

Aula 17 – Redes Neurais Convolucionais

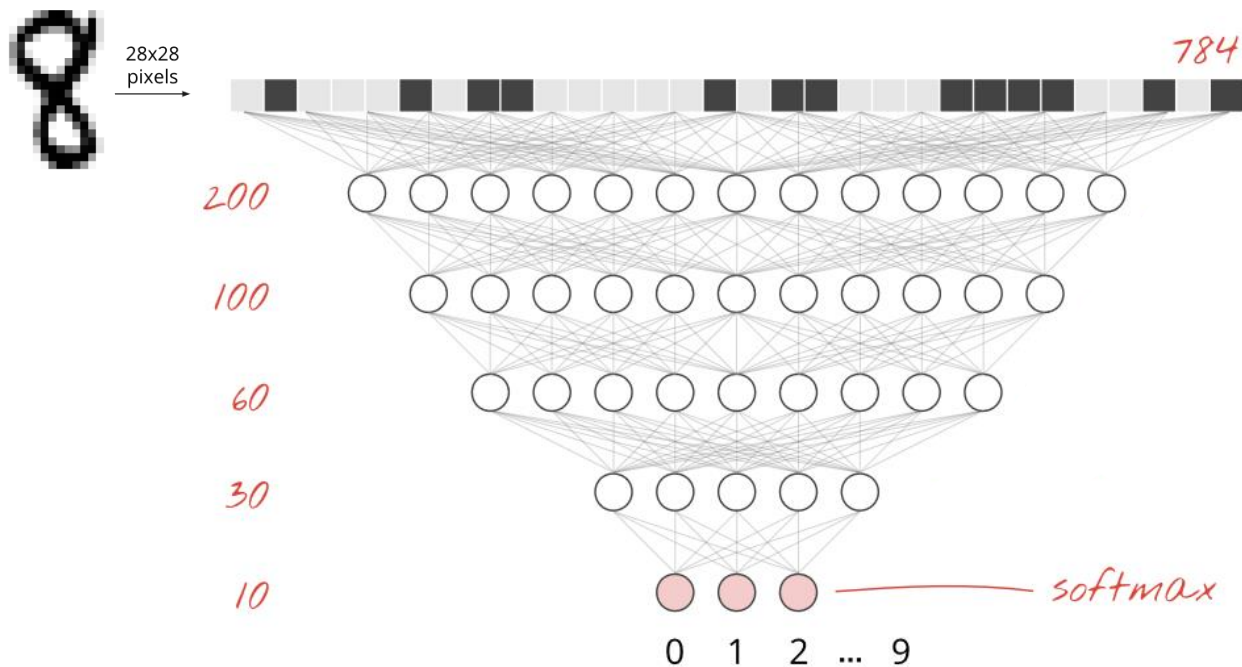
Prof. João Fernando Mari

joaofmari.github.io

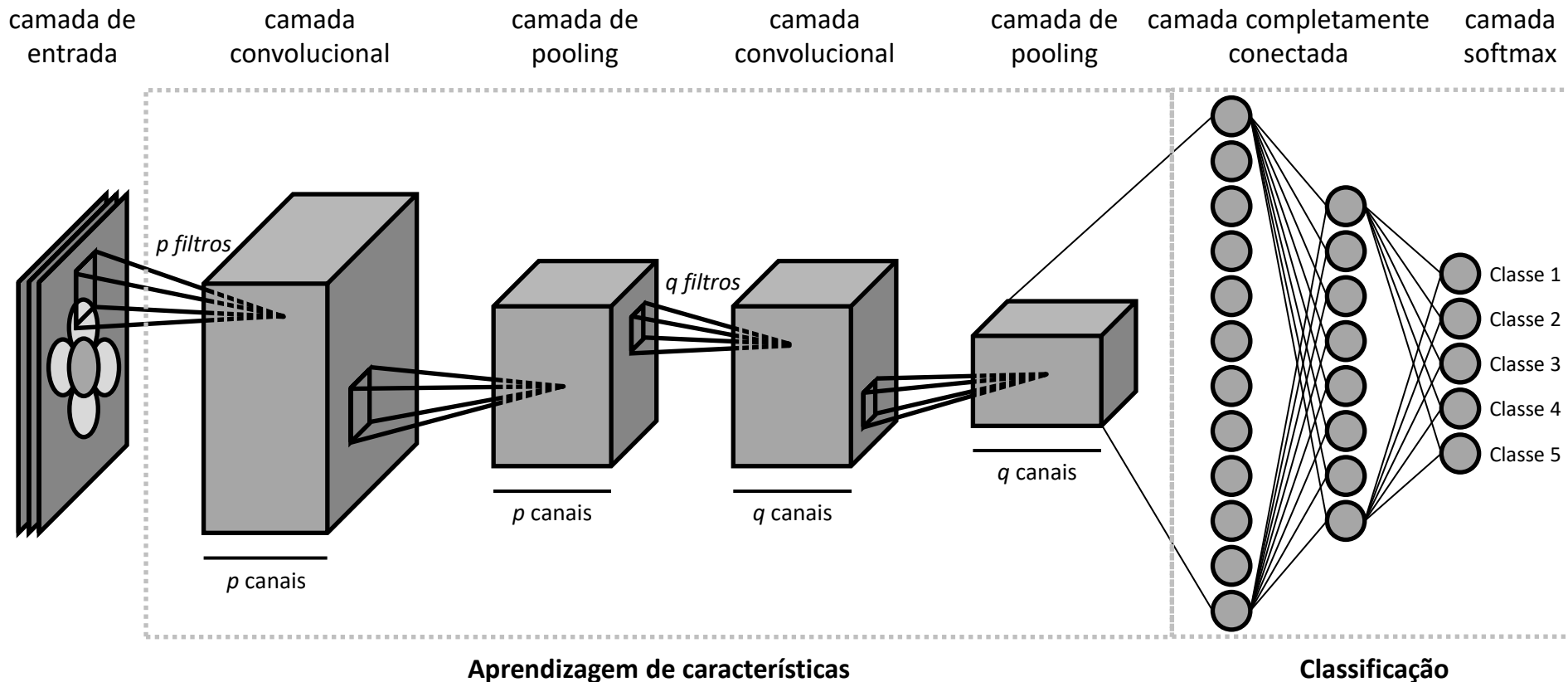
joaof.mari@ufv.br

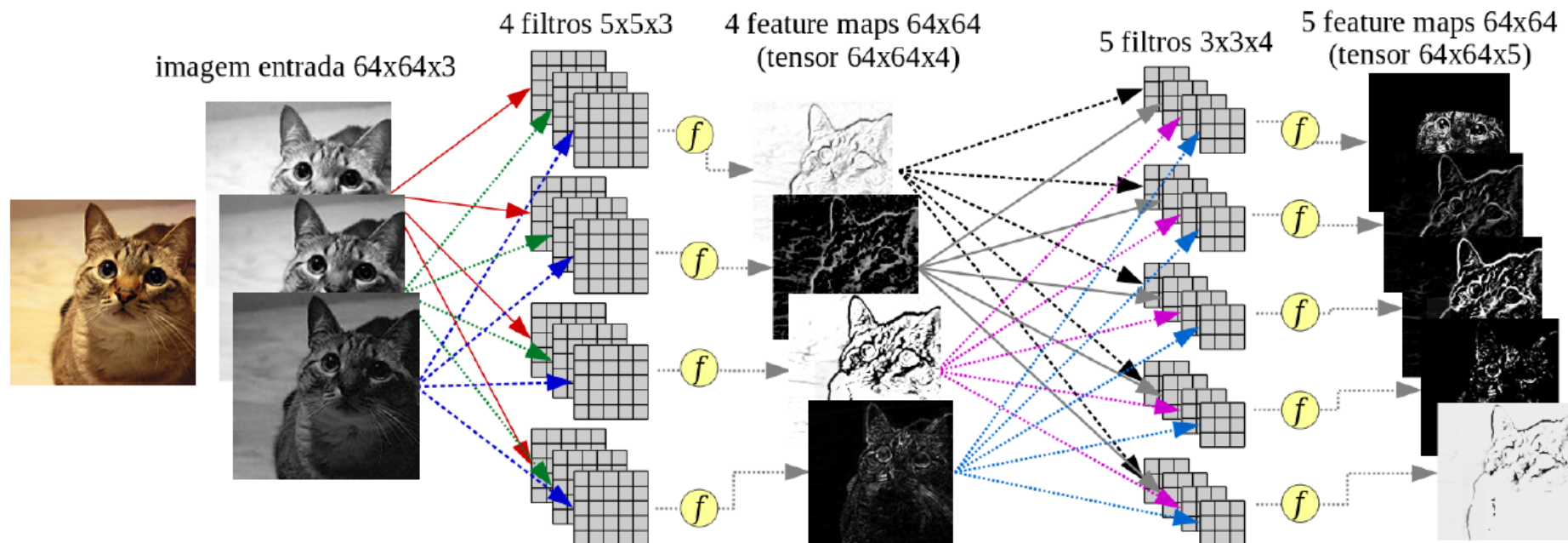
- Perceptron de multiplas camadas (MLP)
- Redes Neurais Convolucionais (CNNs)
- Camada convolucional
- Camada de pooling
- Modelos
- Bibliotecas e ambientes de desenvolvimento
- Conjuntos de imagens

Perceptron de multiplas camadas (MLP)

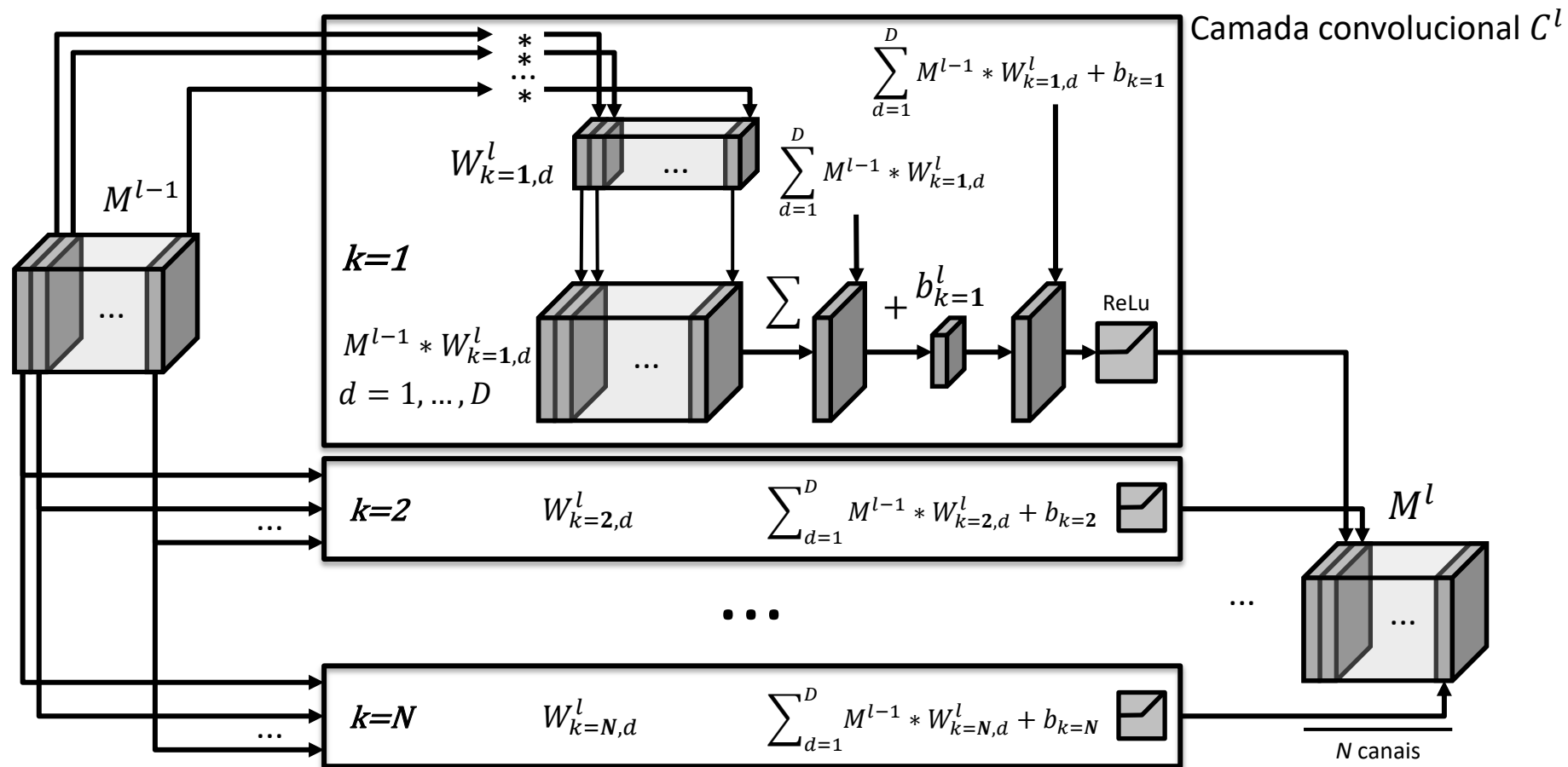


Redes Neurais Convolucionais (CNNs)

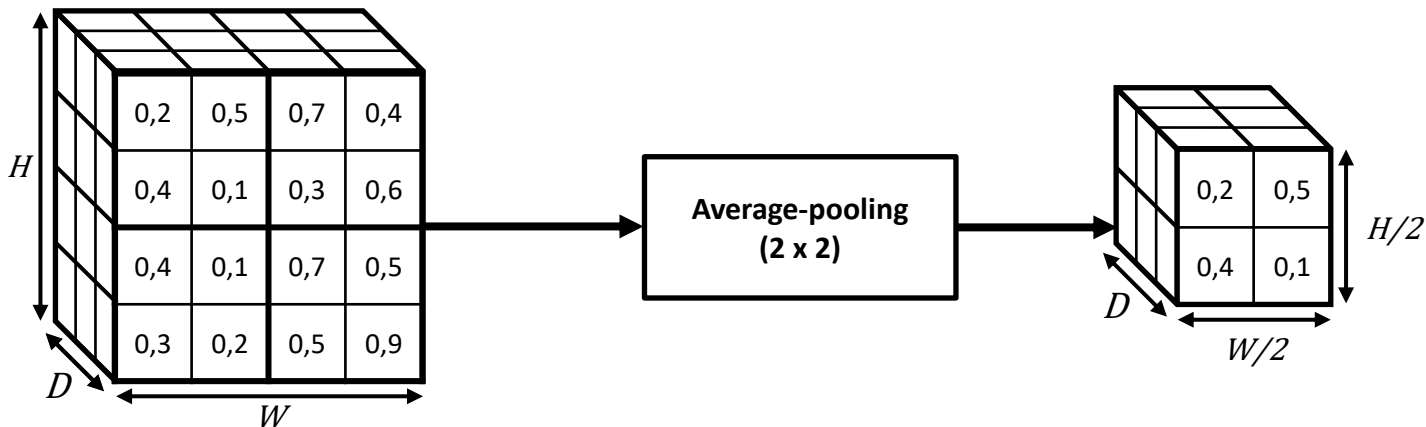
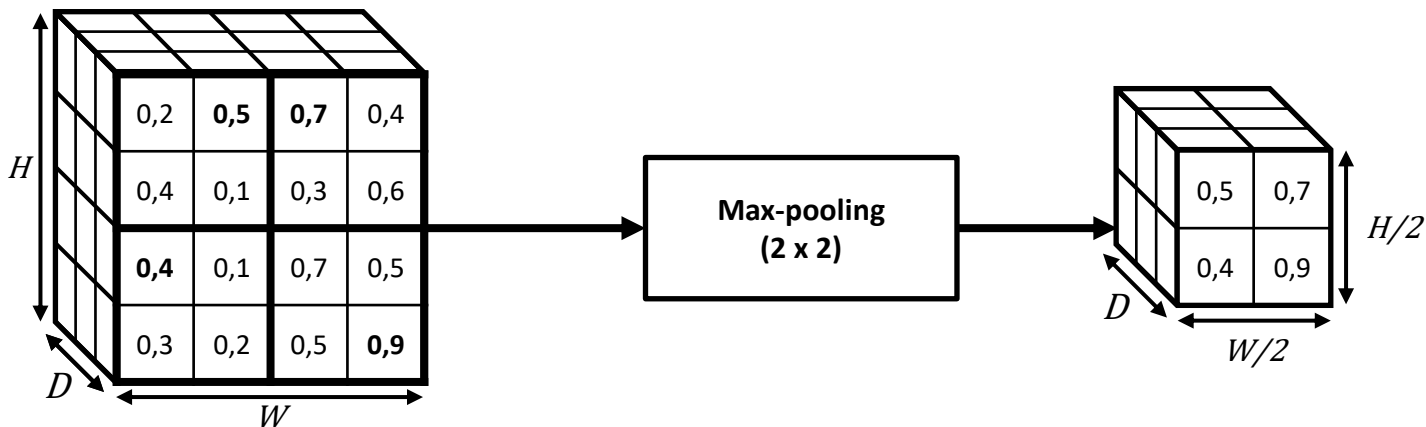




Camada convolucional

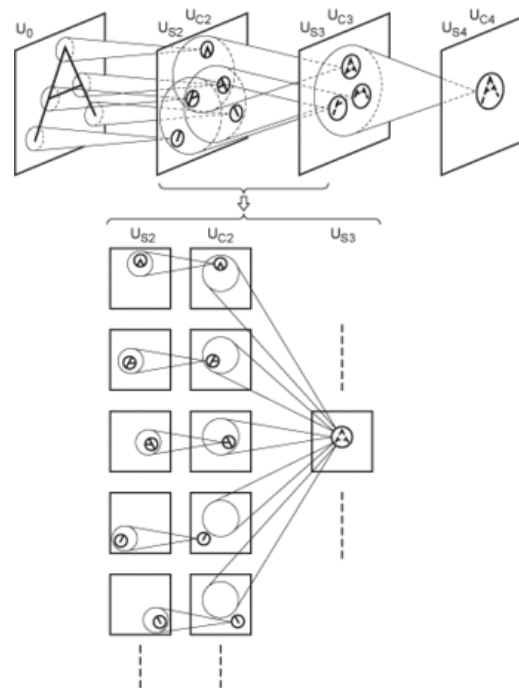
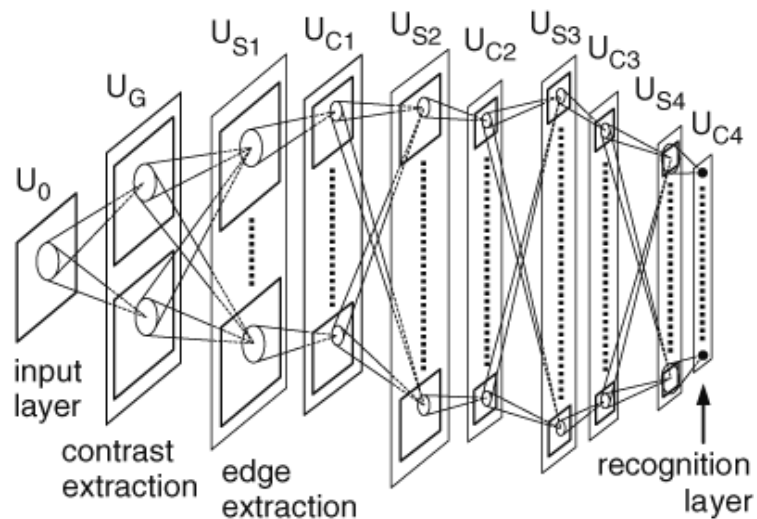


Camada de pooling



MODELOS

Neocognitron (1980)



Kunihiro Fukushima

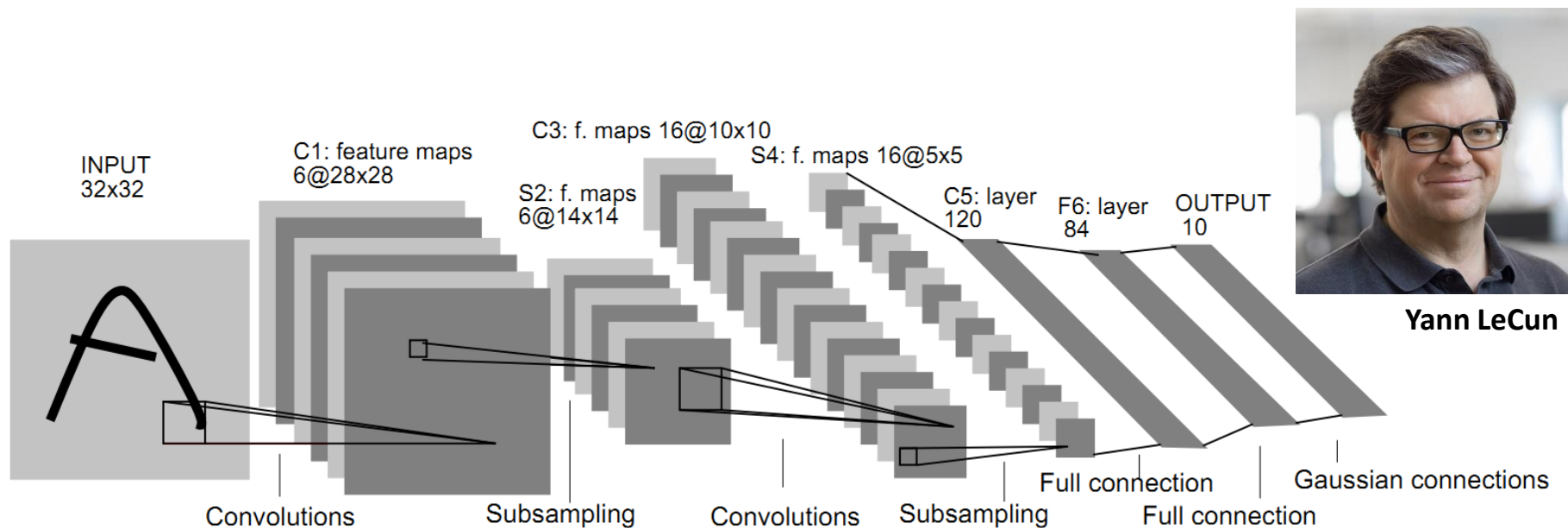
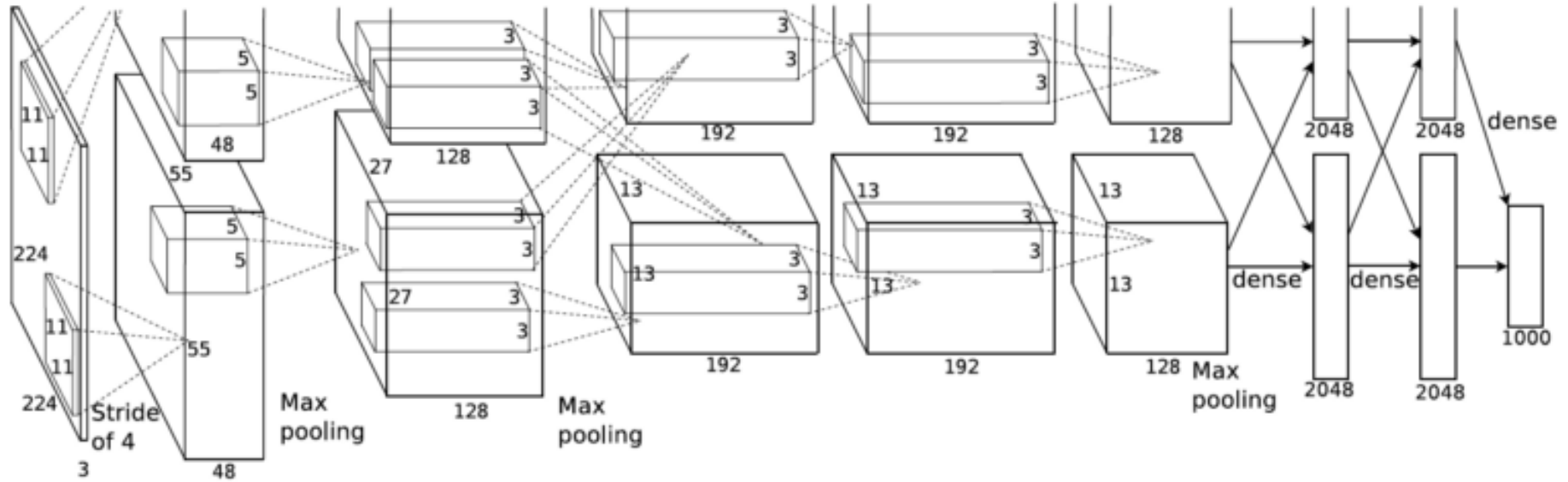
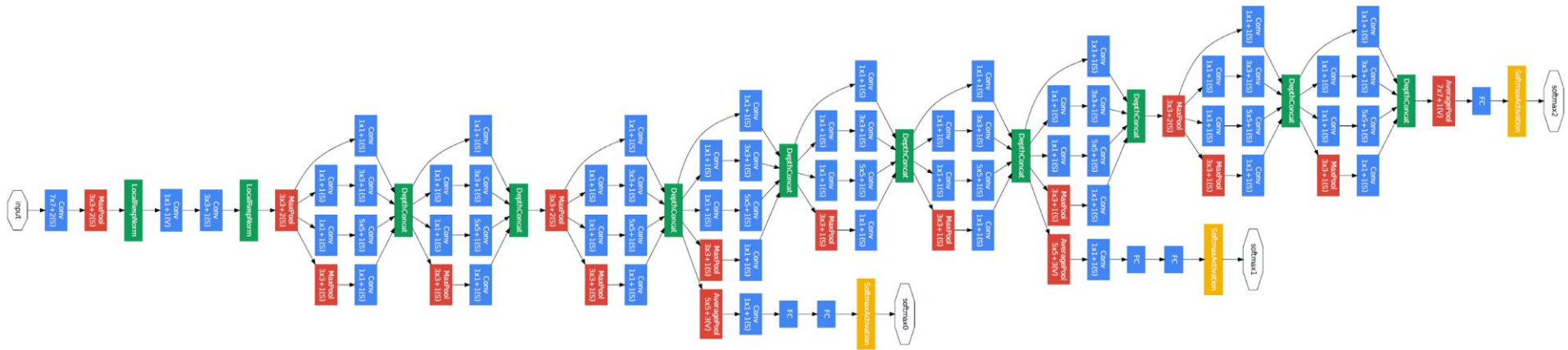
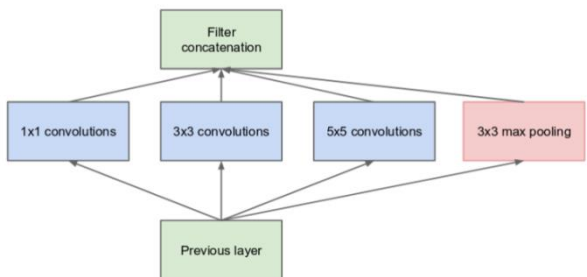


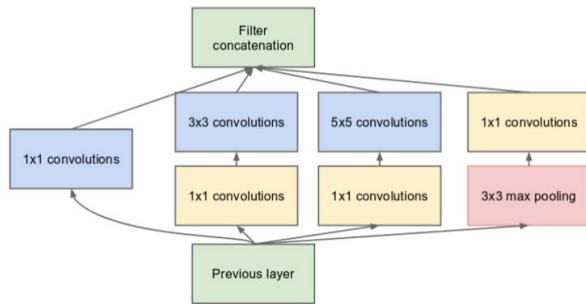
Fig. 2. Architecture of LeNet-5, a Convolutional Neural Network, here for digits recognition. Each plane is a feature map, i.e. a set of units whose weights are constrained to be identical.



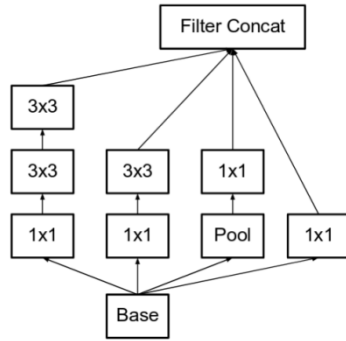
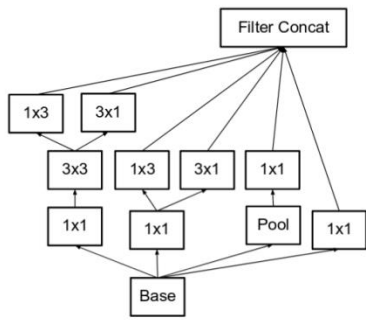
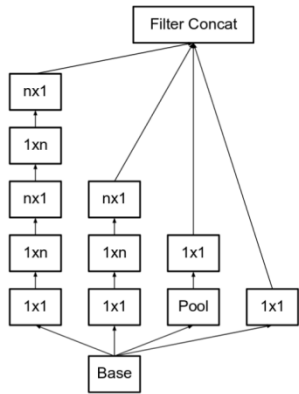




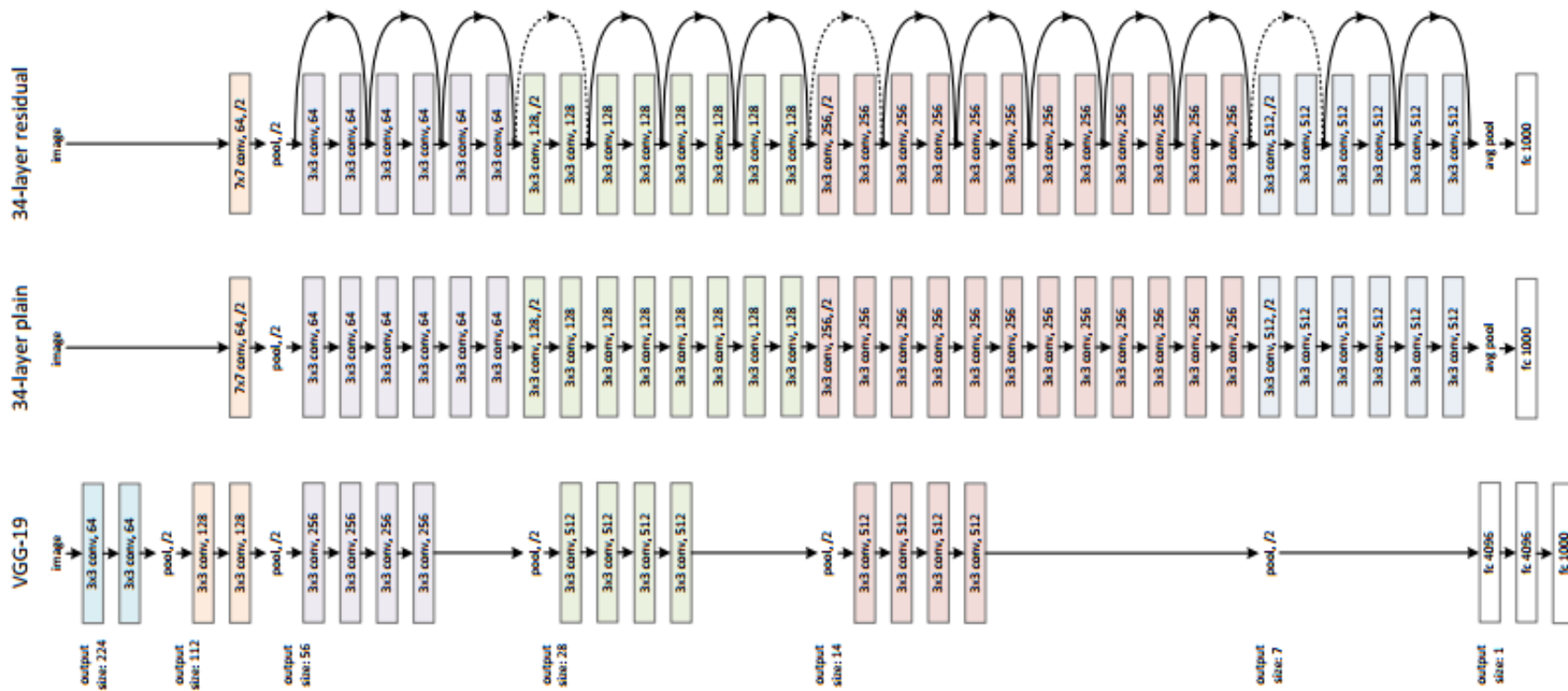
(a) Inception module, naïve version



(b) Inception module with dimension reductions



VGG (2014) e ResNet (2015)



BIBLIOTECAS E AMBIENTES DE DESENVOLVIMENTO

- O treinamento de CNNs possui alto custo computacional.
 - Recomenda-se que sejam treinados usando GPUs.
 - O Google Colab fornece acesso à GPUs (com algumas restrições).



- Principais bibliotecas para Deep Learning e Redes Neurais Convolucionais
 - PyTorch
 - <https://pytorch.org/>
 - Tensorflow
 - <https://www.tensorflow.org/>



- **Anaconda Distribution:**
 - Distribuição Python com suporte às principais bibliotecas
 - <https://www.anaconda.com/products/distribution>
- **Google Colab:**
 - Ambiente de execução em nuvem com GPUs.
 - <https://colab.research.google.com>



CONJUNTOS DE IMAGENS

Conjuntos de imagens

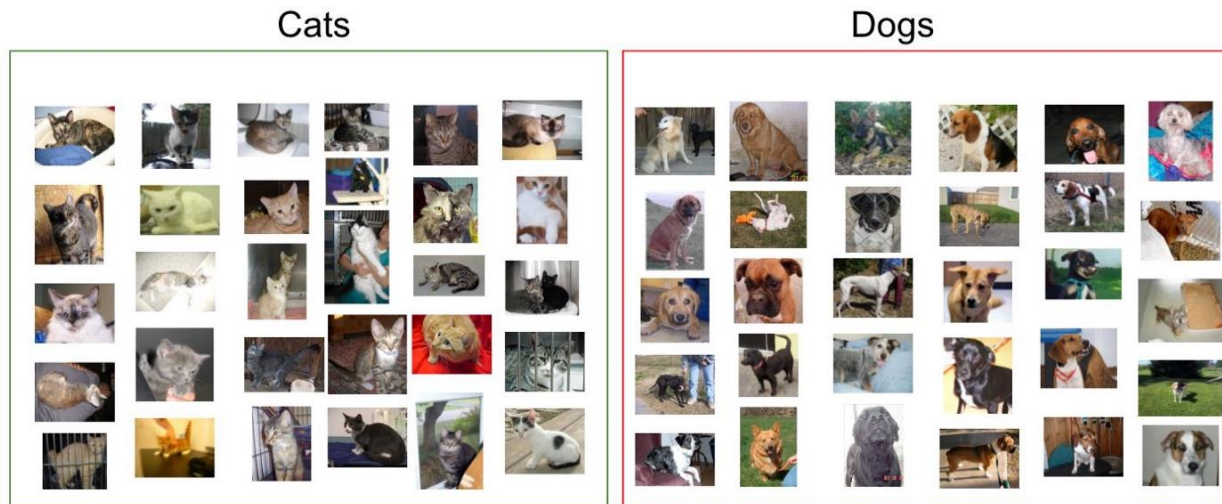
- MNIST

- <http://yann.lecun.com/exdb/mnist/>
- 60,000 training images
- 10,000 testing images
- 28 x 28 pixels
- Níveis de cinza



Conjuntos de imagens

- Cats vs. Dogs
 - <https://www.kaggle.com/c/dogs-vs-cats>
 - 25,000 images de treinamento
 - 12,500 imagens de teste
 - 2 classes
 - Diversos tamanhos
 - RGB



Sample of cats & dogs images from Kaggle Dataset

Conjuntos de imagens

- CIFAR10
 - <https://www.cs.toronto.edu/~kriz/cifar.html>
 - 50,000 training images
 - 10,000 testing images
 - 10 classes
 - 32 x 32 pixels
 - RGB

airplane

automobile

bird

cat

deer

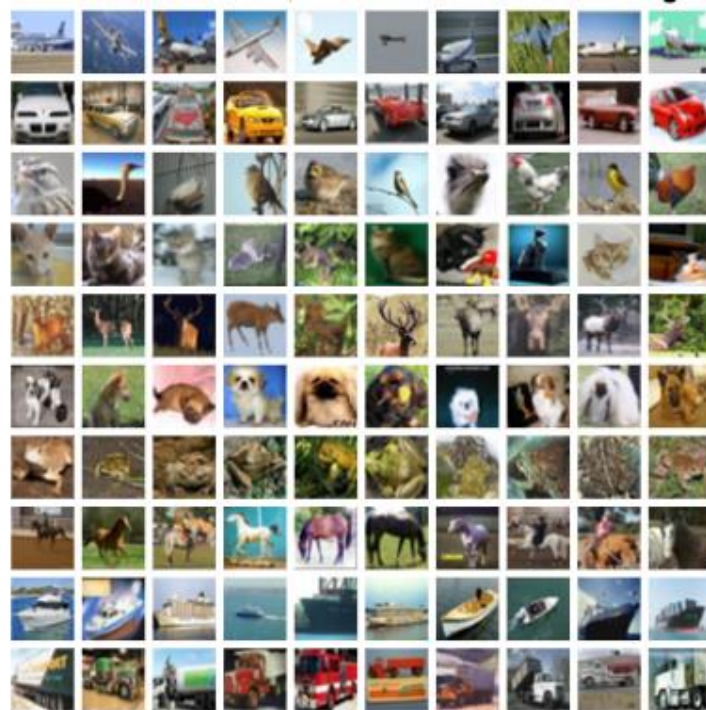
dog

frog

horse

ship

truck



- ImageNet

- <https://www.image-net.org/>
- ~1,000,000 imagens
- 1,000 classes
- RGB

IMAGENET



- Ponti et al. **Everything You Wanted to Know about Deep Learning for Computer Vision but Were Afraid to Ask**. Sibgrapi 2017.
 - <https://sites.icmc.usp.br/moacir/p17sibgrapi-tutorial/>
- Prof. Moacir Ponti (ICMC-USP). **Material para o minicurso *Deep Learning***
 - https://github.com/maponti/deeplearning_intro_datascience
- Görner, M. **Learn TensorFlow and deep learning, without a Ph.D.**
 - <https://cloud.google.com/blog/products/gcp/learn-tensorflow-and-deep-learning-without-a-phd>
- CS231n: Convolutional Neural Networks for Visual Recognition
 - <http://cs231n.github.io/>
- Goodfellow, Bengio e Courville. **Deep Learning**. MIT Press, 2016
 - <https://www.deeplearningbook.org/>
- The MathWorks, Inc. **What is a Convolutional Neural Network? 3 things you need to know.**
 - <https://www.mathworks.com/discovery/convolutional-neural-network-matlab.html>

- Rodrigues, L. F.; Naldi M. C., **Mari, J. F.** *Comparing convolutional neural networks and preprocessing techniques for HEp-2 cell classification in immunofluorescence images.* **Computers in Biology and Medicine**, 2019.
 - <https://doi.org/10.1016/j.compbiomed.2019.103542>

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FIM DA DISCIPLINA!