



Machine Learning

Project work:

“Autoencoder based onboard image segmentation”

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Overview

01

**SPLIT VALIDATION
AND TRAINING
SETS**

02

**PRE-PROCESSING
PIPELINE**

03

**NETWORK
ARCHITECTURE
SELECTED**

04

**HYPERPARAMETERS
SETTING AND LOSS
FUNCTION**

01

SPLIT VALIDATION AND TRAINING SETS



Multilabel stratified split based on class presence

Construction of a **binary matrix** ($n_{\text{sample}} \times n_{\text{class}}$) which indicates the presence of the classes in each image

	CLASS 0	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	CLASS 8
SEMPL 0000	1	1	0	0	1	0	1	0	0
SEMPL 0001	1	0	1	1	0	1	0	1	1
SEMPL 0001	0	1	0	1	0	0	1	1	1
SEMPL 0002	0	1	0	0	0	1	1	0	1

Split which preserves the **distribution of the classes** between the sample in the training and validation sets.

80% TRAINING SET vs 20% VALIDATION SET

Advantages:

- Balanced split
- Rare classes present in both sets
- Evaluation of the most reliable model

02

PRE-PROCESSING PIPELINE



**Exclusion of
mislabeled sample**



1

2

Data Augmentation

Base Augmentation

Resize 256×256 ,
normalization

Rare Augmentation

Horizontal flip, contrast,
brightness + Oversampling

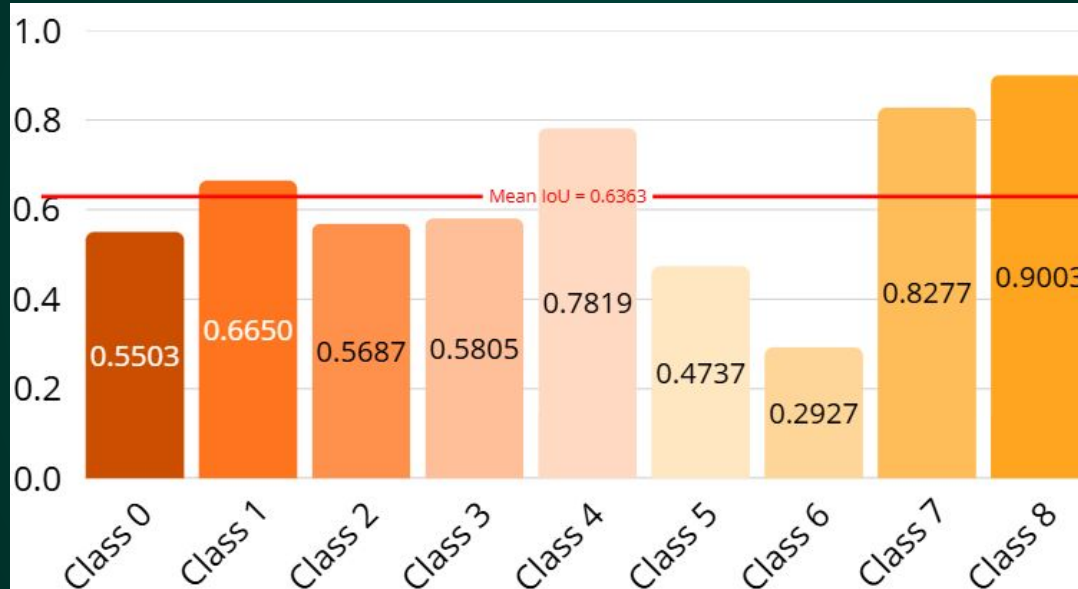
Confusion Augmentation

Texture based augmentation
(blur, noise, sharpen)



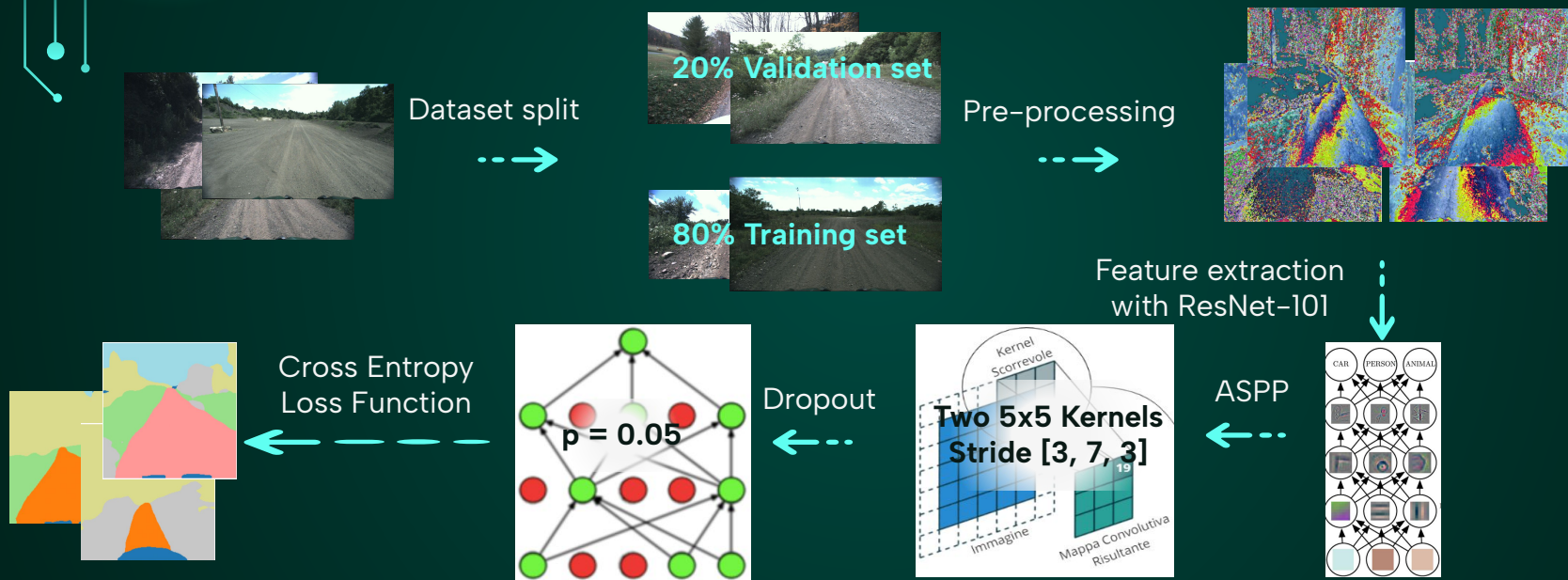
03

NETWORK ARCHITECTURE SELECTED



03

NETWORK ARCHITECTURE SELECTED



04

HYPERPARAMETER SETTING AND LOSS FUNCTION



Optimizer: Adam
Learning rate: $1e-4$

Batch size: 4

Input size: 256x256

Dropout: 0.05

ASPP:
Two 5x5 Kernels
Stride: [3, 7, 3]

Data augmentation probabilities:
Flip: 0.5
Brightness: 0.4
Motion Blur: 0.5
GaussianBlur: 0.5

Loss Function:
CrossEntropyLoss

Class Weights:
[1.0, 1.0, 1.0,
1.0, 5.0, 4.0, 3.5,
0.8, 0.8]

The background is a dark teal color. In the four corners, there are abstract, glowing circuit board patterns. These patterns consist of white lines representing traces and small teal circles representing solder points or vias. The patterns are more dense in the top-left and bottom-right corners and more sparse in the top-right and bottom-left corners.

THANKS

DOES ANYONE HAVE ANY QUESTIONS?
