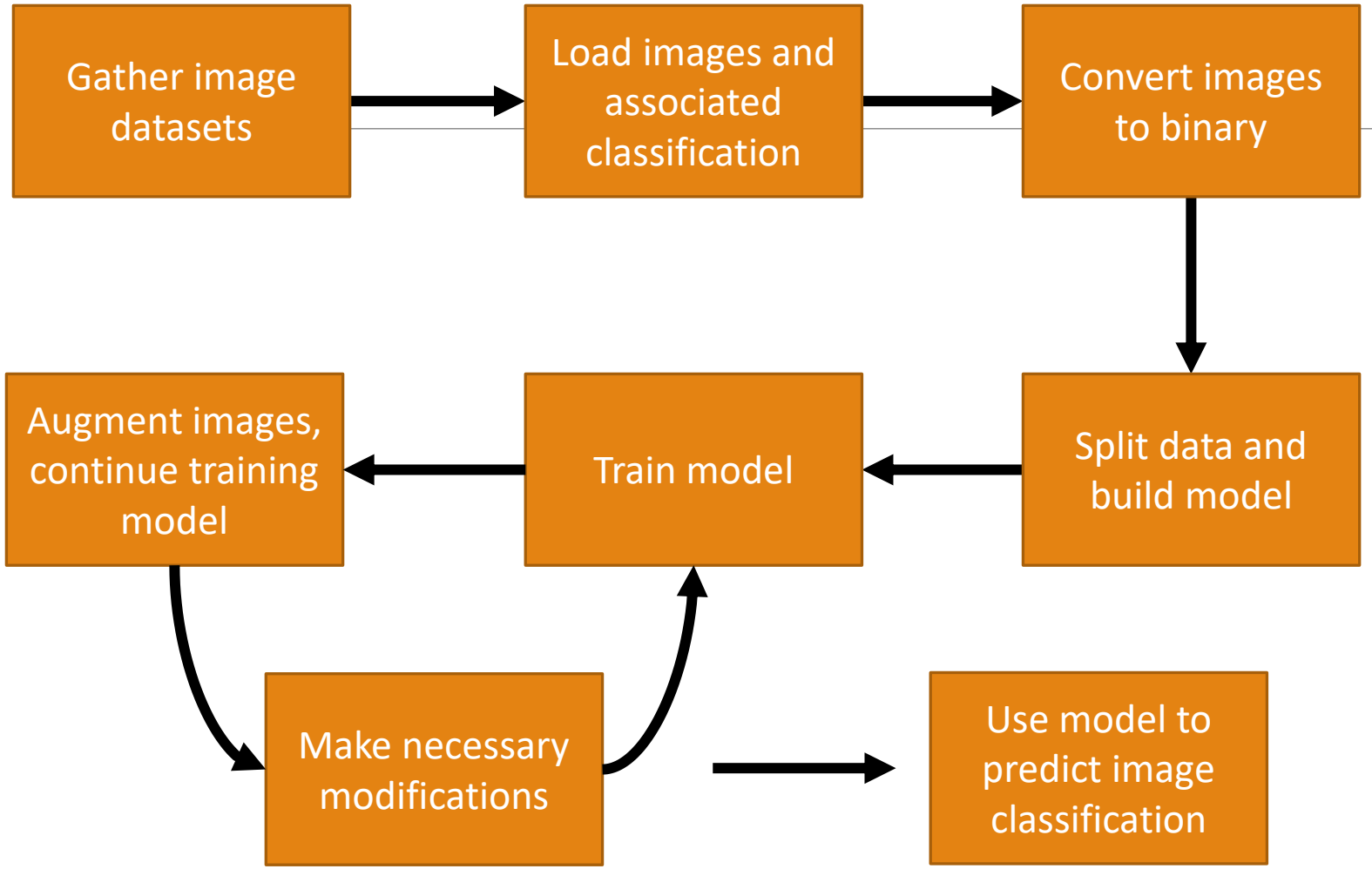
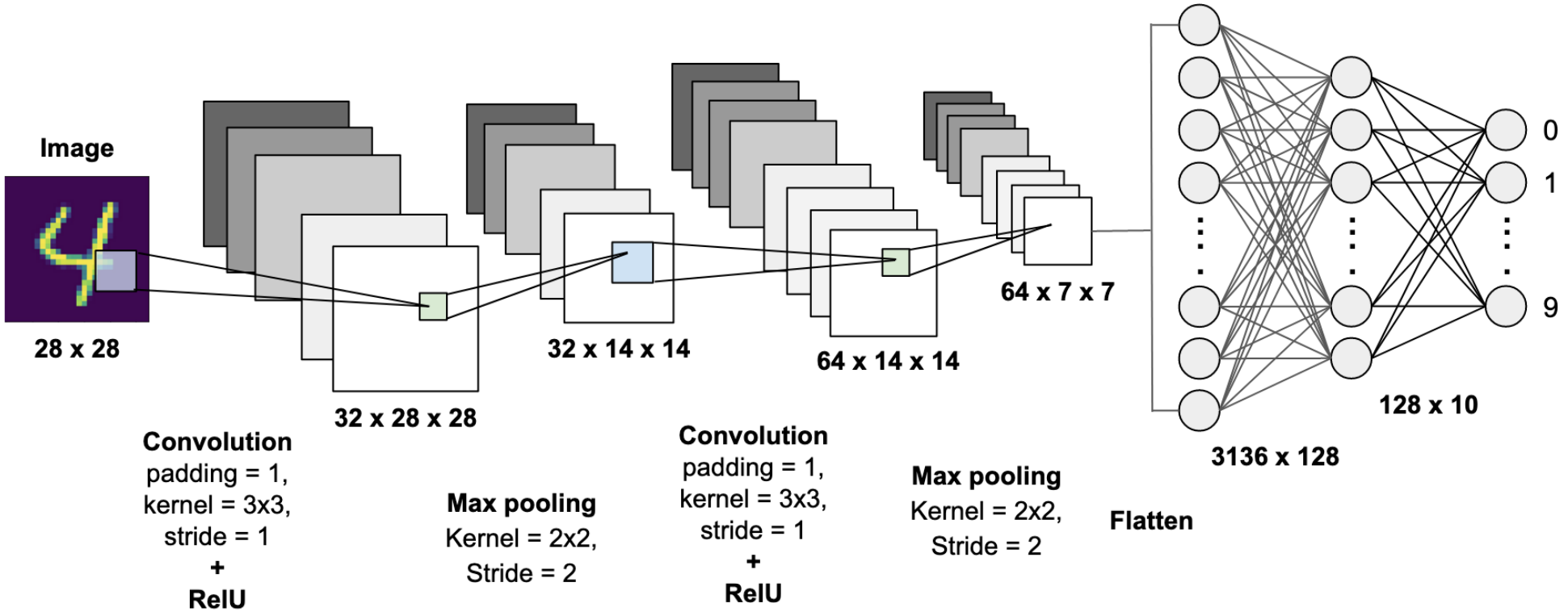
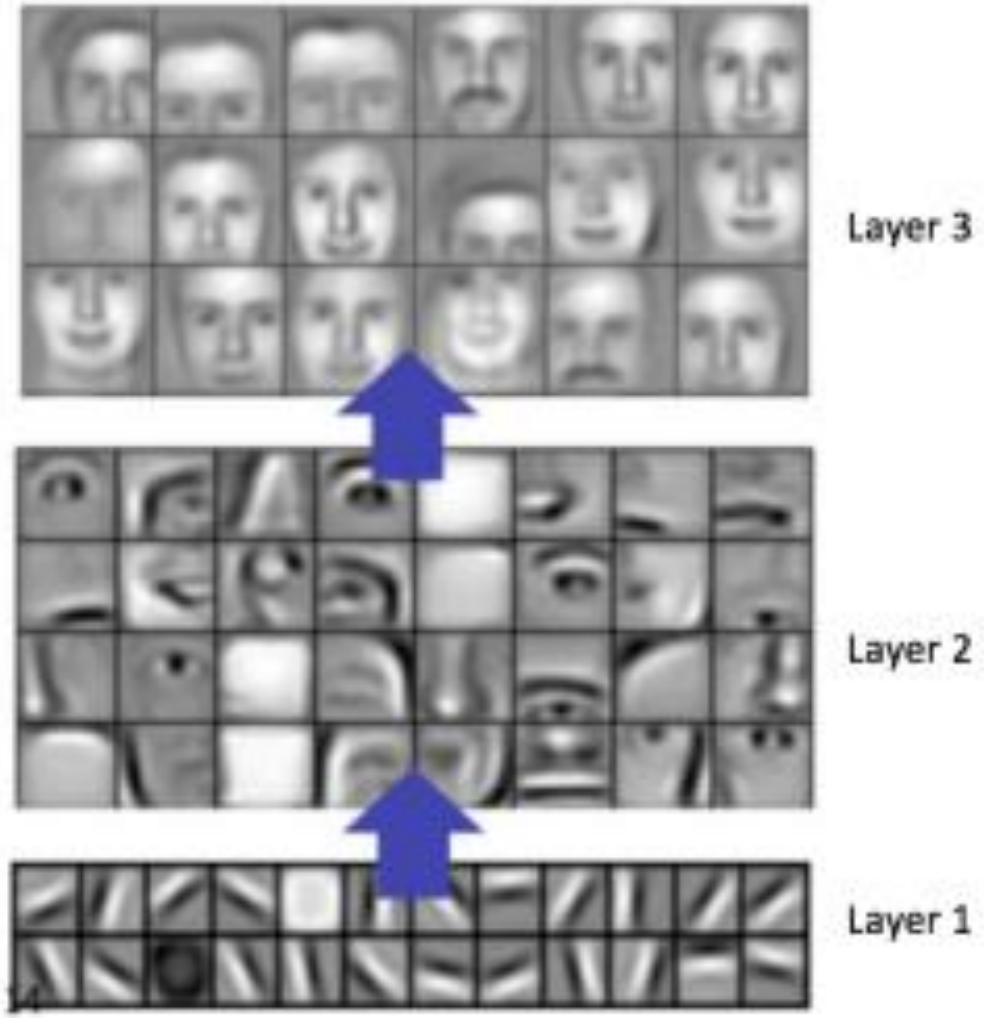


Image Processing Flowchart

Image Classification using CNNs



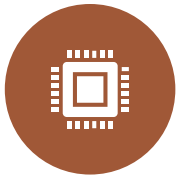


How CNNs Image Layers work:

Revisiting our model

Different parameters

Different layer combinations



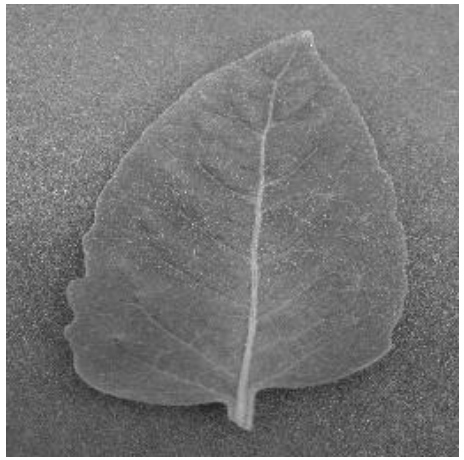
Grayscale

More data

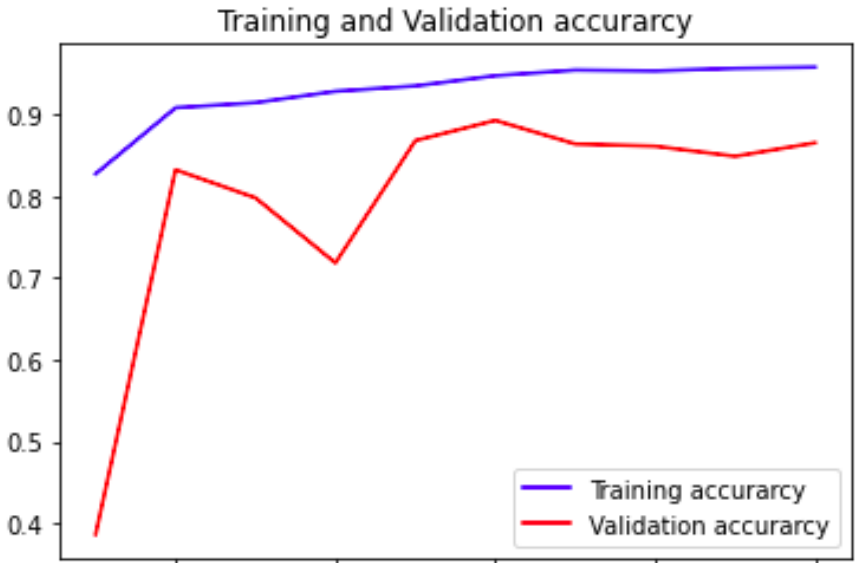
More groups

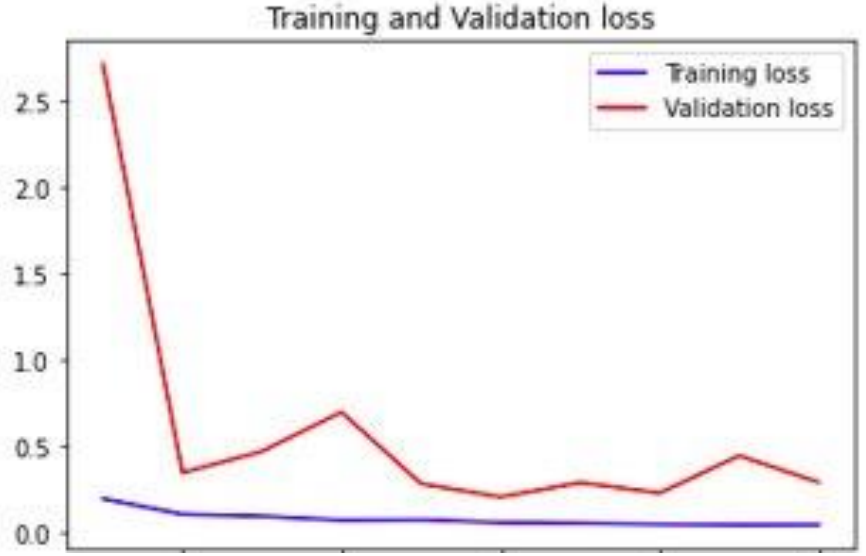
5 Leaves:

1. Poison Ivy
2. Bell-pepper
3. Tomato
4. Potato
5. Raspberry



Grey Scale





Grey Scale

EPOCHS = 10

DEPTH = 1

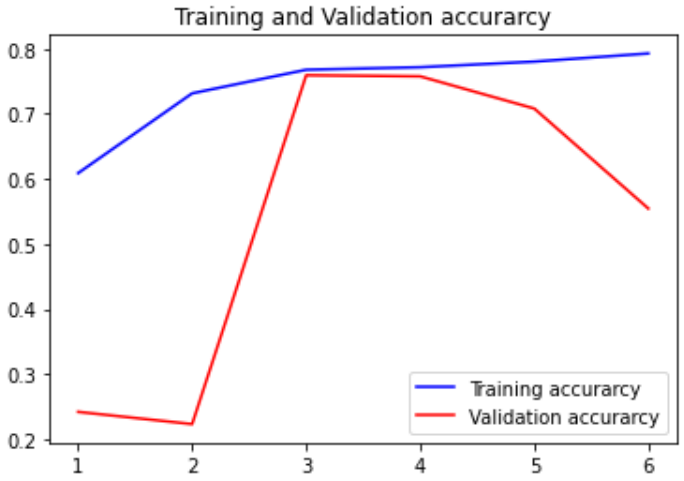
ACCURACY = 86%

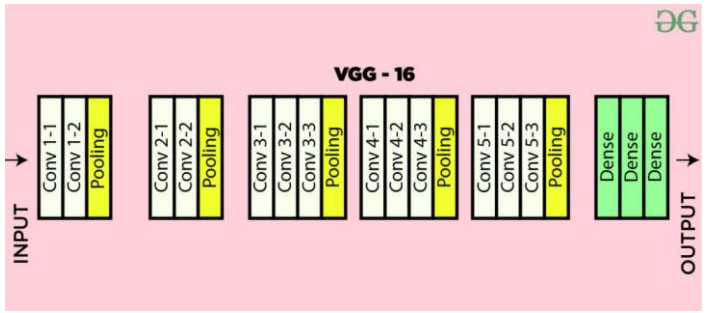
Changes to Original Model

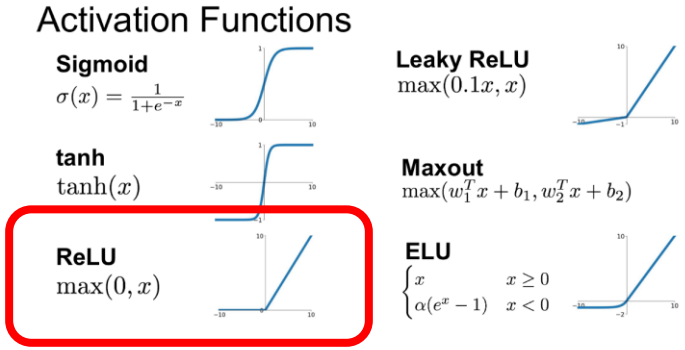
Model 1: Uses ‘relu’ activation and Adam optimization with the VGG-16 Architecture

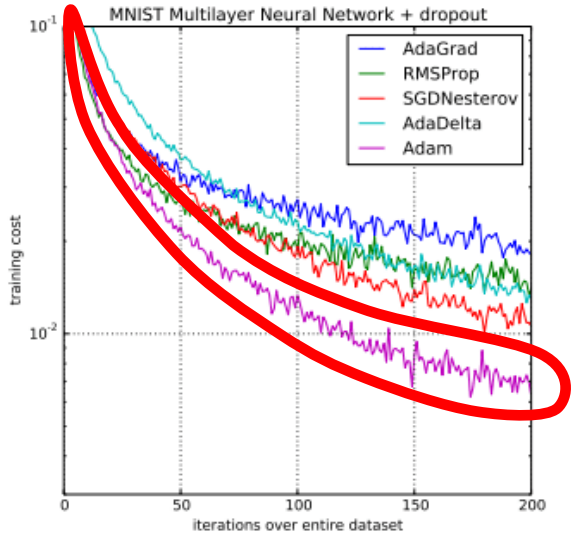
Model 2: Uses built-in keras optimizer named RMSProp with 7 epochs

Model 3: Focuses on exploring different optimization methods to improve model accuracy

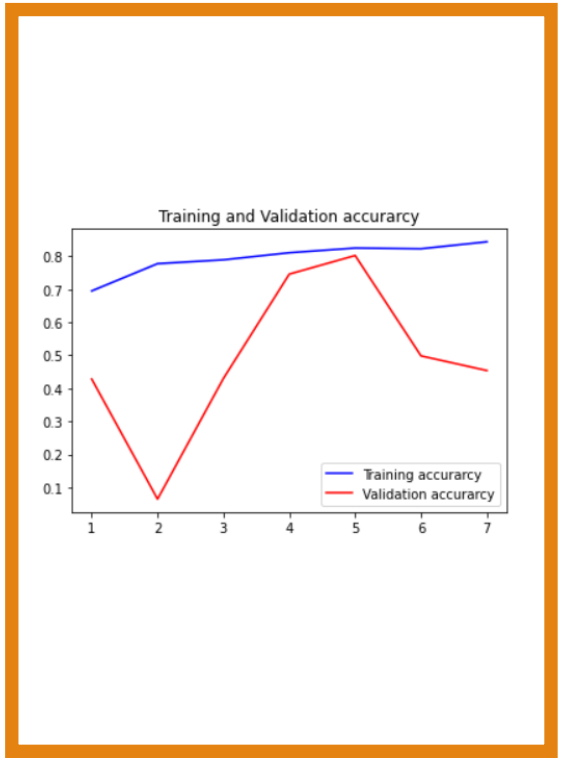








Model 1: VGG-16 (2014)

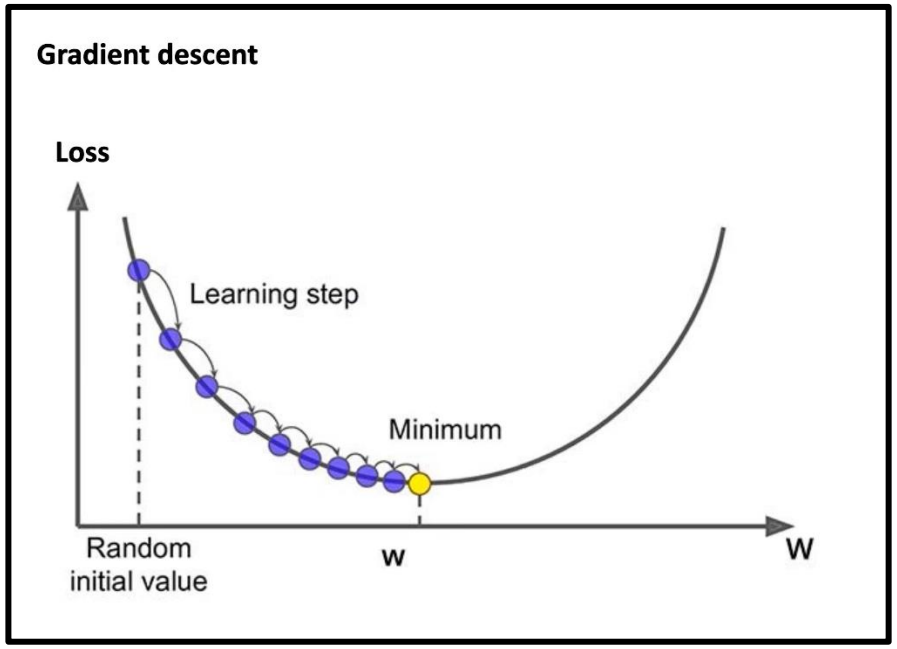


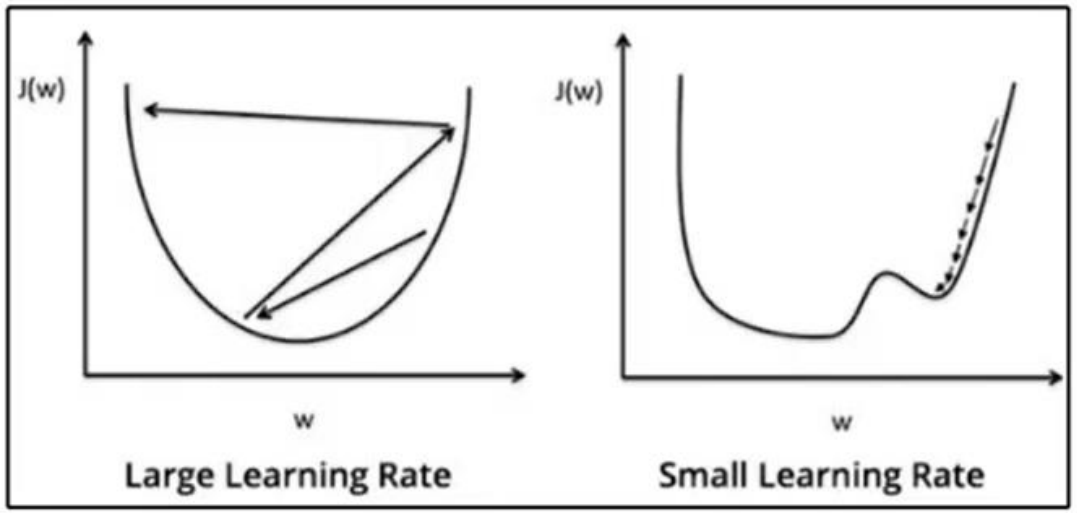
Model 2:

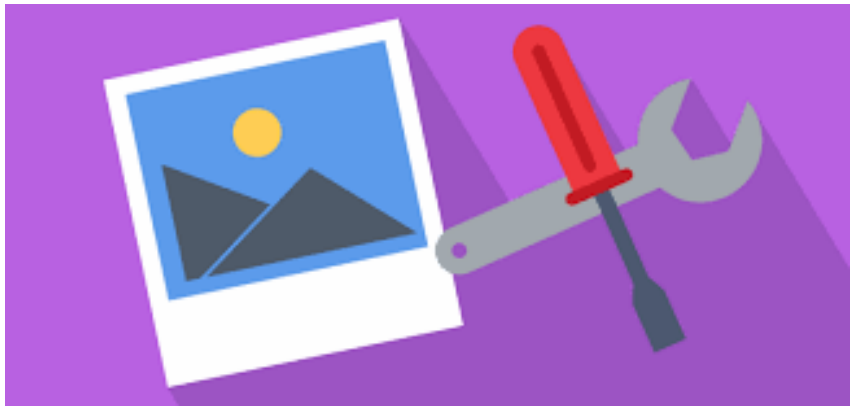
- RMSProp optimization method
- Epochs = 7
- 66% accuracy

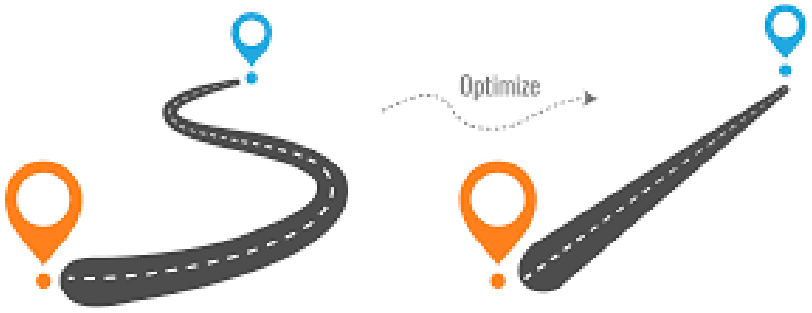
Fine Tuning Models

- Optimizers update the model in response to the output of the loss function
- Optimizers assist in minimizing the loss function.
- Learning rate controls how much to change the model in response to the estimated error (loss)









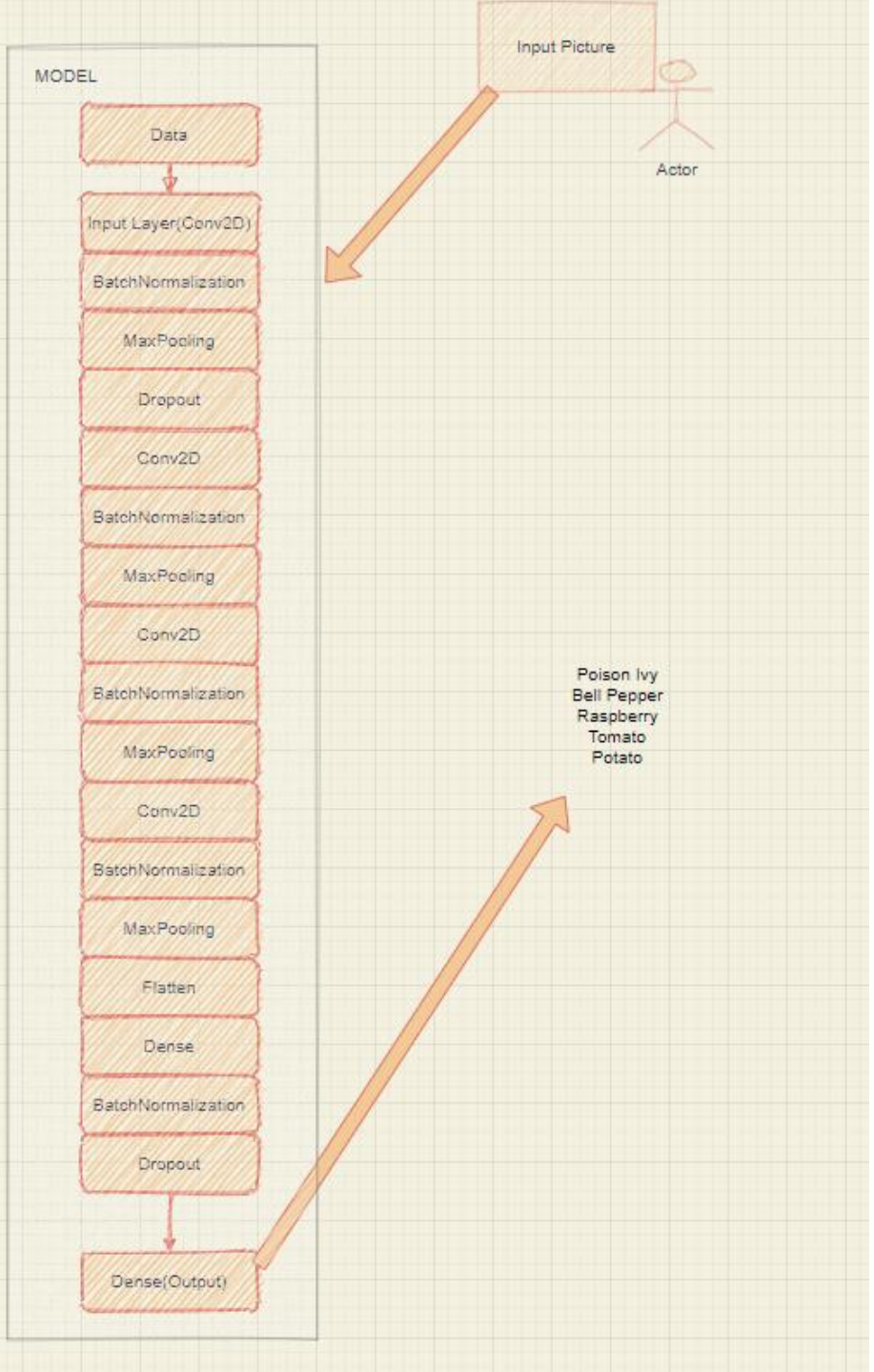
Model 3: Variants of Adam Optimization

ADAM: Adaptive Moment Estimation

Results using different methods (epochs = 3):

- Adam: 59% accuracy rate
- Adamax : 83% accuracy rate
- Nadam: 95% accuracy rate

Nadam optimization generated the best prediction results. It adapts and molds the most accurate model by adjusting CNN weights.



Final Model

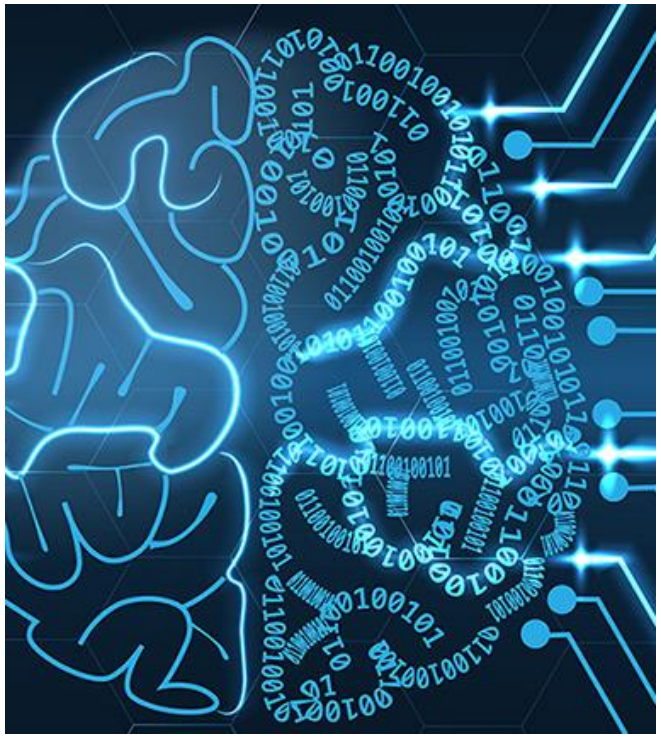
Activation Function: ReLU

Optimizer: Nadam

Learning Rate: 0.001

Accuracy: 95%

Summary



- We improved our model over the course of this semester
- Tried different optimization algorithms, transformations, and added new plant images.
- Our best model to classify images was Model 3 when using the Nadam optimizer with a 95 percent accuracy
- Model predicted images above-average results, however there is room for improvement; with more data and changes made to the model
- More improvement can be made since there is so much diversity in plants
- Adding more images and testing the model using different methods can improve the overall prediction

QUESTIONS?