Inteligência Artificial para Melhorar o Mundo

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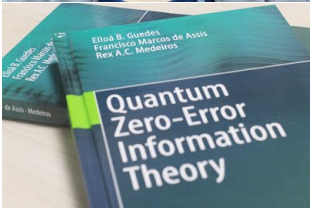
Universidade do Estado do Amazonas

Campus Party Amazônia, 12 de outubro de 2023

Apresentação

- Doutora em Ciência da Computação
  - Teoria da Computação e Informação Quânticas
  - Universidade Federal de Campina Grande, 2013
- Docente da Universidade do Estado do Amazonas
  - Engenharia de Computação, Sistemas de Informação e Licenciatura em Computação
  - Laboratório de Sistemas Inteligentes
  - Professora Associada, 2023
- Entusiasta Python



LSI

LABORATÓRIO DE SISTEMAS
INTELIGENTES

LSI
LABORATÓRIO DE SISTEMAS INTELIGENTES
Aqui tem
STAR WARS
HARD ROCK

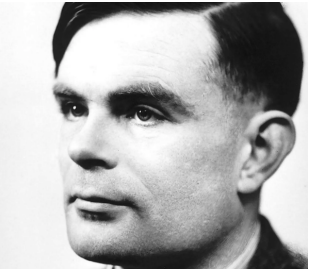
VOL. LIX. No. 236.] [October, 1950

MIND

A QUARTERLY REVIEW

OF

PSYCHOLOGY AND PHILOSOPHY



I.—COMPUTING MACHINERY AND INTELLIGENCE

BY A. M. TURING

1. *The Imitation Game.*

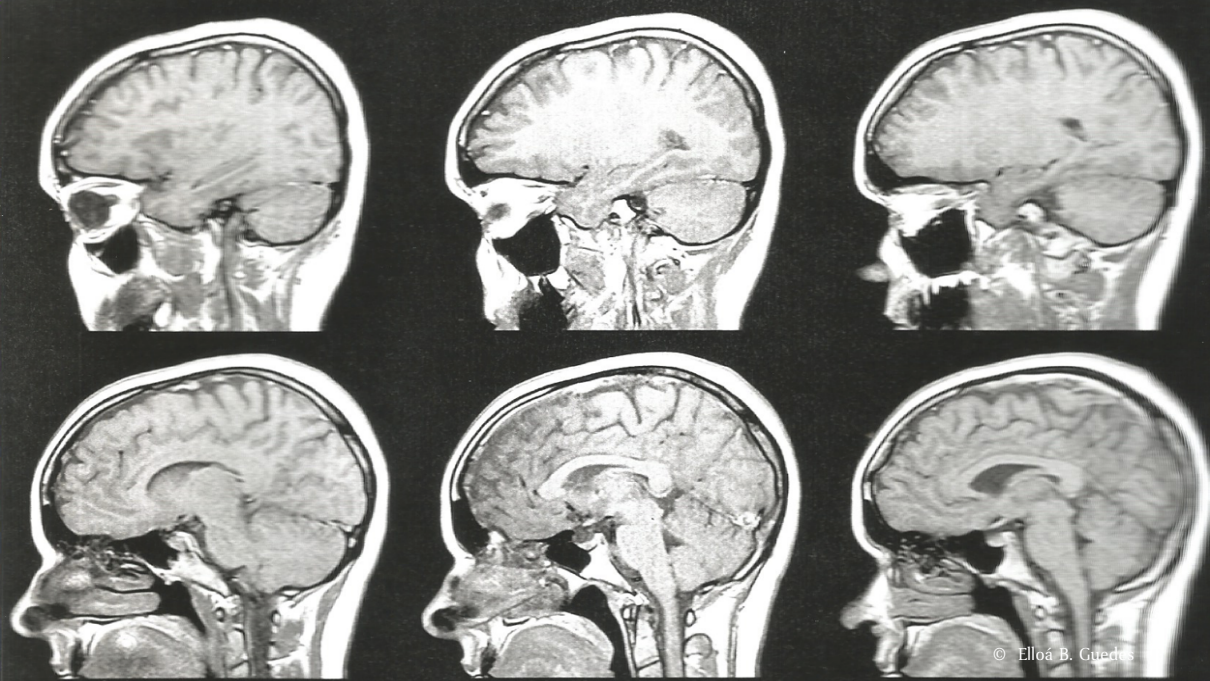
I PROPOSE to consider the question, 'Can machines think?' This should begin with definitions of the meaning of the terms 'machine' and 'think'. The definitions might be framed so as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words 'machine'

Inteligência Artificial:

Construir entidades inteligentes.

Russel & Norvig, 2016.

© http://mriquestions.com/visual.html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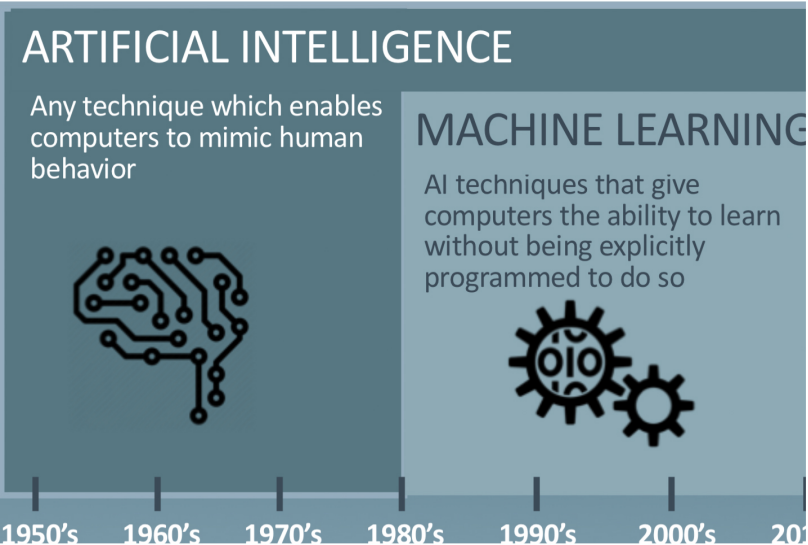

ARTIFICIAL INTELLIGENCE
Any technique which enables computers to mimic human behavior
MACHINE LEARNING
AI techniques that give computers the ability to learn without being explicitly programmed to do so
1950's
1960's
1970's
1980's
1990's
2000's

© Oracle, 2018

Machine Learning:

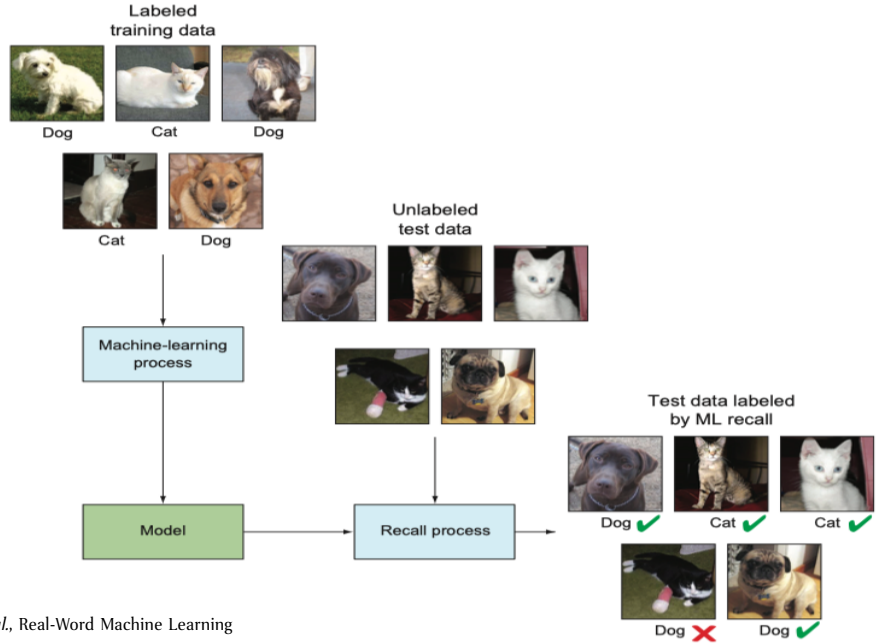
1. *Algoritmos que melhoram sua performance com a experiência*

Machine Learning:

1. *Algoritmos que melhoram sua performance com a experiência*
2. *Não são explicitamente programados para a tarefa*

Machine Learning:

1. *Algoritmos que melhoram sua performance com a experiência*
2. *Não são explicitamente programados para a tarefa*
3. *Modelos + dados + métricas*



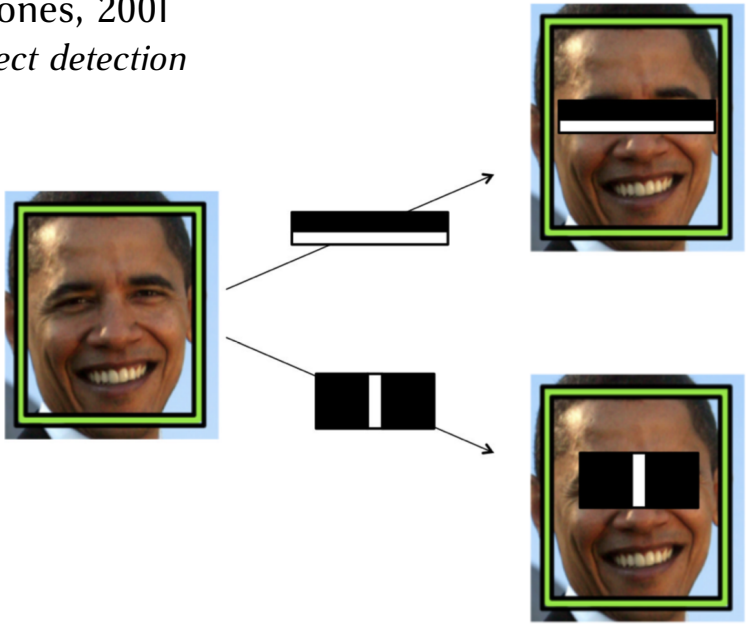
© Brink *et al.*, Real-Word Machine Learning

Visão Computacional:

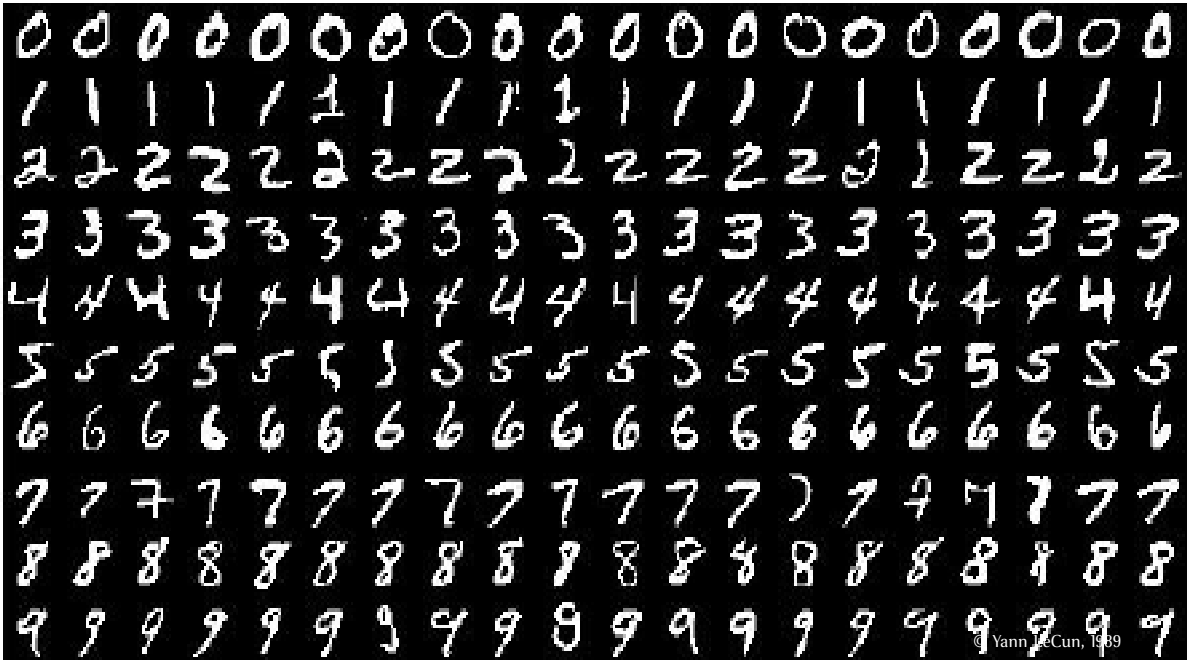
Automatizar tarefas que a visão humana é capaz de fazer

Viola & Jones, 2001

Rapid object detection



© Buduma, N. Fundamentals of Deep Learning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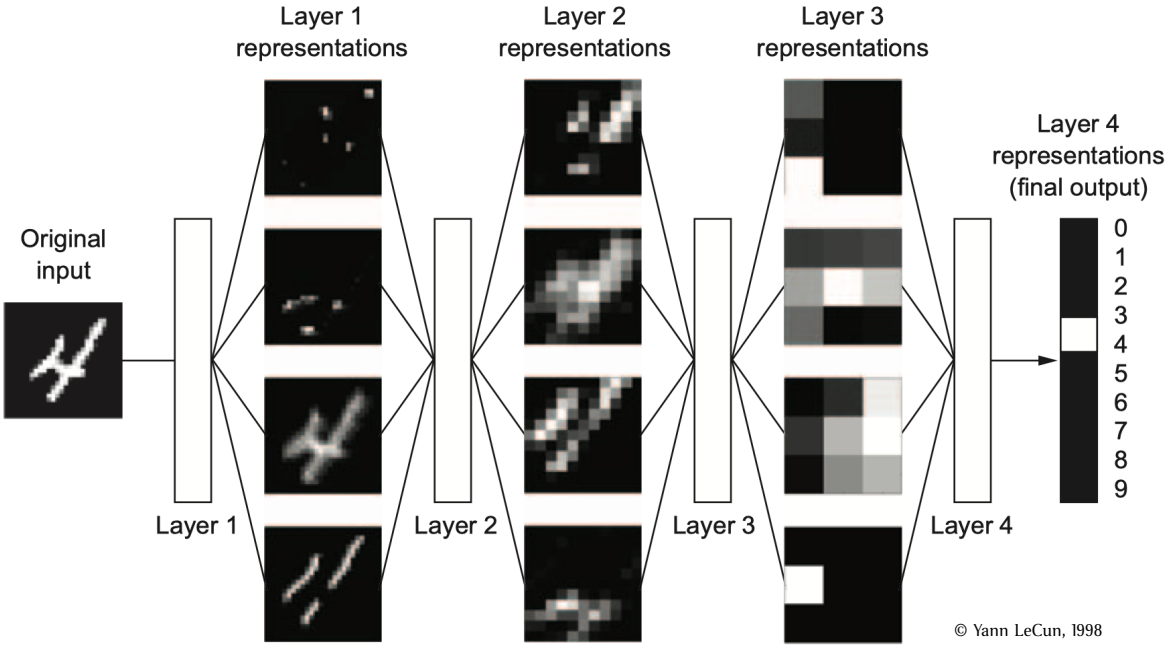
Layer 1
representations
Layer 2
representations
Layer 3
representations
Layer 4
representations
(final output)
Original
input
0
1
2
3
4
5
6
7
8
9
Layer 1
Layer 2
Layer 3
Layer 4
© Yann LeCun, 1998

1
2
3
4
5
6
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Bases de Dados:

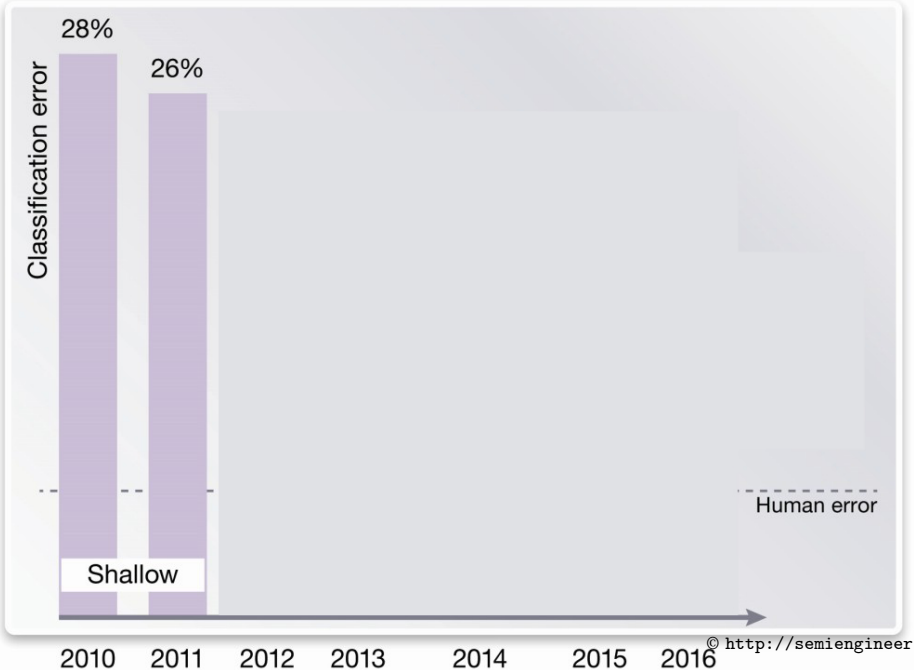
1. *Imagens representativas*
2. *Rótulos consistentes*
3. *Muitos dados*

IMAGENET
© ImageNet

- ImageNet Large Scale Visual Recognition Challenge
- Classificação de imagens em larga escala
- Universidades: Stanford, Princeton, Carnegie-Mellon, Michigan e North Carolina, etc.

- ImageNet Large Scale Visual Recognition Challenge
- Classificação de imagens em larga escala
- Universidades: Stanford, Princeton, Carnegie-Mellon, Michigan e North Carolina, etc.

- 1.4 milhões de imagens
- 10.000+ classes
- Envolveu mais de 25 mil pessoas



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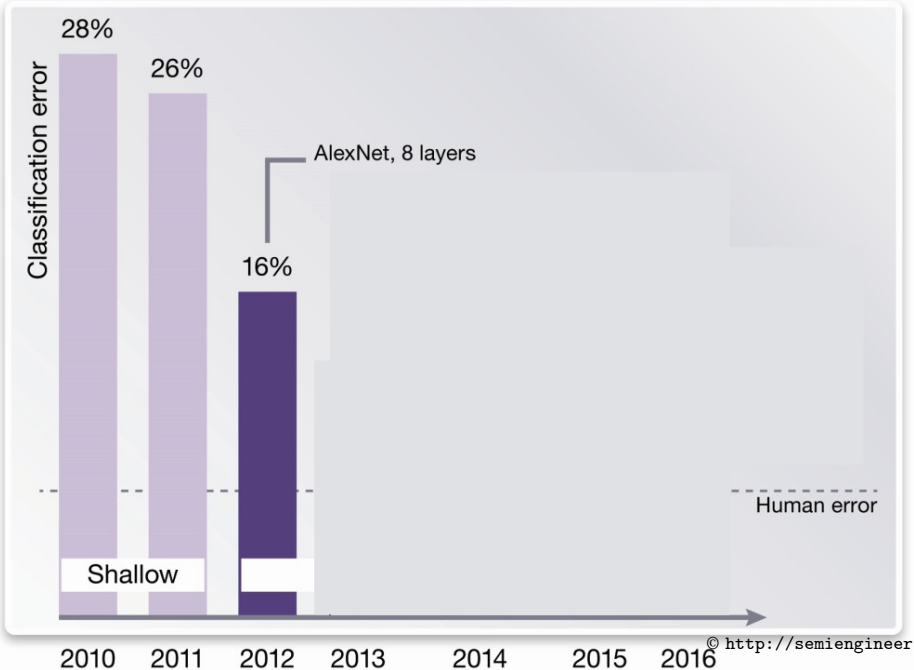

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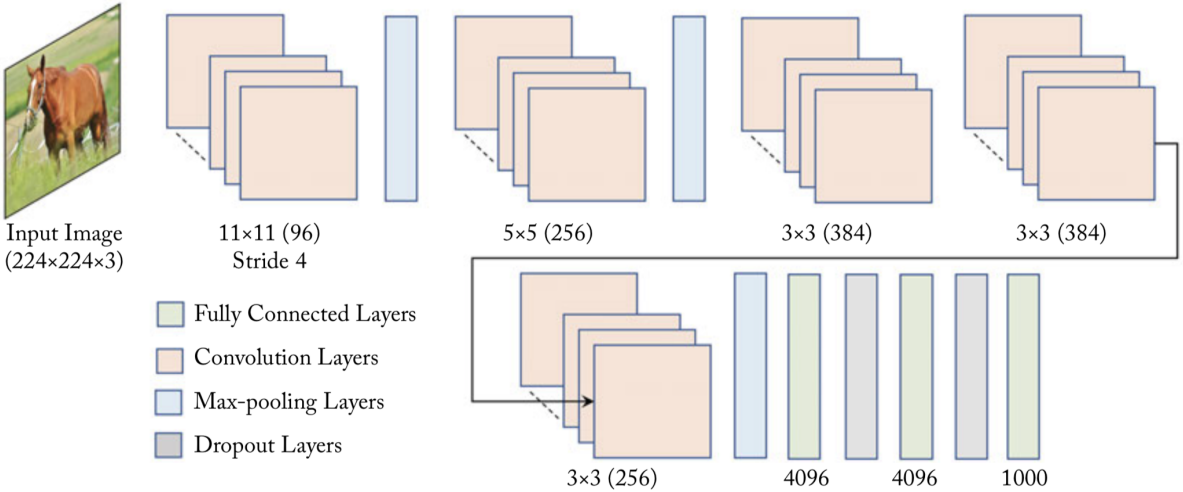
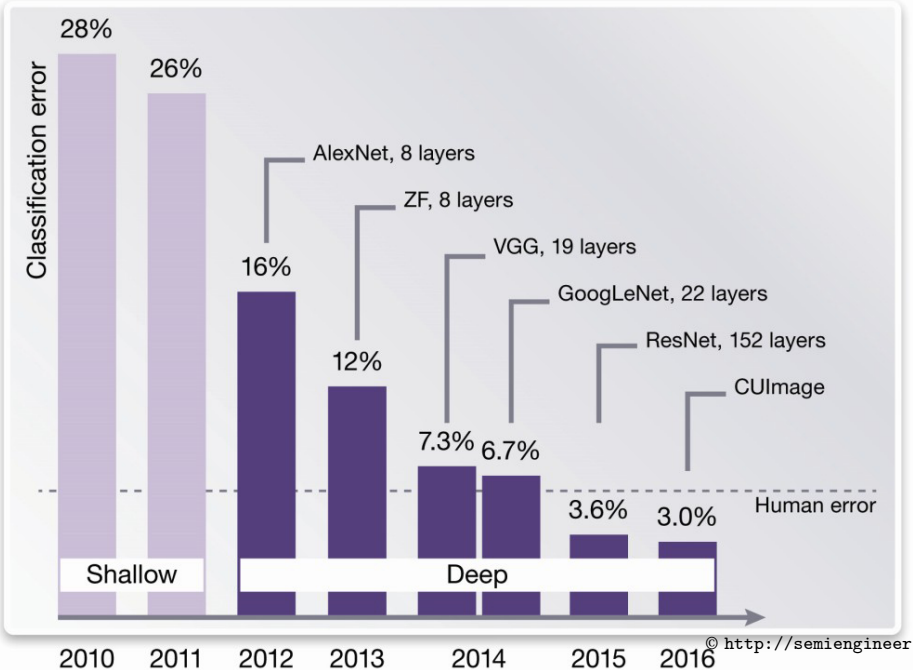


© Khan et al., 2018



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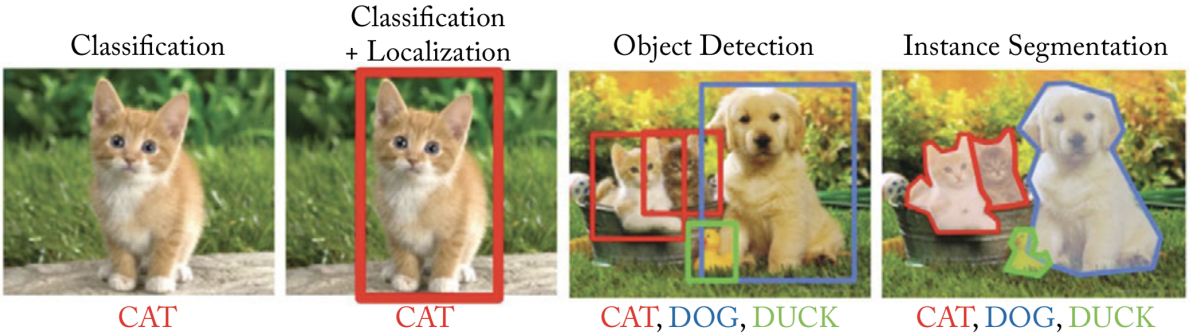
Deep Learning:

- *Redes neurais convolucionais profundas*
- *Aprendizado por representações hierárquicas*

Classification

CAT

© Khan et al., 2018



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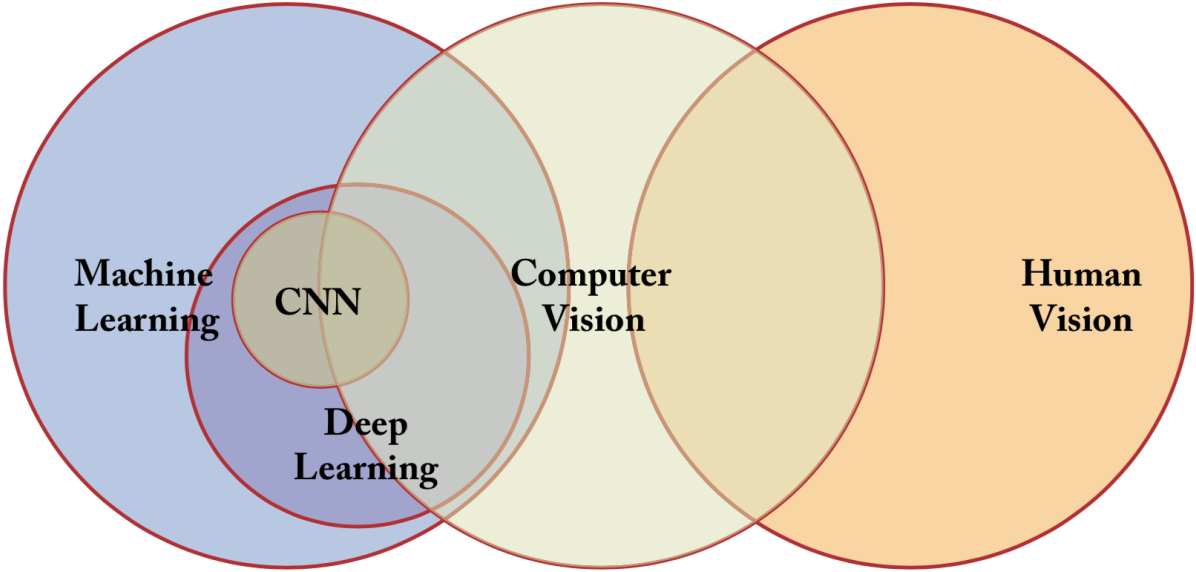

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ARTIFICIAL INTELLIGENCE

Any technique which enables computers to mimic human behavior

MACHINE LEARNING

AI techniques that give computers the ability to learn without being explicitly programmed to do so

DEEP LEARNING

A subset of ML which make the computation of multi-layer neural networks feasible

1950's 1960's 1970's 1980's 1990's 2000's 2010s

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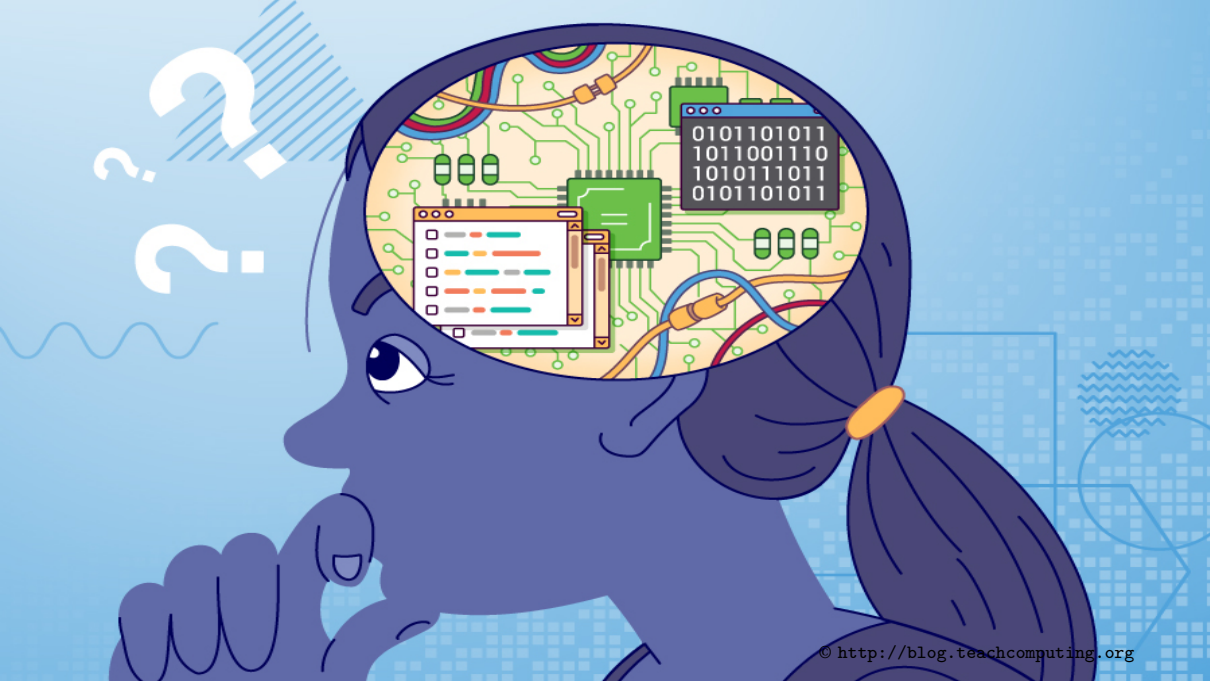

© http://blog.teachcomputing.org

Computação para o Bem:

- *Computação como uma plataforma de melhoria da humanidade e do meio ambiente*
- *Enfoque em problemas sistêmicos*
- *Educação, Pesquisa e Inovação*

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Soluções para Melhorar o Mundo:

- *Desenvolvidas no Laboratório de Sistemas Inteligentes*
- *Aplicações em diversos domínios*
- *Públicas e gratuitas*

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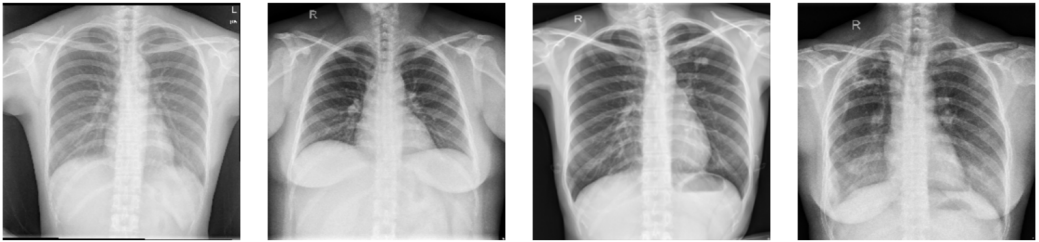
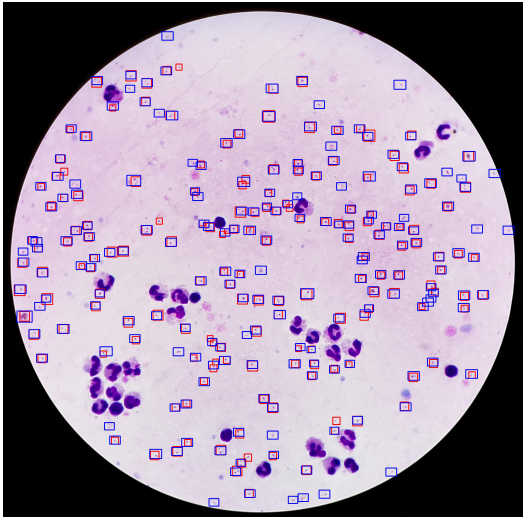
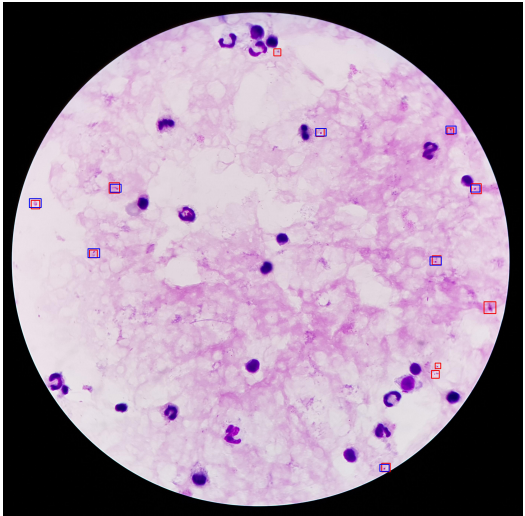
Classificação de Tuberculose Pulmonar:

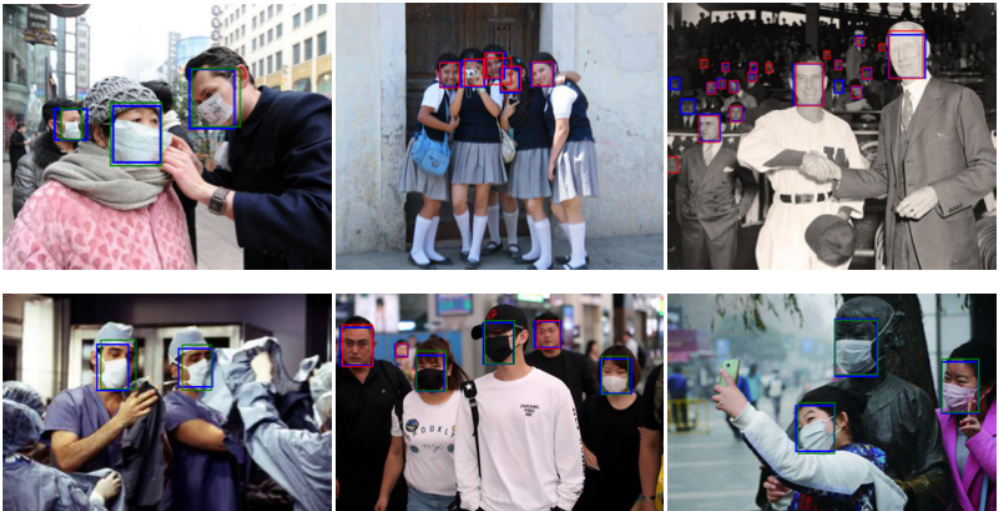


Detecção de Malária:





Uso de Máscaras Faciais:



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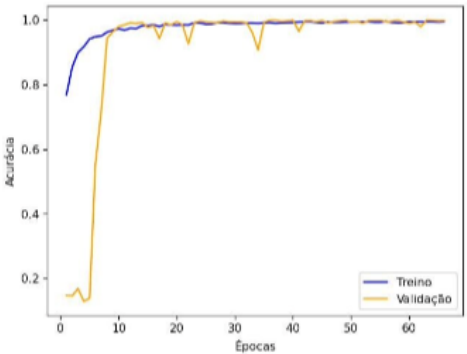
Detecção Inteligente de Patologias na Folha do Café:

(a) Saudável (b) Cercospirose (c) Ferrugem (d) Bicho Mineiro (e) Phoma

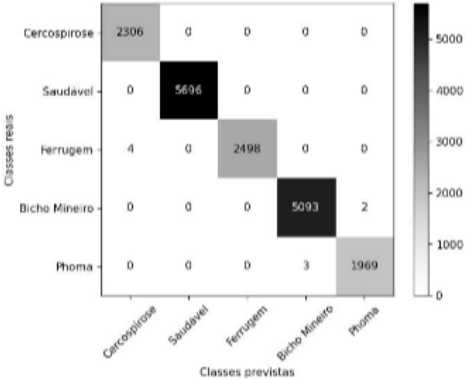
Figura 1: Exemplos aleatoriamente selecionados das bases de dados com seus respectivos rótulos. Fonte: [Jepkoech et al. 2021].

Tabela 2: Resultados experimentais para a Abordagem Contemporânea.

Arquiteturas	Parâmetros	Precisão	Revocação	F_1-*Score*	Acurácia
MobileNetV2	2,91 mi	0.0628 ± 0.0368	0.2407 ± 0.0852	0.0987 ± 0.0547	0.2407 ± 0.0852
ShuffleNet	1,37 mi	0.9988 ± 0.0012	0.9988 ± 0.0012	0.9988 ± 0.0012	0.9988 ± 0.0012
InceptionV3	22,85 mi	0.9990 ± 0.0001	0.9990 ± 0.0002	0.9990 ± 0.0002	0.9990 ± 0.0002
VGG-16	18,91 mi	0.9861 ± 0.0099	0.9852 ± 0.0109	0.9847 ± 0.0115	0.9852 ± 0.0109
EfficientNetV2S	22,85 mi	0.9986 ± 0.0004	0.9986 ± 0.0004	0.9986 ± 0.0004	0.9986 ± 0.0004



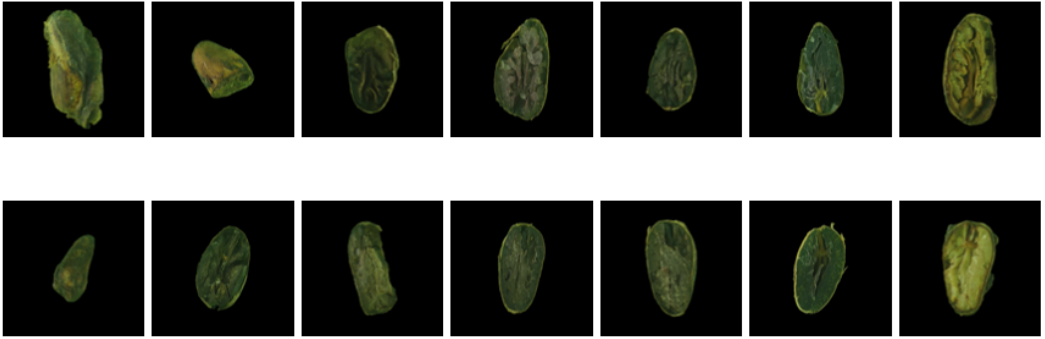
(a) Acurácia no Treinamento



(b) Matriz de Confusão

Figura 4: Artefatos visuais coletados de uma das repetições experimentais da ShuffleNet.

Análise de Qualidade do Cacau:



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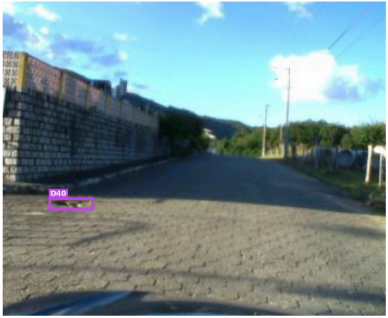
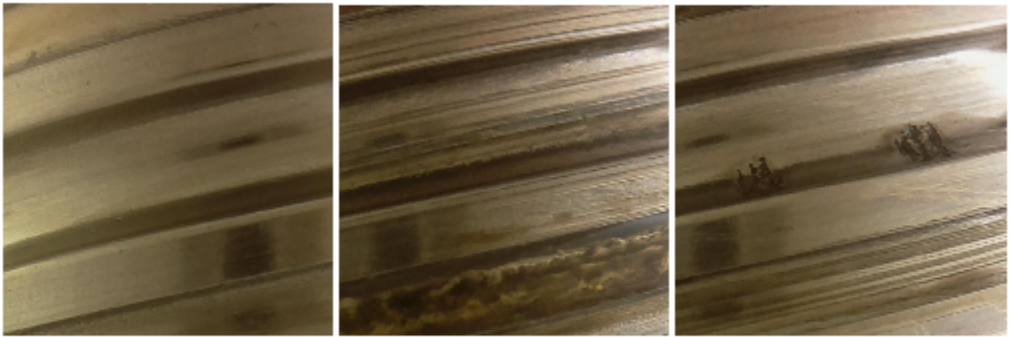
Classificação Inteligente de Falhas em Pavimentação Asfáltica:

D40
D10
D10

D10
D40
D00

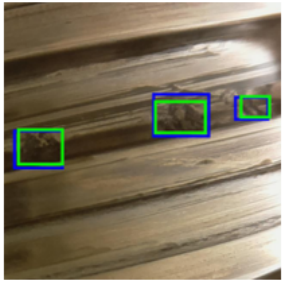

D40

Detecção de Defeitos na Indústria 4.0:

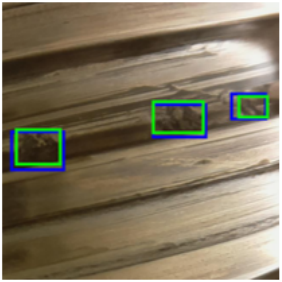


(a) Íntegro (b) Íntegro com Resíduo (c) Danificado

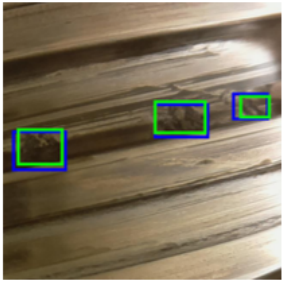
Detecção de Defeitos na Indústria 4.0:



(a) *Nano* (mIoU = 0.735)



(b) *Small* (mIoU = 0.710)



(c) *Medium* (mIoU = 0.709)

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Classificação de Gestos em Libras:

Aluna da UEA desenvolve solução automática para classificar gestos de Libras

Divulgação/UEA

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Previsão da Bacia do Rio Madeira:

A Comparative Analysis of Artificial Neural Networks on River Level Forecasting for the Rio Madeira Basin

João F. S. Brandão, Francis Wagner Silva Correia, Elloá B. Guedes

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Universidade do Estado do Amazonas
Av. Darcy Vargas, 1200 – Manaus – Amazonas
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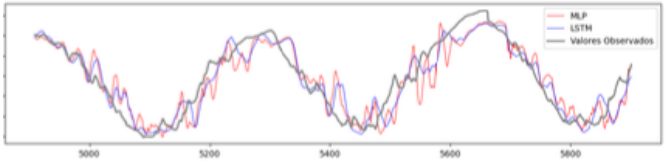

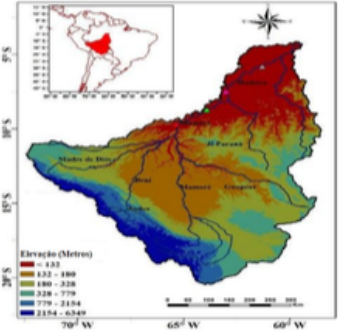

Tecnologias

Obrigada!

Agradecimentos

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MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO

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Universidade do Estado do Amazonas

Campus Party Amazônia, 12 de outubro de 2023