THE DEVELOPER'S CONFERENCE

Classificação de gatos usando Transfer Learning

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Data Scientist na Poatek

Agenda

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- Motivação
- Transfer Learning
- Aplicação

Motivação

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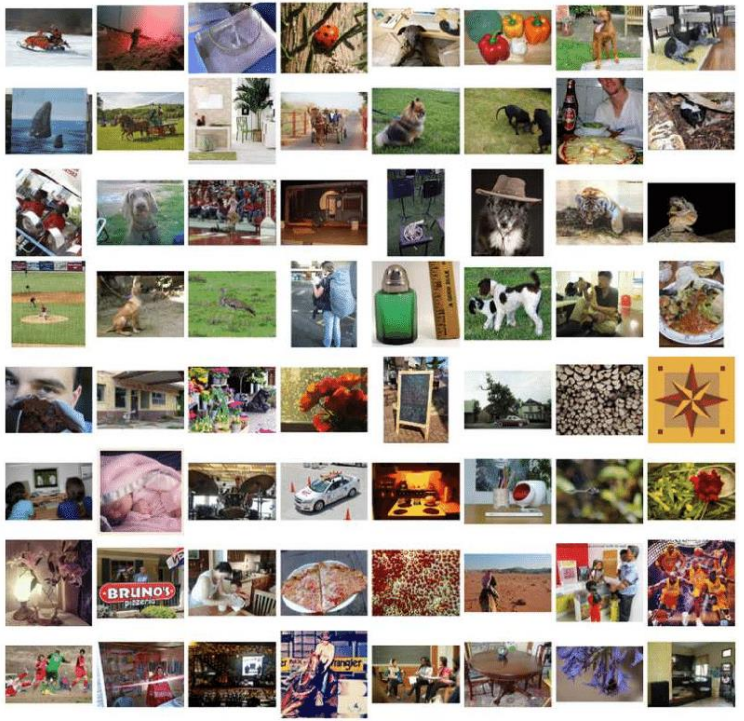
ImageNet

14.2M imagens
1000 categorias



Motivação

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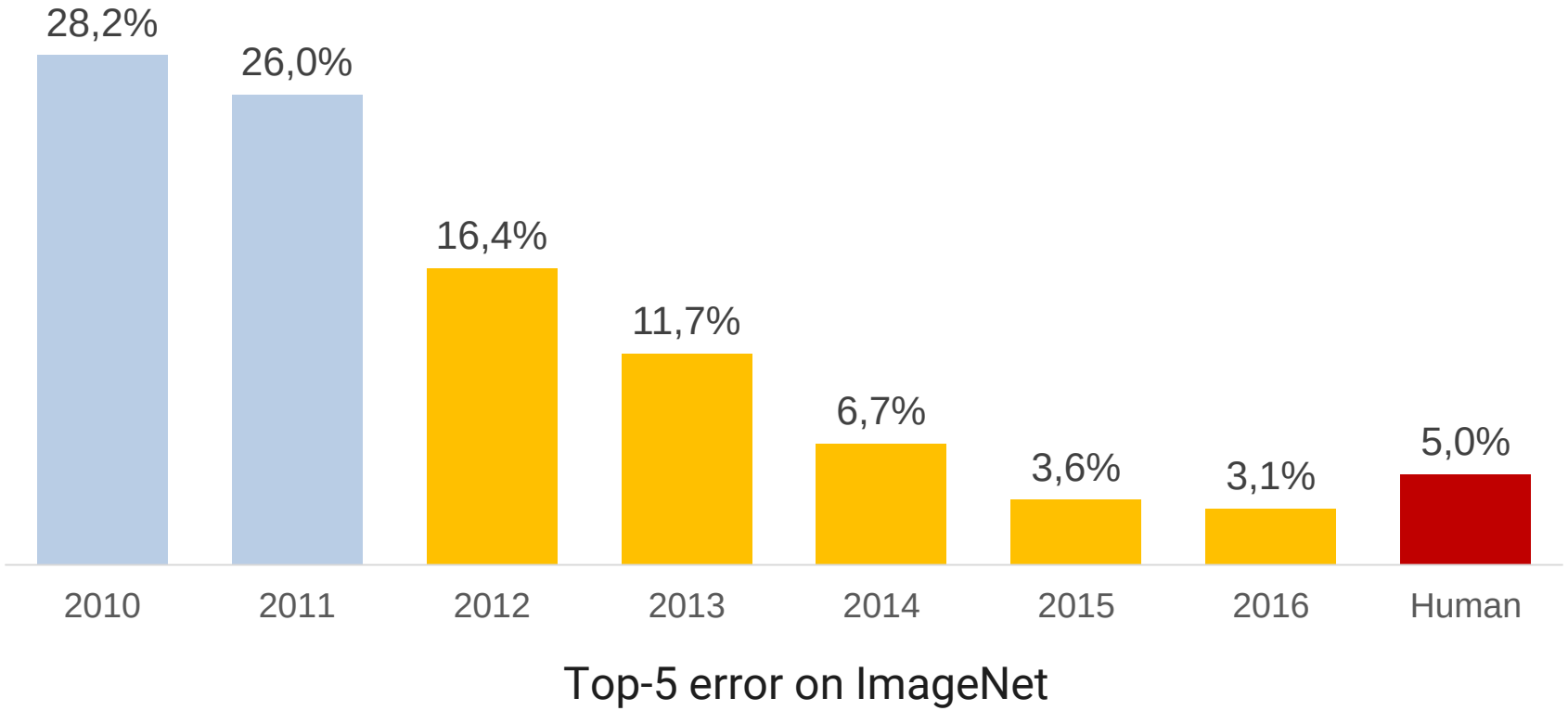
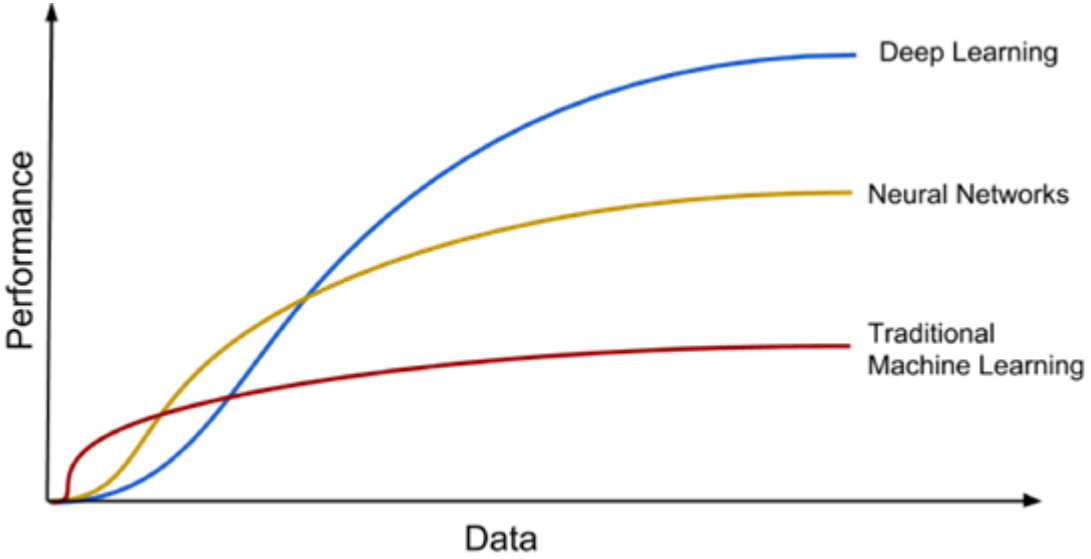


Motivação



E o que fazer quando temos poucos dados?

Transfer Learning

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Método de Machine Learning cujo objetivo é **transferir** o conhecimento aprendido em **uma tarefa** para a solução de **outro problema**.

O tipo mais comum é o **fine tuning** que se refere ao treinamento de camadas em uma rede neural.

Transfer Learning

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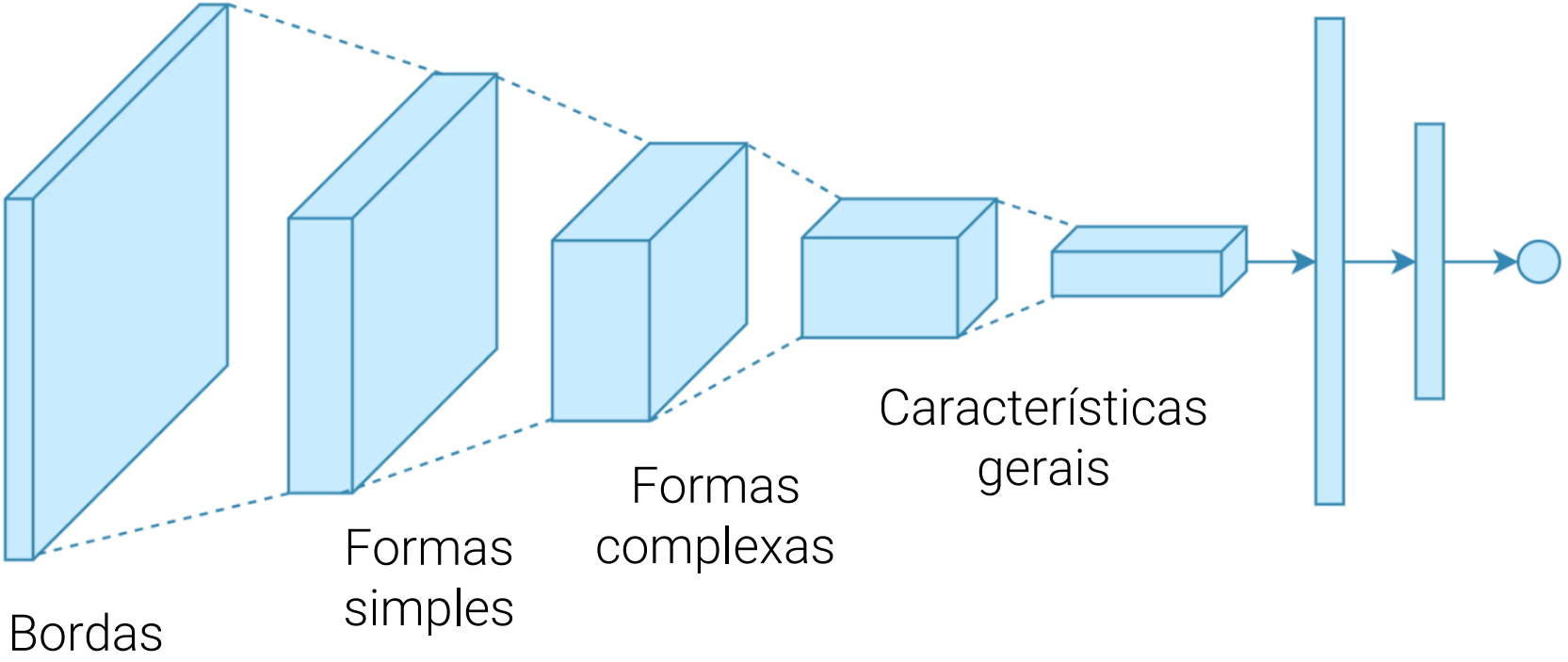

Aplicação

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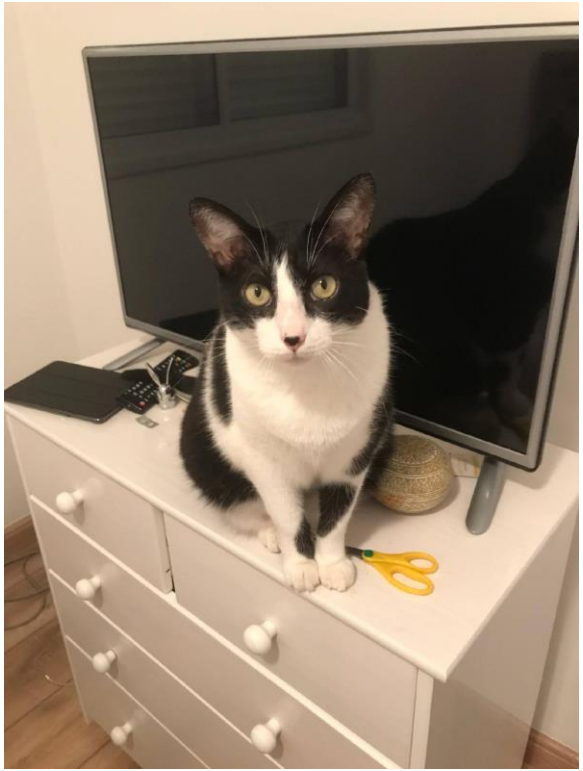
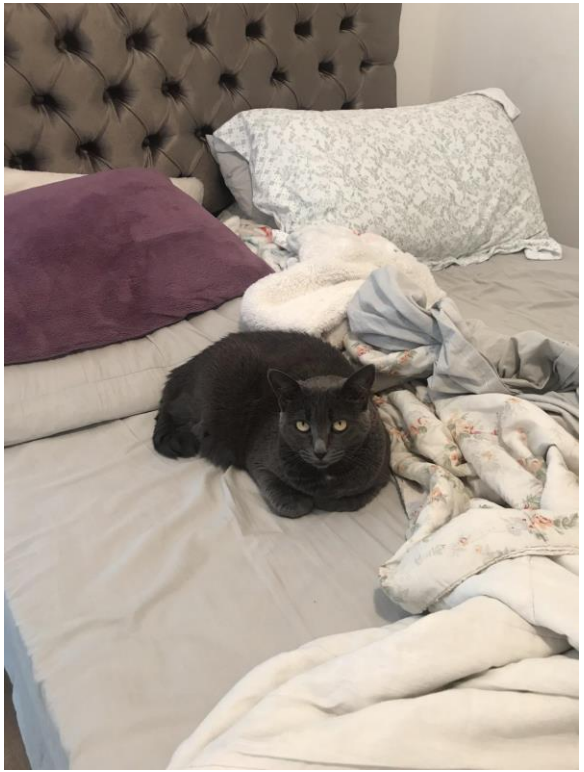
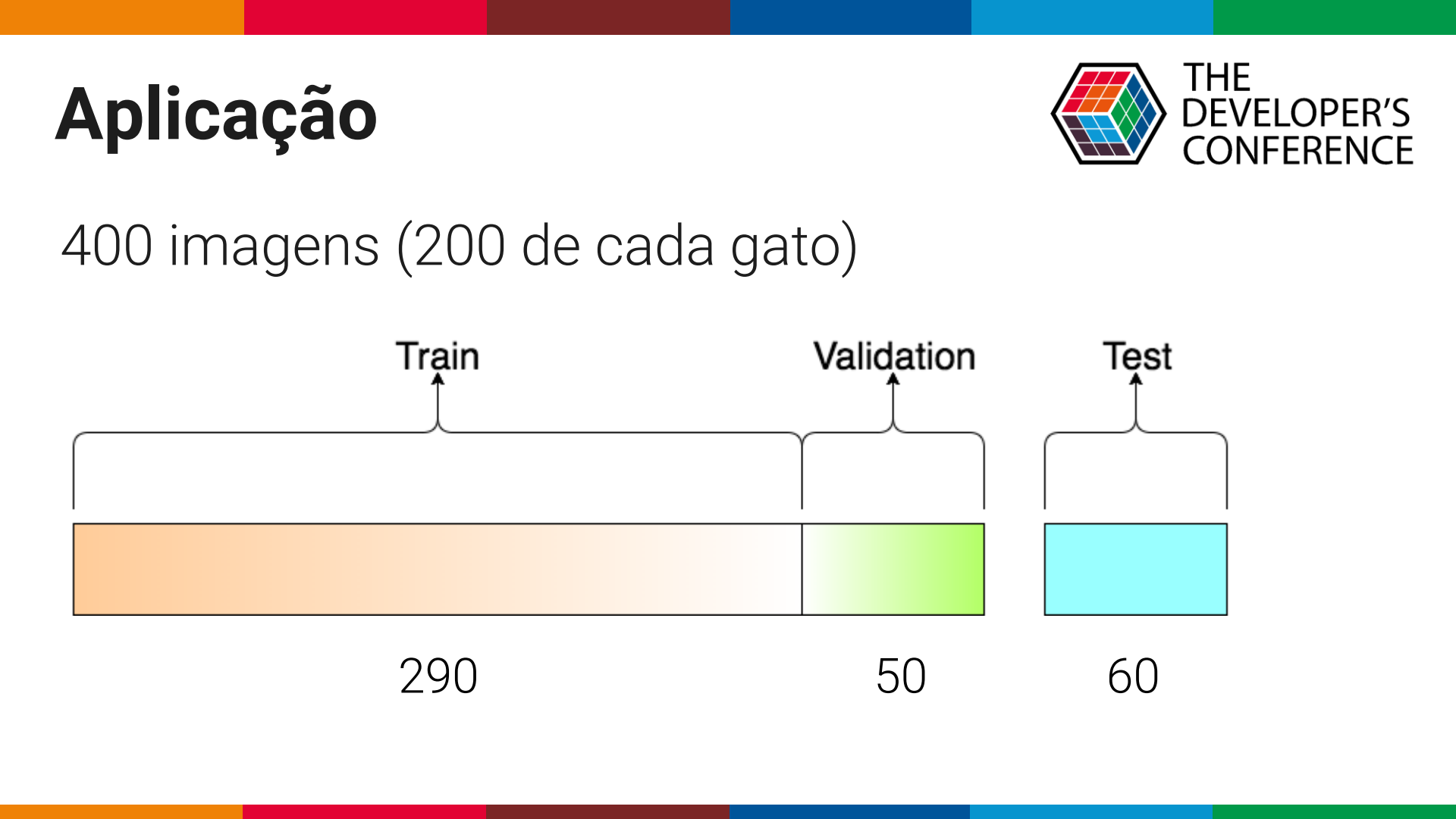




Aplicação



400 imagens (200 de cada gato)

Aplicação

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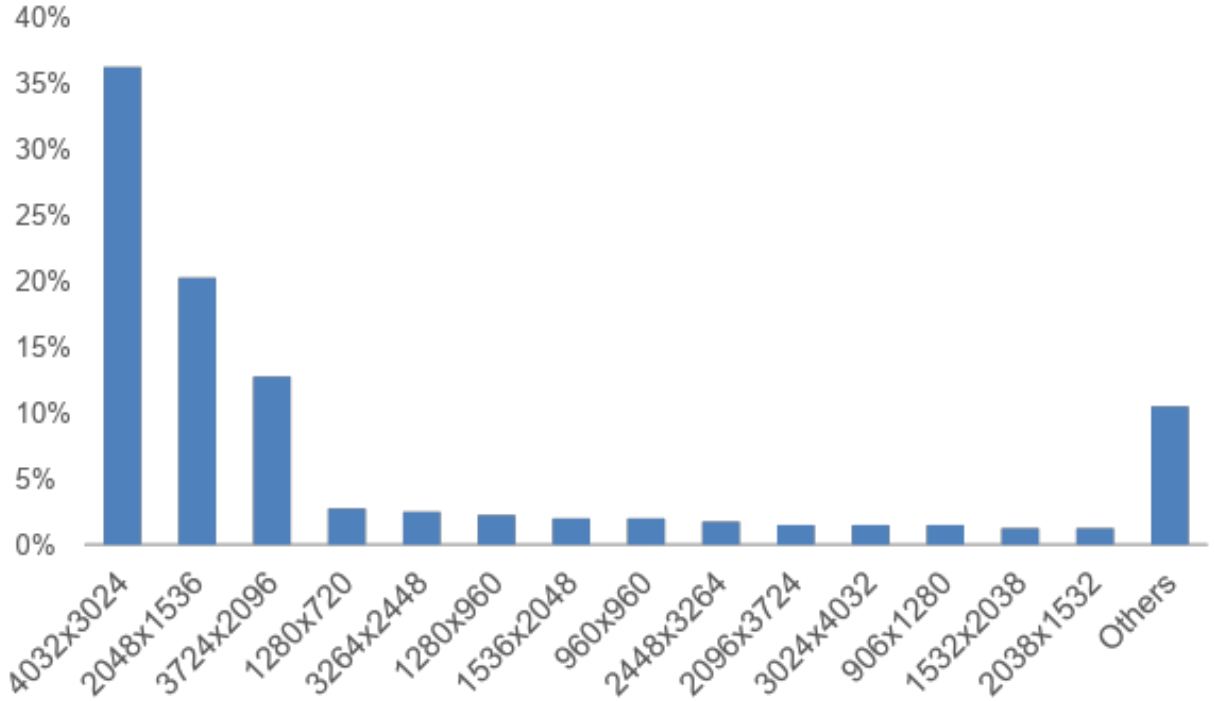
Pré processamento

Benchmark

Transfer Learning

Data Augmentation

Pré processamento



Resolução das fotos

331x331

299x299

Benchmark

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Conv (16) + MaxPool | Conv (32) + MaxPool | GAP | Dense (1)

Conv (16) + MaxPool | Conv (32) + MaxPool | GAP | Dense (16) + Dropout(0,2) | Dense (1)

Conv (16) + MaxPool | Conv (32) + MaxPool | Conv (64) + MaxPool | GAP | Dense (20) + Dropout(0,2) | Dense (1)

Benchmark

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Modelo	Acurácia
1	66,7 %
2	64,7 %
3	58,8 %

Benchmark

THE DEVELOPER'S CONFERENCE

Modelo	Acurácia
1	66,7 %
2	64,7 %
3	58,8 %

Teste

61,70%

Transfer Learning

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Model	Size	Top-1 Accuracy	Top-5 Accuracy	Parameters	Depth
Xception	88 MB	0.790	0.945	22,910,480	126
VGG16	528 MB	0.713	0.901	138,357,544	23
VGG19	549 MB	0.713	0.900	143,667,240	26
ResNet50	98 MB	0.749	0.921	25,636,712	-
ResNet101	171 MB	0.764	0.928	44,707,176	-
ResNet152	232 MB	0.766	0.931	60,419,944	-
ResNet50V2	98 MB	0.760	0.930	25,613,800	-
ResNet101V2	171 MB	0.772	0.938	44,675,560	-
ResNet152V2	232 MB	0.780	0.942	60,380,648	-
ResNeXt50	96 MB	0.777	0.938	25,097,128	-
ResNeXt101	170 MB	0.787	0.943	44,315,560	-
InceptionV3	92 MB	0.779	0.937	23,851,784	159
InceptionResNetV2	215 MB	0.803	0.953	55,873,736	572
MobileNet	16 MB	0.704	0.895	4,253,864	88
MobileNetV2	14 MB	0.713	0.901	3,538,984	88
DenseNet121	33 MB	0.750	0.923	8,062,504	121
DenseNet169	57 MB	0.762	0.932	14,307,880	169
DenseNet201	80 MB	0.773	0.936	20,242,984	201
NASNetMobile	23 MB	0.744	0.919	5,326,716	-
NASNetLarge	343 MB	0.825	0.960	88,949,818	-

Transfer Learning

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Inception ResNetV2: Google AI (2006)
Xception: François Chollet (2017)
NasNetLarge: Google AI (2018)

Modelo	Input	Output
Inception ResNet	299x299x3	1536
Xception	299x299x3	1000
NasNet Large	331x331x3	4032

Transfer Learning

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Transfer Learning

Modelo

Input

Modelo

Bottleneck Features

Transfer Learning

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Dense (1)

Dense (10) Dense (1)

Dense (10) Dropout(0.2) Dense (1)

Transfer Learning

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Modelo	Arquitetura	Acurácia
NasNet	1	95,3 %
NasNet	2	85,9 %
NasNet	3	94,9 %
Inception ResNet	1	83,9 %
Inception ResNet	2	78,8 %
Inception ResNet	3	77,6 %
Xception	1	50,2 %
Xception	2	73,7 %
Xception	3	63,1 %

Transfer Learning

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Modelo	Arquitetura	Acurácia
NasNet	1	95,3 %
NasNet	2	85,9 %
NasNet	3	94,9 %
Inception ResNet	1	83,9 %
Inception ResNet	2	78,8 %
Inception ResNet	3	77,6 %
Xception	1	50,2 %
Xception	2	73,7 %
Xception	3	63,1 %

Teste

91,67%

Data Augmentation

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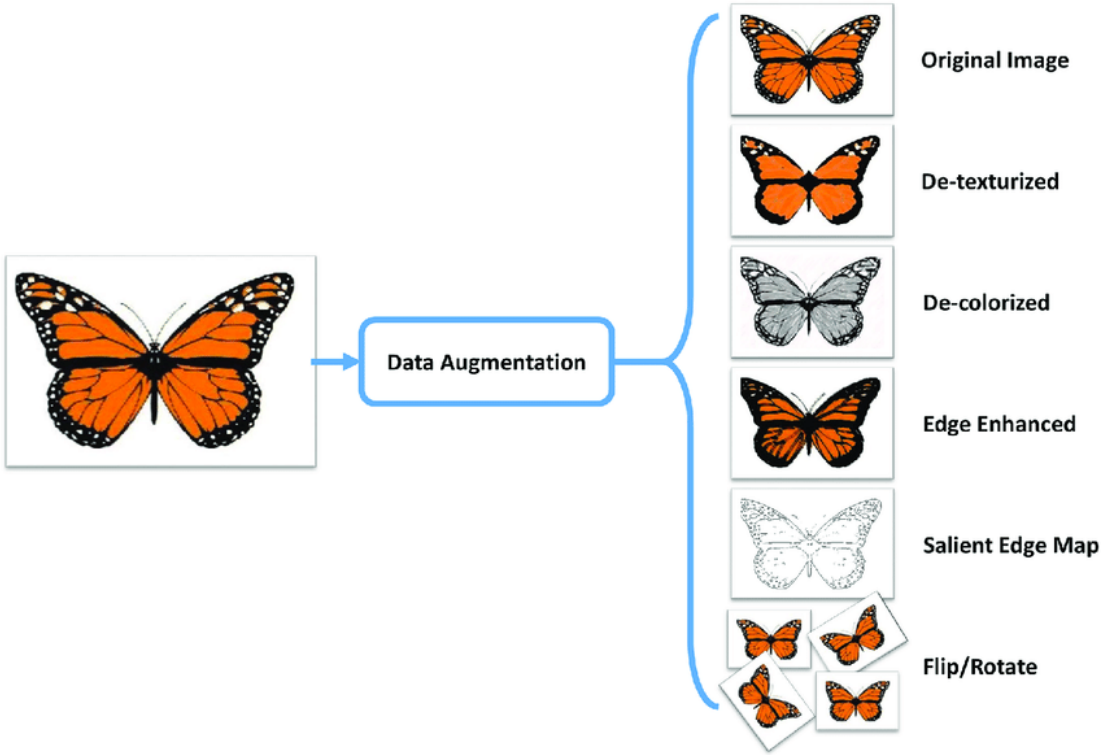

Data Augmentation

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Geração de 680 novas imagens a partir do conjunto original de treino e validação.

Conjunto de teste manteve o mesmo.

Data Augmentation

Dense (1)

Dense (20) | Dropout(0.2) | Dense (1)

Dense (40) | Dropout(0.2) | Dense (20) | Dropout(0.2) | Dense (1)

Data Augmentation

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Modelo	Arquitetura	Acurácia
NasNet	1	50,1 %
NasNet	2	76,9 %
NasNet	3	73,9 %

Data Augmentation

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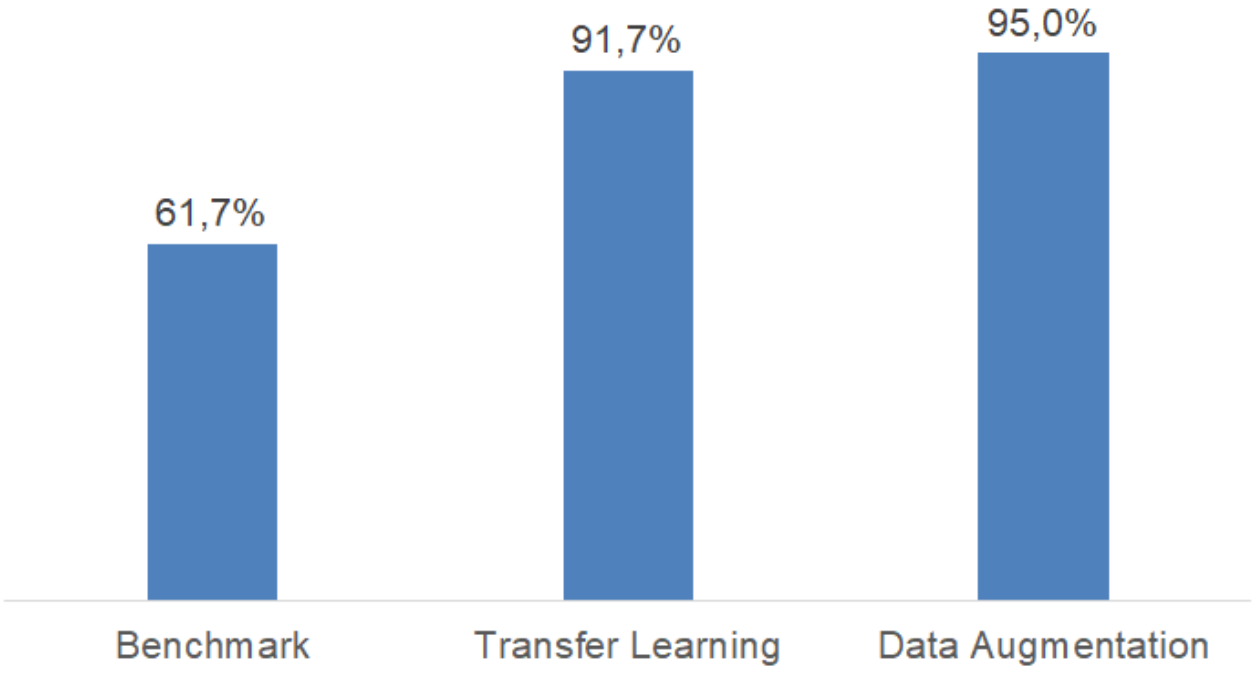
Modelo	Arquitetura	Acurácia
NasNet	1	50,1 %
NasNet	2	76,9 %
NasNet	3	73,9 %

Teste

95,00%

Resultados Finais



Acurácia de teste

Mais informações

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data/bottleneck_features	Added the data and models folders	20 days ago
models	Added the data and models folders	20 days ago
1 - Image Preprocessing.ipynb	Changed notebook names	21 days ago
2 - Bottleneck Features.ipynb	Changed notebook names	21 days ago
3 - Benchmark Model.ipynb	Changed notebook names	21 days ago
4 - Transfer Learning.ipynb	Changed notebook names	21 days ago
5 - Data Augmentation.ipynb	Changed notebook names	21 days ago
Capstone Project.pdf	Added the project and proposal pdf file	20 days ago
Capstone Proposal.pdf	Added the project and proposal pdf file	20 days ago
README.md	Added more information to the README	20 days ago

github.com/luiznonenmacher/cat-classification

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