



End-to-End Cell Counting Architecture for Microscopic Image Analysis

Presented By
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Why should we count the Cells?



Why should we count the Cells?



Monitoring Cell Health and
Poliferation rate.



Bacterial Research.

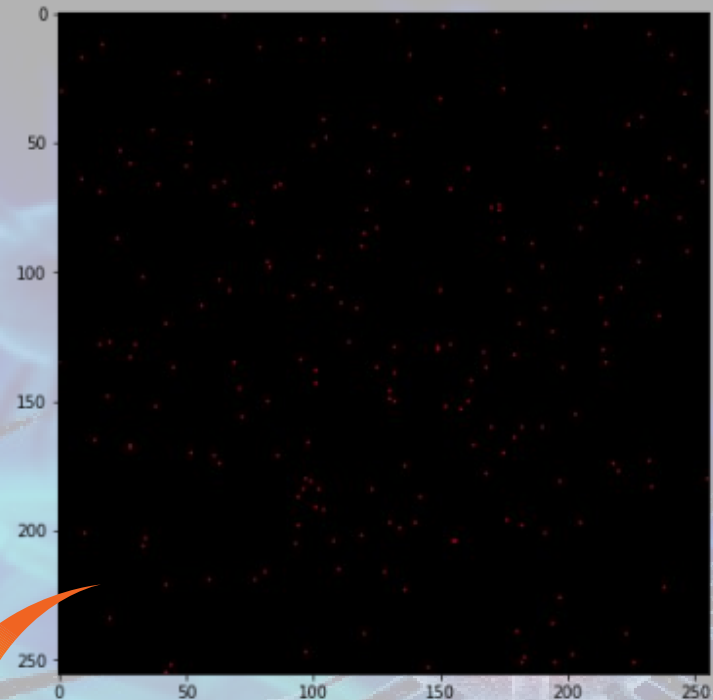
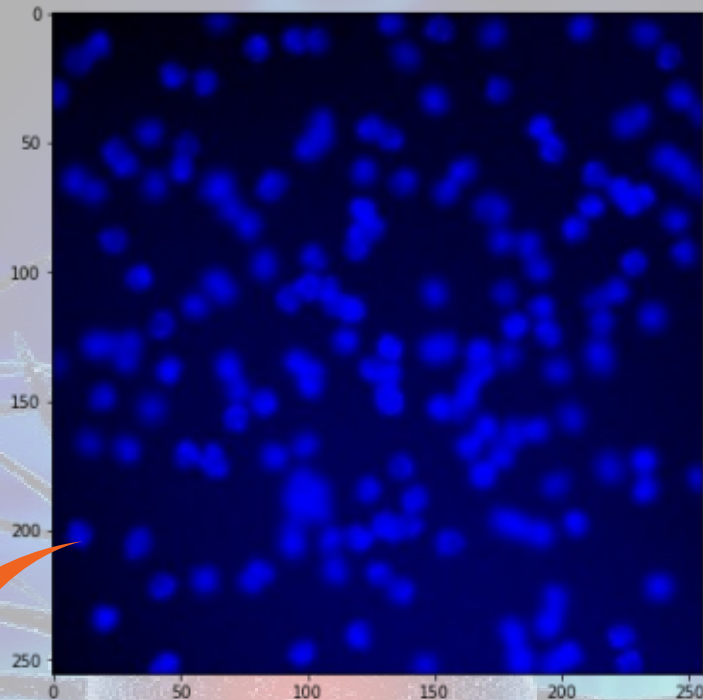
***Let's Take a Brief
Look on The
DataSet First***



DataSet Link

<https://github.com/ieee8023/countception>

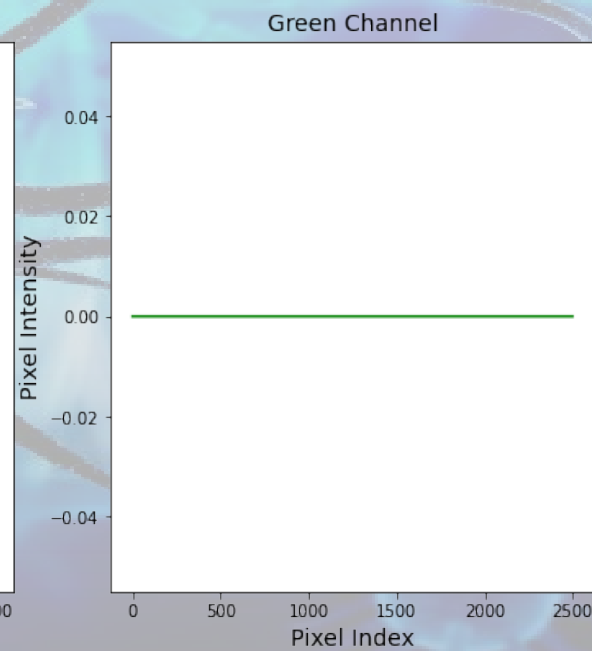
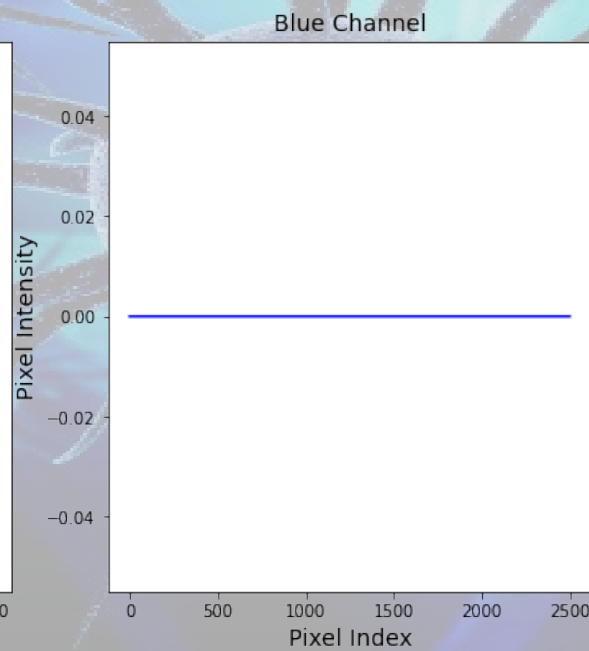
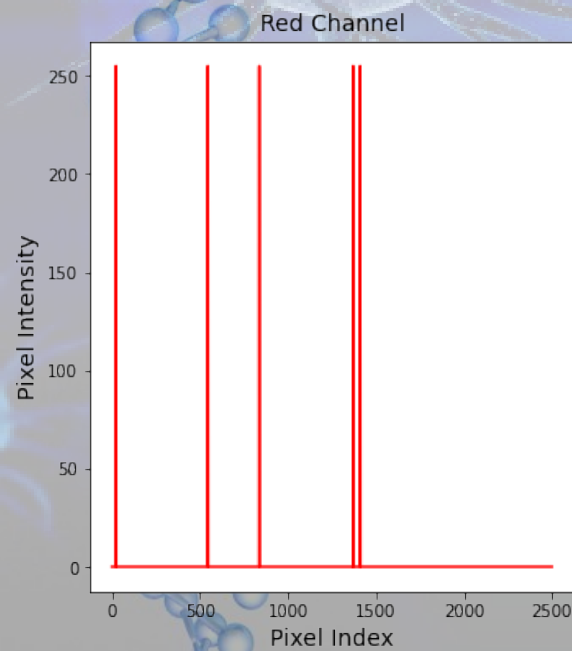
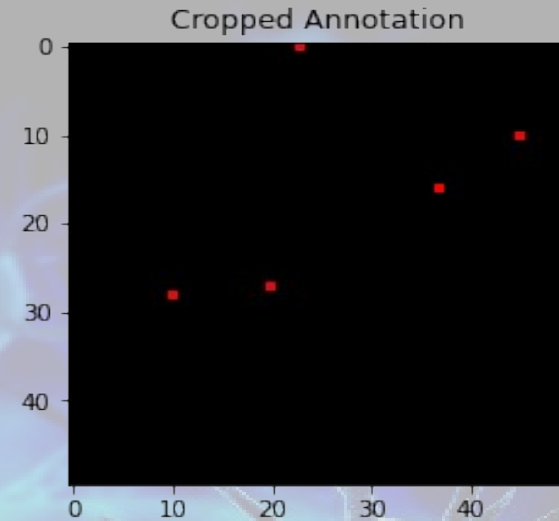
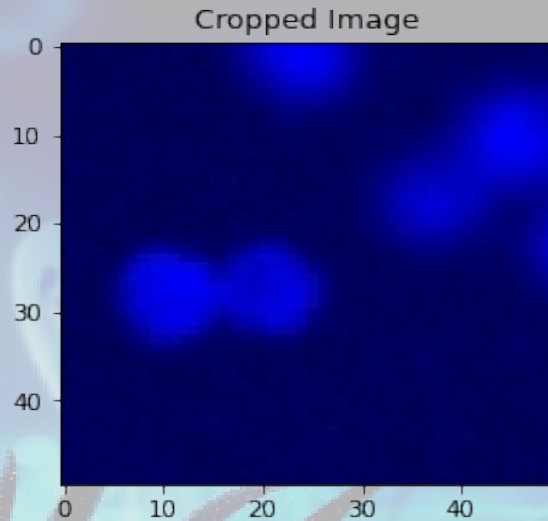
VGG CELLS



200 Images
Image Shape (256,256,3)

200 Annotations
Annotation Shape (256,256,3)

Randomly Cropped (50,50,3) Image & Annotation



Data Loading

{ X = Image File
Y = Number of Cells }

Training
128 Observations

Data Set
200 Observations

Test
40 Observations

Validation
32 Observations

Network Architecture

Convolutional Neural Network (CNN)

Max Pool --> (2x2)
Stride = 2

Drop Out --> 0.20

(5x5)
6 filters
Stride=1
pad=2

(3x3)
16 filters
Stride=1
pad=1

(3x3)
32 filters
Stride=1
pad=1

Flatten
The
Image

Hidden
Layer
1200
Neuron

Hidden
Layer
120
Neuron

Hidden
Layer
84
Neuron

Hidden
Layer
10
Neuron

Output
Layer
1
Neuron

Activation = "Relu"

Training & Validation

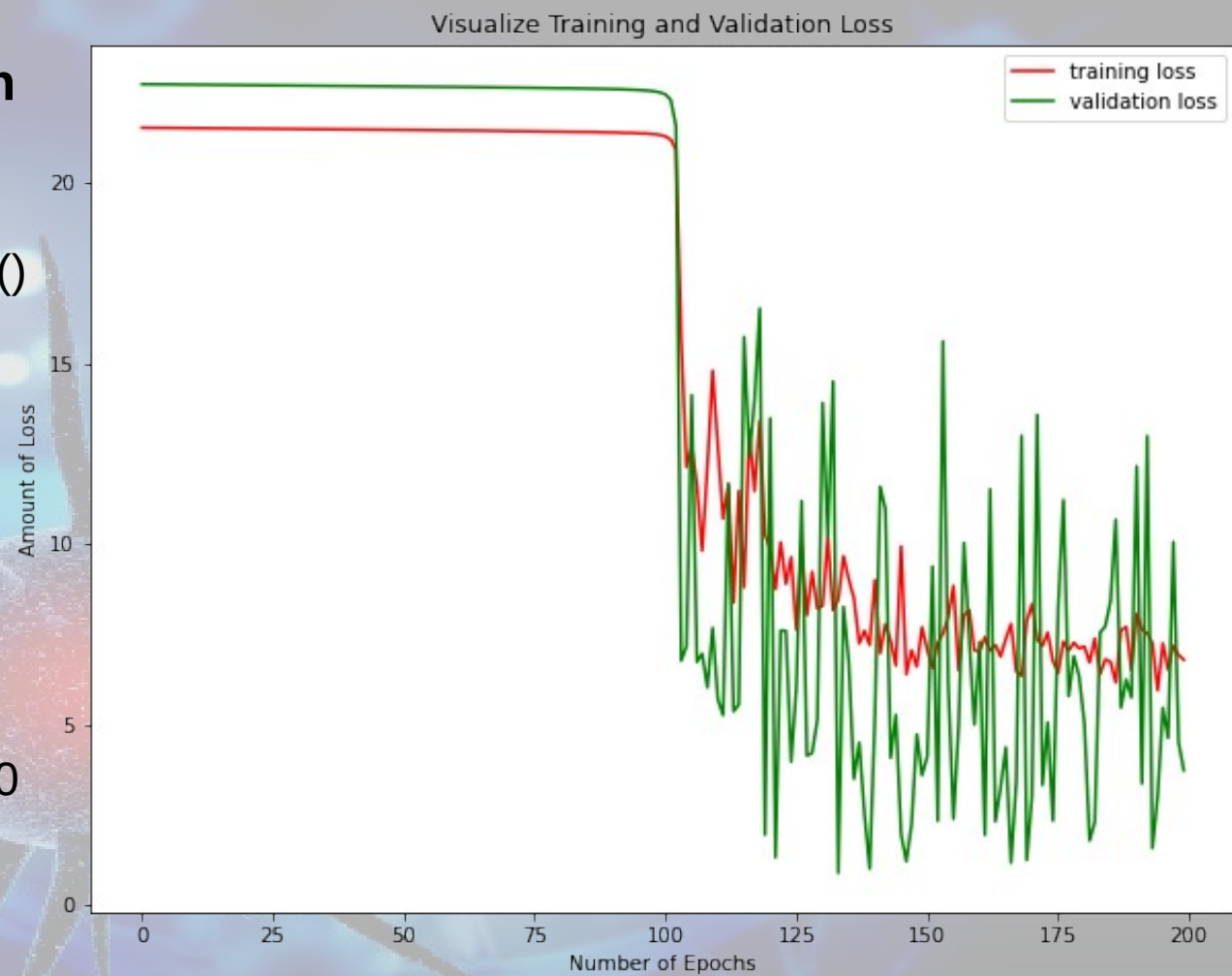
Loss Function = L1Loss()

Optimizer = "SGD"

Learning Rate = 0.0005

Batch Size 8

Number of Epochs = 200



Test The Model

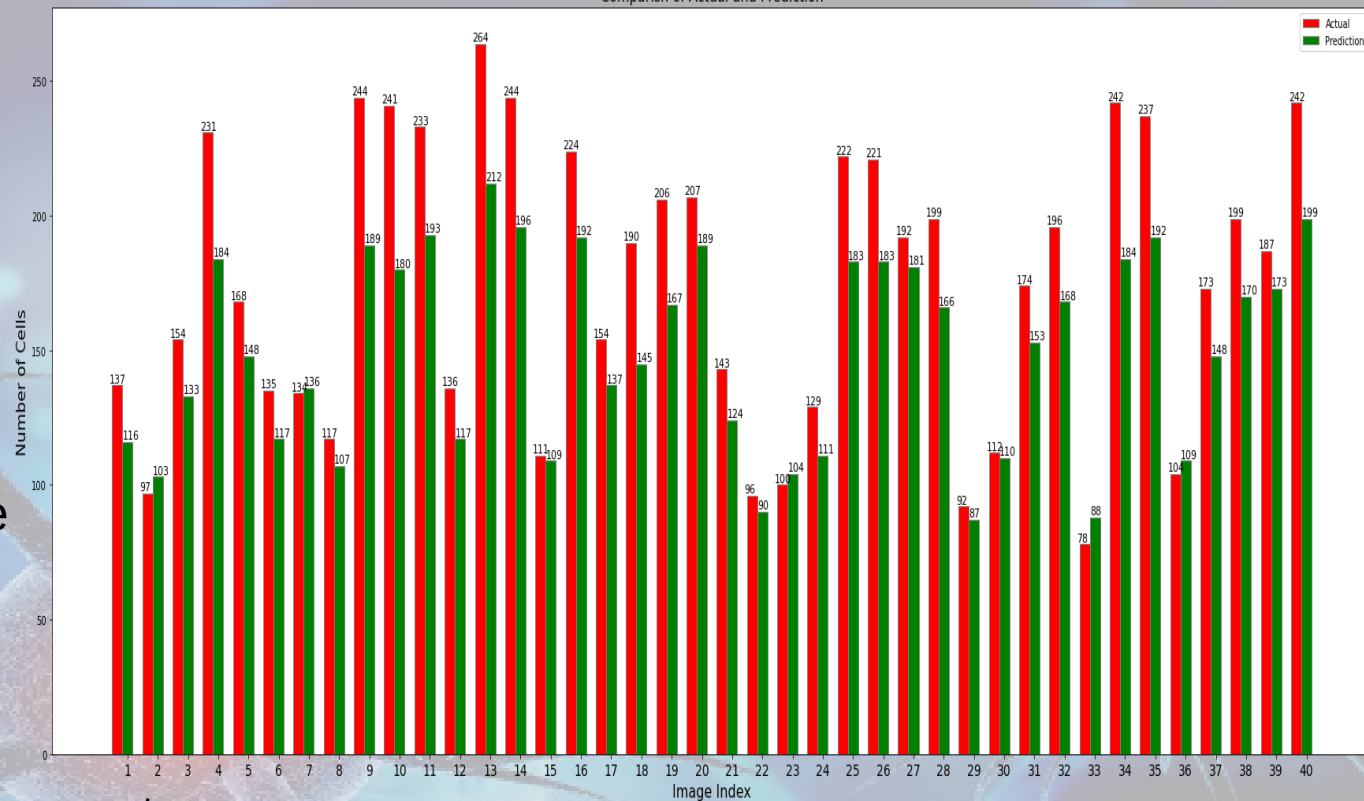
40 Images

Model Performance

85.32 %

Performance Measurement

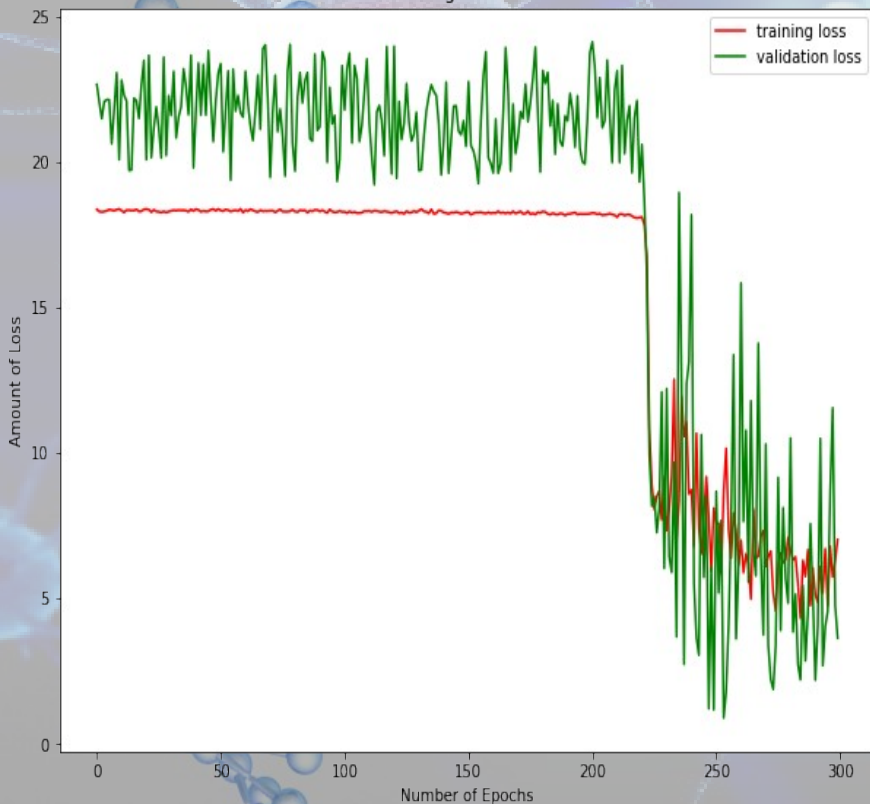
$$\left(1 - \frac{\sum | \text{Actual Count} - \text{Predicted Count} |}{\sum \text{Actual Count}} \right) * 100$$



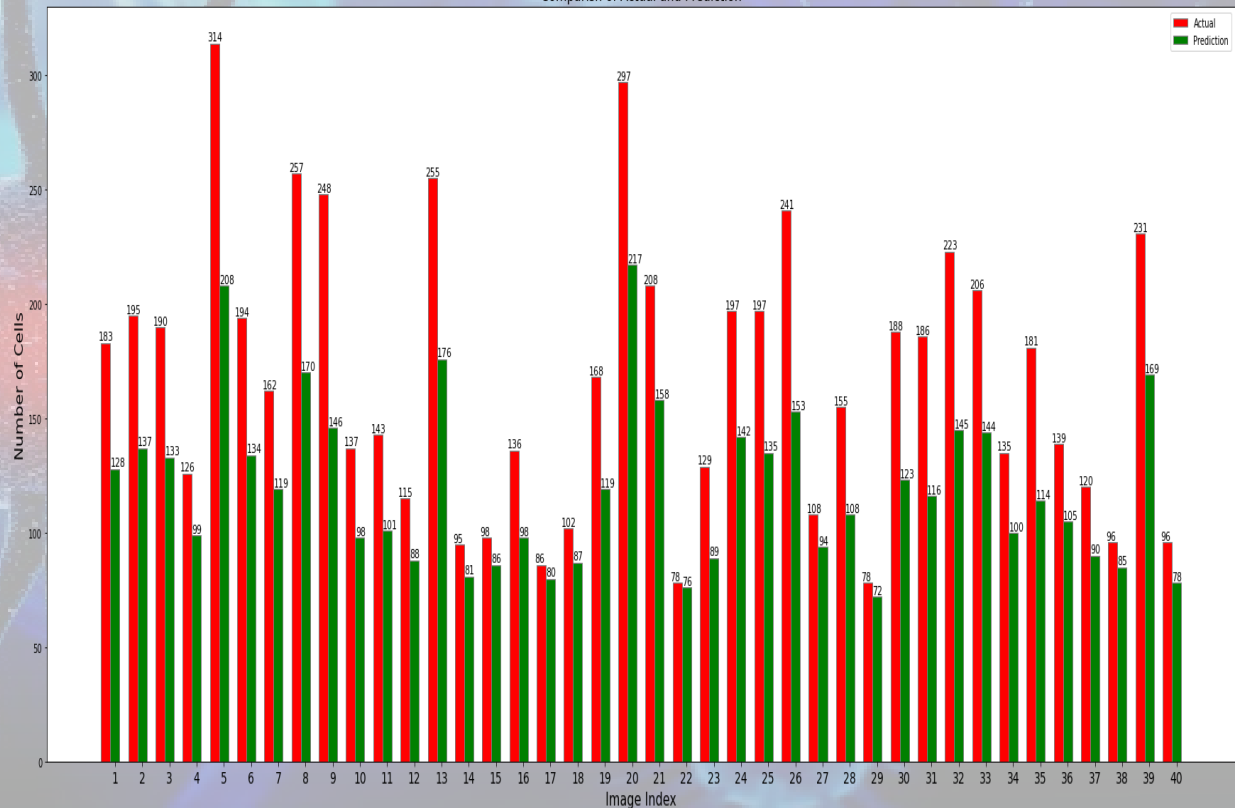
Another Test Case

Epochs	Learning Rate	Batch Size	Performance
300	0.0005	10	83.22 %

Visualize Training and Validation Loss



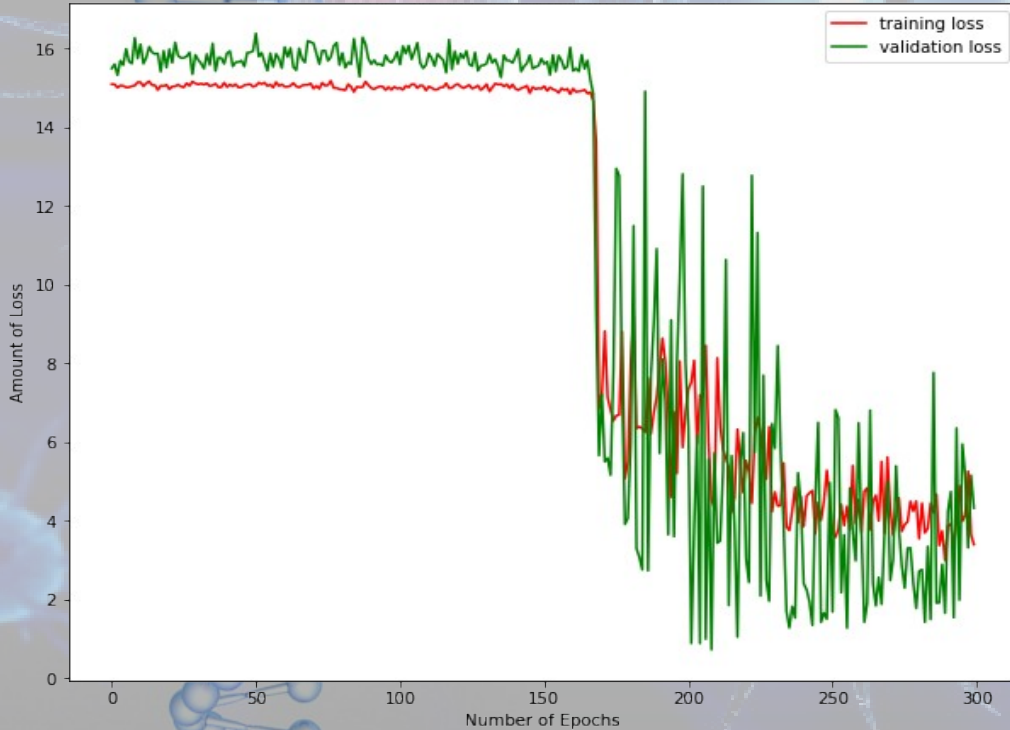
Comparison of Actual and Prediction



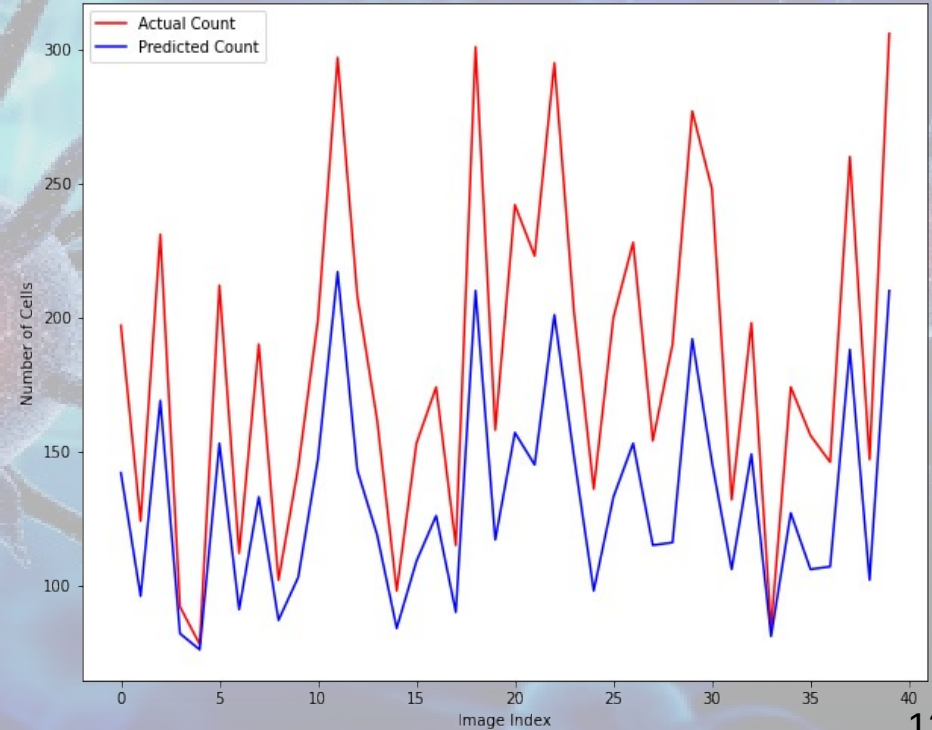
Another Test Case II

Epochs	Learning Rate	Batch Size	Performance
300	0.0005	12	71.80 %

Visualize Training and Validation Loss



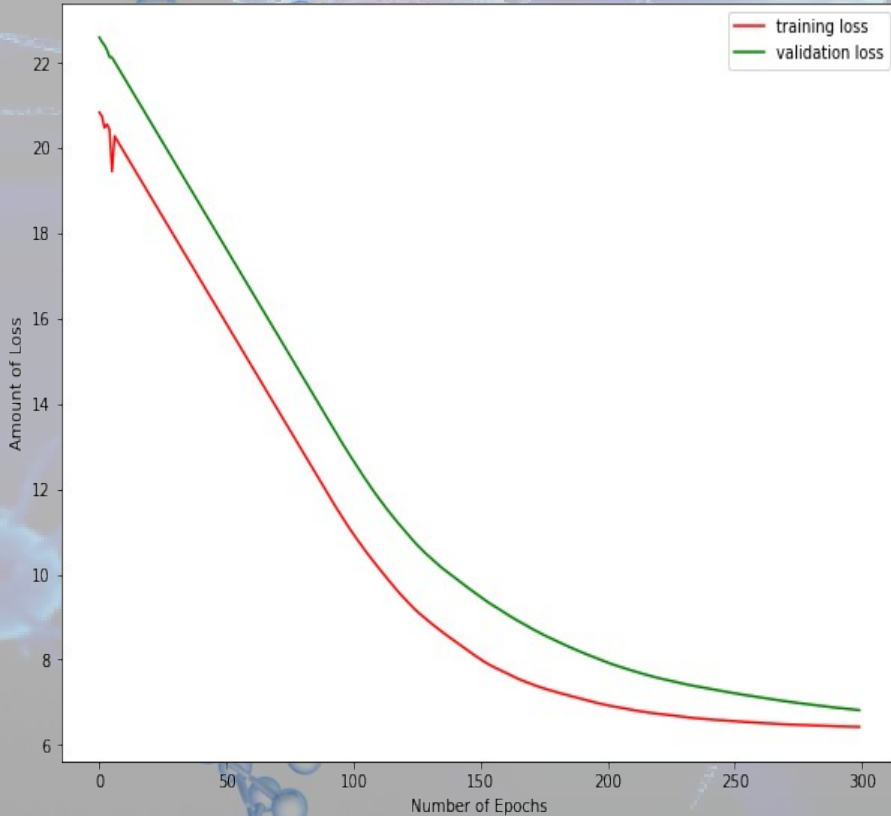
Comparison of Actual and Prediction



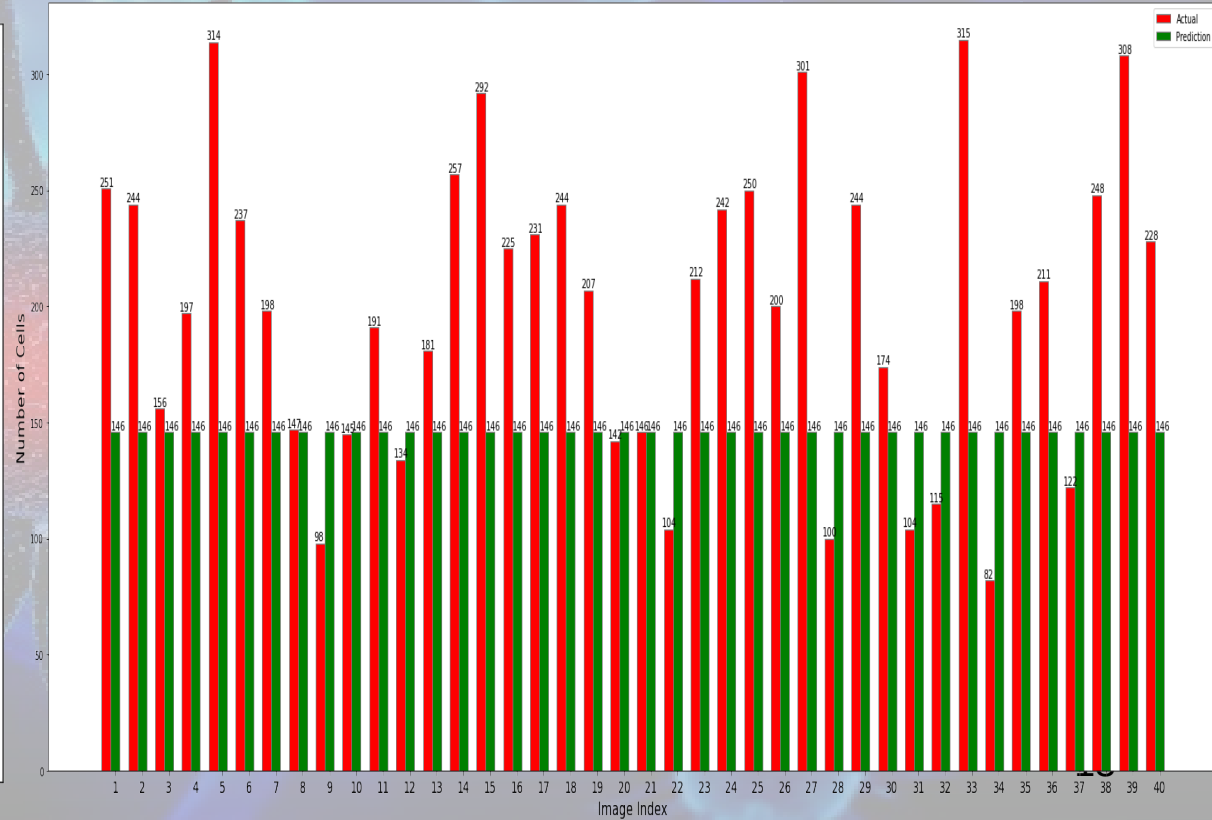
Another Test Case III

Epochs	Learning Rate	Batch Size	Momentum	Nesterov	Performance
300	0.0005	8	0.9	True	65.19 %

Visualize Training and Validation Loss



Comparison of Actual and Prediction





END