

# The Keras framework

Go with the (tensor)flow

Filippo Biscarini  
*Senior Scientist*  
*CNR, Milan (Italy)*

Nelson Nazzicari  
*Senior Scientist*  
*CREA, Lodi (Italy)*



# Why Keras?

- Deep learning on CPU/GPU/TPU
- Many available alternatives (PyTorch, Lasagne, fast.ai, Theano, TensorFlow, Caffe, Mxnet ...)
- Keras was born as a “library agnostic” layer supporting mainly three backends: Tensorflow, Theano and Microsoft CNTK ...
- ... but nowadays Tensorflow is one of the “winners” (more popular, more active community, more installations)



# What is Keras?

**Keras API**

TensorFlow / CNTK / MXNet / Theano / ...

**GPU**

**CPU**

**TPU**

From François Chollet



# What is Keras?

- Python library (modules and submodules):

```
— import keras.utils  
  
— from keras.models import Sequential  
  
— from keras.layers import Dense, Dropout, Activation, Flatten
```

- Clean, consistent API
- “User friendly” (as much as these things go)
- Define models via building blocks
- User defined forward-propagation → back-propagation is automatic



# Who is behind Keras?

 **633** contributors



From François Chollet



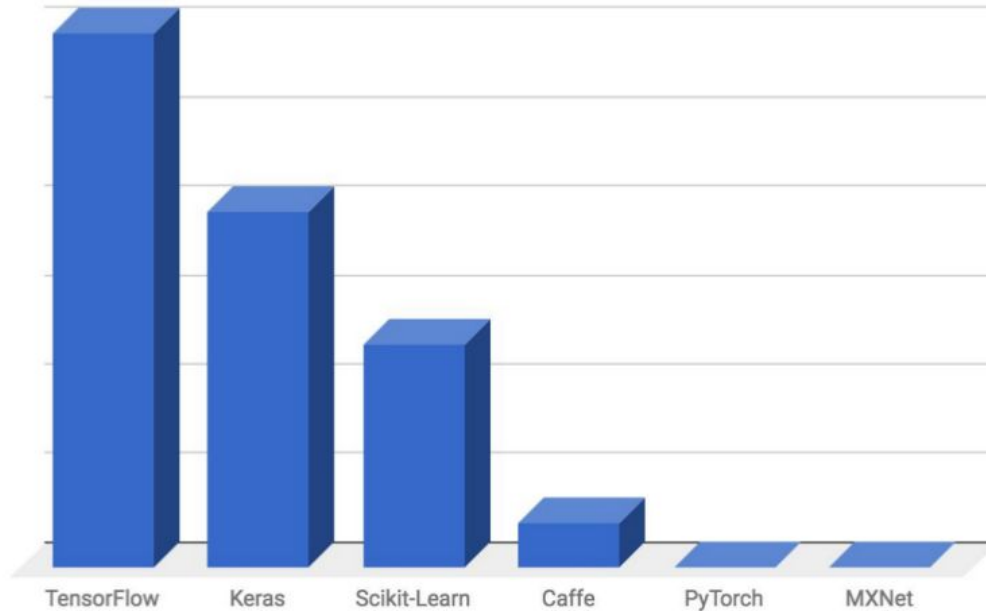
# Keras pros

- Large community of users
- Multi-backend, multi-platform
- Easy and quick development and deployment of deep learning models



# Keras - large community

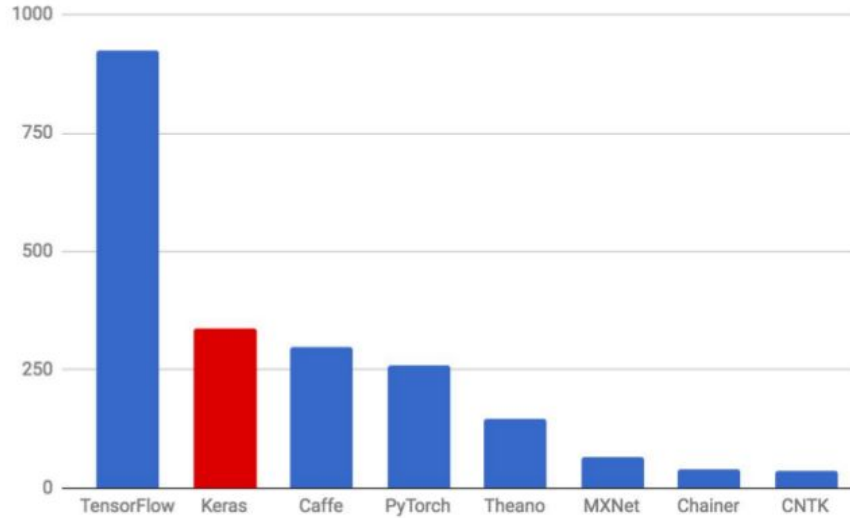
Hacker News jobs board mentions - out of 964 job postings



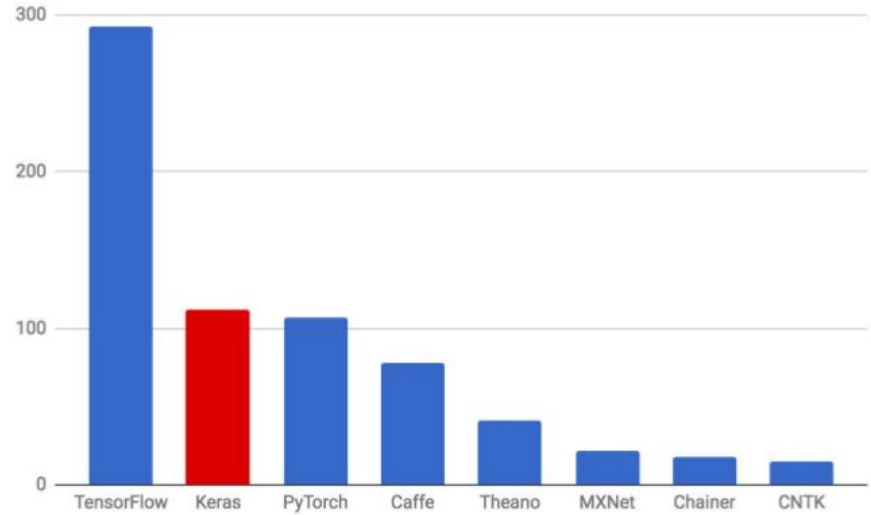
From François Chollet



# Keras - arXiv mentions



arXiv mentions as of 2018/03/07 (past 3 months)

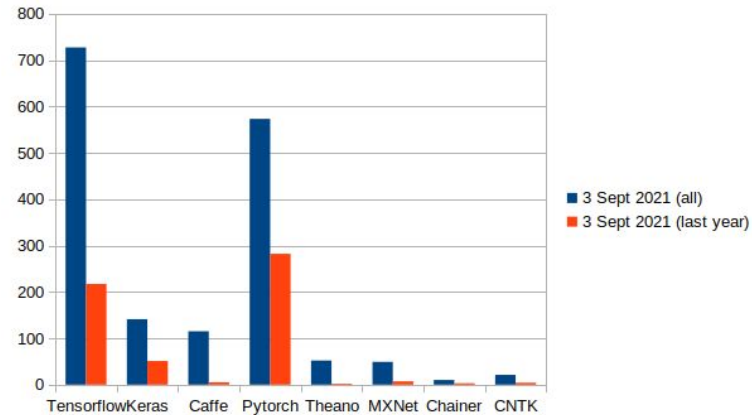
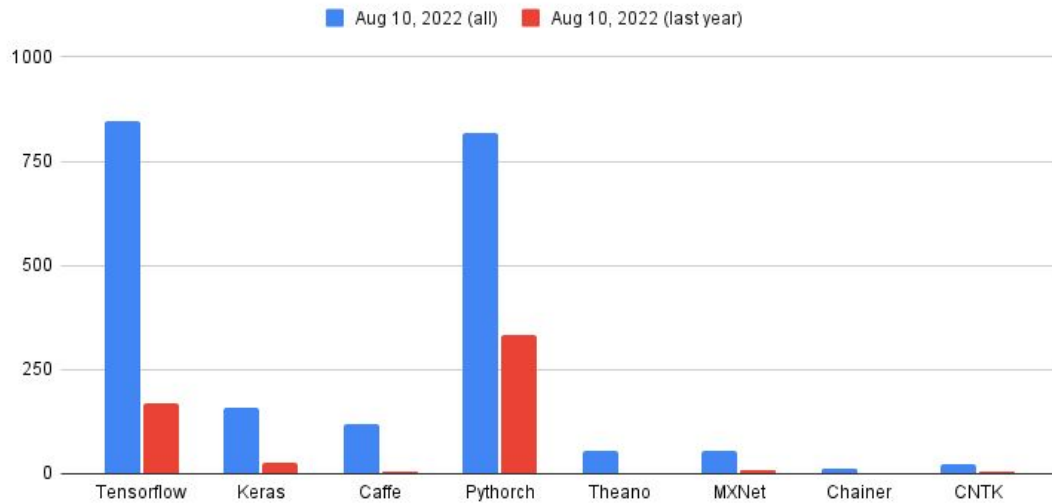


arXiv mentions as of 2018/03/07 (past 1 month)

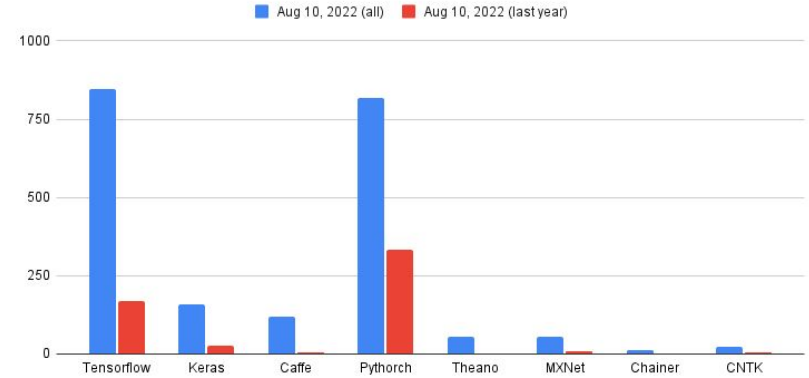
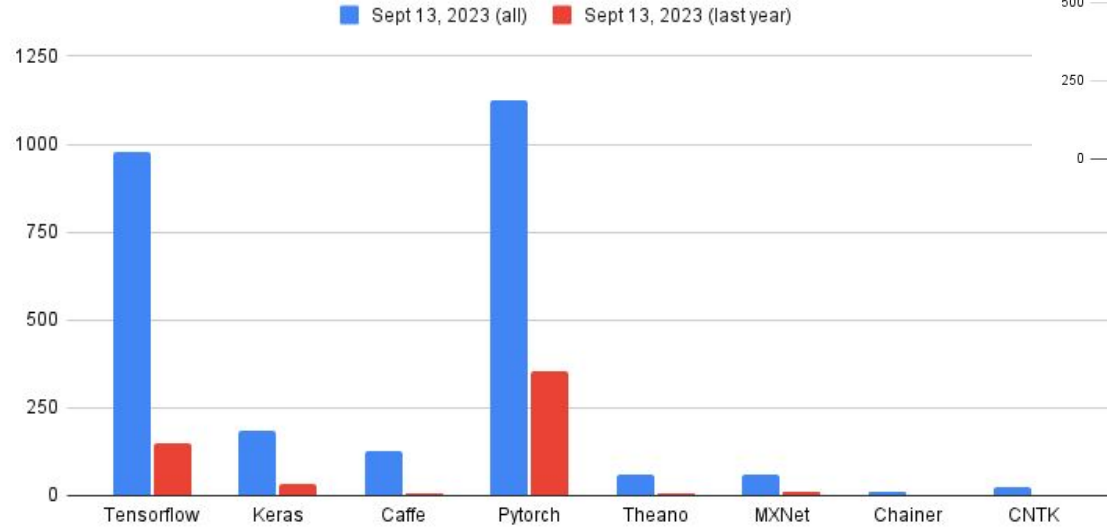




# Keras - arXiv mentions



# Keras - arXiv mentions



# Keras/Tensorflow vs Pytorch

[\[on google trends\]](#)



# Keras - multi-backend, multi-platform

- develop in **Python, R**
- on **Unix/Linux, MacOS, Windows**
- high-level wrapper for **TensorFlow** (but also Theano, CNTK etc.)
  - In practical terms it's now part of TensorFlow
- **CPU, GPU** (Nvidia, Amd), **TPU**



# Keras - easy and quick

- designed for humans, not machines: consistent and simple APIs, clear code, clear error feedback
- easy to learn and use: > productivity, > freedom to explore ideas
- easy, yet flexible: lower level APIs (e.g. TensorFlow) allow to implement anything you need



# A keras workflow

1. **Prepare and split data**
  - a. NumPy arrays
  - b. `from keras.preprocessing.image import ImageDataGenerator`
  - c. ... but also `.sequence` and `.text`
2. **Define the model** (`from keras.layers import Dense, Dropout, Activation, Flatten ...`)
3. **Compile the model** (`model.compile(...)`)
  - a. Choose loss, optimizer
4. **Fit the model** (`model.fit(...)`)
5. **Predict result for unknown value** (`model.evaluate(...)`)
6. **Modify until satisfied**
7. **Save for future use** (`model.save(...)`)



# [REF] Keras tutorials and docs

- [https://www.tutorialspoint.com/keras/keras\\_introduction.htm](https://www.tutorialspoint.com/keras/keras_introduction.htm) [very good]
- [https://keras.io/getting\\_started/intro\\_to\\_keras\\_for\\_engineers/](https://keras.io/getting_started/intro_to_keras_for_engineers/)
- <https://keras.io/api/> the official doc
- <https://playground.tensorflow.org> to see a neural network live



# Keras

- It's time for exercises!
- see notebook “keras\_basics”

