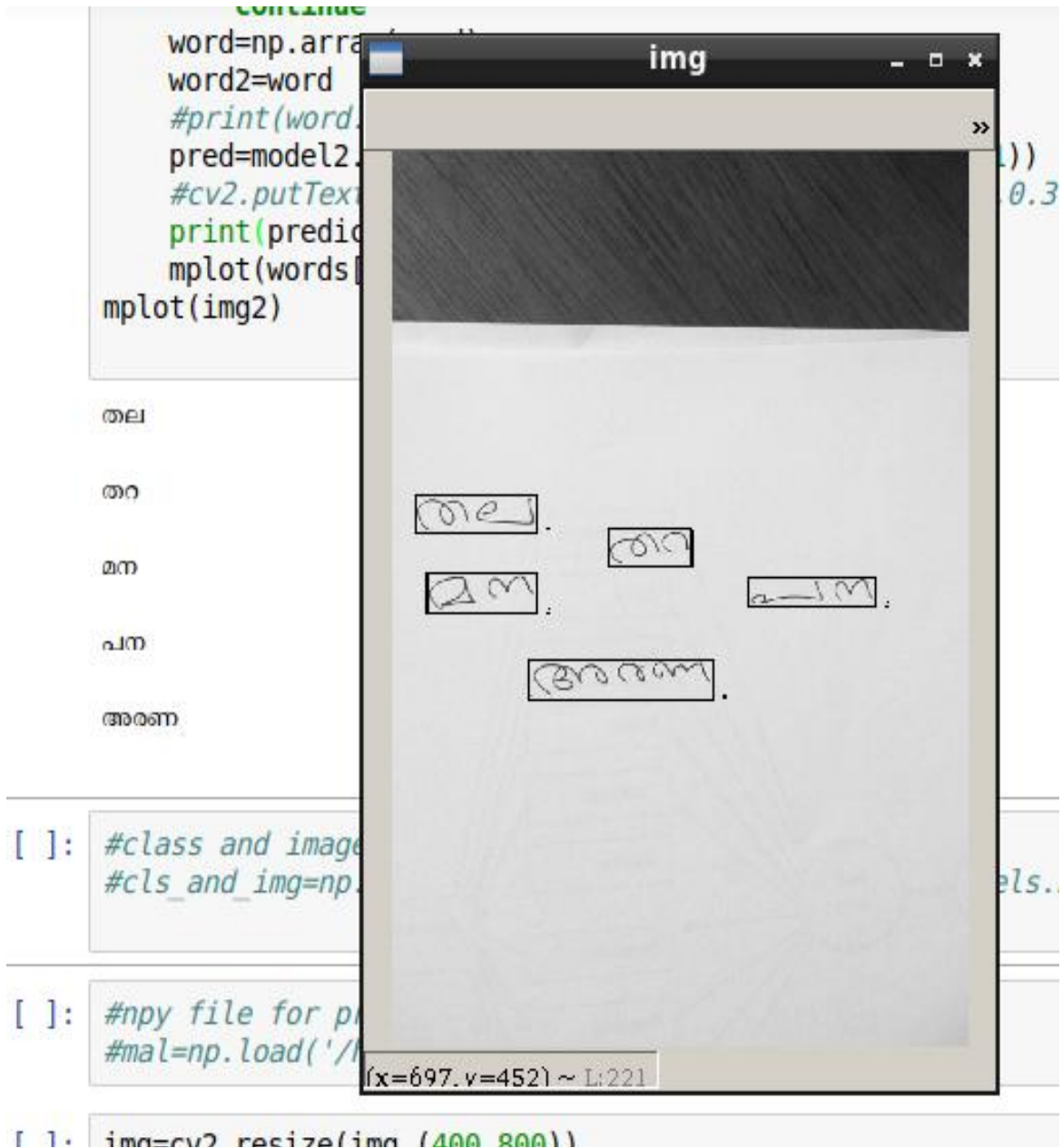


APPENDIX

Prediction Of Real Time Input



The CNN Architecture

```
In [8]: model2 = Sequential()
model2.add(Conv2D(32, kernel_size=(3, 3), activation='relu', input_shape=(86, 86, 1)))
model2.add(MaxPooling2D(pool_size=(2, 2)))
model2.add(BatchNormalization())
model2.add(Conv2D(64, (3, 3), activation='relu'))

model2.add(MaxPooling2D(pool_size=(2, 2)))
model2.add(BatchNormalization())
model2.add(Conv2D(128, (3, 3), activation='relu'))

model2.add(MaxPooling2D(pool_size=(2, 2)))
model2.add(BatchNormalization())
model2.add(Conv2D(256, (3, 3), activation='relu'))

model2.add(MaxPooling2D(pool_size=(2, 2)))
model2.add(Flatten())

model2.add(Dense(512, activation='relu'))
model2.add(Dropout(0.25))

model2.add(Dense(1024, activation='relu'))
model2.add(Dropout(0.5))

model2.add(Dense(512, activation='relu'))
model2.add(Dropout(0.5))

model2.add(Dense(44, activation='softmax'))

model2.summary()
```

Training The CNN Model

```
In [13]: model2.fit_generator(generator(X_train,y_train,128),steps_per_epoch=(58816/128)+10,validation_data=generator(X_val,y_val,140),

Epoch 1/12
470/469 [=====] - 77s 163ms/step - loss: 1.7460 - acc: 0.5245 - val_loss: 3.2278 - val_acc: 0.30
38
Epoch 2/12
470/469 [=====] - 69s 147ms/step - loss: 0.6597 - acc: 0.8700 - val_loss: 0.6054 - val_acc: 0.89
31
Epoch 3/12
470/469 [=====] - 69s 148ms/step - loss: 0.5094 - acc: 0.9202 - val_loss: 2.0894 - val_acc: 0.48
14
Epoch 4/12
470/469 [=====] - 69s 148ms/step - loss: 0.4247 - acc: 0.9412 - val_loss: 0.7767 - val_acc: 0.83
86
Epoch 5/12
470/469 [=====] - 70s 148ms/step - loss: 0.4277 - acc: 0.9472 - val_loss: 0.4543 - val_acc: 0.94
76
Epoch 6/12
470/469 [=====] - 70s 148ms/step - loss: 0.4487 - acc: 0.9497 - val_loss: 3.2272 - val_acc: 0.20
20
Epoch 7/12
470/469 [=====] - 70s 148ms/step - loss: 0.3963 - acc: 0.9574 - val_loss: 0.5080 - val_acc: 0.94
43
Epoch 8/12
470/469 [=====] - 70s 148ms/step - loss: 0.3730 - acc: 0.9617 - val_loss: 1.4918 - val_acc: 0.64
81
Epoch 9/12
470/469 [=====] - 70s 150ms/step - loss: 0.3668 - acc: 0.9631 - val_loss: 0.5871 - val_acc: 0.88
73
Epoch 10/12
470/469 [=====] - 71s 152ms/step - loss: 0.2756 - acc: 0.9738 - val_loss: 0.2536 - val_acc: 0.97
68
Epoch 11/12
470/469 [=====] - 71s 150ms/step - loss: 0.3492 - acc: 0.9674 - val_loss: 0.9146 - val_acc: 0.79
71
Epoch 12/12
470/469 [=====] - 70s 150ms/step - loss: 0.3159 - acc: 0.9712 - val_loss: 0.5250 - val_acc: 0.93
96
```

Out[13]: <keras.callbacks.History at 0x7f4683cc6438>

```
In [24]: model2.save('/home/workstation/Desktop/jab/MHCR/modelMHCR_gray_10.9_97_97.h5')
```