Classifying Greek Pottery

Using CNN to Classify Greek Pottery

Pottery Types

Black Figure

Red Figure

Problem Statement

Large amounts archaeological data

Takes experience to develop expertise

Often involves subjective assessments without clear criteria

Should attempt to computerize assessment

Helps to uncover assumptions

Tools

Requests library to collect data

Pathlib and hashlib to reorganize and deduplicate data

Pillow to reformat images

Keras to train machine learning model

AWS and Collab for compute

Data

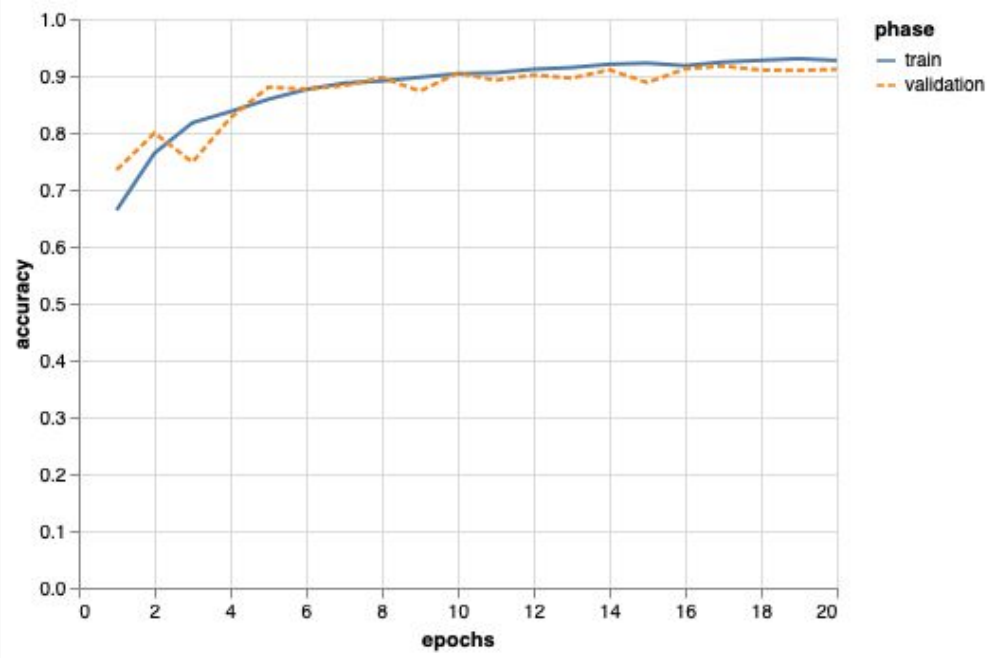
98,000 images from the Beazley Ancient Pottery Database

54% Red-Figure, 46% Black-Figure

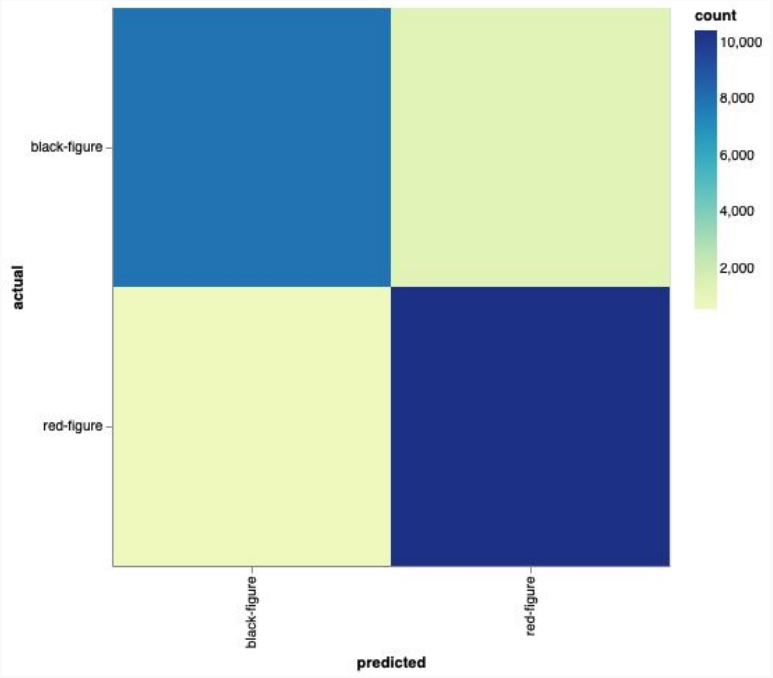
All images were used in grayscale

Relatively noisy data (drawings, different angles and viewpoints)

Results


1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
accuracy
0
2
4
6
8
10
12
14
16
18
20
epochs
phase
train
validation

Results


count
10,000
8,000
6,000
4,000
2,000
actual
black-figure
red-figure
black-figure
red-figure
predicted

Methods

Only used grayscale images

Reduced to rank 2 tensors (X, Y)

Scaled and cropped images to (200, 200)

Used custom neural network

```
DROPOUT = .07
L2 = 2e-3

model = Sequential()
model.add(InputLayer(input_shape=(200,200,1)))
model.add(Conv2D(filters=60, kernel_size=5, activation='relu',kernel_regularizer=l2(L2)))
model.add(MaxPooling2D())
model.add(Conv2D(filters=60, kernel_size=3, activation='relu',kernel_regularizer=l2(L2)))
model.add(MaxPooling2D())
model.add(Dropout(DROPOUT))
model.add(Conv2D(filters=60, kernel_size=3, activation='relu',kernel_regularizer=l2(L2)))
model.add(MaxPooling2D())
model.add(Conv2D(filters=50, kernel_size=3, activation='relu',kernel_regularizer=l2(L2)))
model.add(MaxPooling2D())
model.add(Dropout(DROPOUT))
model.add(Conv2D(filters=50, kernel_size=3, activation='relu',kernel_regularizer=l2(L2)))
model.add(MaxPooling2D())
model.add(Conv2D(filters=50, kernel_size=3, activation='relu',kernel_regularizer=l2(L2)))
model.add(MaxPooling2D())
model.add(Dropout(DROPOUT))
model.add(Flatten())
model.add(Dropout(.05))
model.add(Dense(200,activation='relu'))
model.add(Dense(200,activation='relu'))
model.add(Dense(1,activation='sigmoid'))

model.compile(loss='binary_crossentropy',optimizer='adam',metrics=['accuracy'])

history = model.fit(t, validation_data=v, epochs=25, callbacks=[EarlyStopping(patience=3)])
```

Further Work

Clean noisy data to better predictions

Predict harder targets such as vase provenance or age

Use model to evaluate consistency of human classification

Use model to create partial classification (black-red-figure-ness)

Resources

Beazley Ancient Pottery Database

https://www.beazley.ox.ac.uk/carc/Home