

A large steel frame structure under construction, showing the intricate truss system of beams and columns. The sky is clear and blue.

# Edwin Fung

# Steel Defect Detection

# Why?

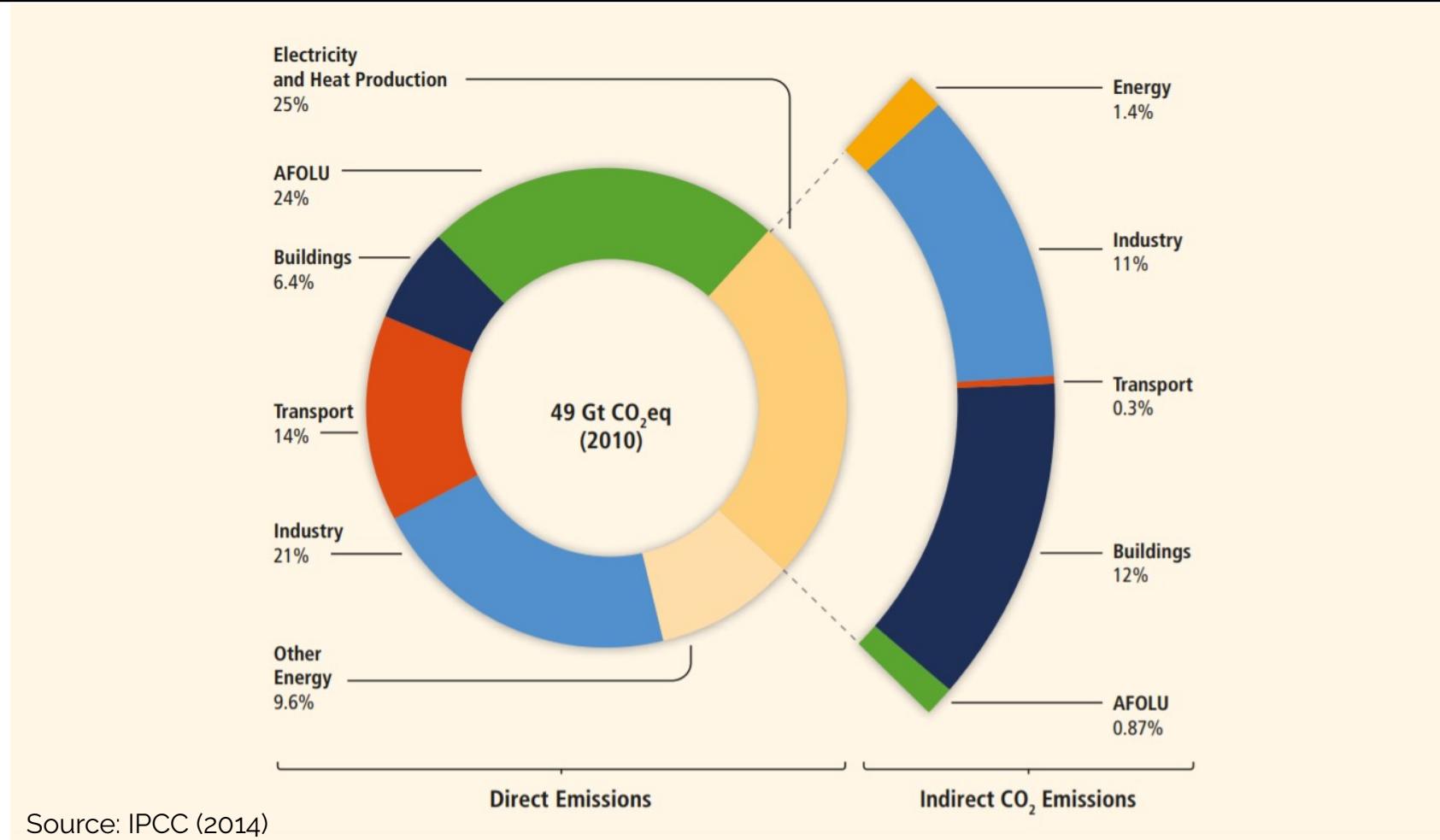


Source:  
WikiCommons

# Why?



# Why?





Featured Code Competition

# Severstal: Steel Defect Detection

Can you detect and classify defects in steel?



Severstal · 2,431 teams · 4 months ago

\$120,000

Prize Money



# Data Source

sample\_submission.csv 3 columns

train.csv 3 columns

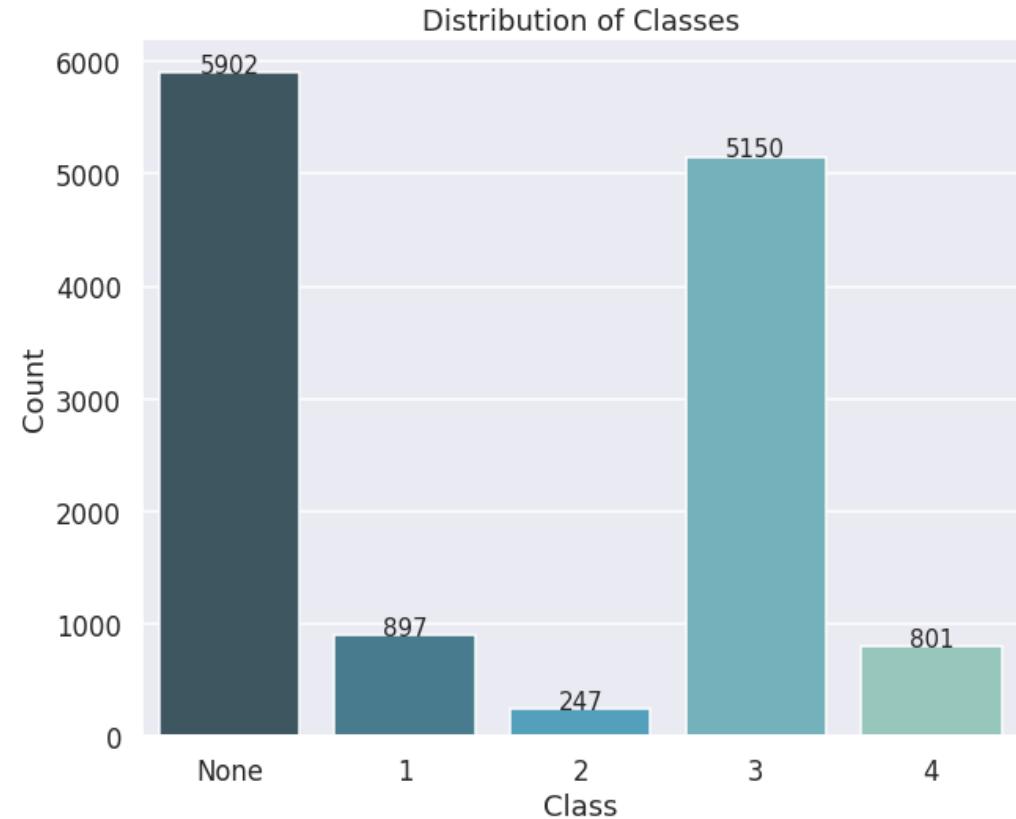
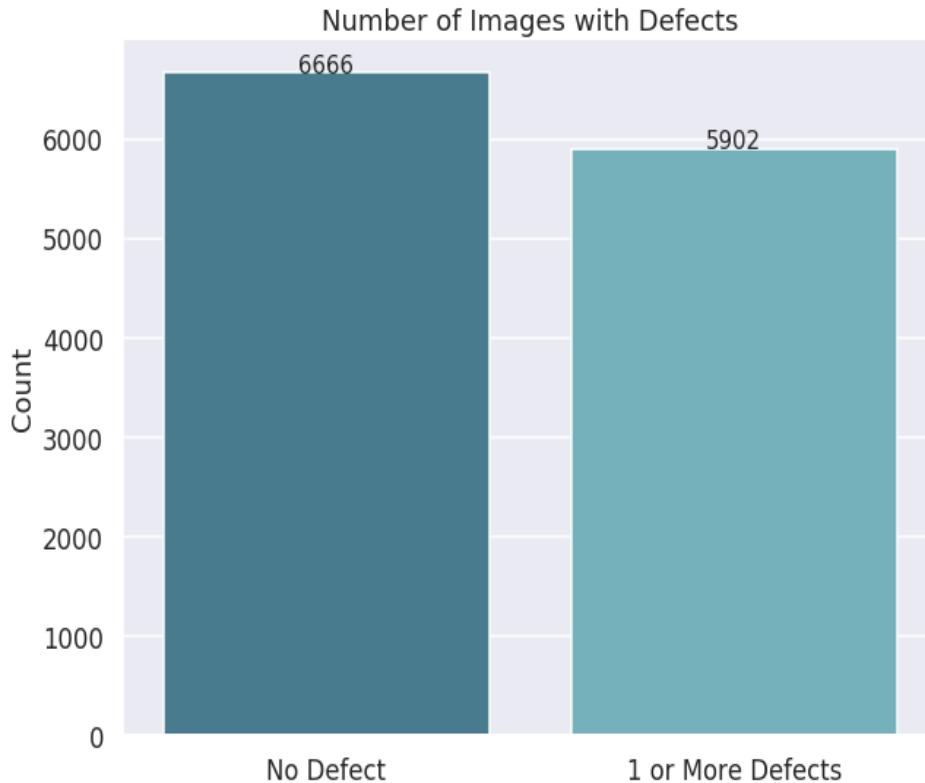
test\_images

train\_images

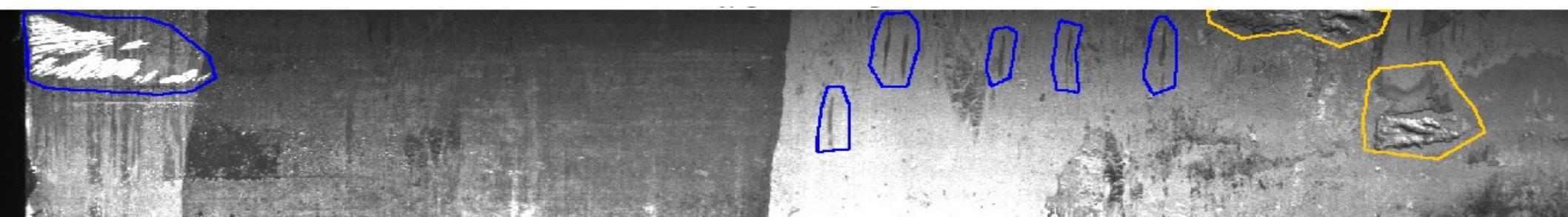
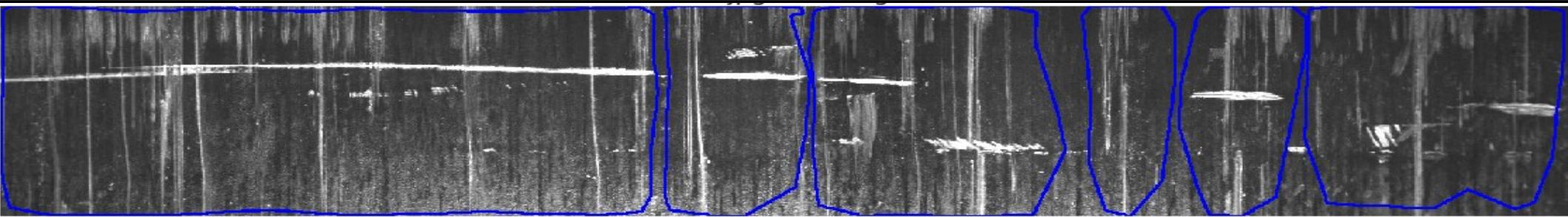
ImageId	ClassId	EncodedPixels
0002cc93b.jpg	1	29102 12 29346 24 29602 24 29858 24 3011
0007a71bf.jpg	3	18661 28 18863 82 19091 110 19347 110 19
000a4bcdd.jpg	1	37607 3 37858 8 38108 14 38359 20 38610



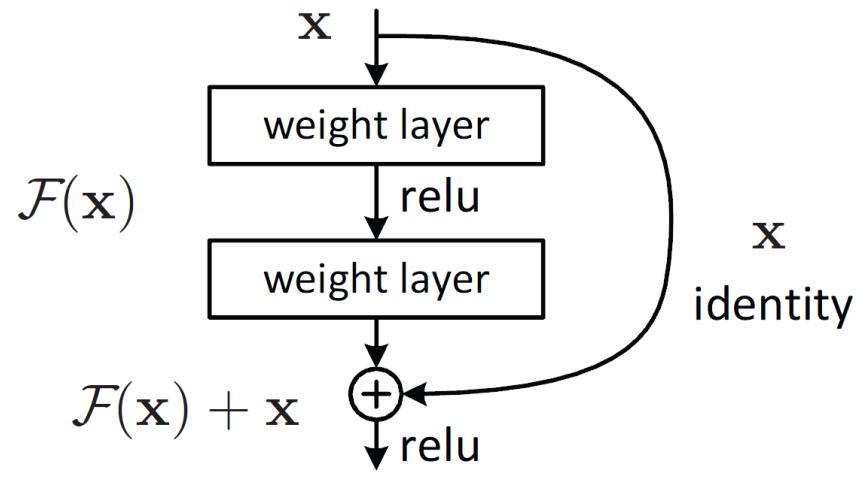
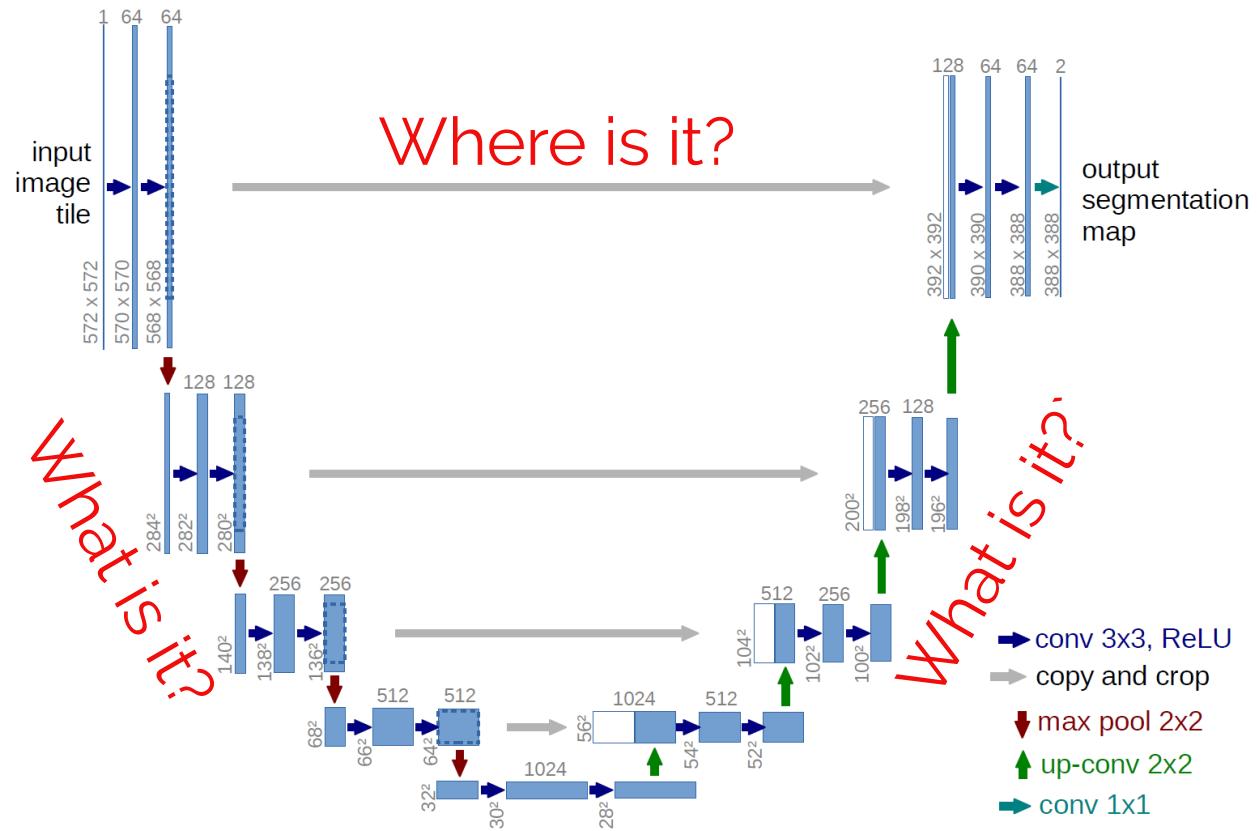
# EDA | Defect & Class Distribution



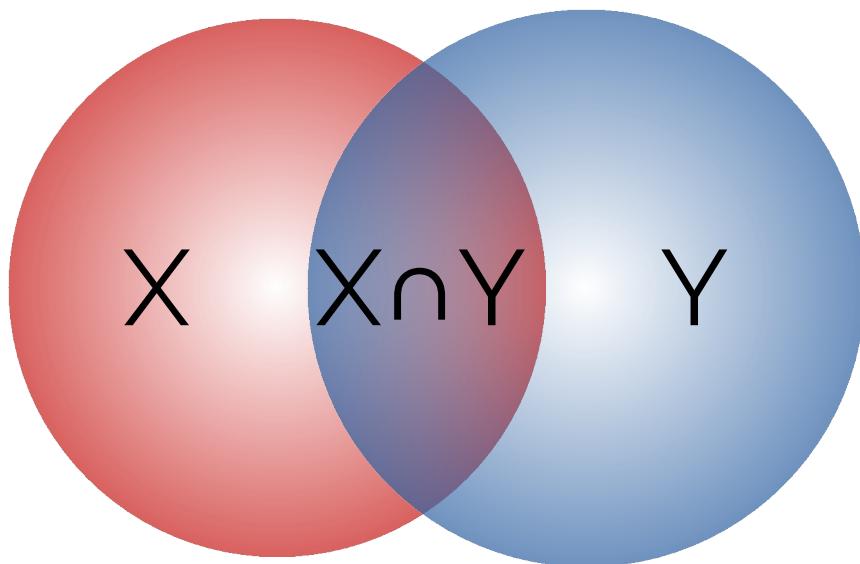
# EDA | Training Images with Masks



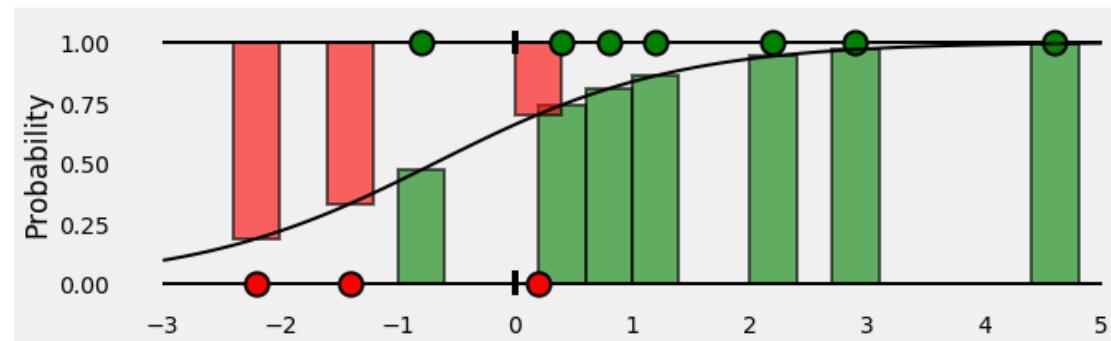
# Model | U-Net + ResNet



# Model | Loss Functions

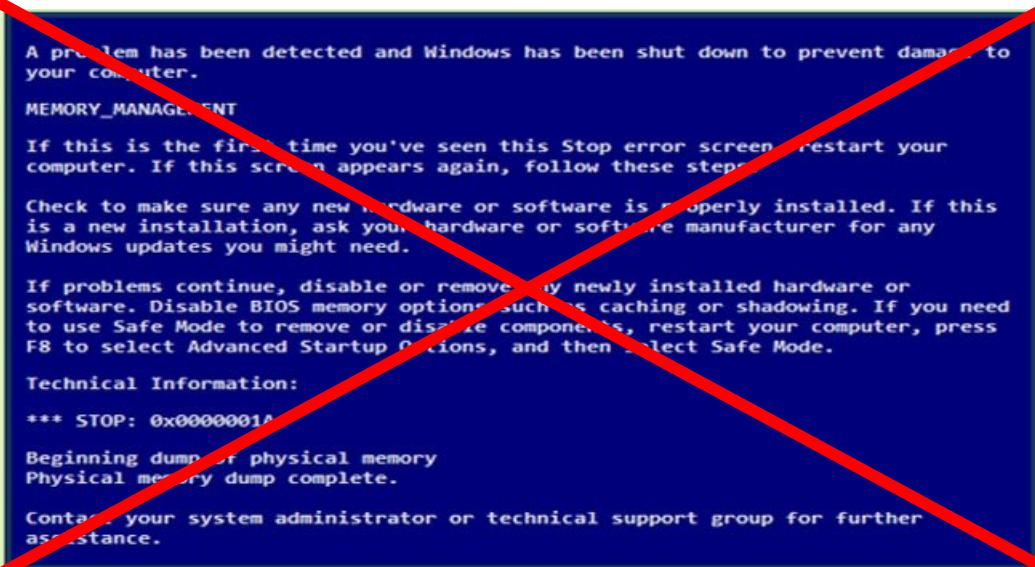


Dice Coeffi. -> Scalar



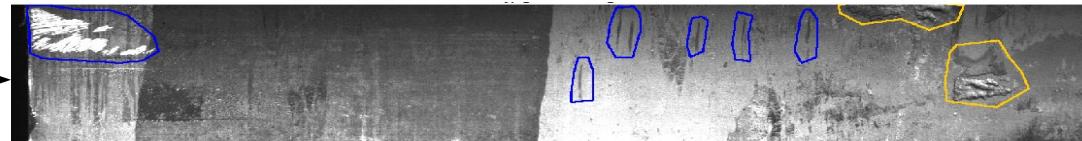
Binary Cross Entropy -> Matrix

# Model | Custom Data Generator



Avoids memory problems

ImageId	ClassId	EncodedPixels
0002cc93b.jpg	1	29102 12 29346 24 29602 24 29858 24 3011
0007a71bf.jpg	3	18661 28 18863 82 19091 110 19347 110 19
000a4bcdd.jpg	1	37607 3 37858 8 38108 14 38359 20 38610

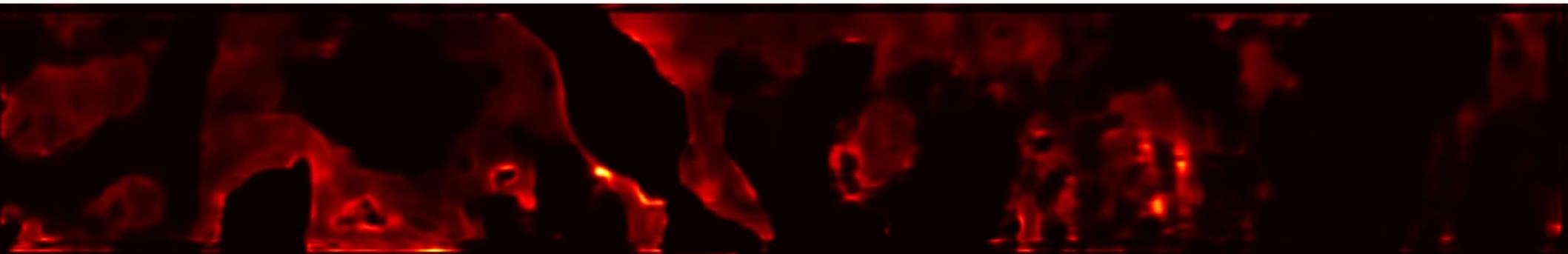


Flexible data transformation

# Results – Predicted Probabilities

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Predicted Class 2:



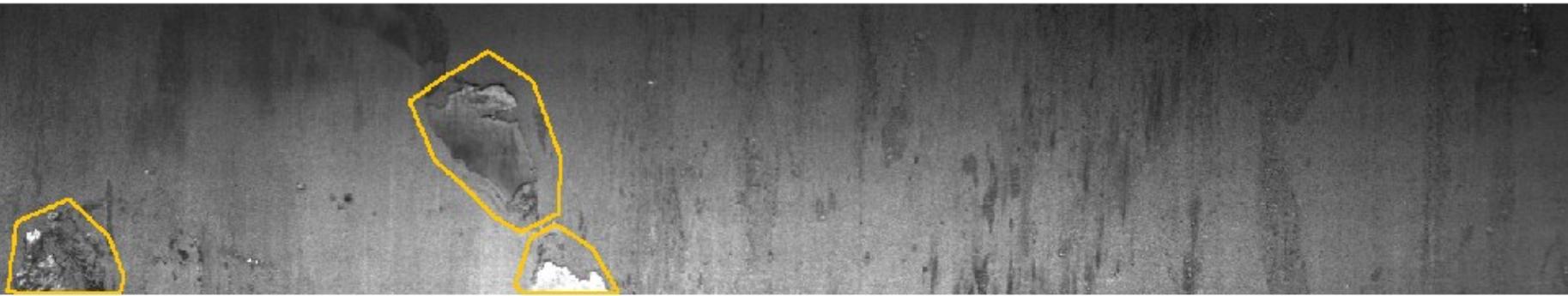
Predicted Class 4:



# Results – Single Class Defect

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Target:



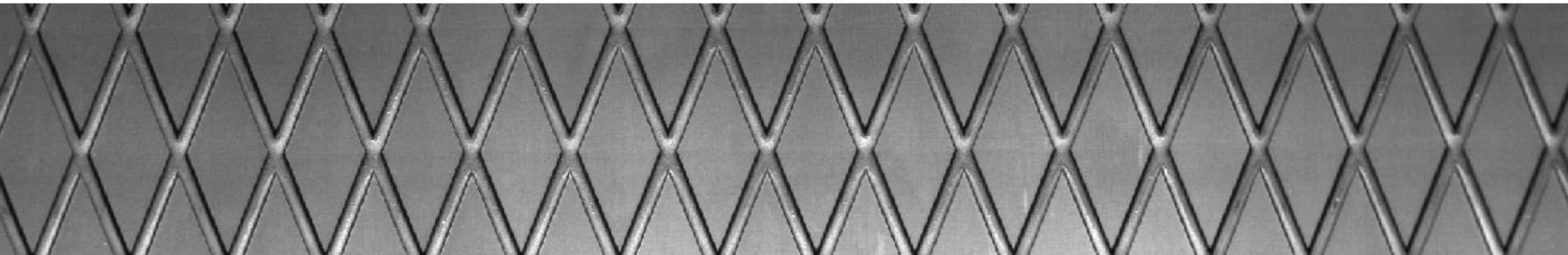
Predicted:



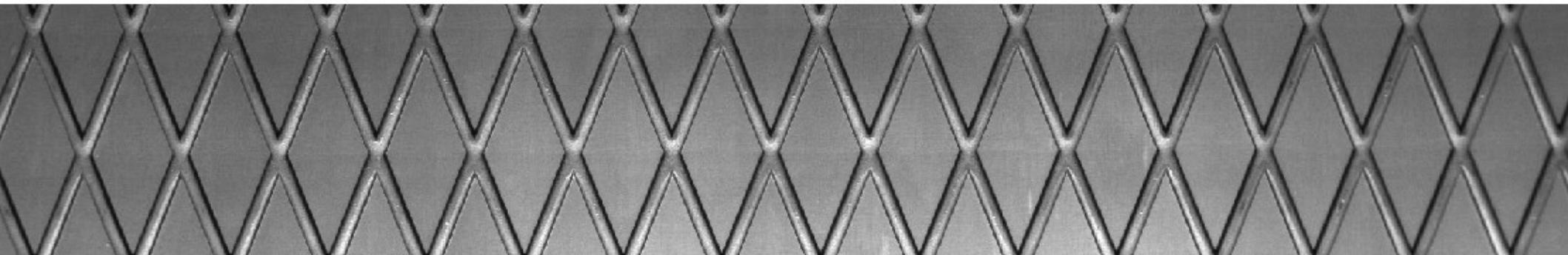
# Results – No Defect

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Target:



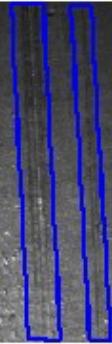
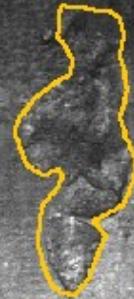
Predicted:



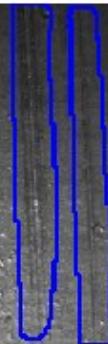
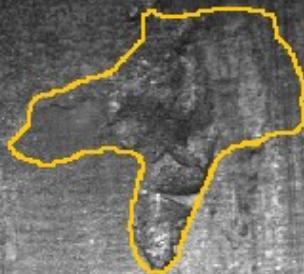
# Results – Multiclass Defect

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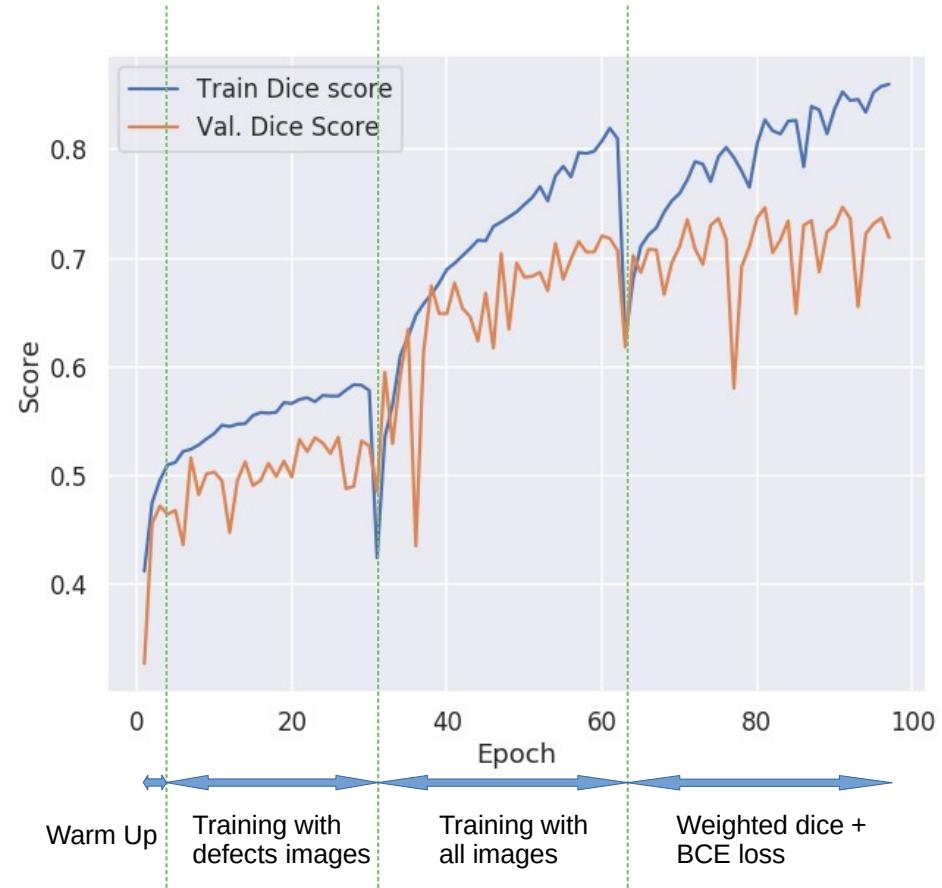
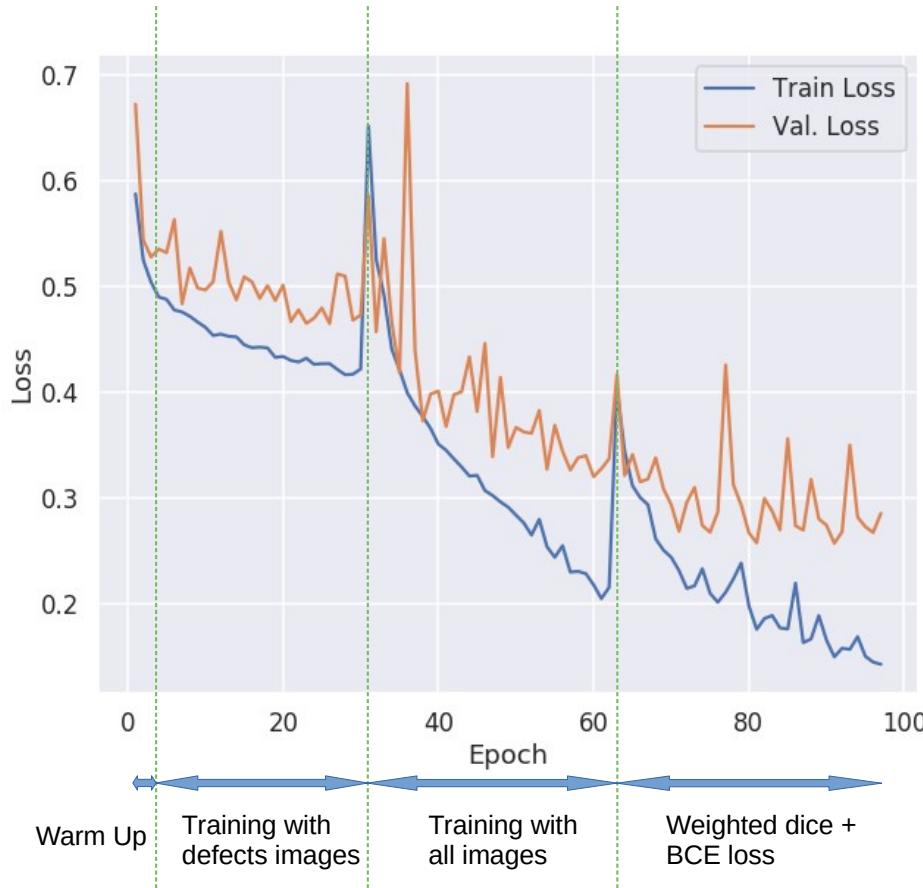
Target:



Predicted:



# Results - Loss and Score



# Ways to Improve

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Image augmentation

Pipeline to reject defectless images

Improve loss functions

Regularization

Threshold

