Développeur d'Intelligence Artificielle Appliquée

Cours #9

www.impactia.org

Structure de la formation

- **#1: Introduction**
- **#2: Vision**
- **#3: Vision**
- **#4: Vision**
- **#5: Renforcement**
- **#6: Renforcement**
- **#7: Renforcement**
- **#8: Langage**
- **#9: Langage**
- #10: Langage
- # 11: Génération d’images
- #12: Génération d’images
- #13: Génération d’images
- #14: Projet
- #15: Projet

Semaine dernière : Cours #8

- Théorie
  - Fin de la partie Renforcement
  - Début de la partie Langage : rapide historique
- Pratique
  - Entrainement d’agents droneRL
  - Challenge droneRL ! 💪

Aujourd’hui : Cours #9

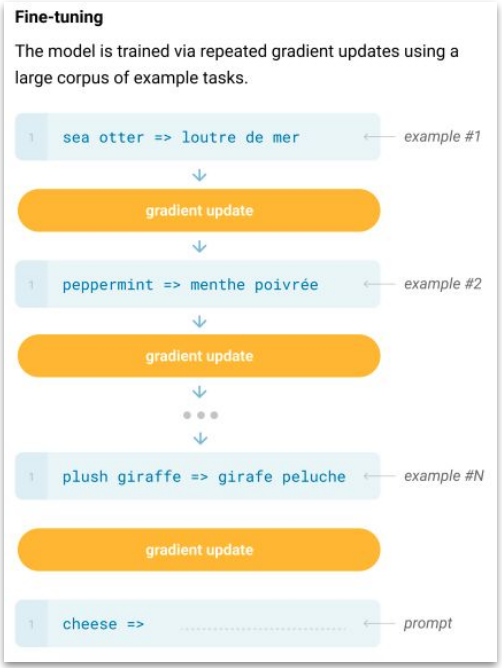
- Pratique
  - Génération de texte avec PyTorch

Traitement du Langage Naturel (NLP)

Comment entraîner un modèle ?

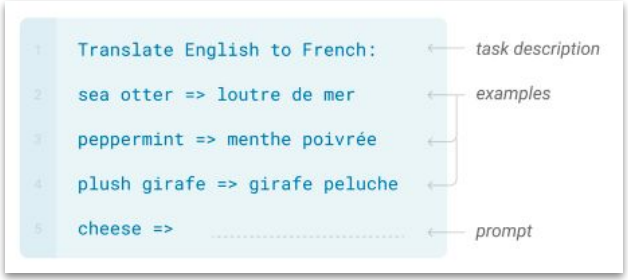
2010-2017: entrainement de zéro
Création d'un nouveau modèle pour chaque tâche

2018: modèles pré-entraînés
Réutilisation de modèles grâce à l'apprentissage par transfert

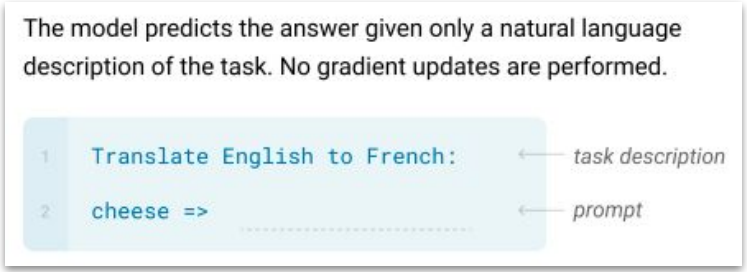


Comment entraîner un modèle ?

2019: apprentissage “few shots”
Création d’un nouveau modèle pour chaque tâche



2020: apprentissage “zero shot”
Réutilisation de modèles grâce à l’apprentissage par transfert



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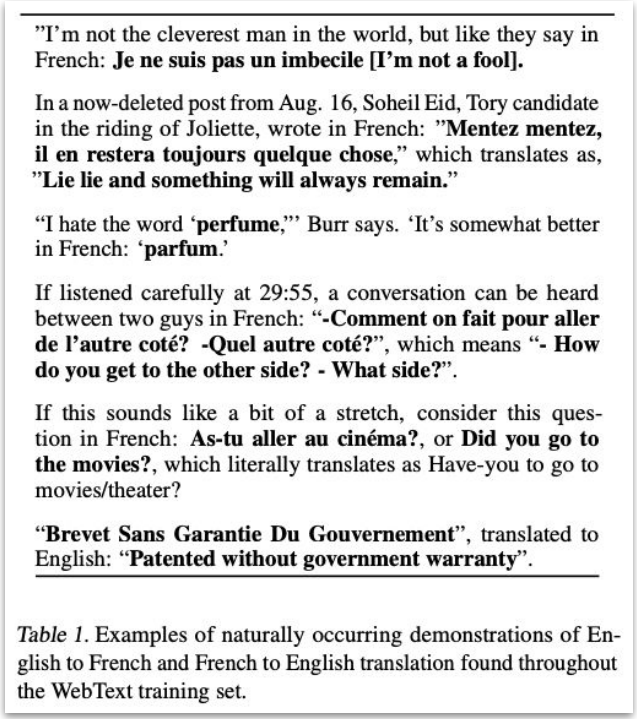


”I’m not the cleverest man in the world, but like they say in French: **Je ne suis pas un imbecile [I’m not a fool].**

In a now-deleted post from Aug. 16, Soheil Eid, Tory candidate in the riding of Joliette, wrote in French: ”**Mentez mentez, il en restera toujours quelque chose**,” which translates as, ”**Lie lie and something will always remain.**”

“I hate the word ‘**perfume**,”’ Burr says. ‘It’s somewhat better in French: ‘**parfum**.’

If listened carefully at 29:55, a conversation can be heard between two guys in French: “**-Comment on fait pour aller de l’autre coté? -Quel autre coté?**”, which means “**- How do you get to the other side? - What side?**”.

If this sounds like a bit of a stretch, consider this question in French: **As-tu aller au cinéma?**, or **Did you go to the movies?**, which literally translates as Have-you to go to movies/theater?

“**Brevet Sans Garantie Du Gouvernement**”, translated to English: “**Patented without government warranty**”.

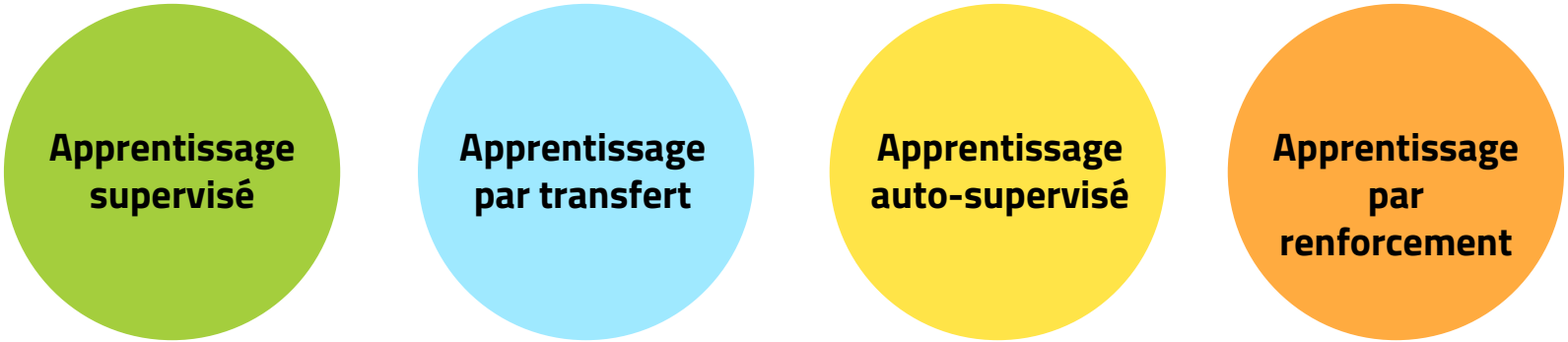
Table 1. Examples of naturally occurring demonstrations of English to French and French to English translation found throughout the WebText training set.

Comment entraîner un modèle ?

2021: interface conversationnel
Interaction avec le modèle sous forme d'une discussion

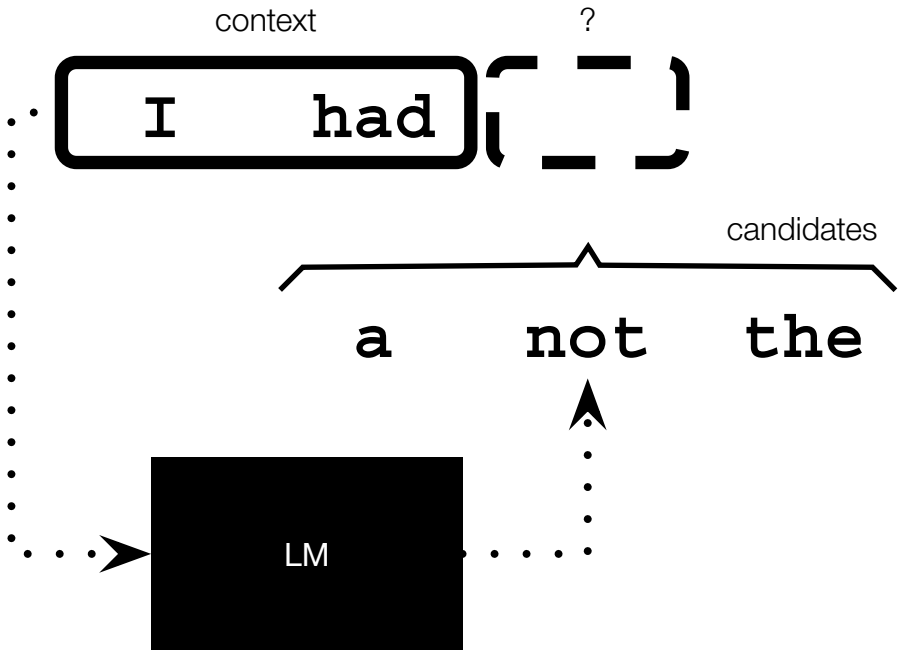
2021 : apprentissage "RLHF"
Amélioration du modèle en utilisant du renforcement de l'apprentissage par les retours humains

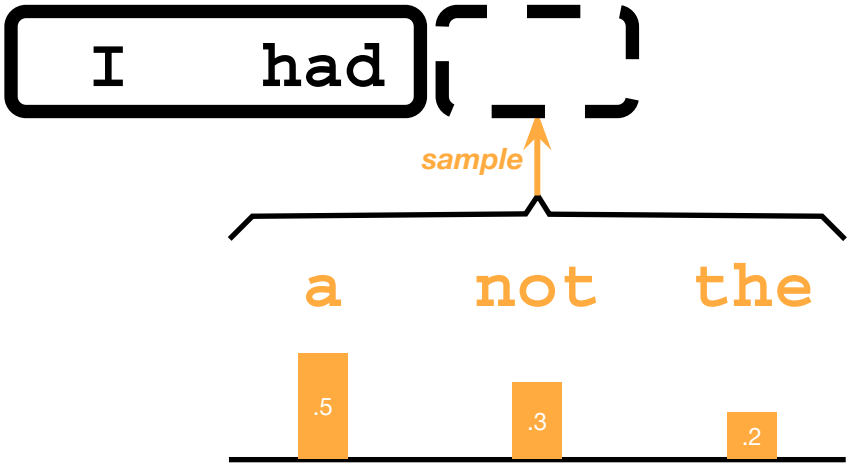
Les approches de formations



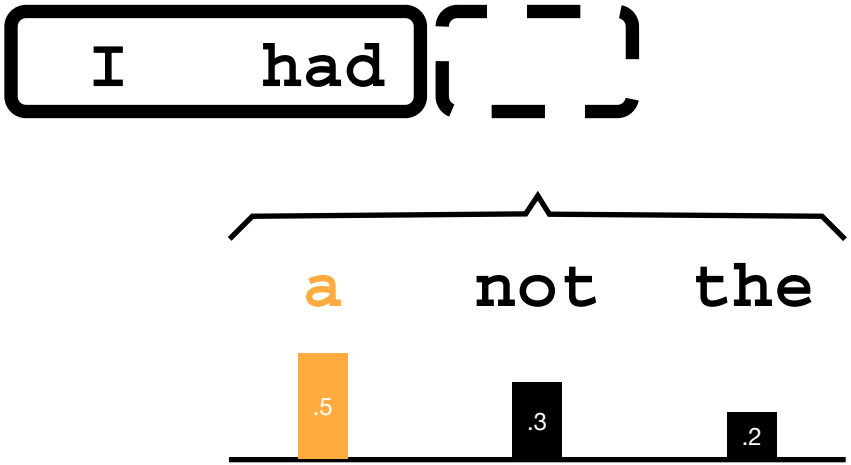
“The unicorns were able to communicate with each other, they said unicorns. a statement that the unicorns. Professor of the Department of Los Angeles, the most important place the world to be recognition of the world to be a of the world to be a of the world to be a of the world to be a of the world to be a of the world to be a of the world to be a of the world to be a of the…”

https://openai.com/blog/better-language-models/


context
?
I had
candidates
a not the
LM

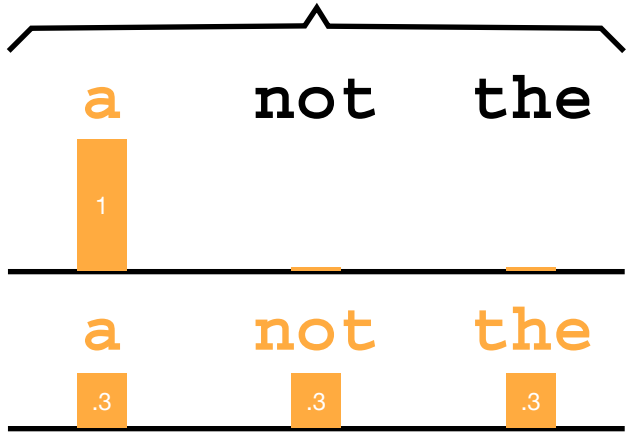

I had
sample
a not the
.5
.3
.2

greedy



temperature t

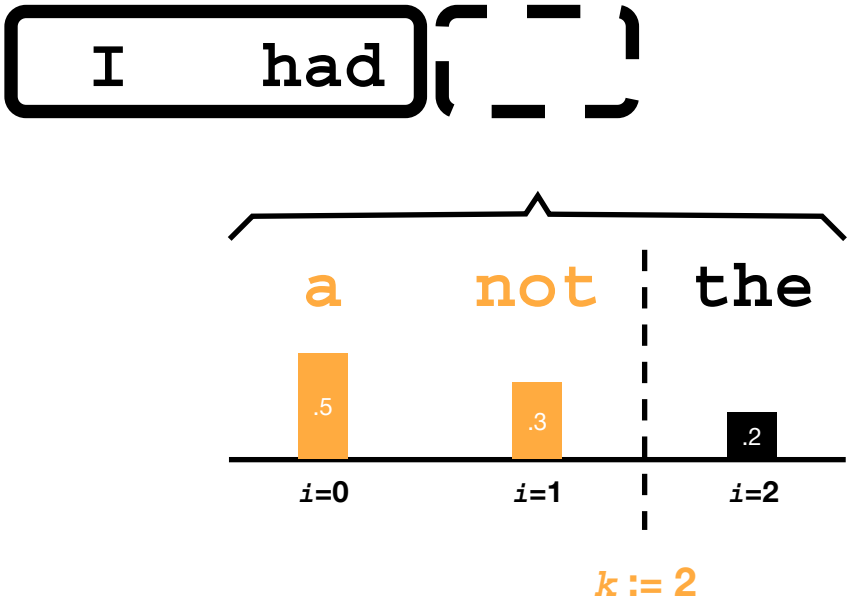
I had [ ]



$t \to 0$ *greedy*

$t \to \infty$ *uniform*

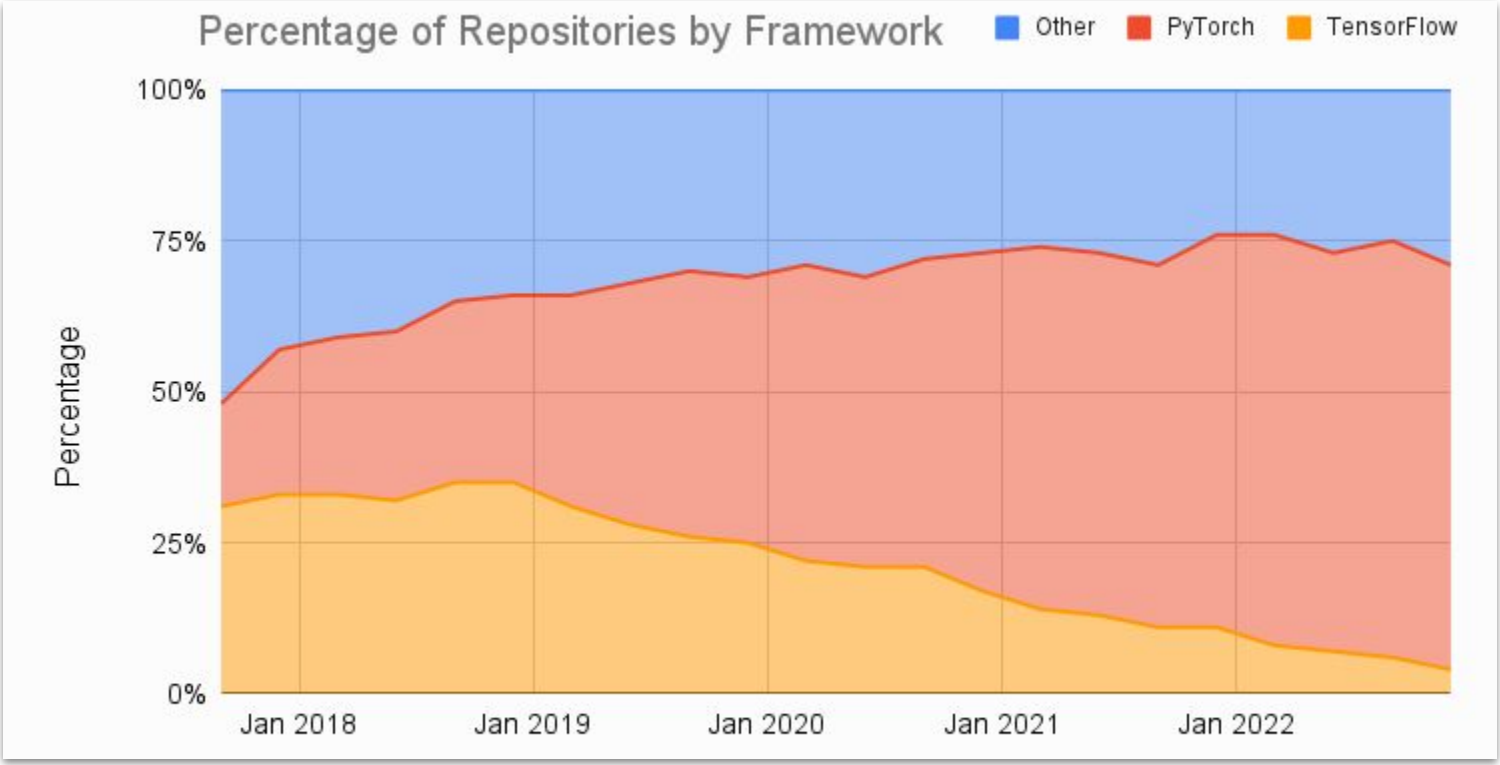
top-k



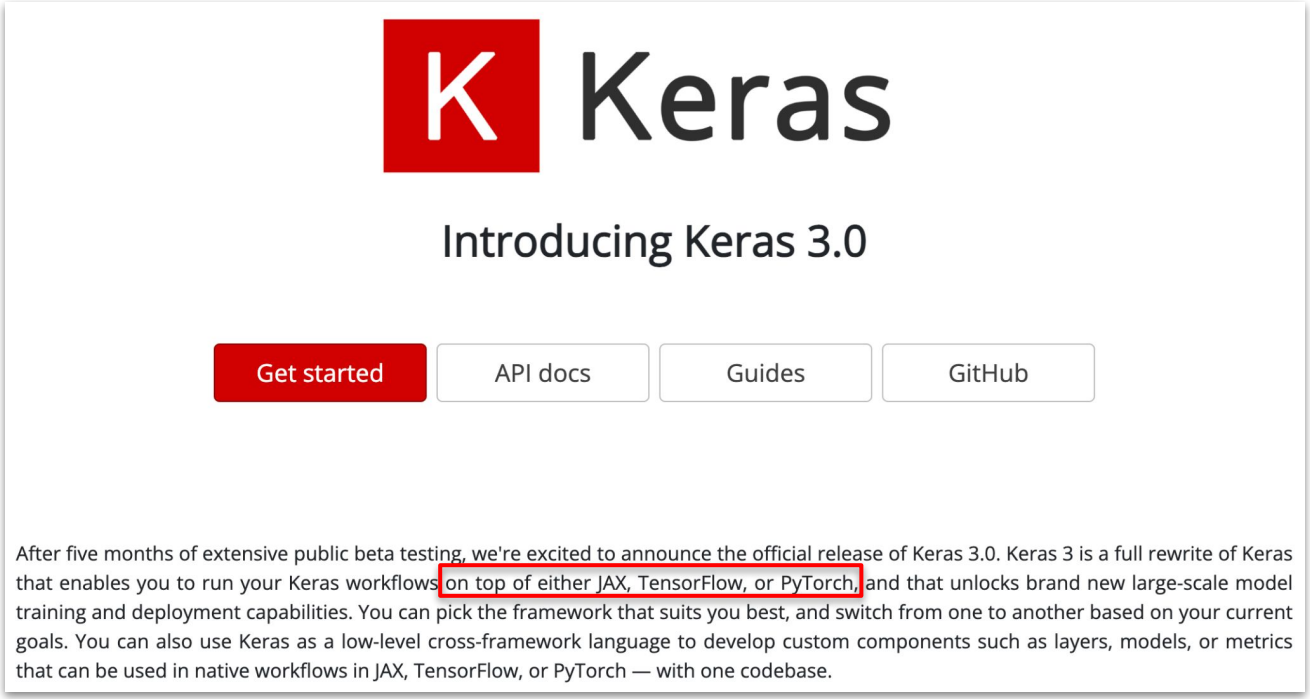
Génération de texte en pratique

Librairies de Machine Learning

TensorFlow
vs PyTorch



Librairies de Machine Learning



https://keras.io/keras_3

Novembre 2023

Reconnaissance d'images avec Keras

```
[ ] from keras import layers

    model = keras.Sequential(
        [
            layers.Flatten(input_shape=(28, 28)),
            layers.Dense(200, activation="relu"),
            layers.Dense(100, activation="relu"),
            layers.Dense(75, activation="relu"),
            layers.Dense(num_classes, activation="softmax"),
        ]
    )
```

```
[ ] 28*28*200
```

```
[ ] # "résumé" de notre modèle
    model.summary()
```

```
[ ] model.compile(
        loss="categorical_crossentropy",
        optimizer="adam",
        metrics=["accuracy"]
    )
```

```
[ ] model.fit(
        x_train, y_train,
        batch_size=128,
        epochs=3,
        validation_split=0.1
    )
```

```
[ ] model.evaluate(x_test, y_test, verbose=0)
```

Apprentissage par renforcement avec droneRL

```python
# Création des agents
agents = {drone.index: RandomAgent(env) for drone in env.drones}
agents[0] = DQNAgent(
    env,
    ConvQNetworkFactory(
        env,
        conv_layers=[
            {'out_channels': 32, 'kernel_size': 3, 'stride': 1, 'padding': 1},
            {'out_channels': 32, 'kernel_size': 3, 'stride': 1, 'padding': 1},
            {'out_channels': 64, 'kernel_size': 3, 'stride': 1, 'padding': 1},
            {'out_channels': 64, 'kernel_size': 3, 'stride': 1, 'padding': 1},
        ],
        dense_layers=[
            1024, 256
        ]),
    gamma=0.95,
    epsilon_start=1,
    epsilon_decay=0.99,
    epsilon_end=0.01,
    memory_size=10000,
    batch_size=64,
    target_update_interval=5
)
trainer = MultiAgentTrainer(env, agents, reset_agents=True, seed=0)
agents[0].qnetwork
```

```python
# Entrainement
# on appelle trainer.train plusieurs fois pour changer d'environnement
for run in range(4):
  trainer.train(1000)
```

Génération de texte avec PyTorch

In [795…

```
for i in range(200000):

  # minibatch construct
  ix = torch.randint(0, Xtr.shape[0], (32,))

  # forward pass
  emb = C[Xtr[ix]] # (32, 3, 10)
  h = torch.tanh(emb.view(-1, 30) @ W1 + b1) # (32, 200)
  logits = h @ W2 + b2 # (32, 27)
  loss = F.cross_entropy(logits, Ytr[ix])
  #print(loss.item())

  # backward pass
  for p in parameters:
    p.grad = None
  loss.backward()

  # update
  #lr = lrs[i]
  lr = 0.1 if i < 100000 else 0.01
  for p in parameters:
    p.data += -lr * p.grad

  # track stats
  #lri.append(lre[i])
  stepi.append(i)
  lossi.append(loss.log10().item())

#print(loss.item())
```

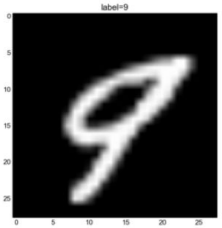
Mise en pratique

Génération de texte

https://colab.research.google.com/#create=true

Encodage des labels

Image :

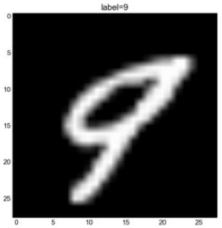


Label : **9**

Label,
représenté en “one-hot” : `0,0,0,0,0,0,0,0,0,1`

Encodage des labels

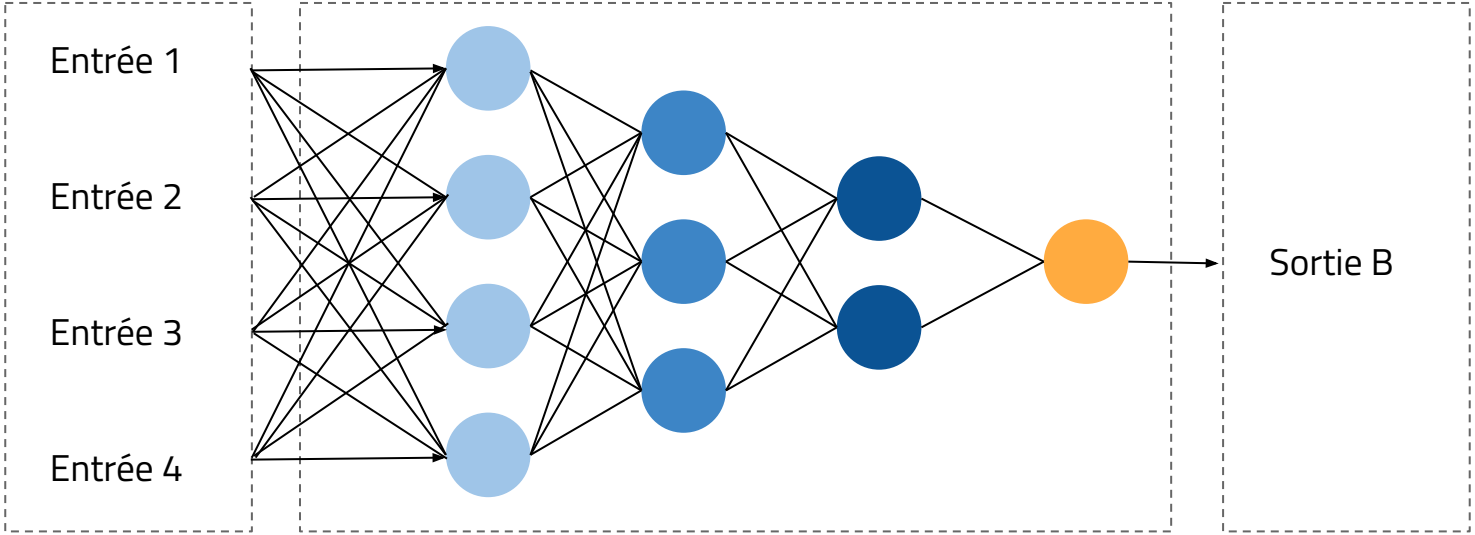
Image :



Label : **9**

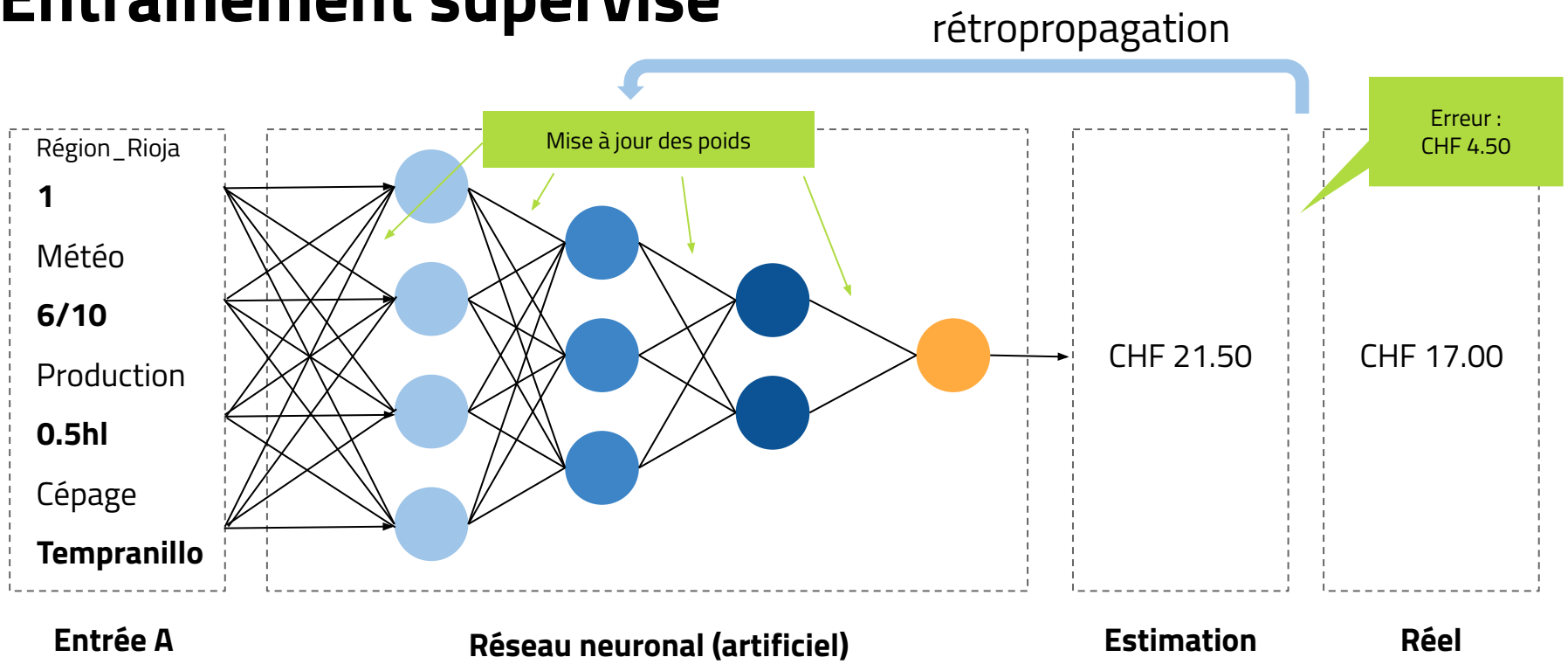
Label,
représenté en “one-hot” : `0,0,0,0,0,0,0,0,0,1`

Réseaux neuronaux

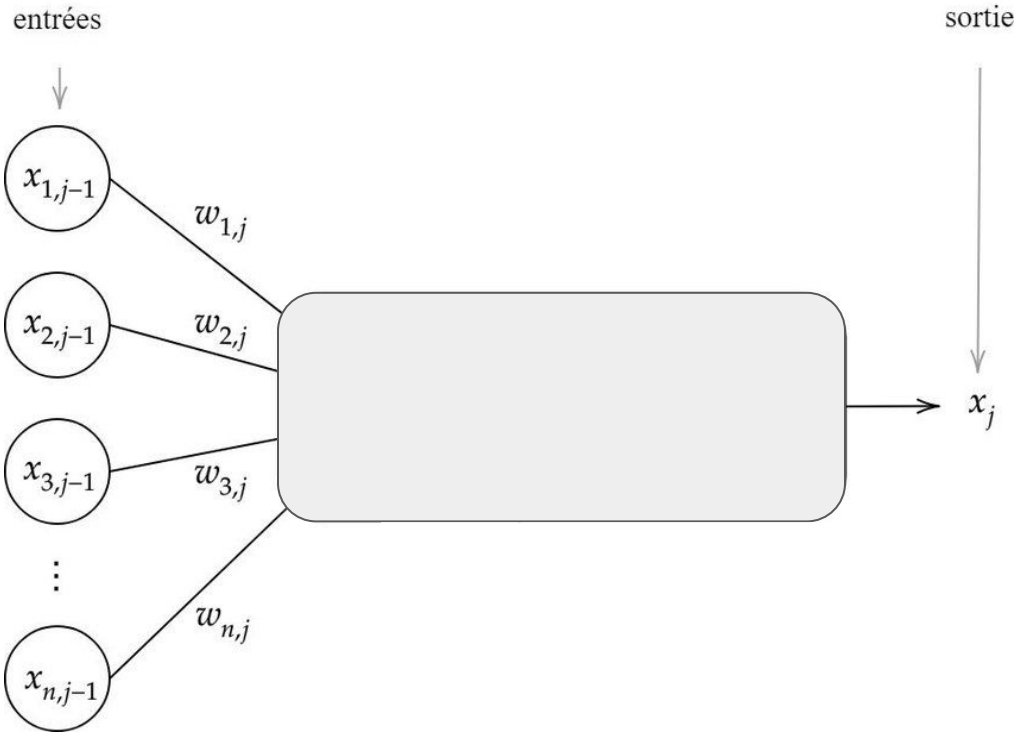


Modèle

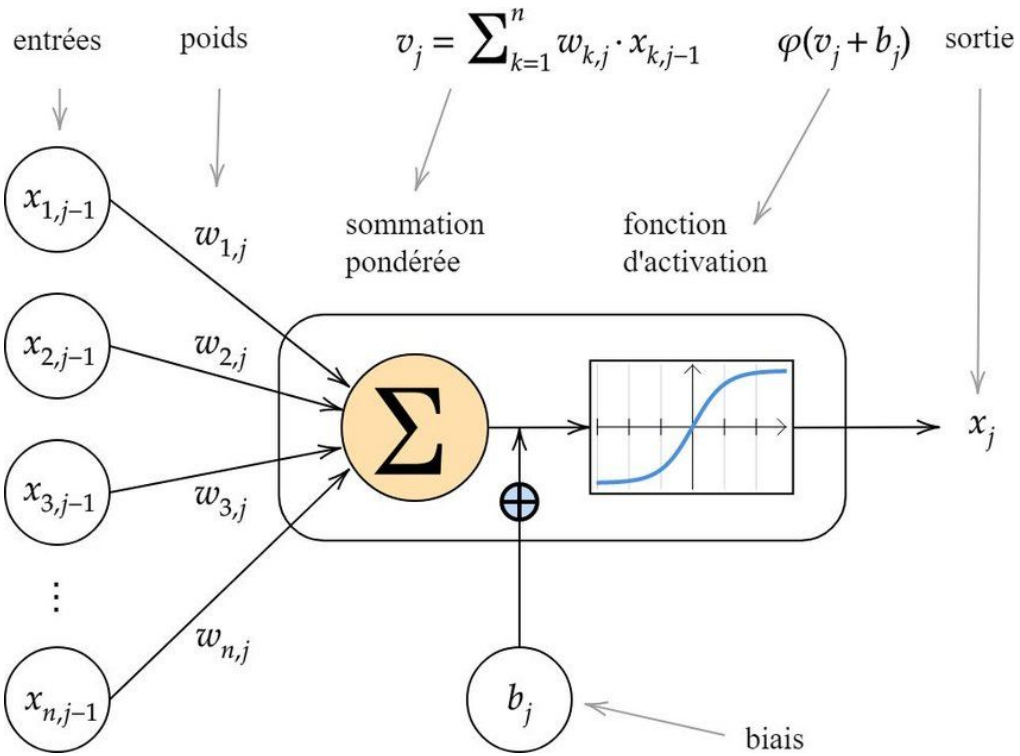
Entrainement supervisé



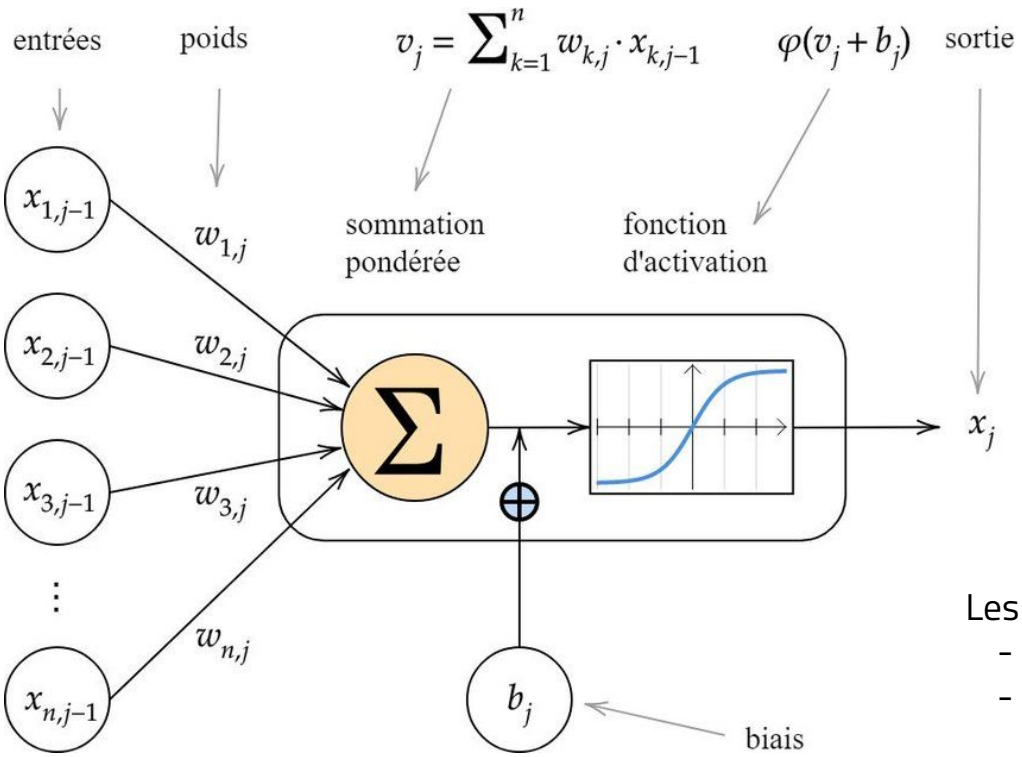
Regardons un seul neurone



Regardons un seul neurone

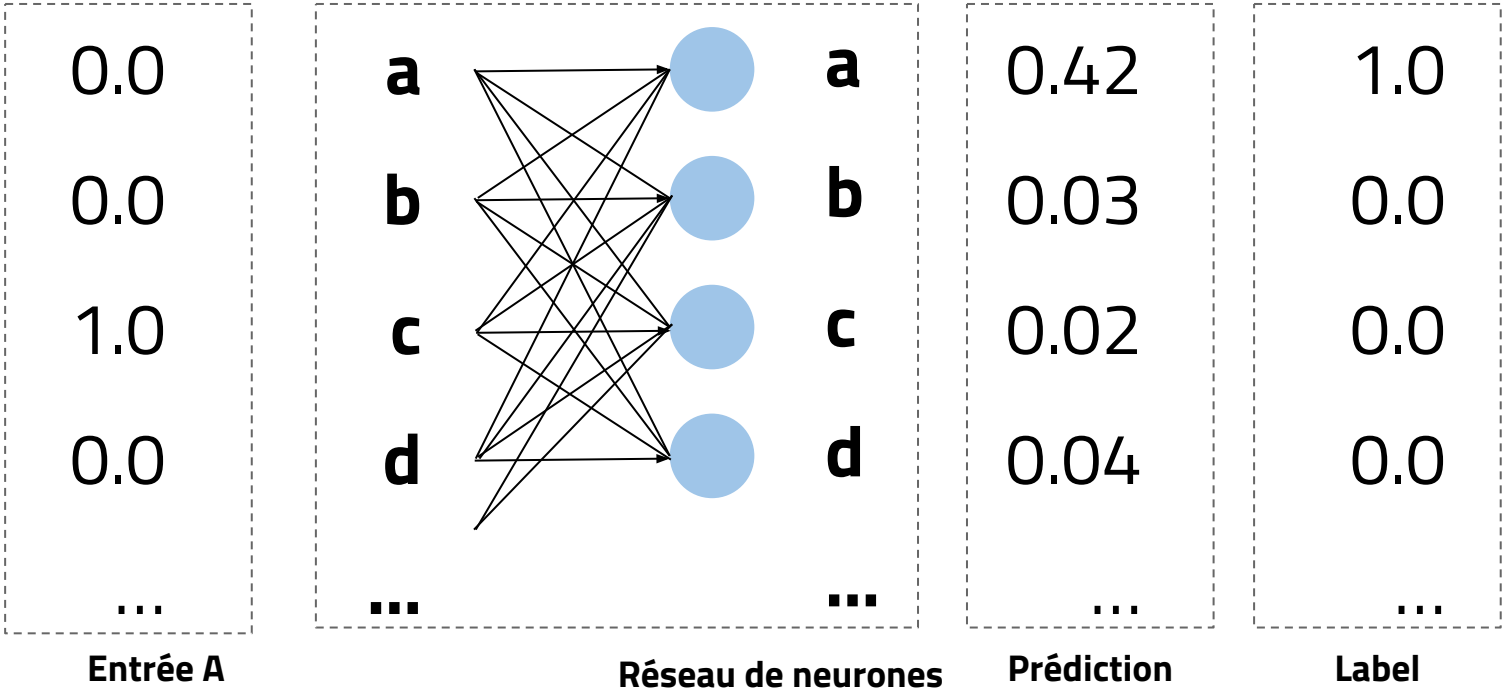


Regardons un seul neurone

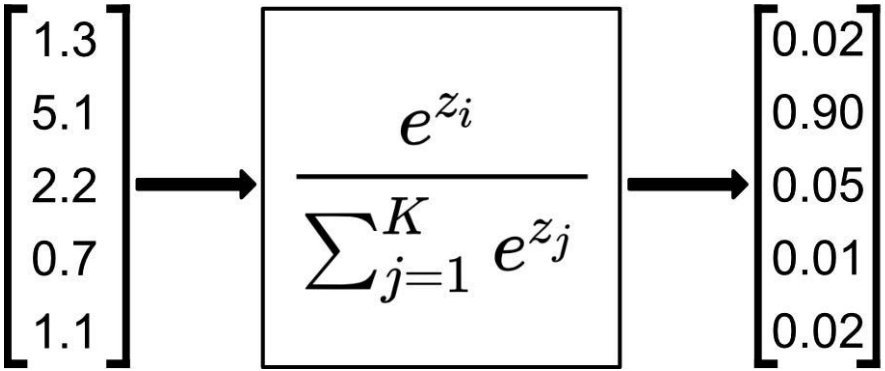


Les “paramètres” sont
- les poids
- les biais

Entrainement supervisé pour classification



Fonction Softmax pour la Classification



Entraînement supervisé pour classification