

Introduction au deep learning

Julien Velcin

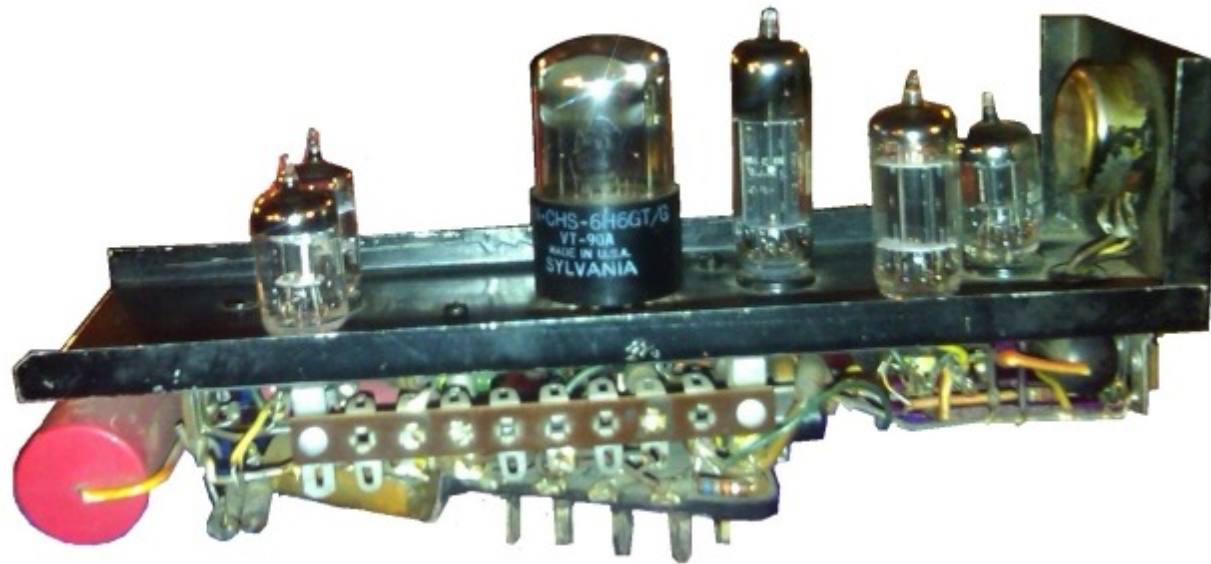
<http://eric.univ-lyon2.fr/jvelcin>

Formation UdL 2023-2024

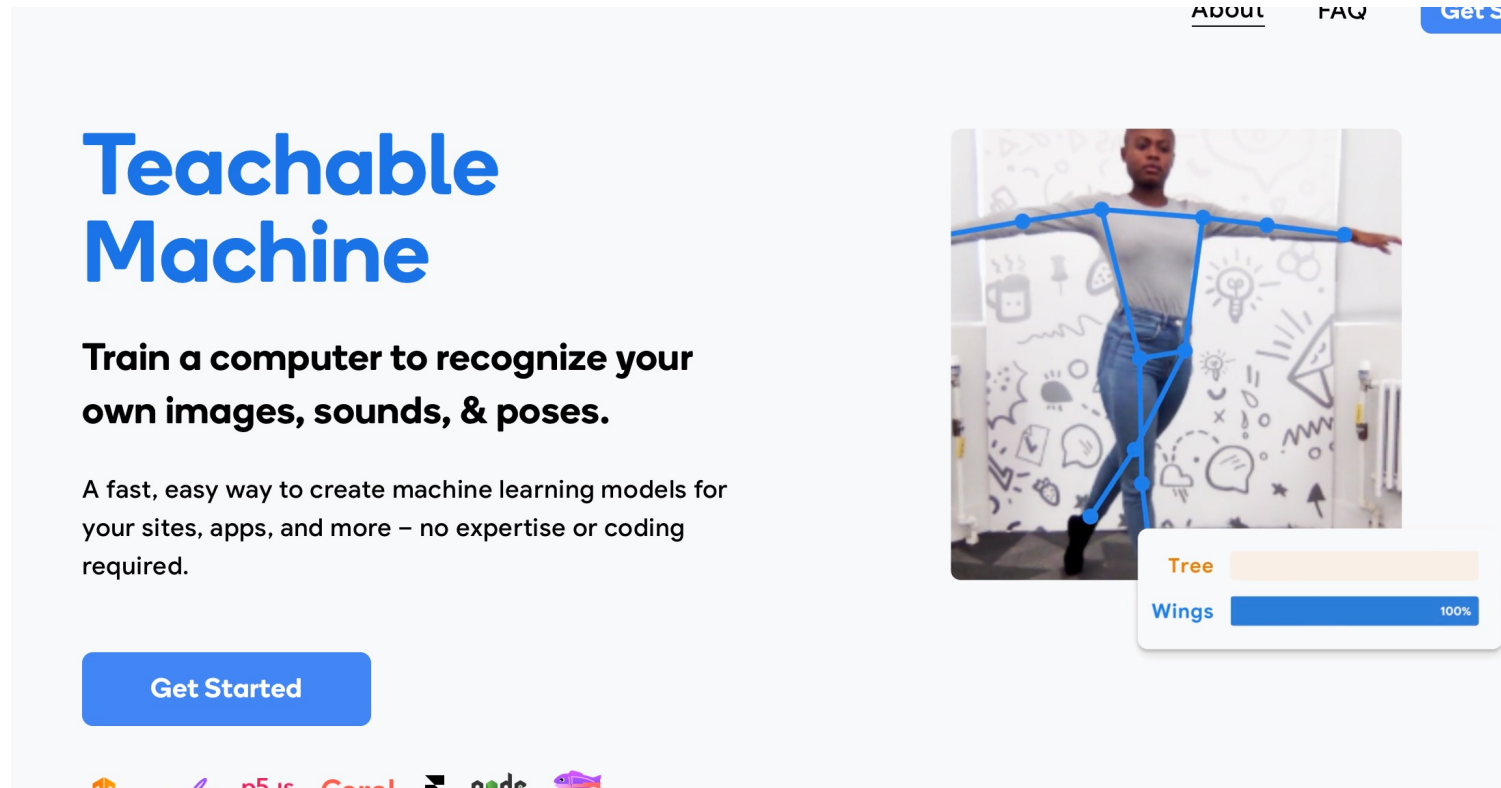
Plan de la formation

- IA, neurone artificiel et apprentissage automatique
- Mécanismes d'apprentissage automatique
- Notions d'algèbre linéaire et d'espaces vectoriels
- Fonctionnement des réseaux de neurones artificiels
- Deep learning et familles de problèmes
- Différentes architectures de réseaux : CNN, RNN, AE
- Mécanismes d'attention
- Quelques questions que pose le deep learning aujourd'hui

IA, neurone artificiel et apprentissage automatique



Des machines qui apprennent



The image shows the Teachable Machine web interface. On the left, the title "Teachable Machine" is in large blue font. Below it, the text "Train a computer to recognize your own images, sounds, & poses." is in bold black. A paragraph follows: "A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required." At the bottom left is a blue "Get Started" button. On the right, a video shows a person in a pose with a blue skeleton overlay. A small overlay box shows two labels: "Tree" with an orange bar and "Wings" with a blue bar at 100%. The top right has links for "About", "FAQ", and "Get Started". The bottom of the interface shows a row of logos for various web frameworks and languages.

Teachable Machine

Train a computer to recognize your own images, sounds, & poses.

A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.

[Get Started](#)

Tree
Wings 100%

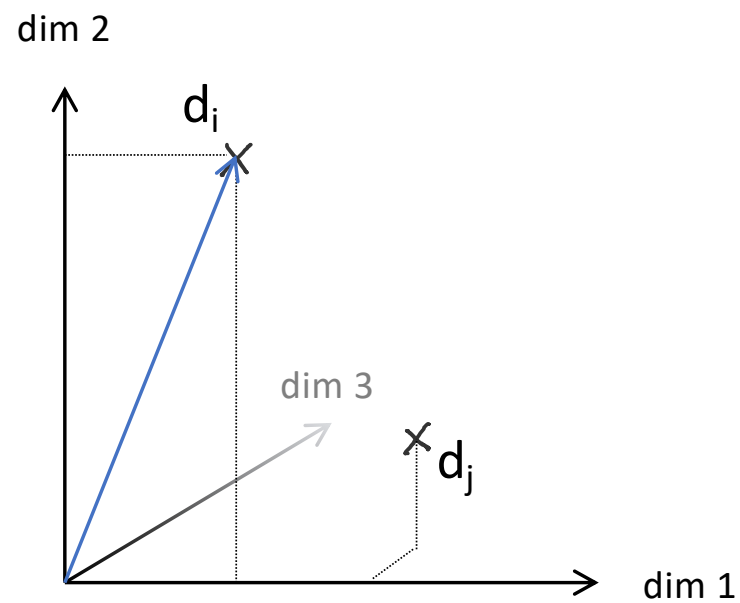
Logos: TensorFlow.js, p5.js, Coral, node, and others.

<https://teachablemachine.withgoogle.com>

Apprentissage automatique

entrée \longrightarrow f_{θ} \longrightarrow sortie

Notions d'algèbre linéaire et d'espaces vectoriels

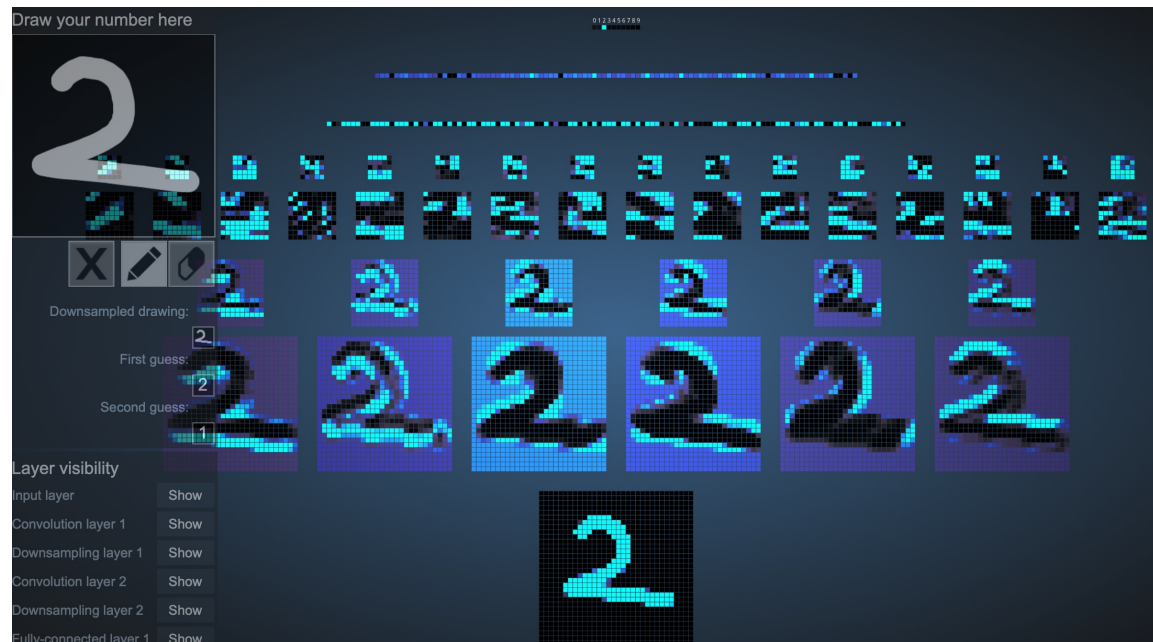


Le neurone artificiel

Apprendre avec un neurone artificiel

$$w'_i = w_i + \eta(y - \hat{y})x_i$$

Réseaux de neurones artificiels



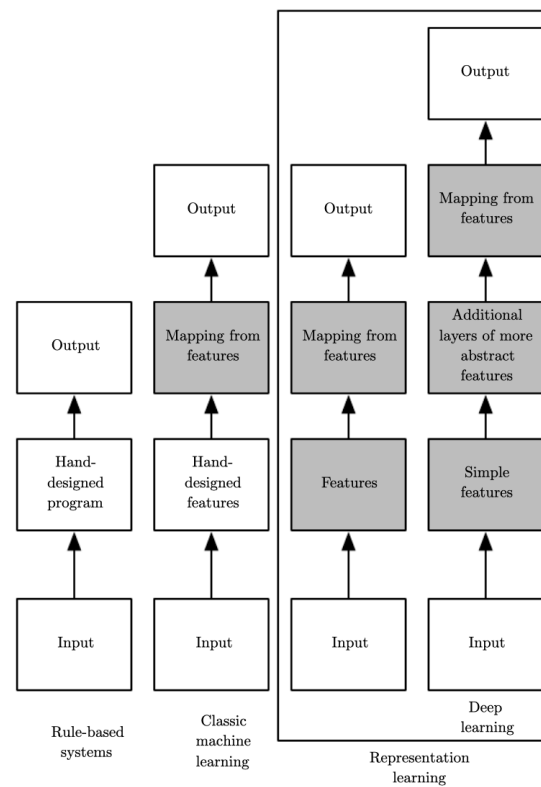
<https://www.cs.ryerson.ca/~aharley/vis/conv/flat.html>

<http://playground.tensorflow.org>

Quelques notions d'optimisation



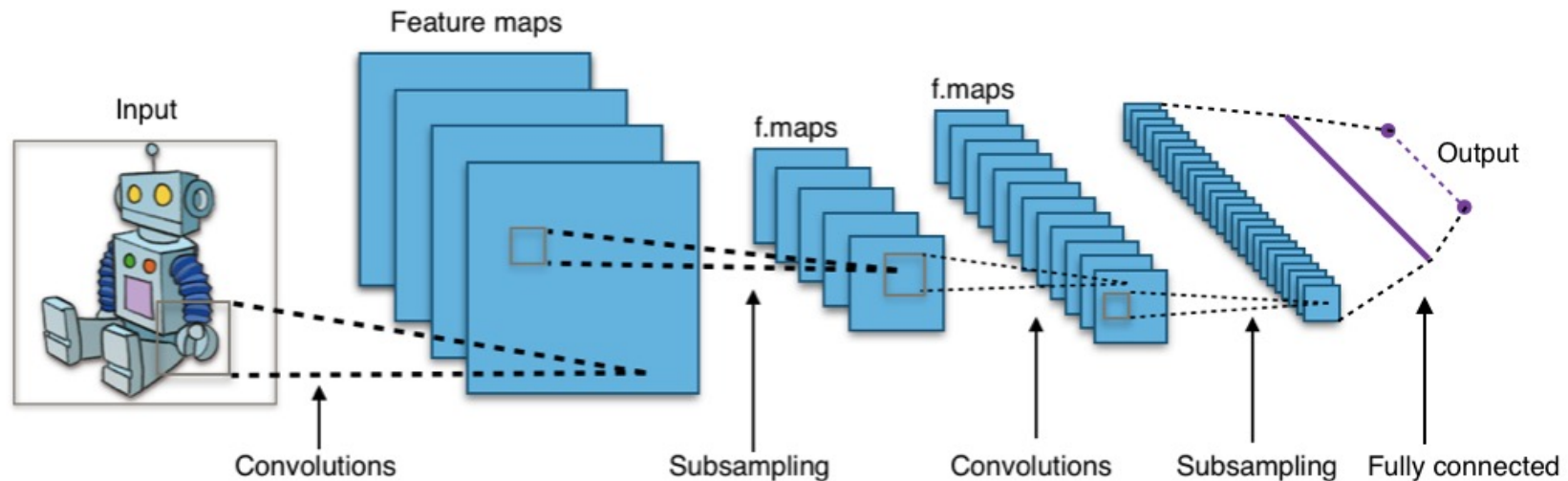
Apprentissage de représentations



Deep learning et classes de problèmes

- Classification supervisée (simple, multi-labels)
- Apprentissage par renforcement
<https://jonathan-hui.medium.com/alphago-how-it-works-technically-26ddcc085319>
- Recherche d'information
<https://huggingface.co/models>
- Génération automatique
<https://deepai.org/machine-learning-model/text-generator>
<https://labs.openai.com/>
<https://chat.openai.com/chat>
- Classification non supervisée
- ...

Différentes architectures de réseaux : CNN

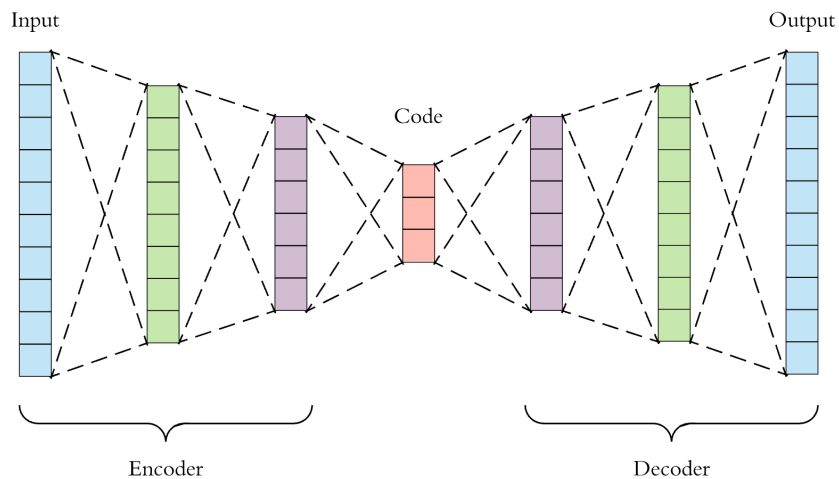


<https://fr.blog.businessdecision.com/tutoriel-deep-learning-le-reseau-neuronal-convolutif-cnn/>

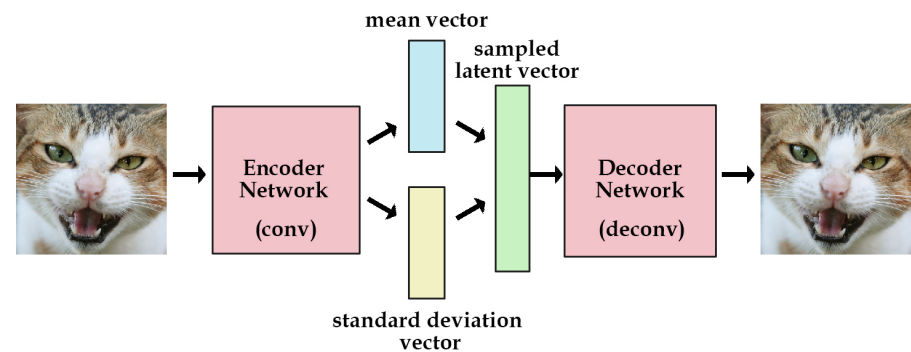
<https://medium.com/apache-mxnet/multi-channel-convolutions-explained-with-ms-excel-9bbf8eb77108>

Différentes architectures de réseaux : AE

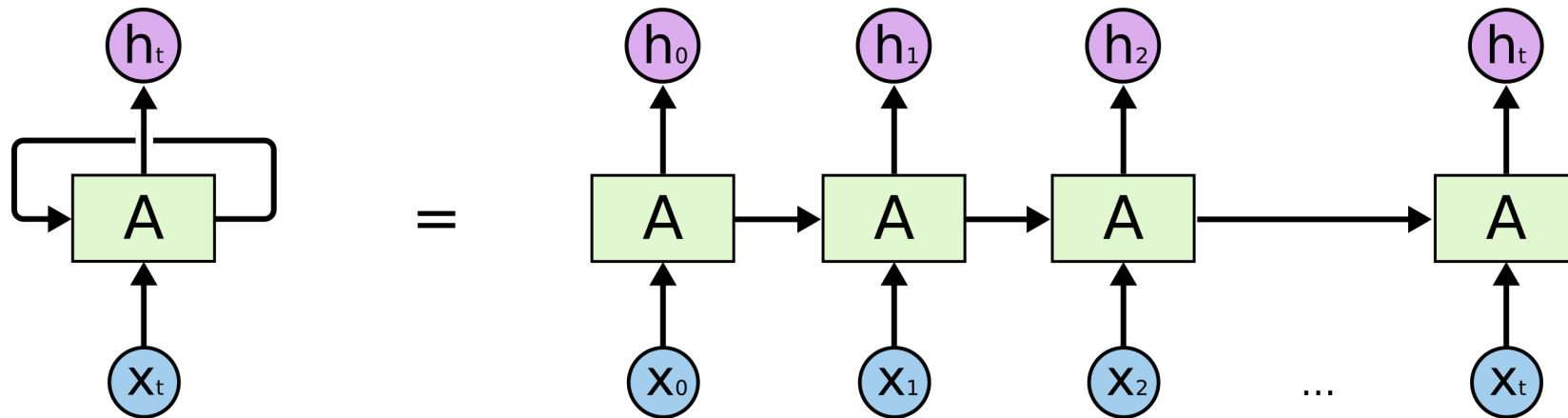
AE empilés :



AE variationnels :



Différentes architectures de réseaux : RNN



Mécanismes d'attention

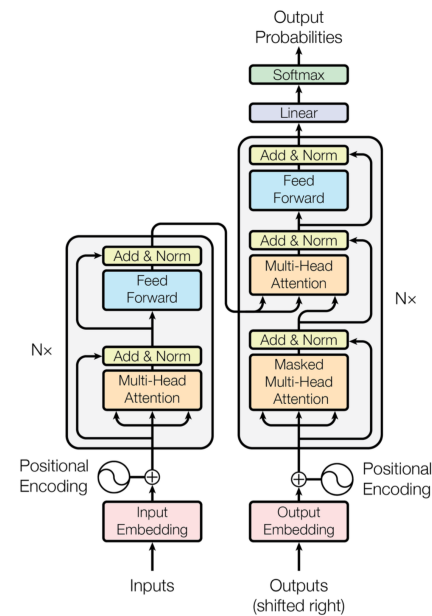
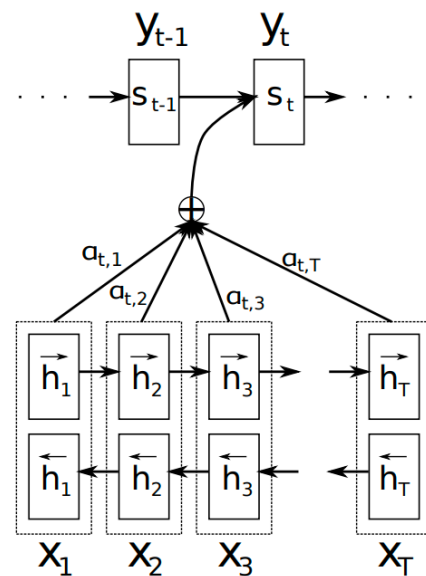


Figure 1: The Transformer - model architecture.

<https://e2eml.school/transformers.html>

Quelques questions que pose le deep learning aujourd'hui

- Effet “boîte noire” et biais des modèles

<https://towardsdatascience.com/bias-in-machine-learning-how-facial-recognition-models-show-signs-of-racism-sexism-and-ageism-32549e2c972d>

<https://github.com/EthicalML/xai>

<https://github.com/jessevig/bertviz>

- Empreinte écologique et compression

<https://www.technologyreview.com/2019/06/06/239031/training-a-single-ai-model-can-emit-as-much-carbon-as-five-cars-in-their-lifetimes/>

<https://towardsdatascience.com/how-to-compress-a-neural-network-427e8ddbcc34>

Références et quelques liens supplémentaires

- Livre de référence sur le deep learning :
Deep Learning, I. Goodfellow, Y. Bengio and A. Courville, MIT Press, 2016:
<http://www.deeplearningbook.org>
- Fonctionnement d'AlphaGo :
<https://jonathan-hui.medium.com/alphago-how-it-works-technically-26ddcc085319>