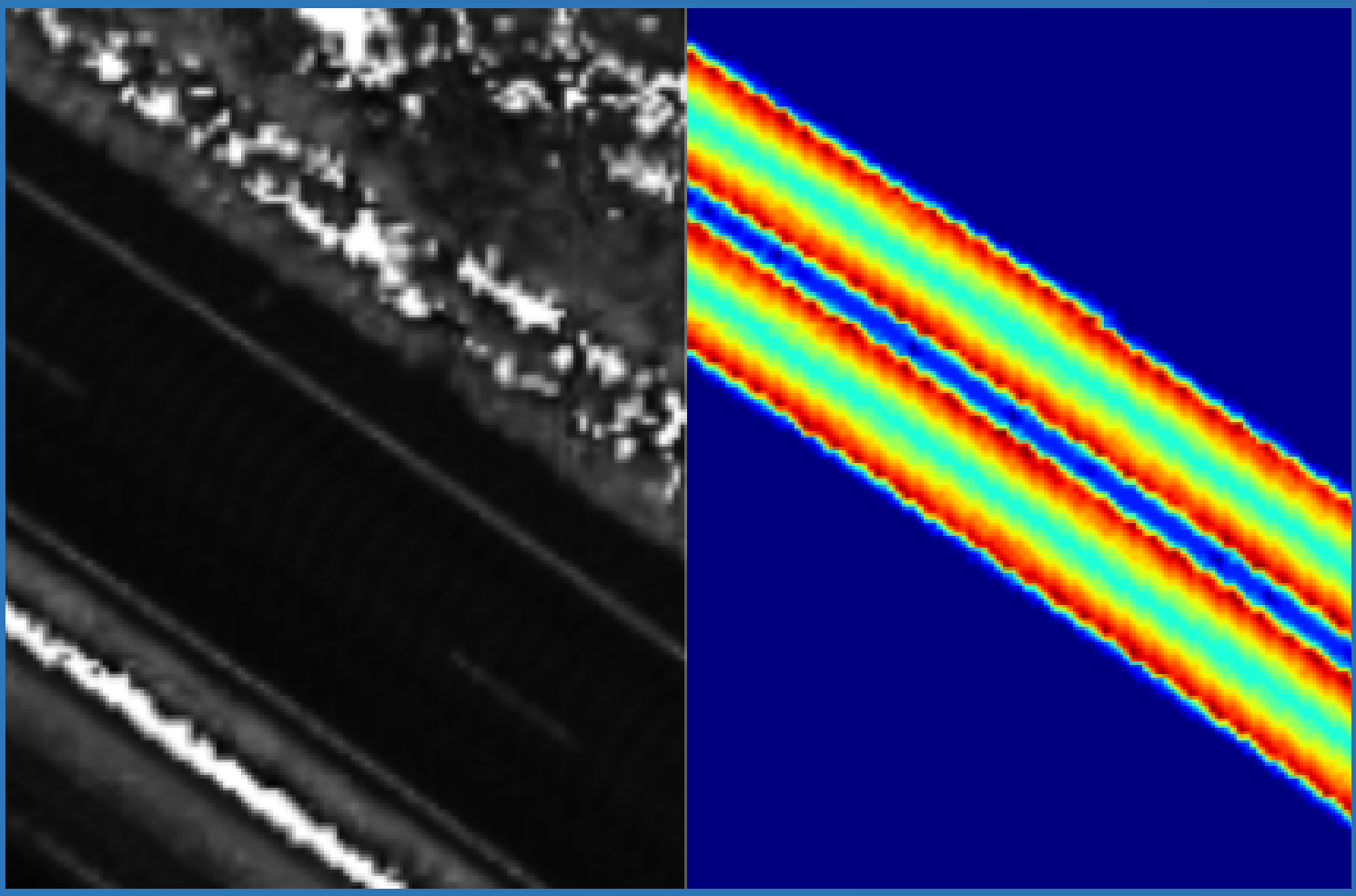
ROAD GRID MAPPER

REDE DE SEGMENTAÇÃO SEMÂNTICA



PREPARADO POR
LUDMILA DIAS

lume ROBOTICS

MAPEAMENTO DE FAIXAS DE ESTRADA USANDO REMISSÃO DE LASERS E REDES NEURAIS

SOBRE O PROJETO

Treinamento de uma rede neural profunda de segmentação semântica para a segmentação de estradas em mapas de remissão. Esse projeto foi feito utilizando como referência o artigo "Mapping Road Lanes using Laser Remission and Deep Neural Networks"[1], entretanto utilizando-se uma rede neural de segmentação semântica diferente e mais atual, U-NET, ao invés da E-NET.

PRINCIPAIS ETAPAS

Pré-processamento e organização dos dados

Geração de peso para as classes

Definição do Modelo, parâmetros e métricas

Divisão de lote de treino e de teste

Treinamento do modelo

Avaliação do modelo

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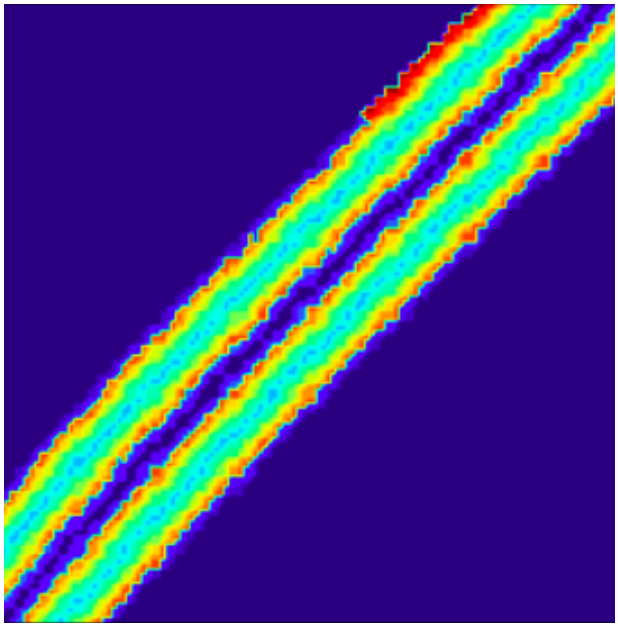
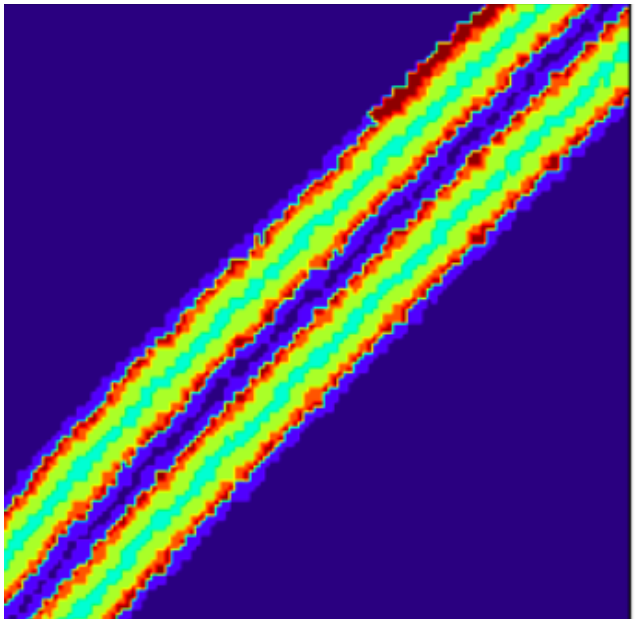
17 CLASSES X 6 CLASSES

17 CLASSES



6 CLASSES



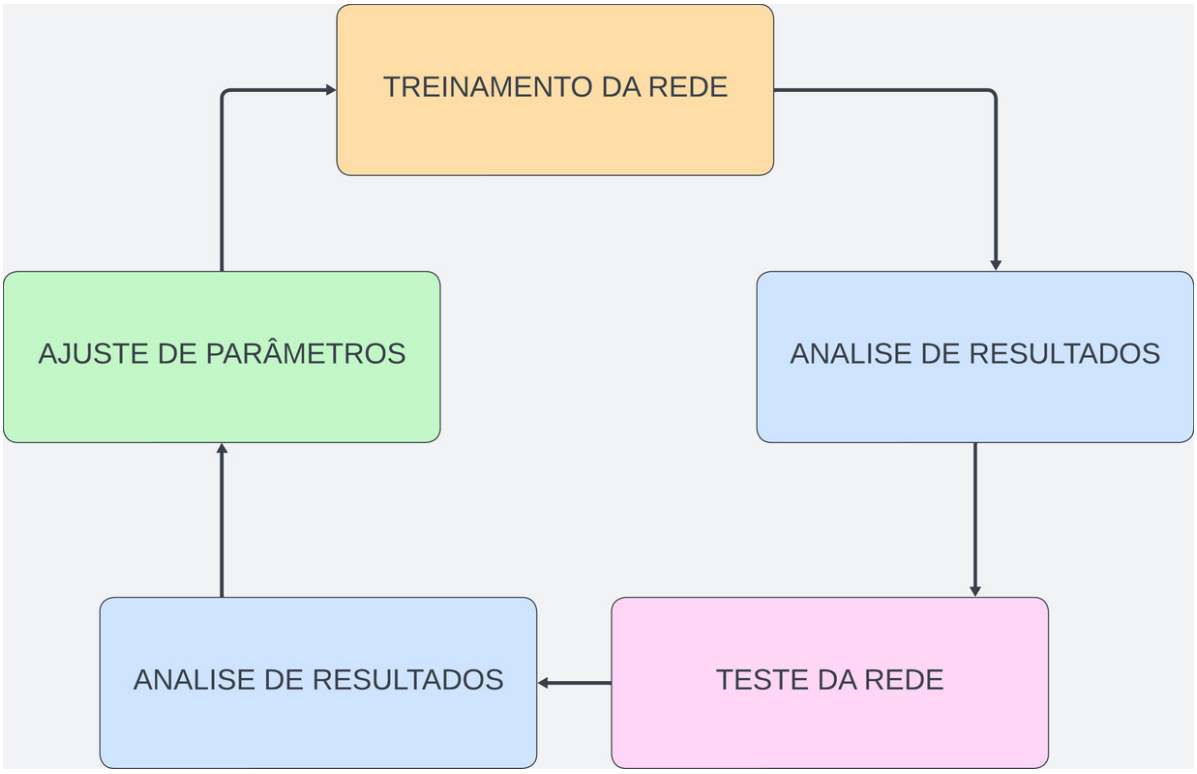
DESCRIÇÃO DAS CLASSES

- Classe 0 (0) → O que não é pista.
- Classe 1 (1,2,3,4) → Limite entre a classe 0 e a pista
- Classe 2 (5,6) → Detalhes de divisão de tipo de pista
- Classe 3 (7,8,9,10) → Área da pista mais próxima da classe 1
- Classe 4 (11,12) → Pista
- Classe 5 (13,14,15,16) → Centro da Pista

MÉTRICAS, PARÂMETROS E ESTRATÉGIAS

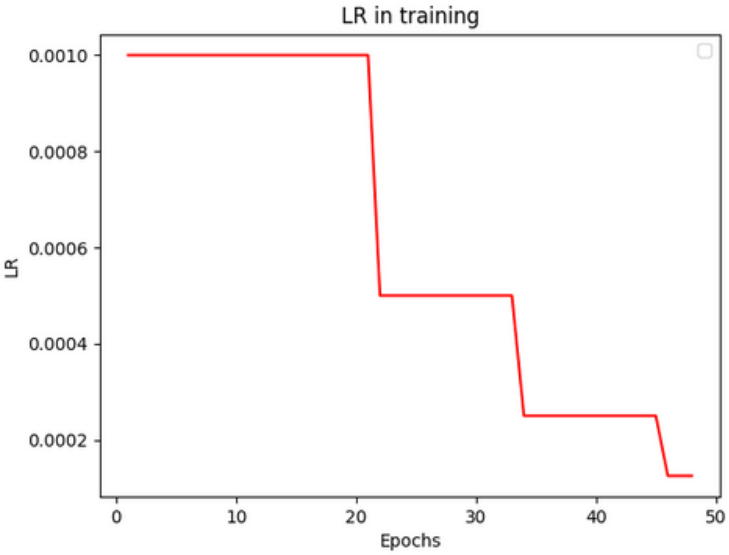
- **PARA TREINAMENTO**
  - Focal Categorical Crossentropy Loss Function [3][5]
  - Adam Optimizer [7]
  - SGD Optimizer [14]
  - Early Stopping [9][10]
  - Model Checkpoint [11]
  - Reduce LR On Plateau [2][4]
  - Cross Validation [8]
  - Categorical Accuracy [12]
  - Class Weights [6]
- **PARA AVALIAÇÃO**
  - Categorical Accuracy [12]
  - F1 [12]
  - Precisão [12]
  - Recall [12]
  - IoU [13]
  - Matriz de Confusão [12]
  - Visualização visual

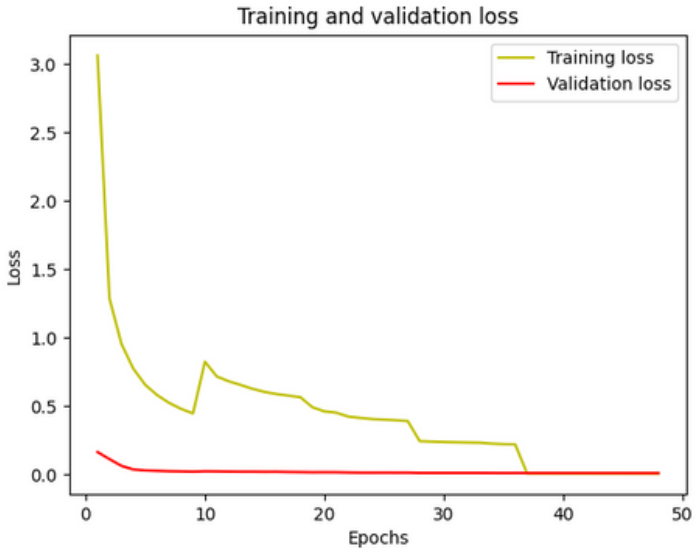
ESTRATÉGIA PARA APRENDIZADO DO MODELO



RESULTADOS DE TREINAMENTO

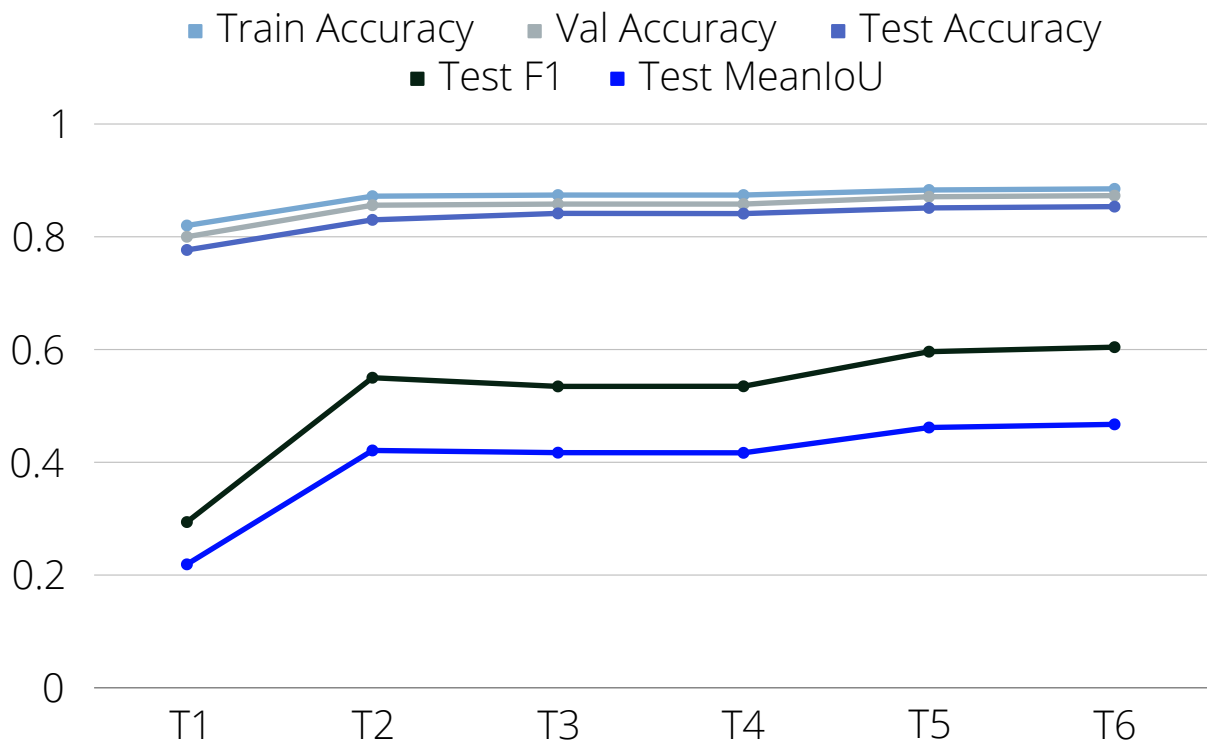
- **6 CLASSES**



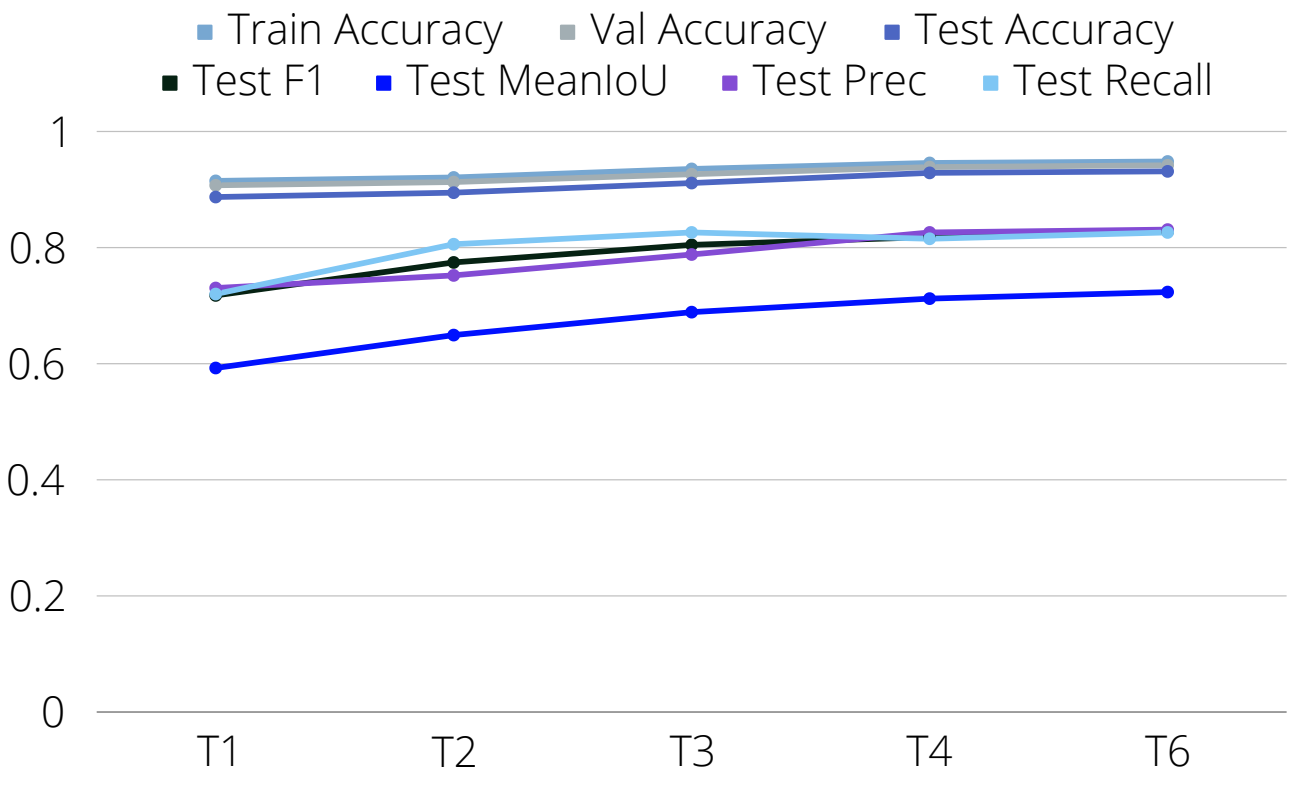


RESULTADOS DE TREINAMENTO

- **17 CLASSES**



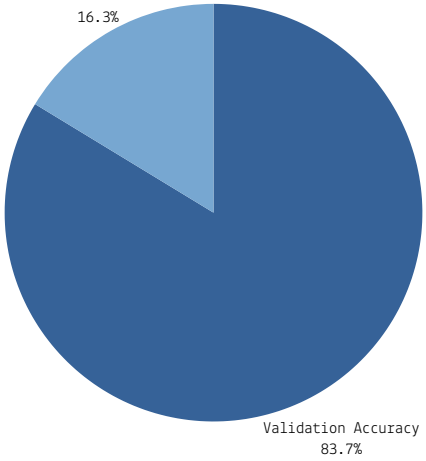
- **6 CLASSES**



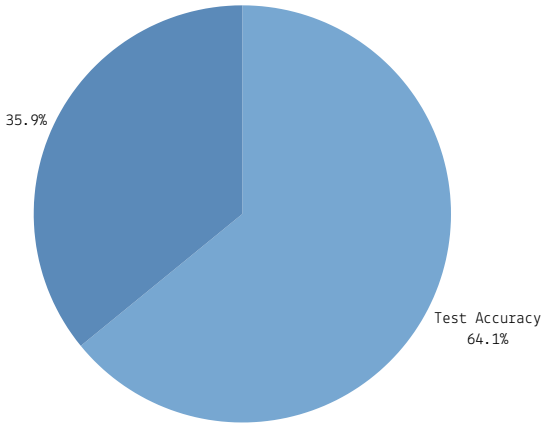
VALORES FINAIS

17 CLASSES - ENET

- Dataset UFES

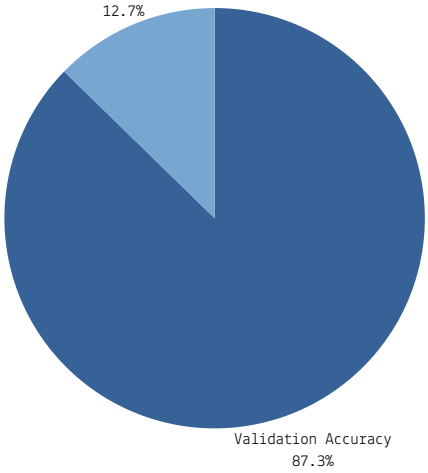


- Dataset Highway

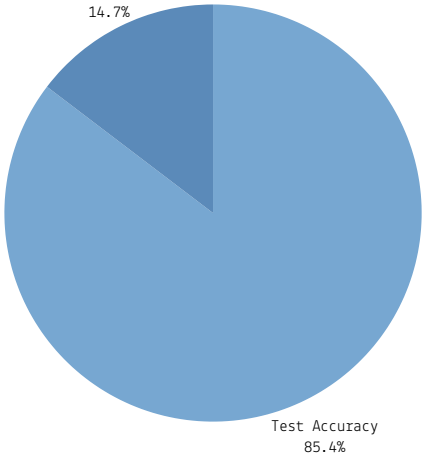


17 CLASSES - UNET

- Dataset UFES

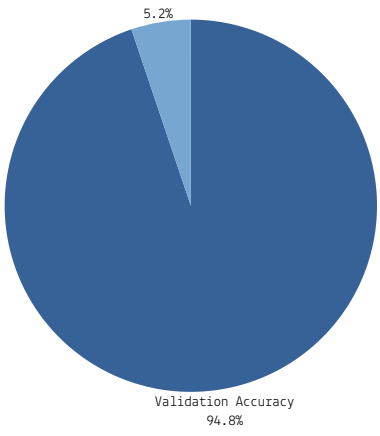


- Dataset UFES - All Classes

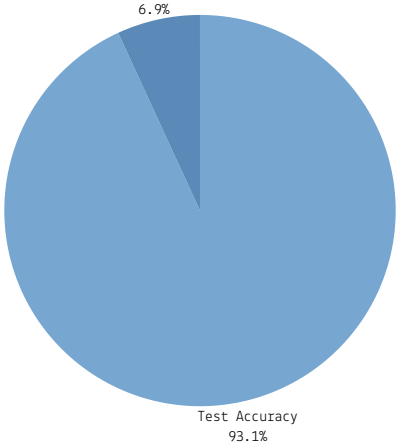


6 CLASSES - UNET

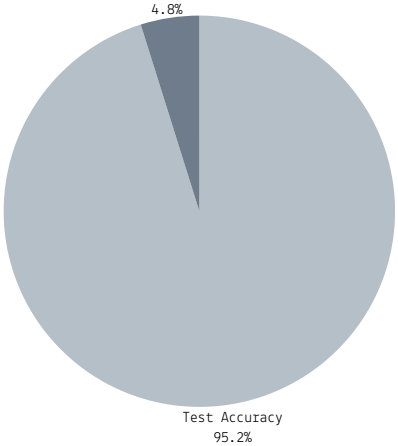
- Dataset UFES



- Dataset UFES - All Classes



- Dataset Highway



VALORES FINAIS

17 CLASSES - UNET

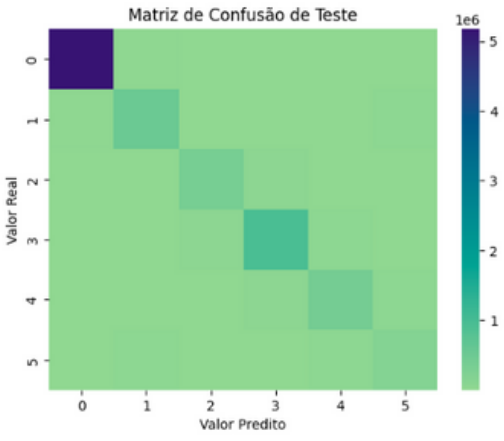
Test Accuracy	Val Accuracy	F1	IoU
0.873	0.8535	0.6042	0.4673

	Classes	IoU
0	1	0.982622
1	2	0.556408
2	3	0.607621
3	4	0.549765
4	5	0.541840
5	6	0.356900
6	7	0.444732
7	8	0.408301
8	9	0.422369
9	10	0.431878
10	11	0.426826
11	12	0.432764
12	13	0.420572
13	14	0.358528
14	15	0.365532
15	16	0.335394
16	17	0.302101

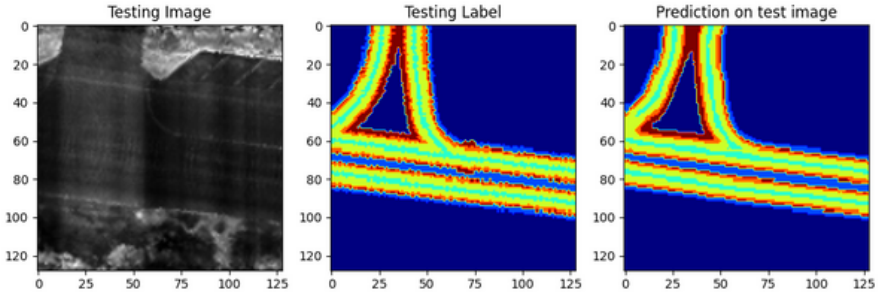
6 CLASSES - UNET

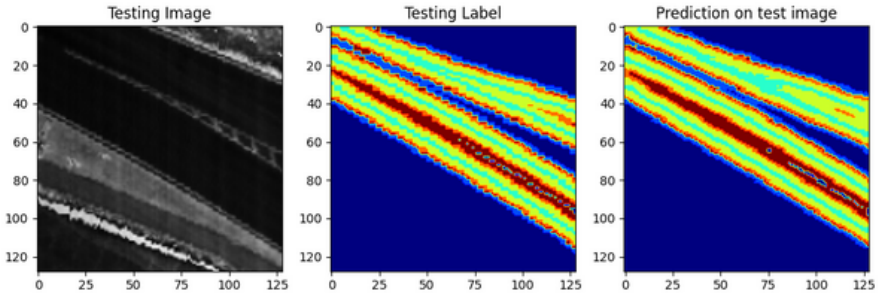
Test Accuracy	Val Accuracy	F1	IoU
0.9418	0.9313	0.8280	0.7234

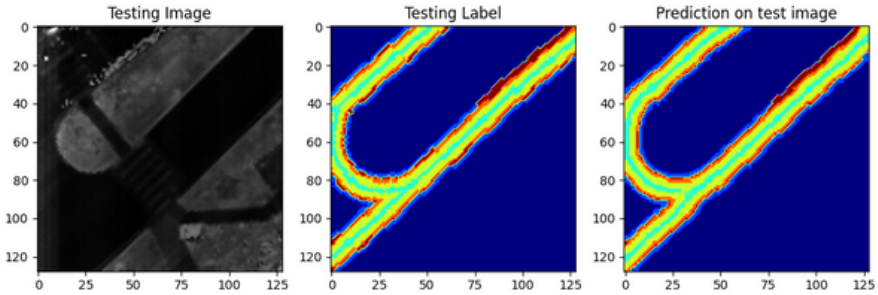
Classe	IoU
0	0.982995
1	0.745107
2	0.720401
3	0.784459
4	0.636177
5	0.471341

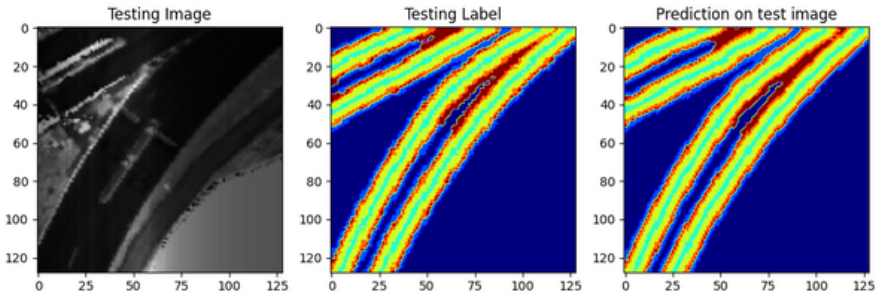


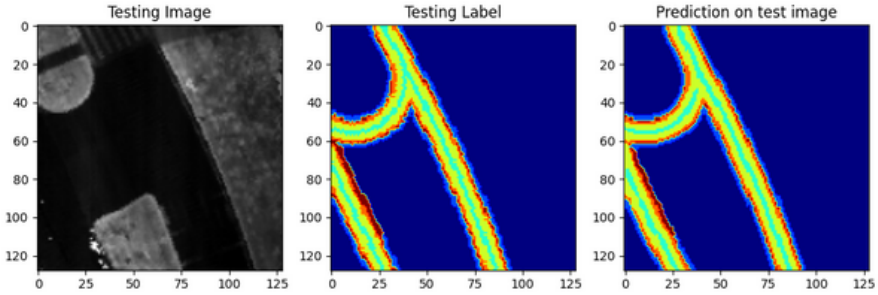
IMAGENS DE SAÍDA





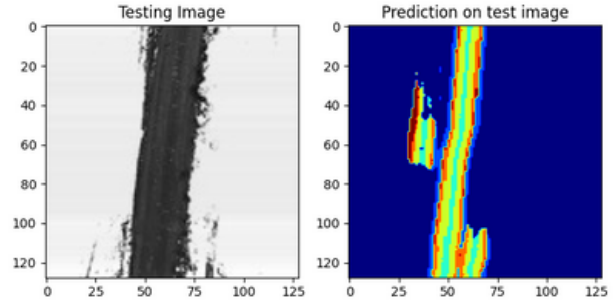


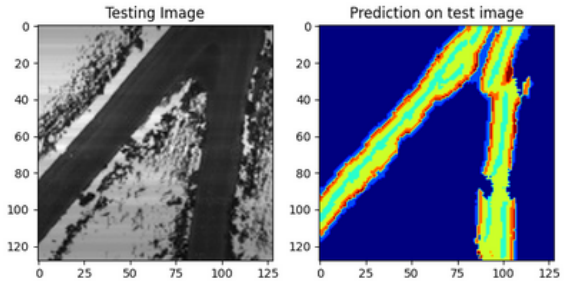


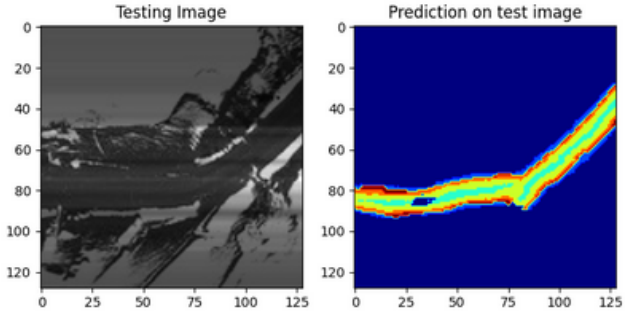


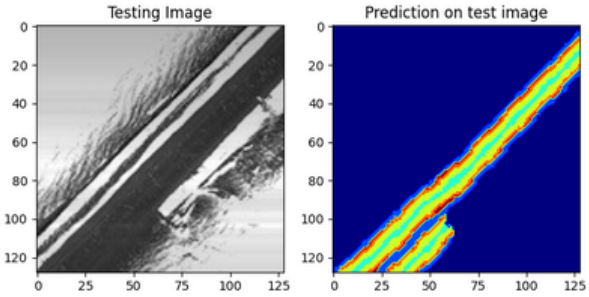
TESTES EXTERNOS

HYDRO (POSTO AVANÇADO)









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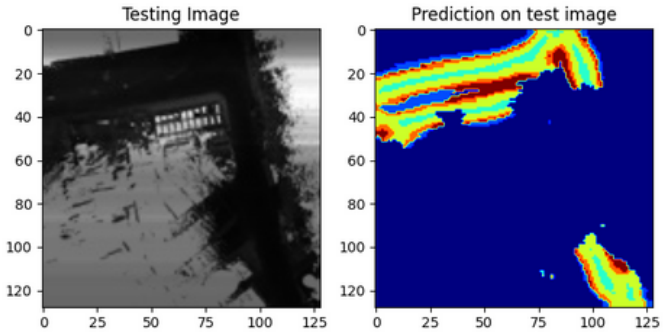
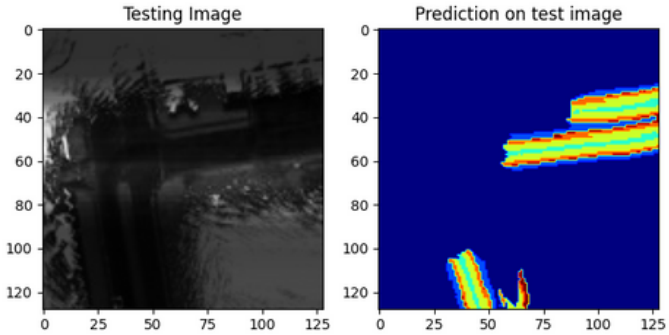
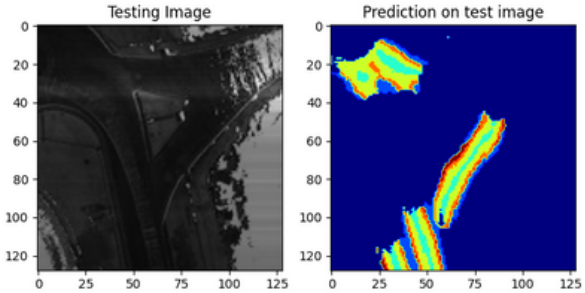
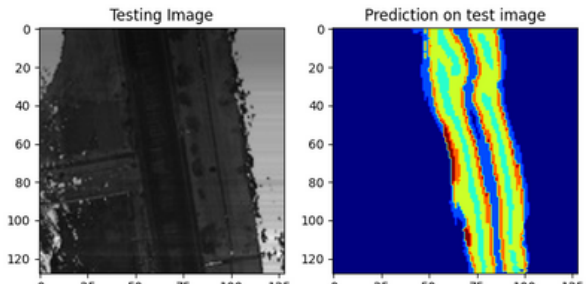
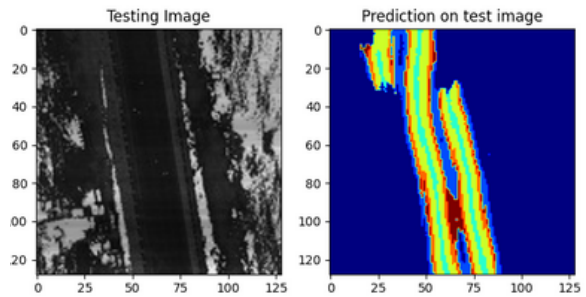




PORTOCEL



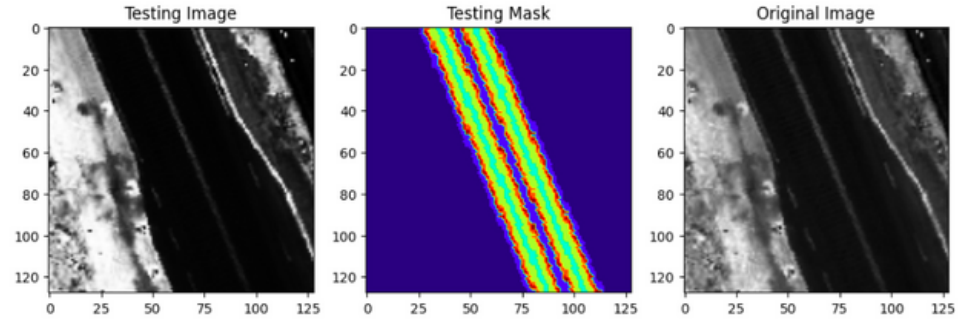




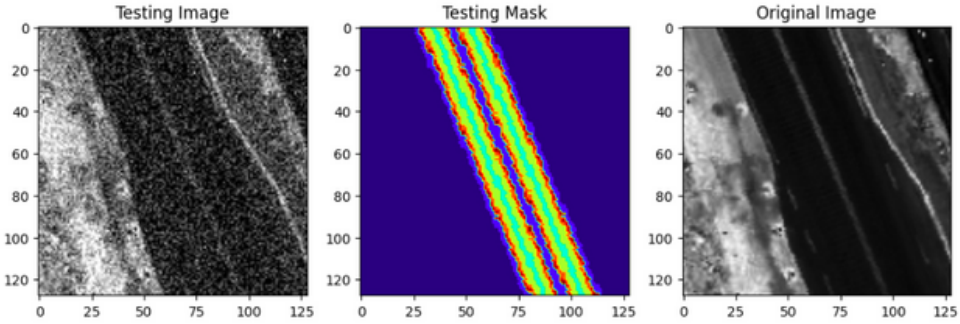
PROPOSTAS DE MELHORIA

Realizar Augmentation [15] nos dados para melhorar a generalização do modelo.

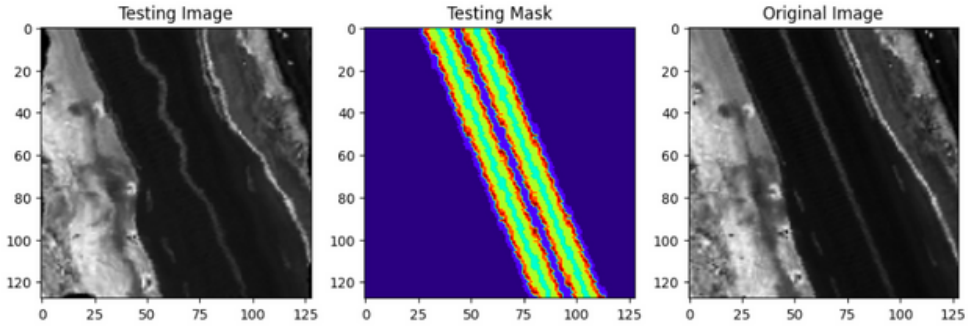
- **CONTRASTE**



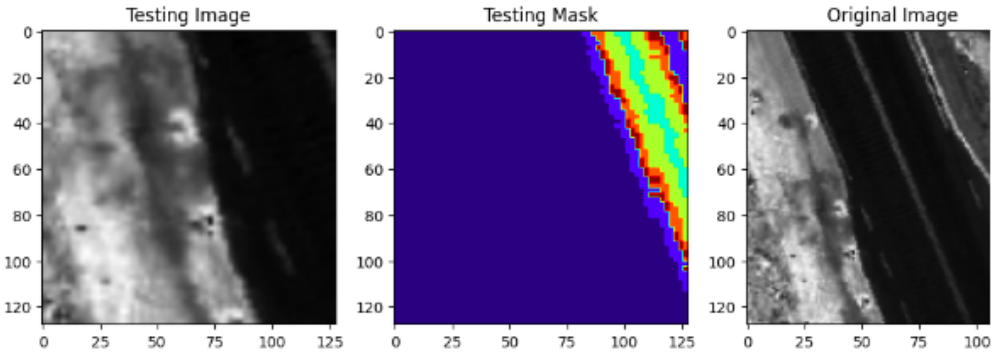
- **NOISE**



- **ELASTIC**



- **CROP ZOOM IN**



Alguns outros tipos de augmentation sugeridas para a melhoria do modelo são: Zoom out, diminuição do contraste e variação de brilho.

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