Transfer Learning com VGG16 e ResNet50

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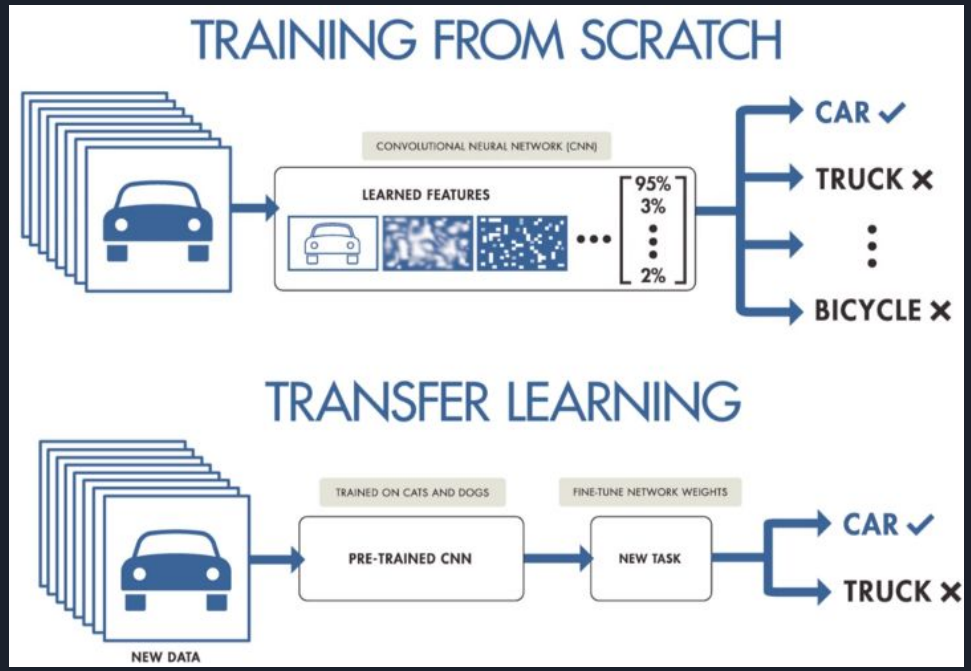
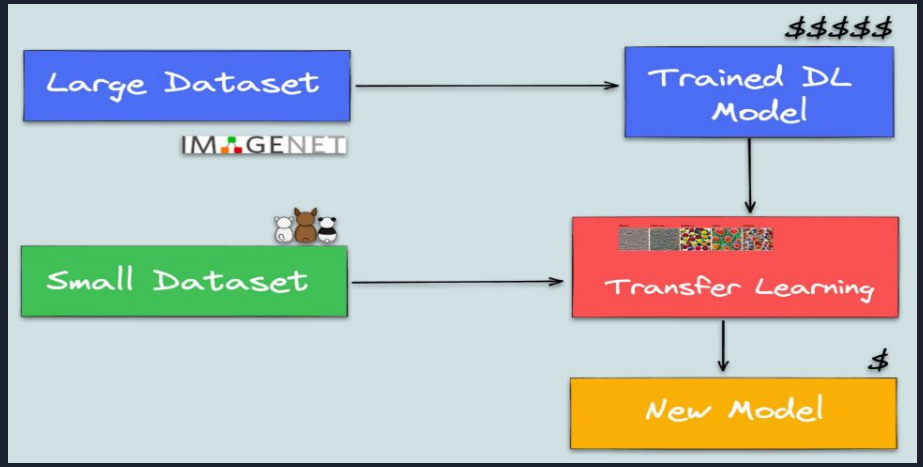
O que é transfer learning?



(Fonte:https://medium.datadriveninvestor.com/introducing-transfer-learning-as-your-next-engine-to-drive-future-innovations-5e81a15bb567 acesso em 27/11/2022)

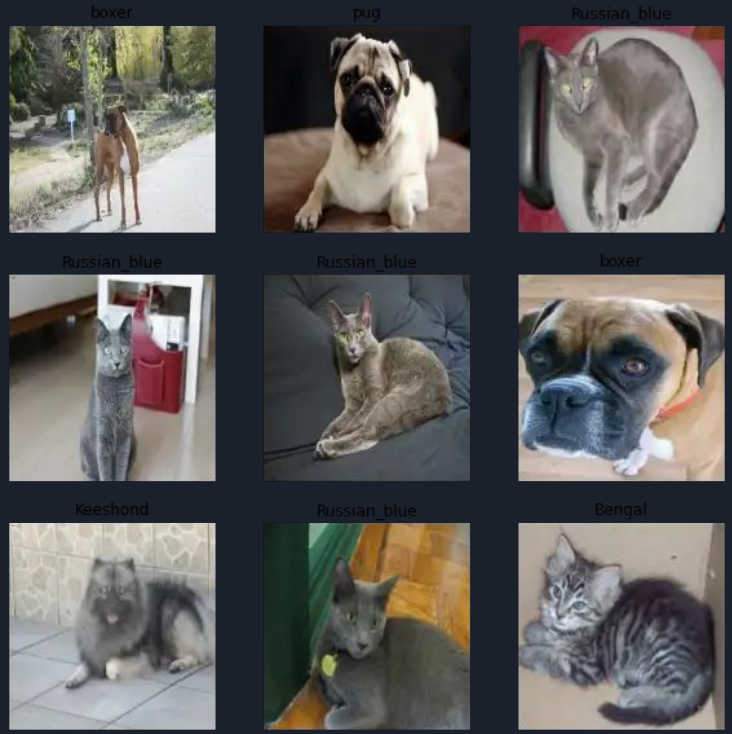
Por que usar transfer learning?

- Custo (Infraestrutura e energético);
- Velocidade;
- Resolve o problema.



(Fonte:https://raw.githubusercontent.com/ivanovitchm/embedded.ai/main/lessons/week_10/TransferLearning.pdf acesso em 27/11/2022)

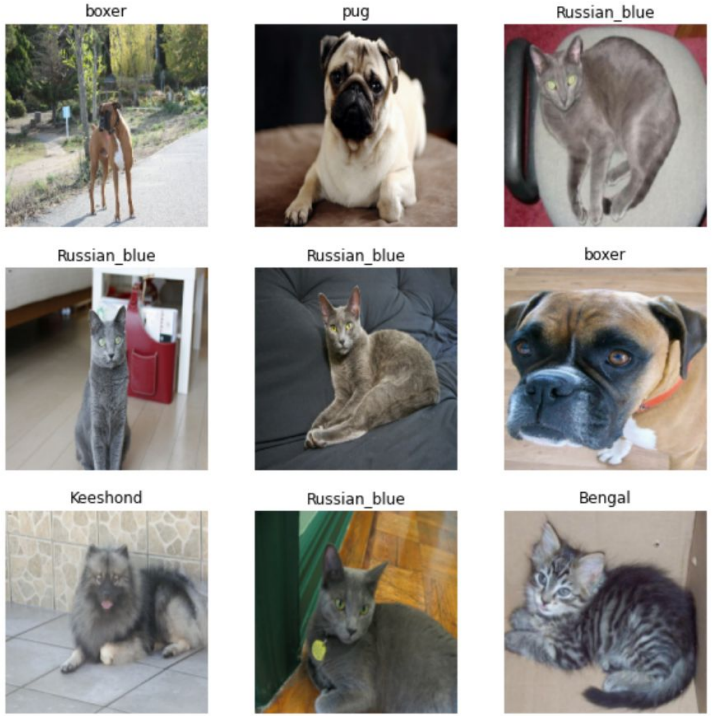
Dataset:



- Dataset com 98,8 MB;
- 5 classes;
  - Bengal;
  - Boxer;
  - Keeshond;
  - Pug;
  - Russian blue.
- 950 Imagens
  - 190 imagens por classe.

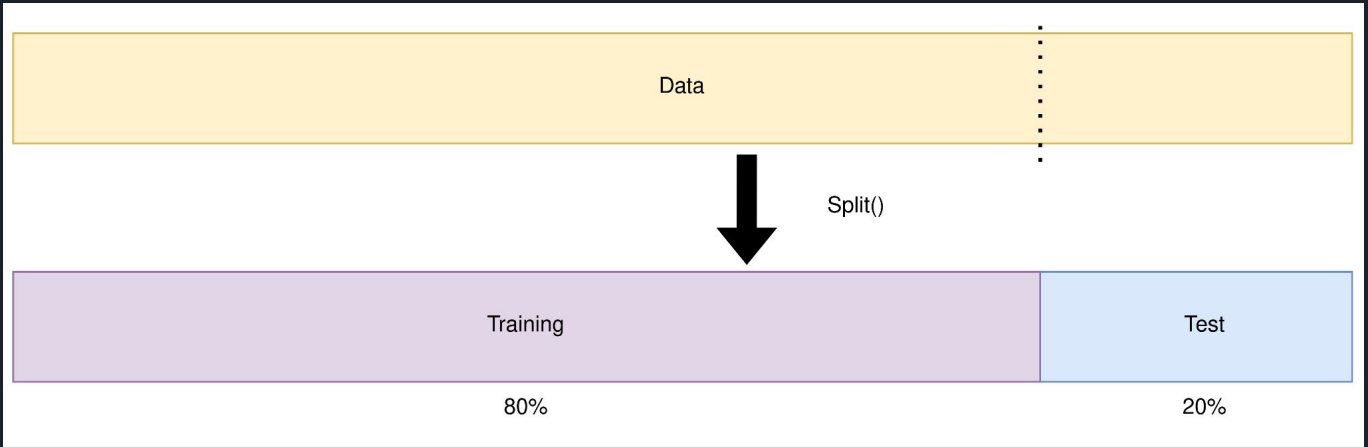
Pré-processamento:

Resize() do OpenCV ⇒ 32x32x3

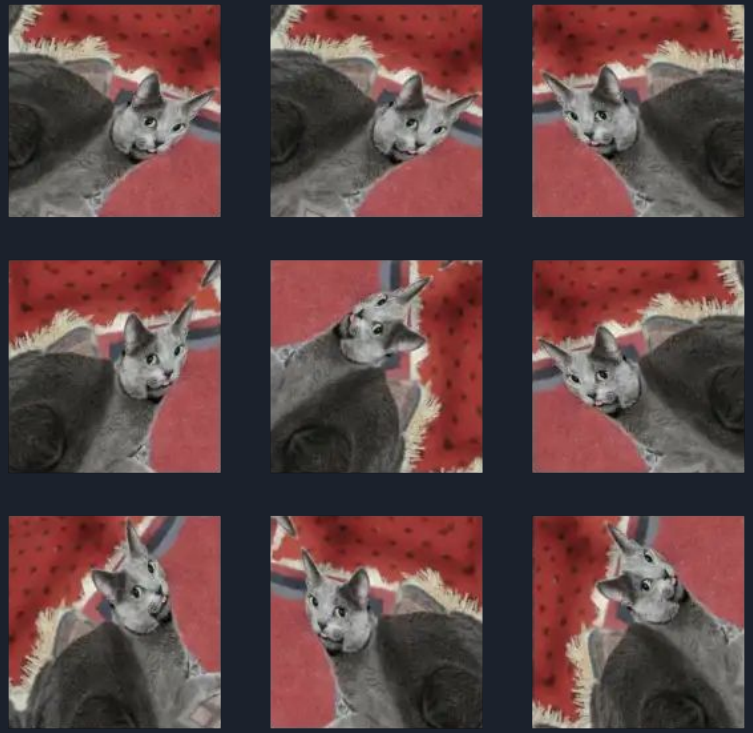


Data Segregation

⇒ Função train_test_split() da biblioteca Scikit Learn

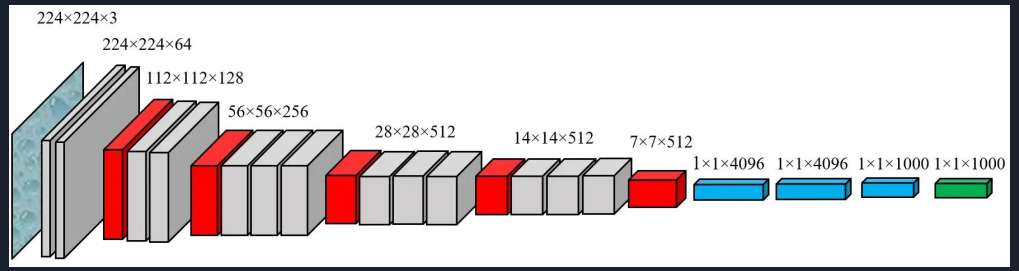


Data Augmentation



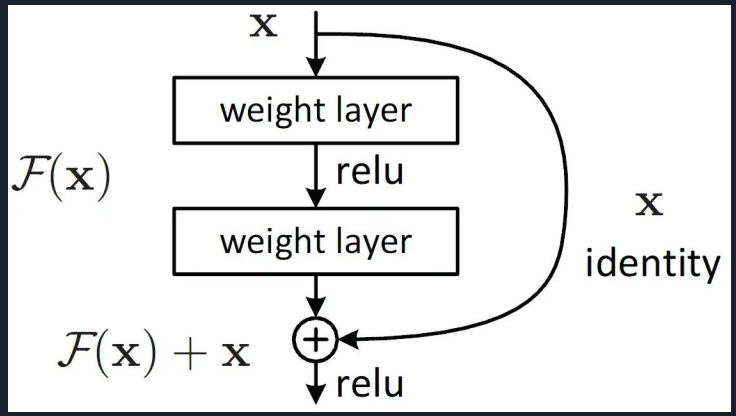
Treinamento:

- VGG16



Arquitetura VGG (Wikimedia Commons).

- ResNet50



Conexões Residuais, o bloco básico da ResNet (Papers With Code)

Treinadas com:

- +14 milhões de imagens
- 1000 classes

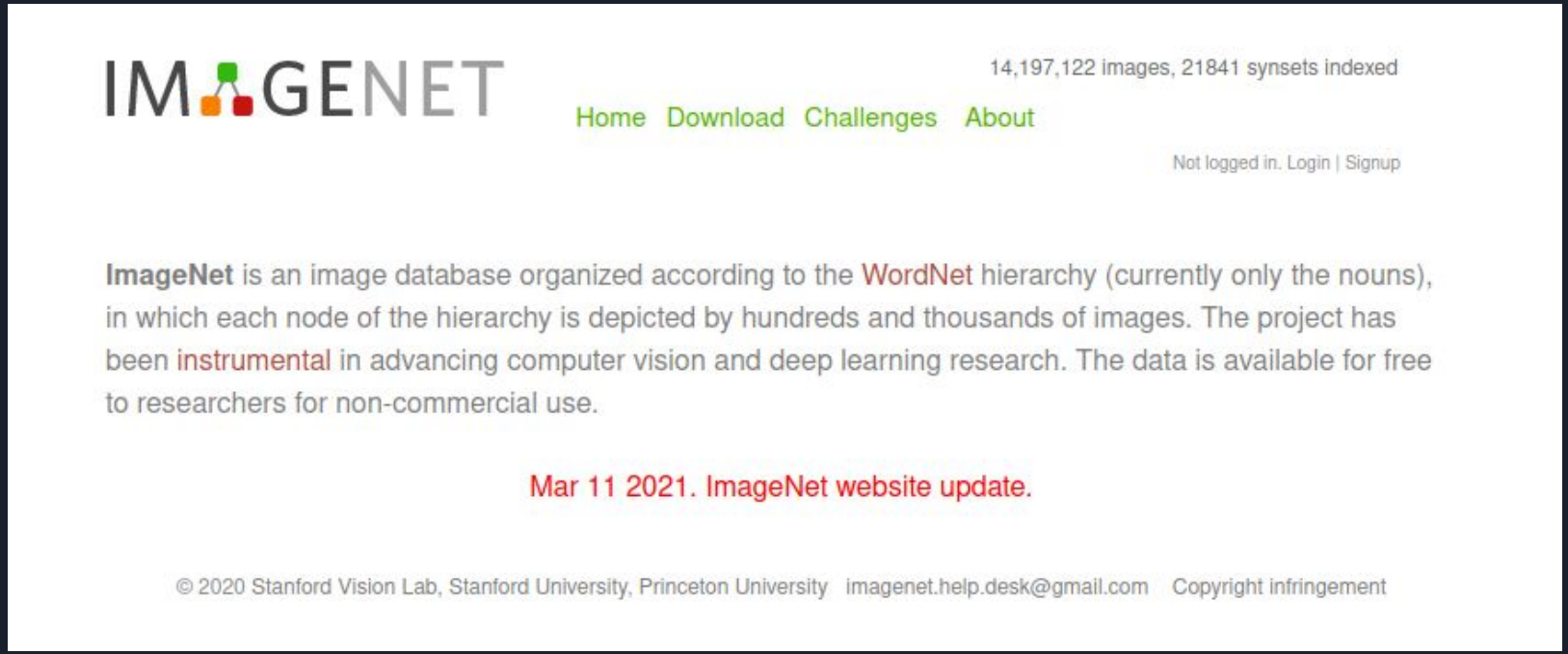
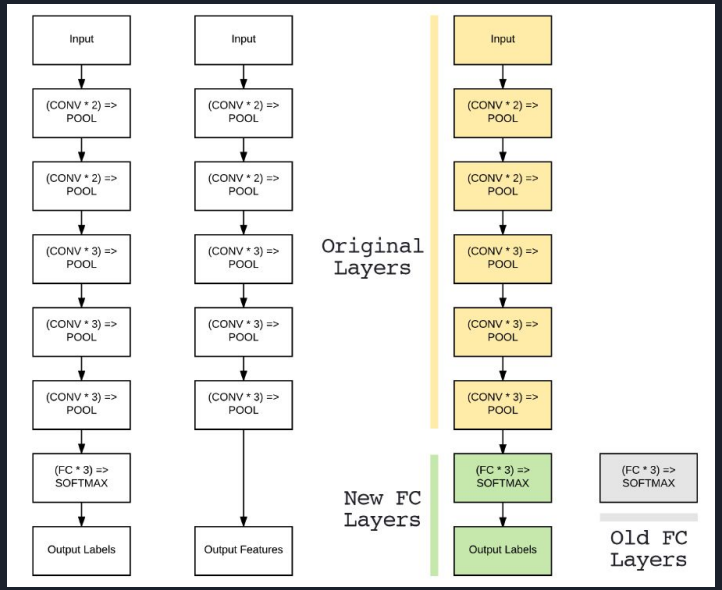
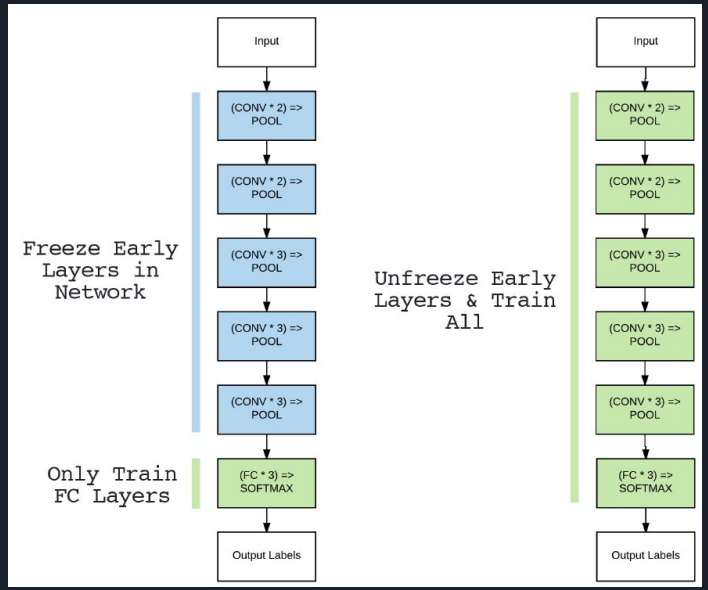


Imagem retirada de: https://www.image-net.org/index.php acesso:28/11/2022

Transfer learning

Feature Extraction X Fine Tunning

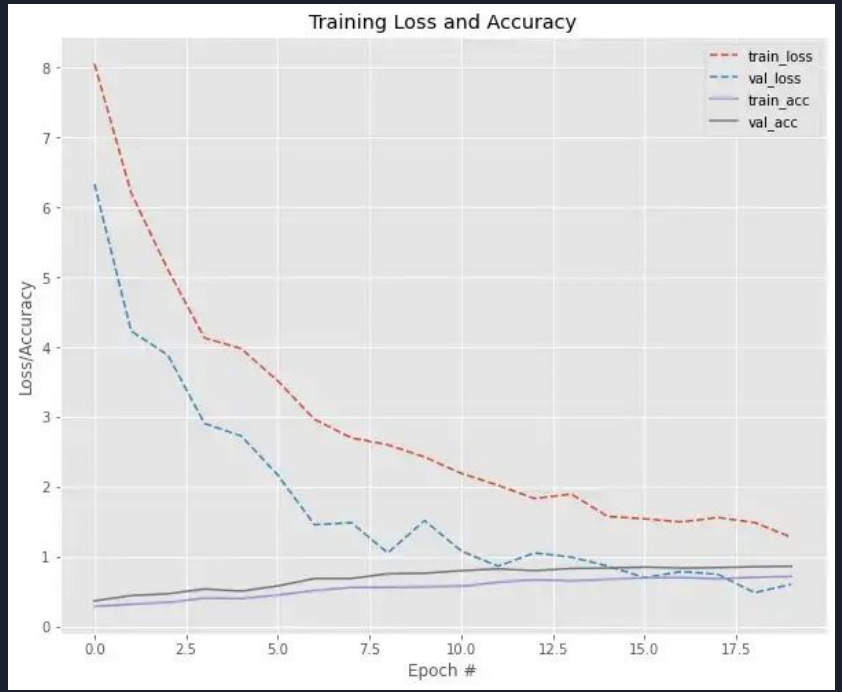




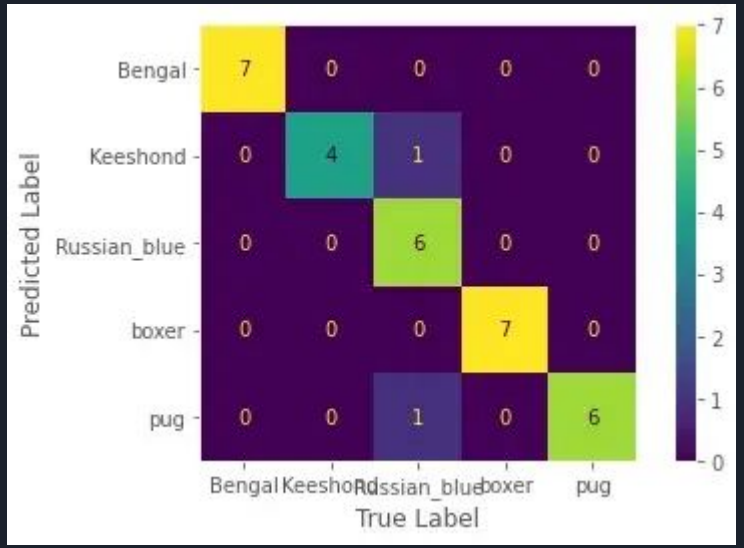
Imagens retiradas de: https://github.com/ivanovitchm/embedded.ai/blob/main/lessons/week_10/TransferLearning.ipynb acesso:28/11/2022

VGG16 - *Feature Extraction*

- Learning rate de 0.0001
- 20 épocas



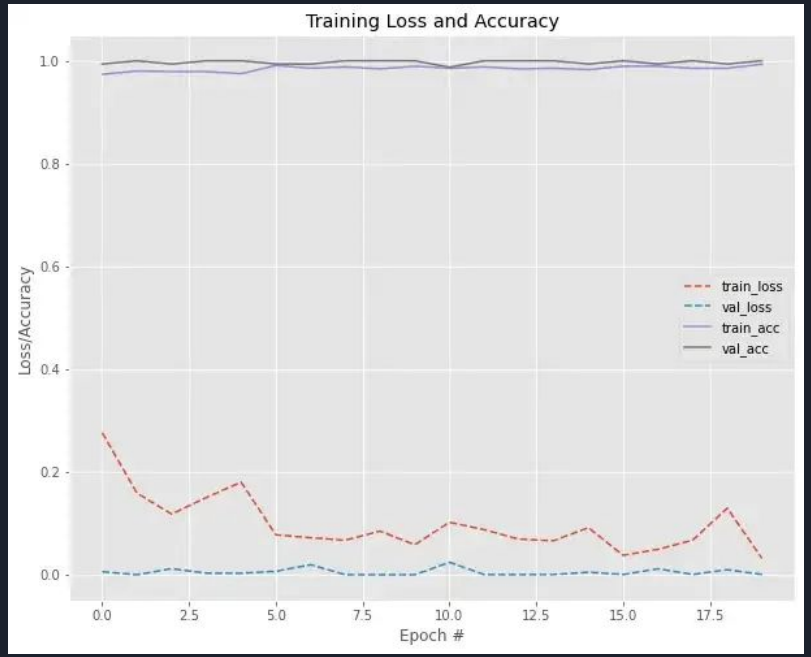
Loss e Acurácia, modelo VGG — Feature Extraction



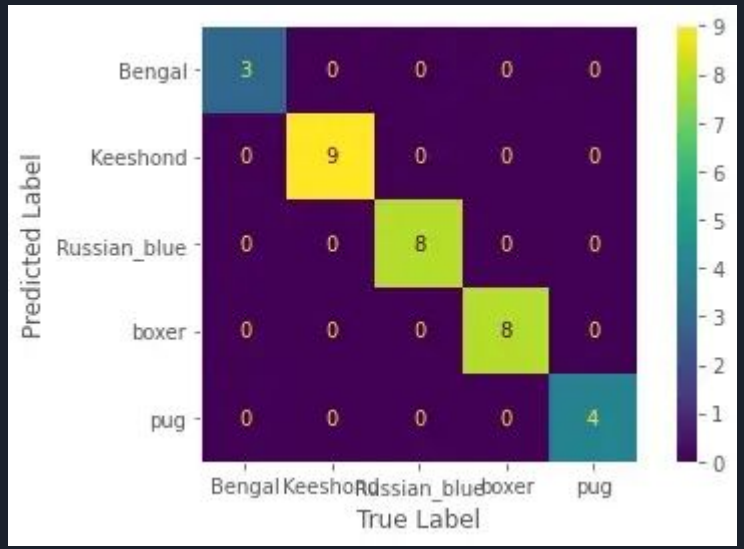
Matriz de Confusão, modelo VGG — Feature Extraction

VGG16 - *Fine Tuning*

- Learning rate de 0.0001
- 20 épocas
- + 1 camada FC



Loss e Acurácia, modelo VGG — Fine Tuning



Matriz de Confusão, modelo VGG — Fine Tuning

VGG16 - *Fine Tuning*

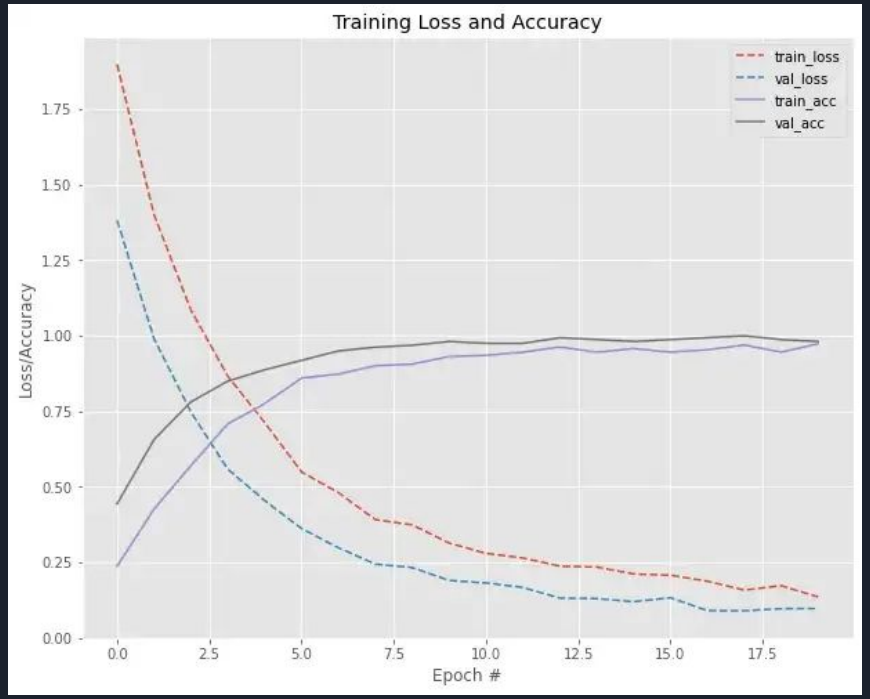
- CodeCarbon
- Métricas

CO2_Emissions transfer learning with feature extractor	0.00394
CO2_Emissions transfer learning with fine tuning	0.00324
Count_Params transfer learning with feature extractor	14717253
Count_Params transfer learning with fine tuning	21138757
Energy_CPU transfer learning with feature extractor	0.00285
Energy_CPU transfer learning with fine tuning	0.00219
Energy_Consumed transfer learning with feature extractor	0.00624
Energy_Consumed transfer learning with fine tuning	0.00513
Energy_GPU transfer learning with feature extractor	0.00308
Energy_GPU transfer learning with fine tuning	0.0027
Energy_RAM transfer learning with feature extractor	0.00032
Energy_RAM transfer learning with fine tuning	0.00024
GFLOPs	15.36296
accuracy	0.9934
best_epoch	9
best_val_loss	0.0
epoch	19
loss	0.03178
val_accuracy	1.0
val_loss	0.00054

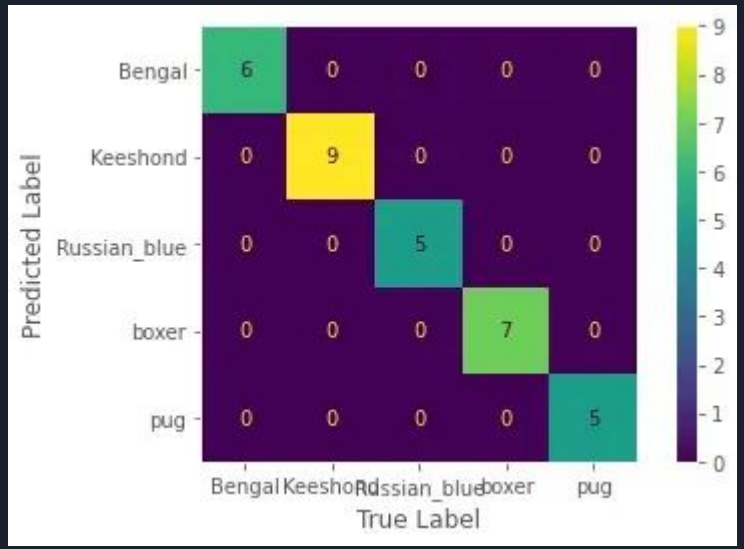
Run Summary — VGG

ResNet50 - *Feature Extraction*

- Learning rate de 0.0001
- 20 épocas



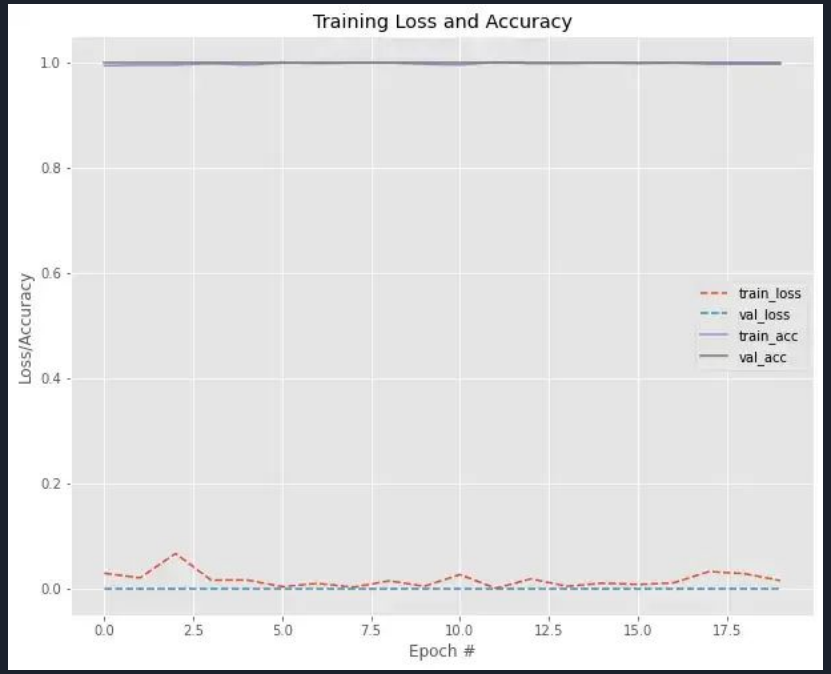
Loss e Acurácia, modelo ResNet50 — Feature Extraction



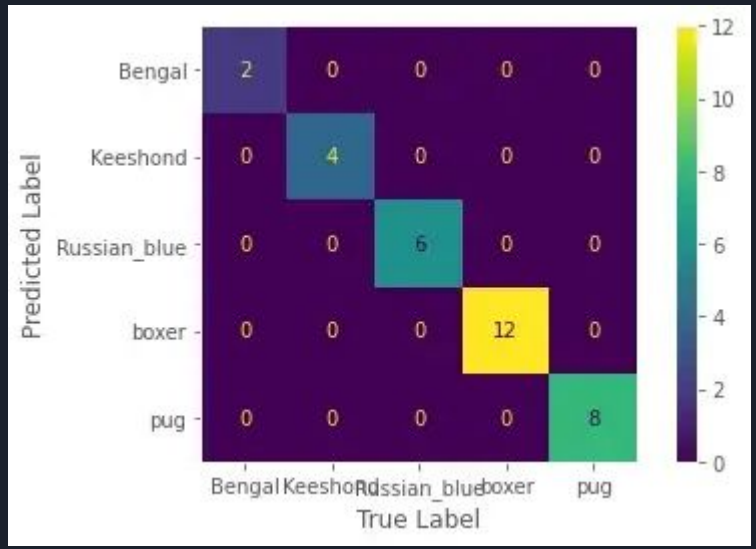
Matriz de Confusão, modelo ResNet50 — Feature Extraction

ResNet50 - *Fine Tuning*

- Learning rate de 0.0001
- 20 épocas
  ⇒ Mais profunda



Loss e Acurácia, modelo ResNet50 — Fine Tuning



Matriz de Confusão, modelo ResNet50 — Fine Tuning

ResNet50 - *Fine Tuning*

- CodeCarbon
- Métricas

CO2_Emissions of the transfer learning with feature extractor	0.00909
CO2_Emissions of the transfer learning with fine tuning	0.00759
CO2_Emissions of the transfer learning with fine tuning (head)	0.00512
Count_Params of the transfer learning with feature extractor	23597957
Count_Params of the transfer learning with fine tuning	49279365
Count_Params of the transfer learning with fine tuning (head)	49279365
Energy_CPU	0.0038
Energy_CPU of the transfer learning with feature extractor	0.00745
Energy_CPU of the transfer learning with fine tuning	0.00519
Energy_Consumed of the transfer learning with feature extractor	0.01441
Energy_Consumed of the transfer learning with fine tuning	0.01204
Energy_Consumed of the transfer learning with fine tuning (head)	0.00811
Energy_GPU of the transfer learning with feature extractor	0.00613
Energy_GPU of the transfer learning with fine tuning	0.00627
Energy_GPU of the transfer learning with fine tuning (head)	0.00388
Energy_RAM of the transfer learning with feature extractor	0.00083
Energy_RAM of the transfer learning with fine tuning	0.00058
Energy_RAM of the transfer learning with fine tuning (head)	0.00042
GFLOPs	3.88789
accuracy	0.99604
best_epoch	16
best_val_loss	0.0
epoch	19
loss	0.01574
val_accuracy	1.0
val_loss	1e-05

Run Summary — ResNet50

Mais informações:

- https://github.com/Gildson/MODEL-CARD-Transfer-learning
- https://medium.com/@mateus.d.assis.silva/transfer-learning-com-vgg16-e-resnet50-39e58c3e84c3

colab

Weights & Biases