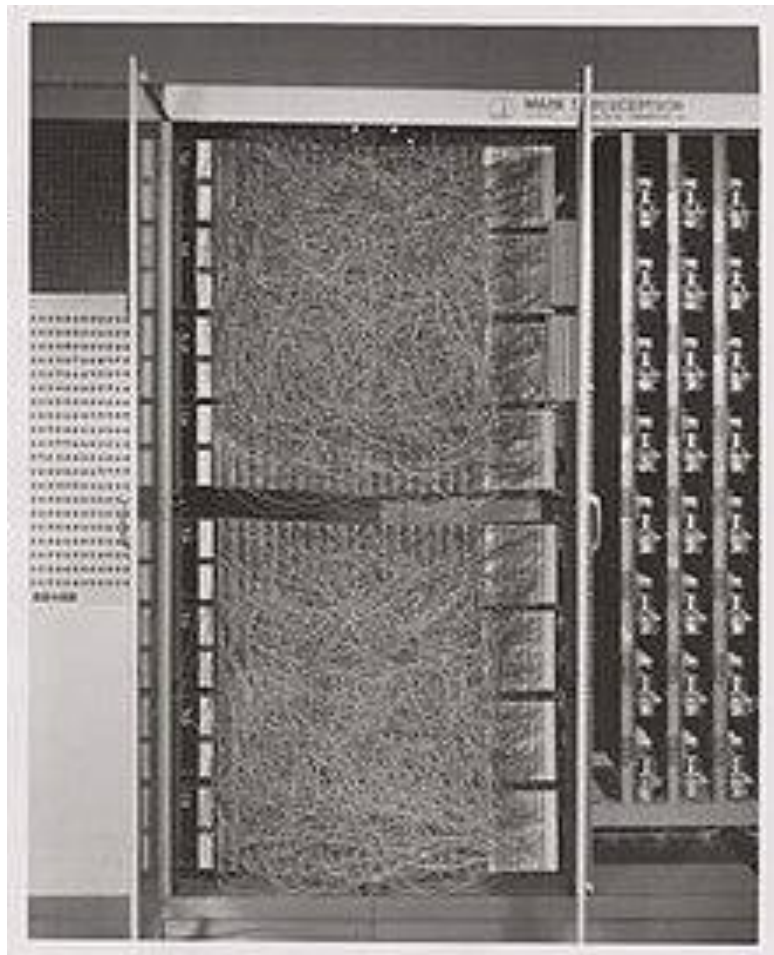

Deep Learning através das abstrações

— O Perceptron —
e o MLP

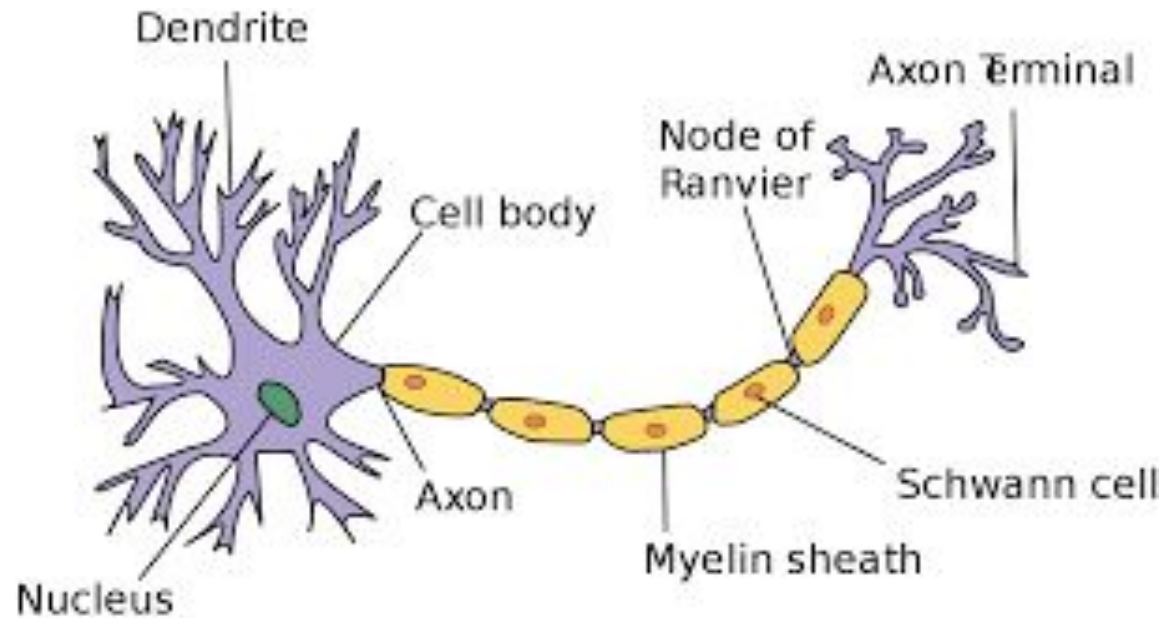
Surgimento

- Frank Rosenblatt 1957
- Mark I
- Inspiração biológica
- Aplicação biológica
- Embrião das redes neurais
- Mais simples, garantias teóricas

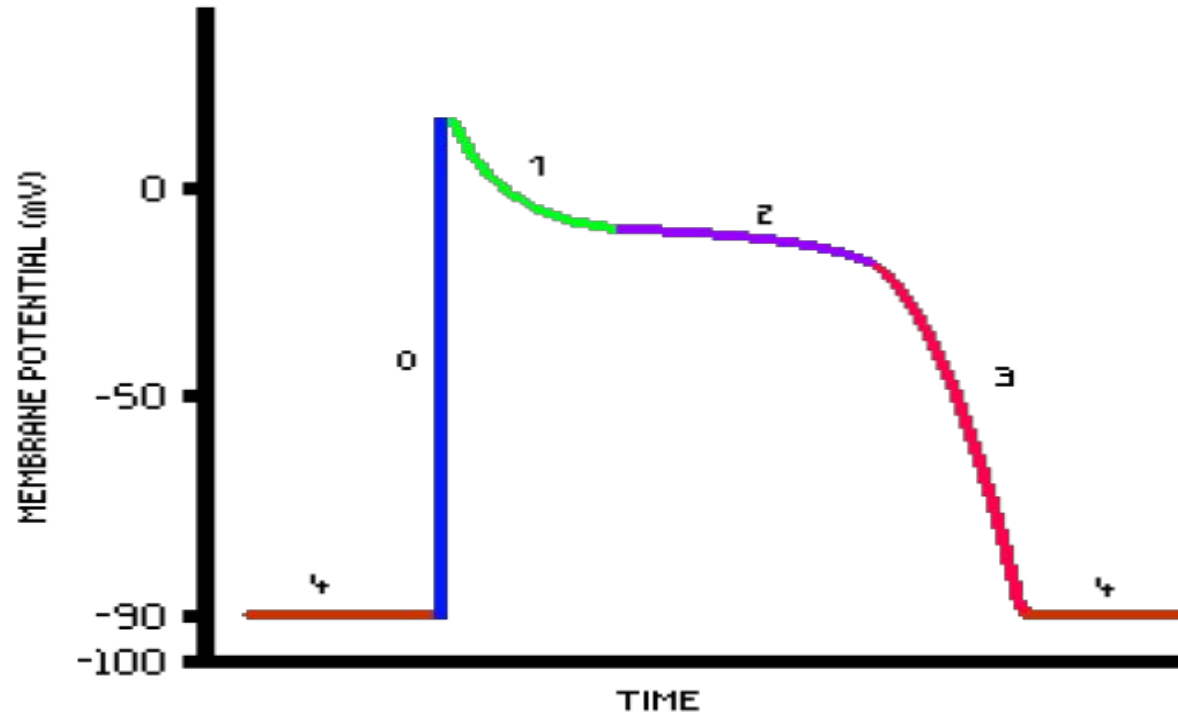
Mark I



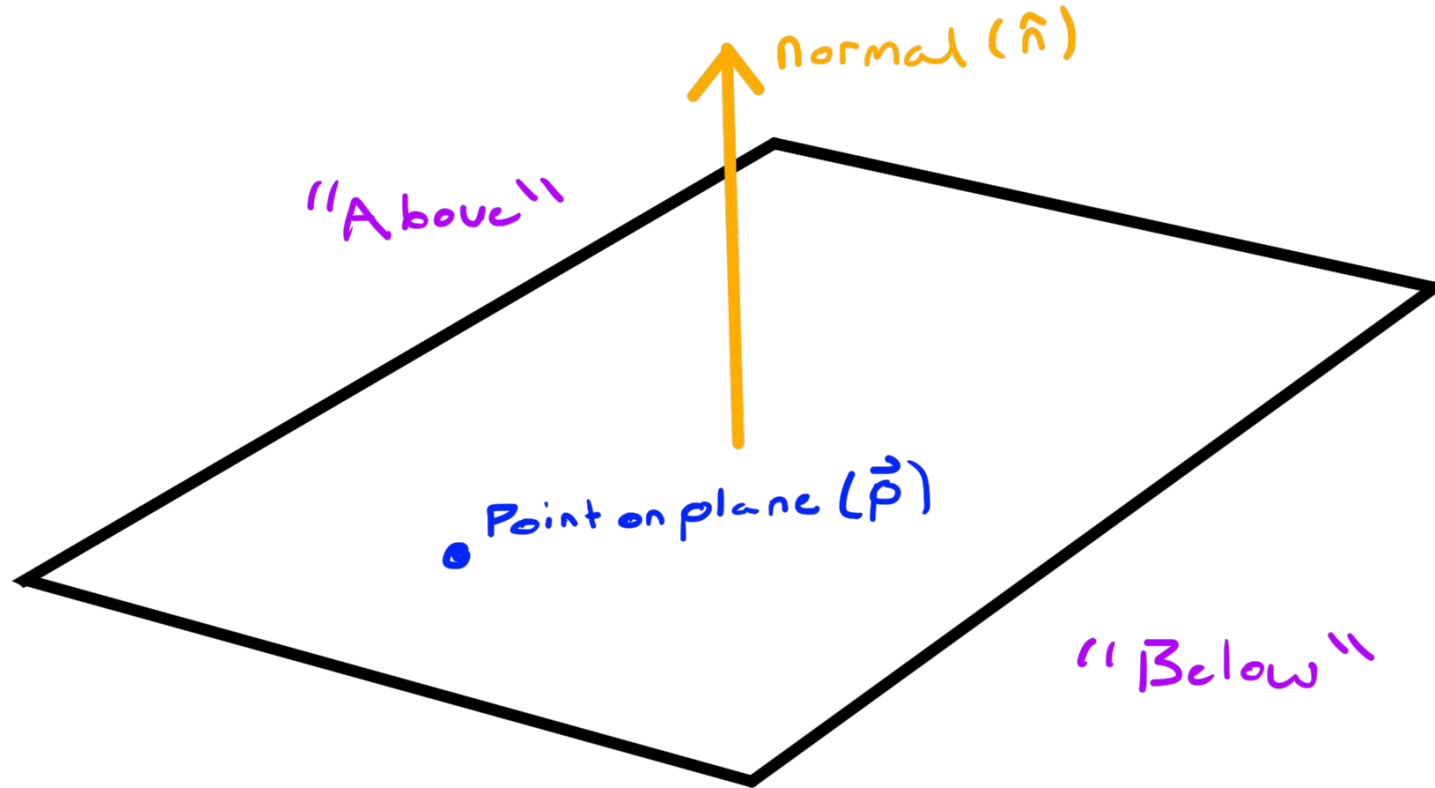
Inspiração Biológica



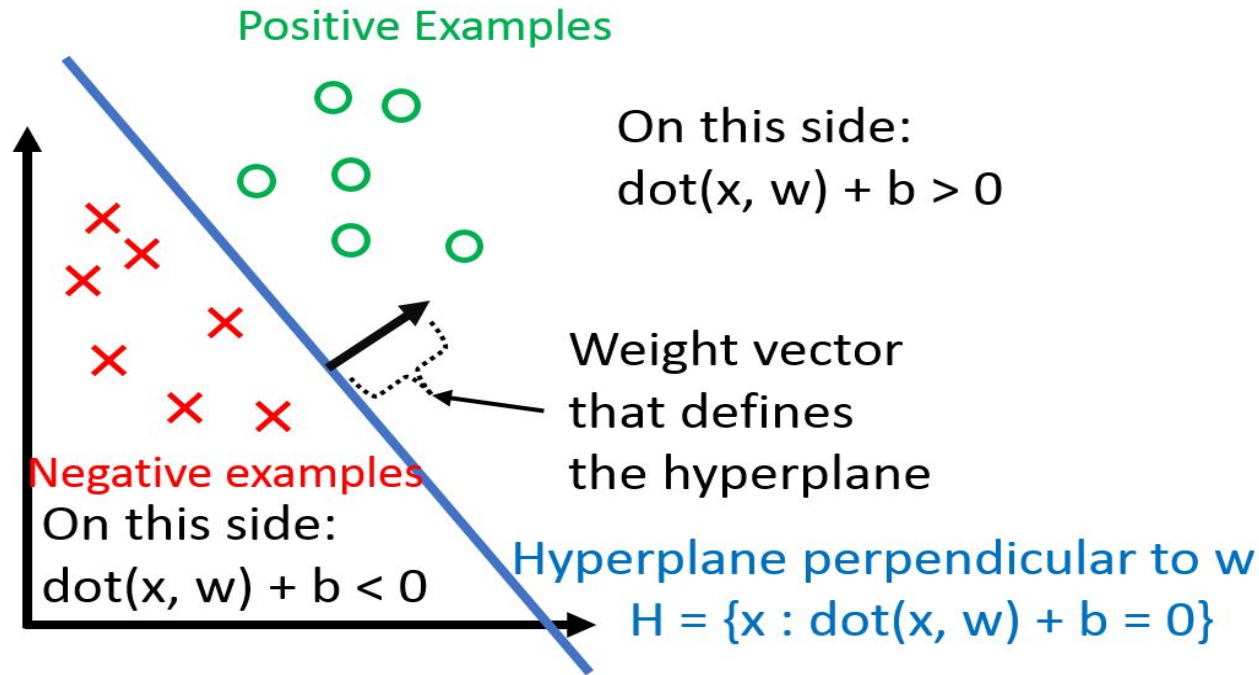
Inspiração biológica



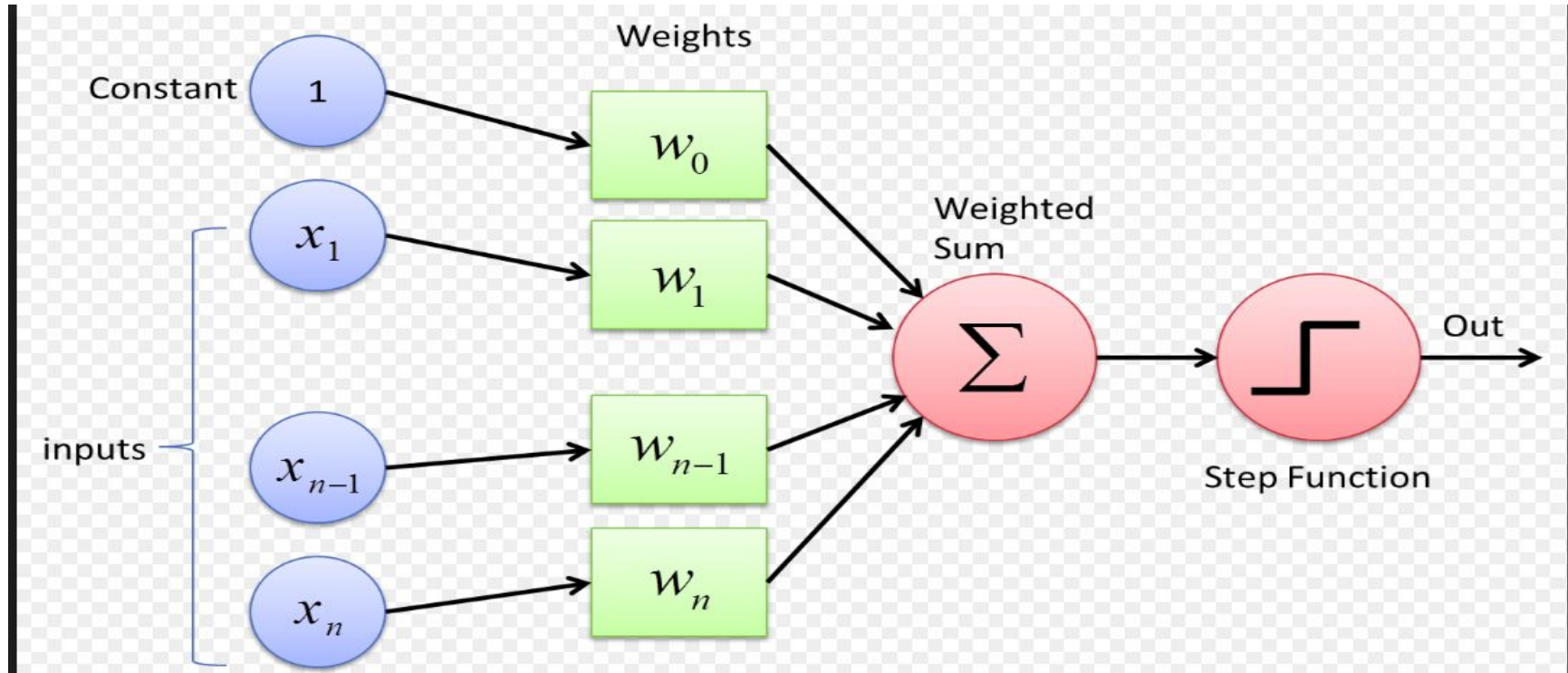
Modelo Matemático



Separador Linear



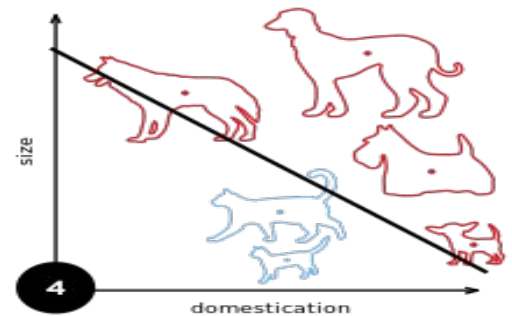
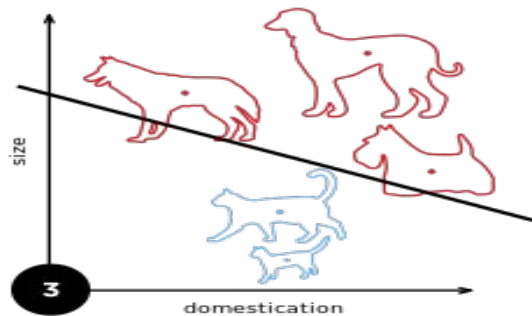
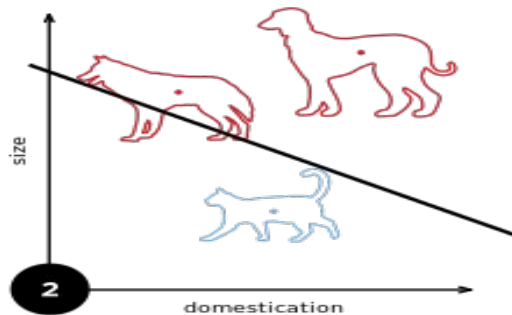
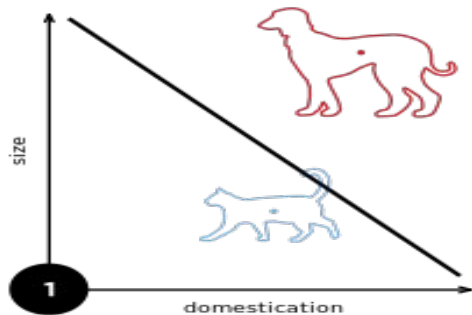
Modelo Matemático



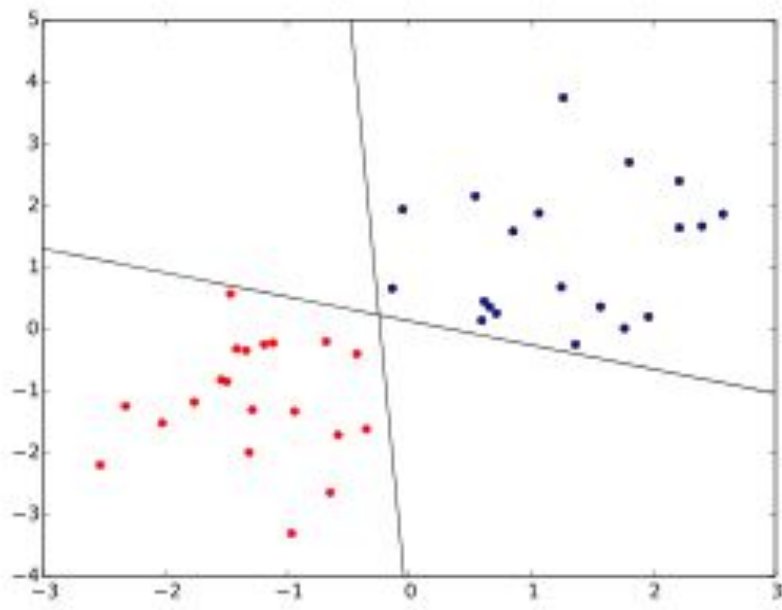
Treinamento

- Para cada entrada calcula a saída do perceptron
- Atualiza os pesos dele com
 - $W += (t - y) * X$
- Repete até convergir

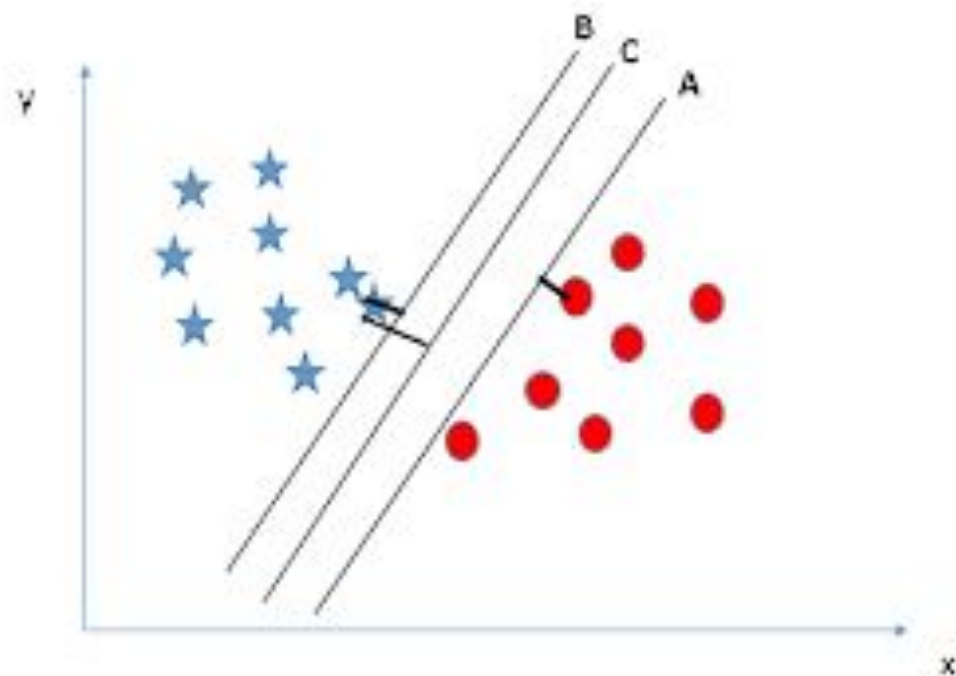
Treinamento



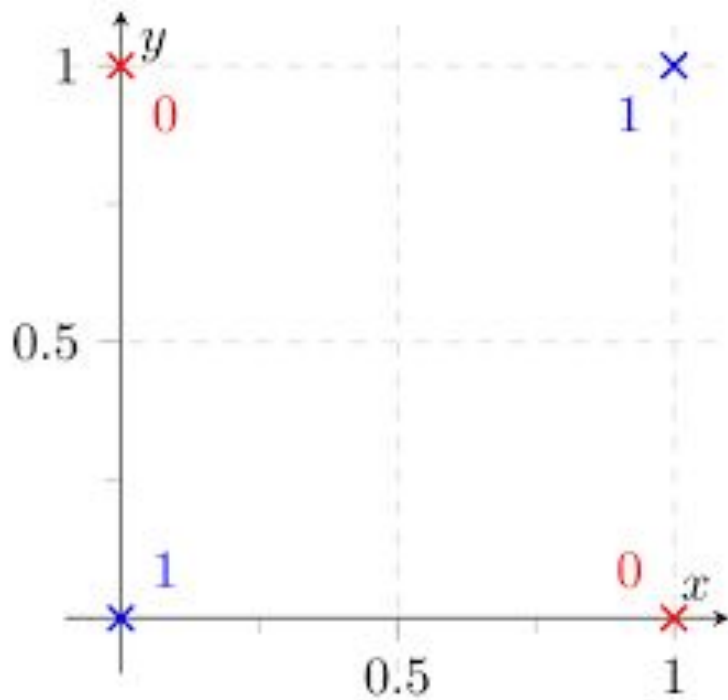
Convergência



Convergência

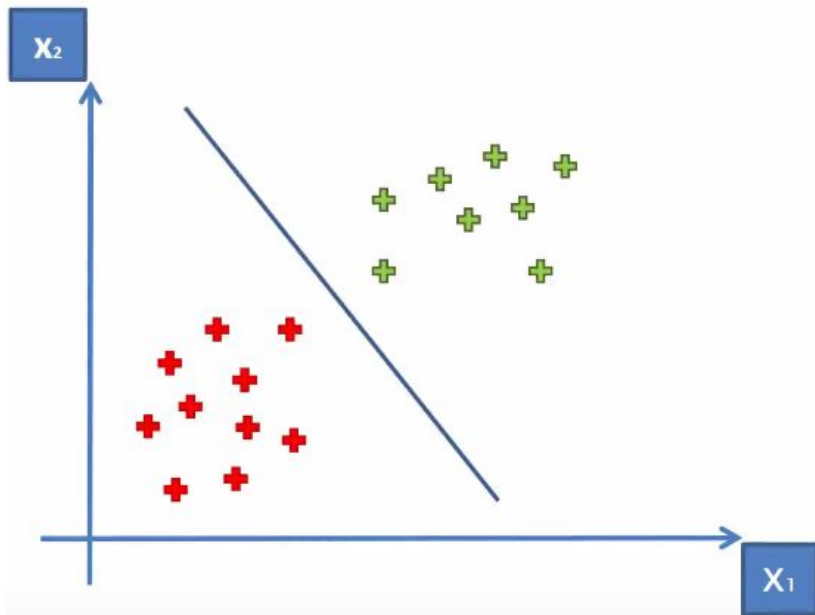


Xor e problemas não lineares

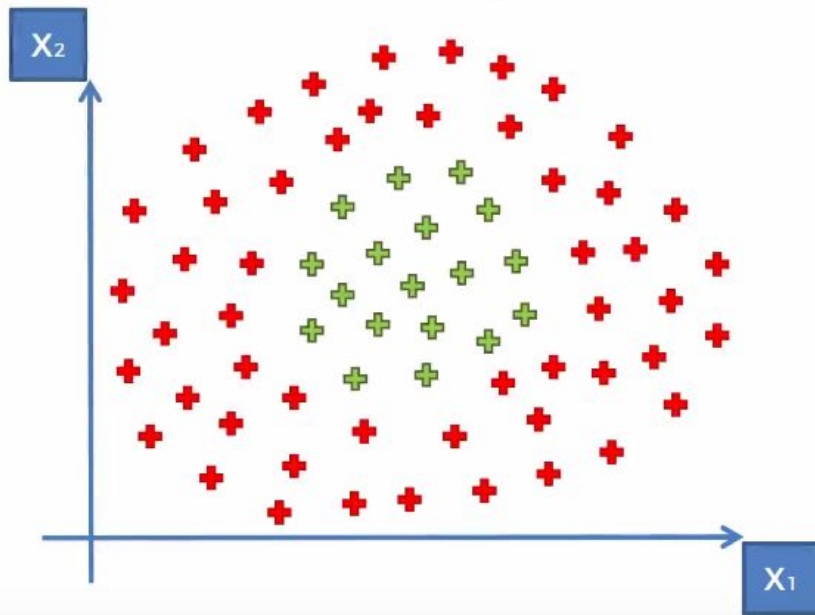


Xor e problemas não lineares

Linearly Separable



Not Linearly Separable



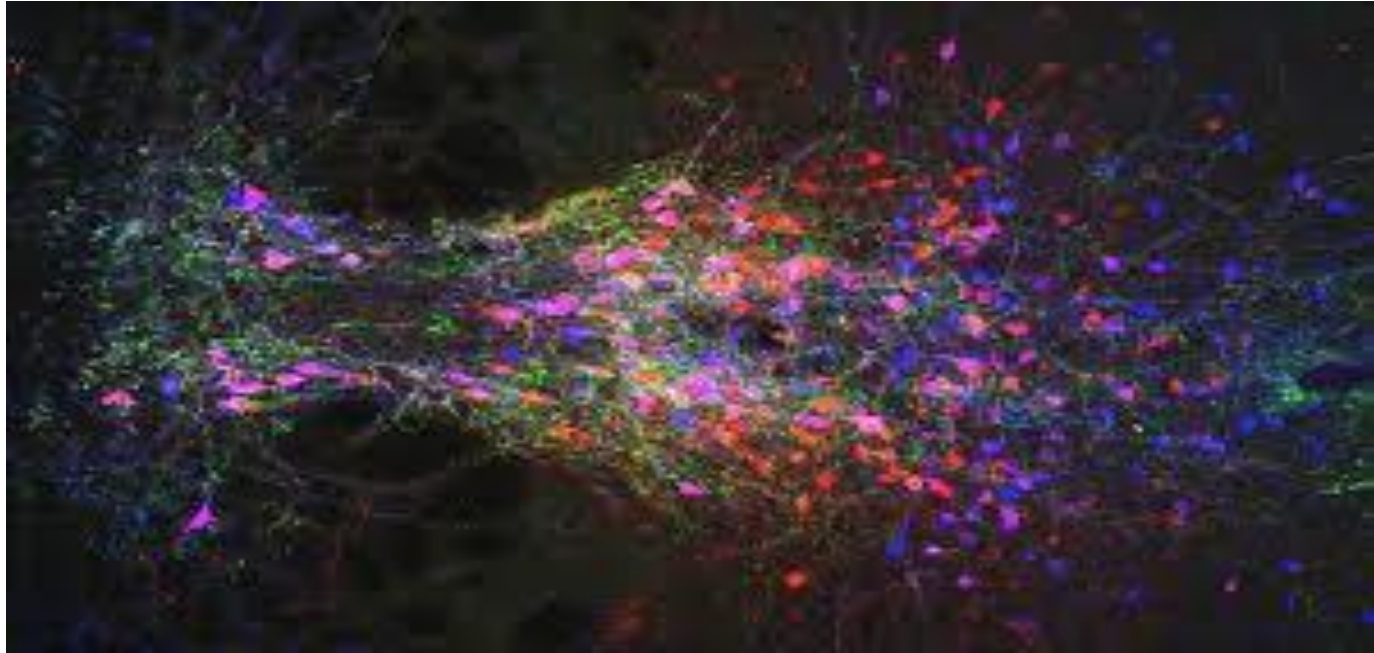
Solução

- Introduzir não-linearidade no modelo
 - Kernel methods: transformação do espaço
 - MLP: Multilayer perceptron
 - No fundo, são a mesma coisa

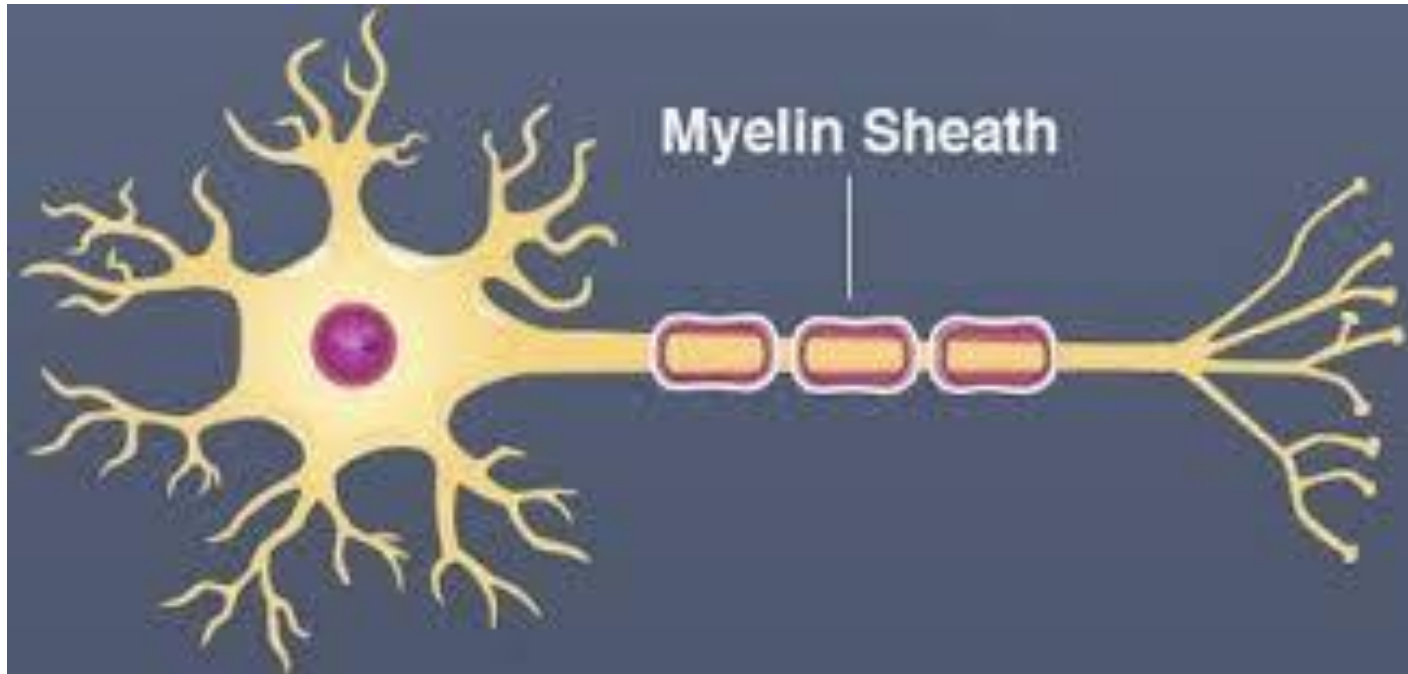
Multilayer Perceptron

- Combinação de vários perceptrons formam uma camada
- Várias camadas formam um MLP
- A famosa rede neural
- Resolve muitos dos nossos problemas, introduz novos
- Muito complexas, menos garantias teóricas
- Teorema da aproximação universal

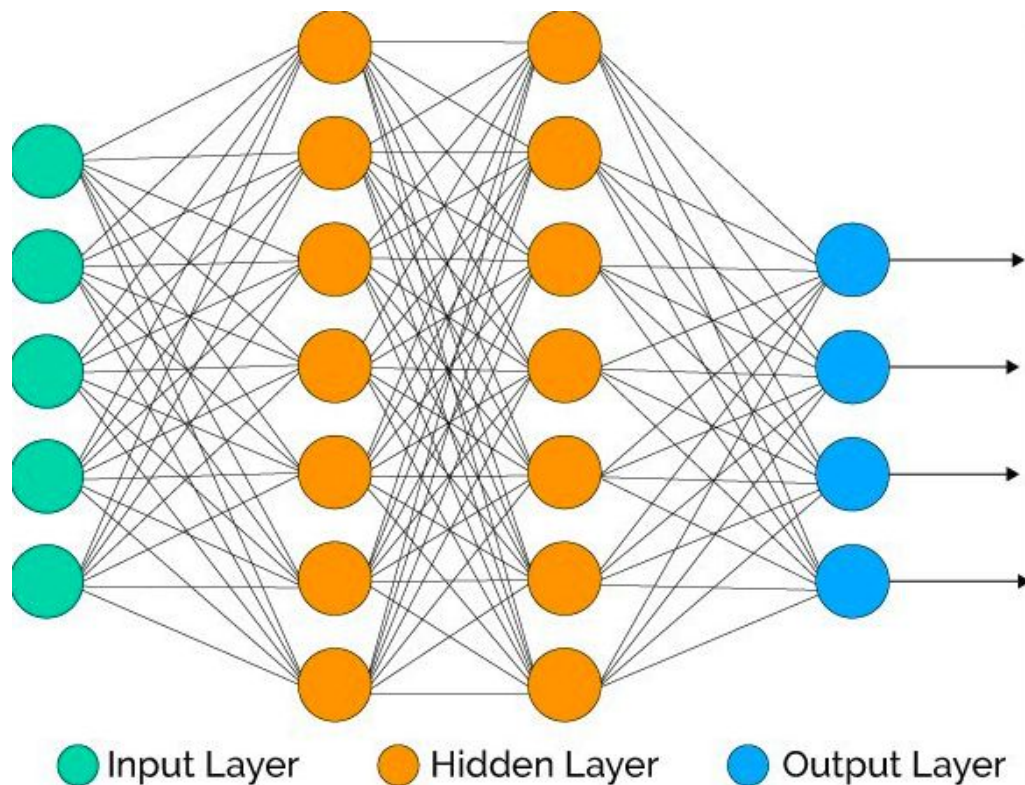
Inspiração biológica - arquitetura



Inspiração biológica - treinamento

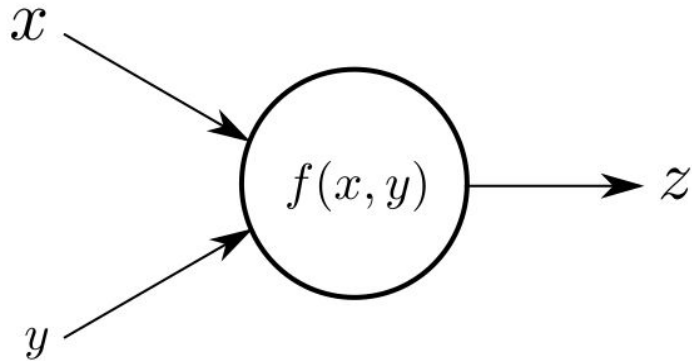


Modelo Matemático

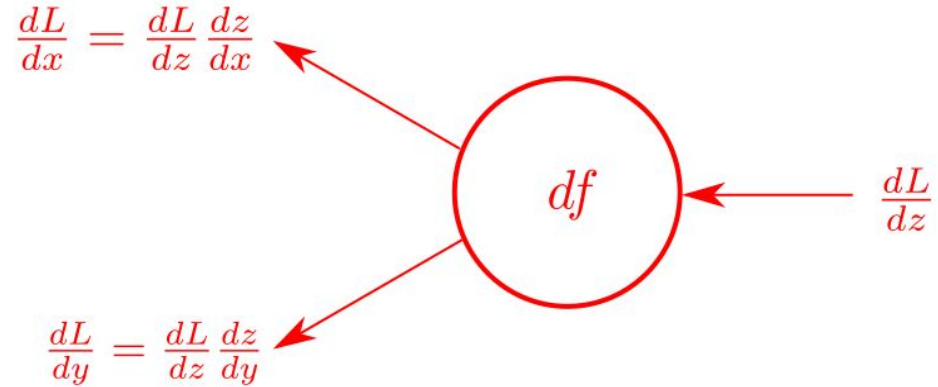


Treinamento - Backpropagation

Forwardpass



Backwardpass



Resources - Cursos

- Tensorflow 2.0 Udacity
- Tensorflow 2.0 Coursera
- Machine Learning Andrew Ng
- Cornell CS 4780
- Stanford CS 231n

Resources - Livros

Neural Networks and Deep Learning

Neural Networks and Deep Learning is a free online book. The book will teach you about:

- Neural networks, a beautiful biologically-inspired programming paradigm which enables a computer to learn from observational data
- Deep learning, a powerful set of techniques for learning in neural networks

Neural networks and deep learning currently provide the best solutions to many problems in image recognition, speech recognition, and natural language processing. This book will teach you many of the core concepts behind neural networks and deep learning.

Neural Networks and Deep Learning

[What this book is about](#)

[On the exercises and problems](#)

► [Using neural nets to recognize handwritten digits](#)

► [How the backpropagation algorithm works](#)

► [Improving the way neural networks learn](#)

► [A visual proof that neural nets can compute any function](#)

► [Why are deep neural networks hard to train?](#)

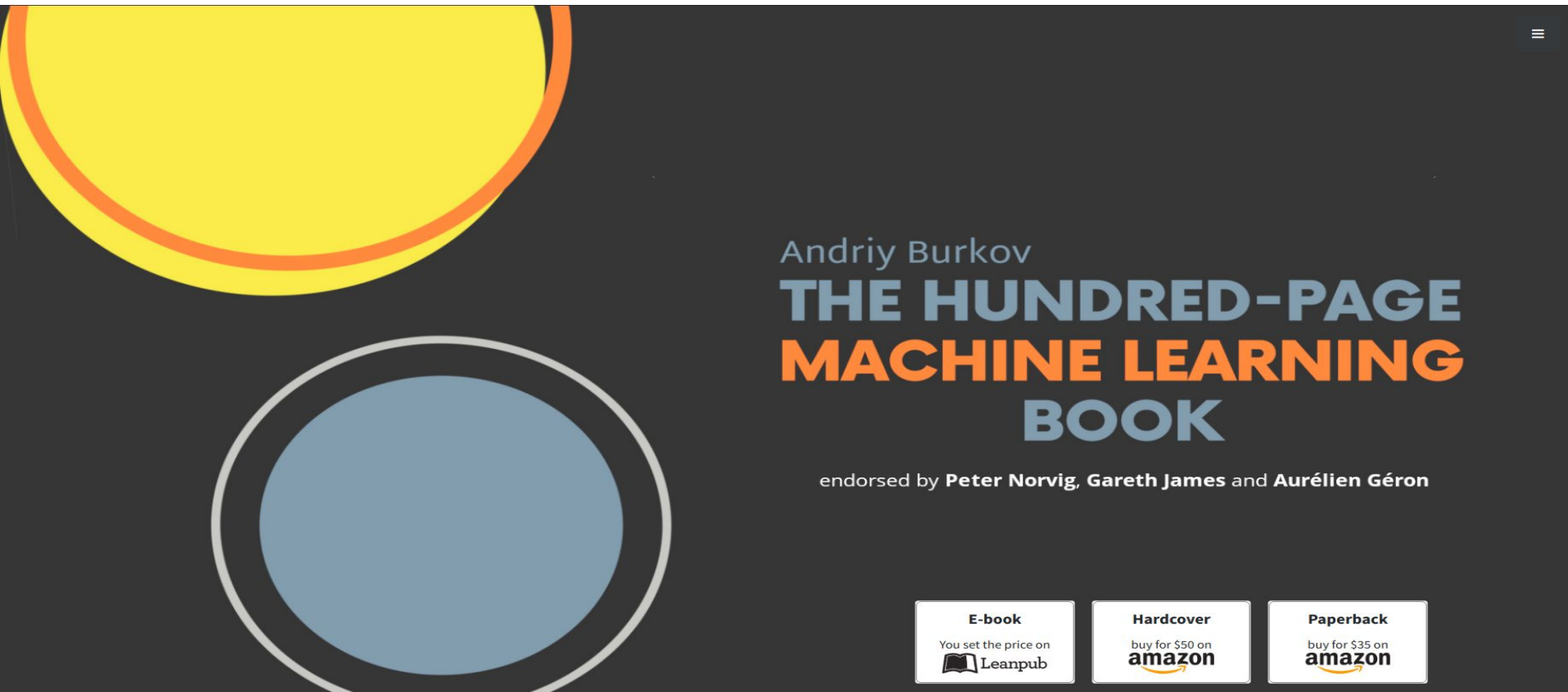
► [Deep learning](#)

[Appendix: Is there a *simple* algorithm for intelligence?](#)

[Acknowledgements](#)

[Frequently Asked Questions](#)

Resources - Livros




Andriy Burkov

THE HUNDRED-PAGE MACHINE LEARNING BOOK

endorsed by **Peter Norvig**, **Gareth James** and **Aurélien Géron**

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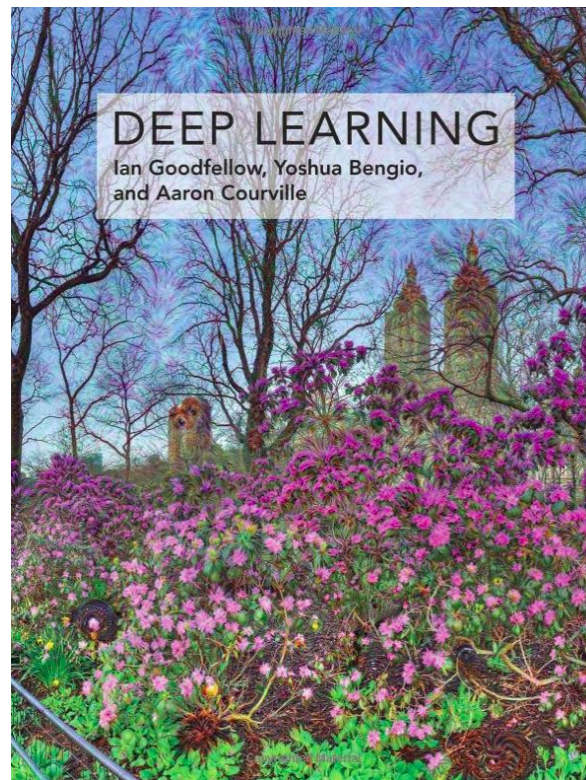
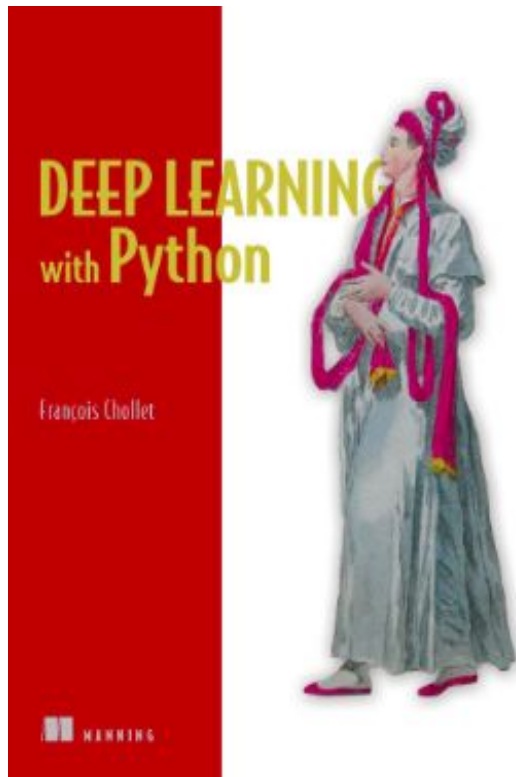
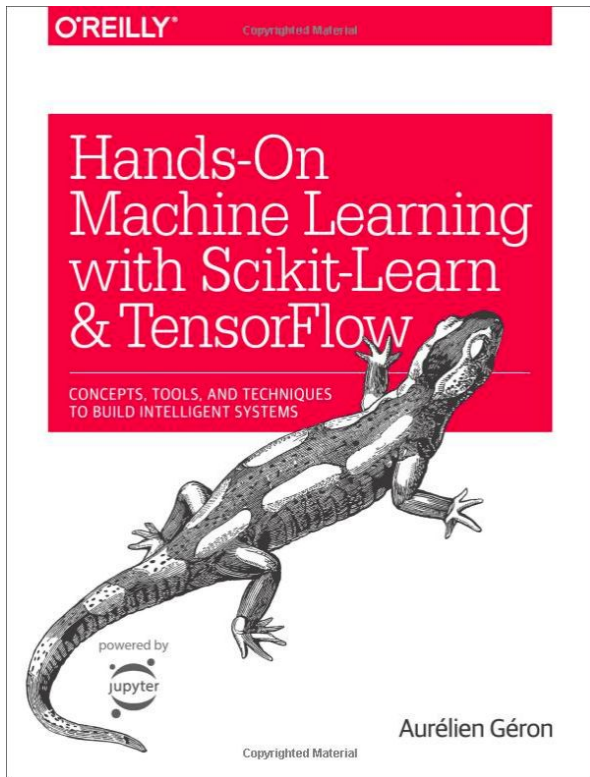
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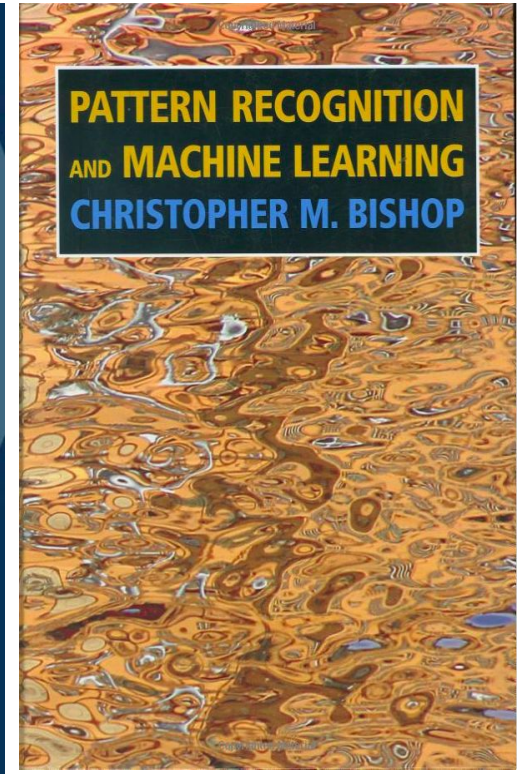
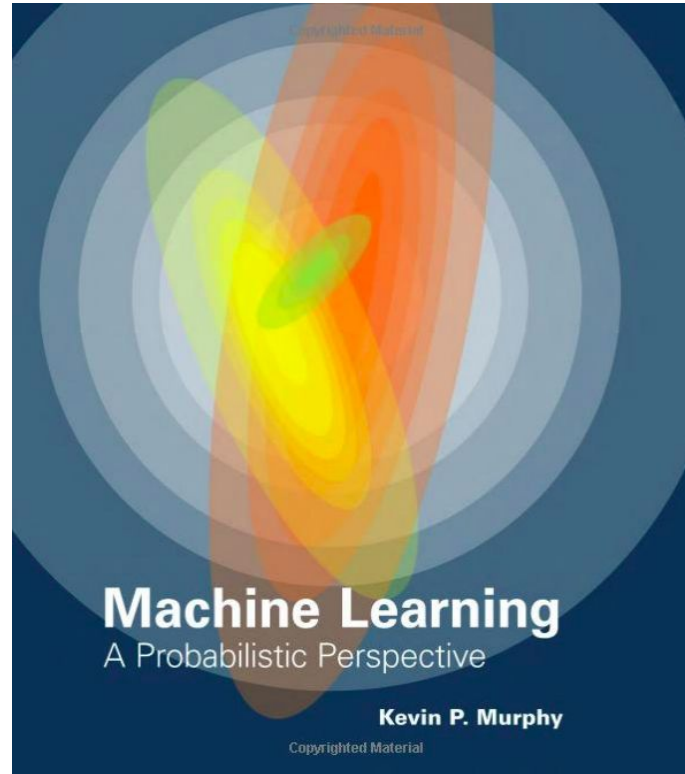
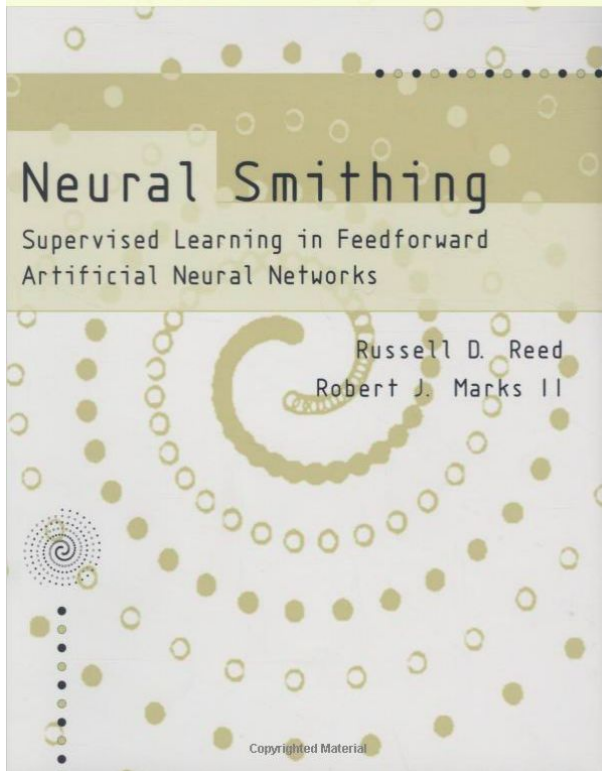

Paperback

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Resources - Livros



Resources - Livros



Mexer e pegar intuição

- Tensorflow playground
- Aifiddle

Despedida

- Deem uma olhada em algum dos resources
- Respondam o forms
- Queria que o número de slides fosse divisível por 3