Deep Learning Course

Picsart Academy

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Outline

Session 1

Deep Learning

What is Deep Learning?

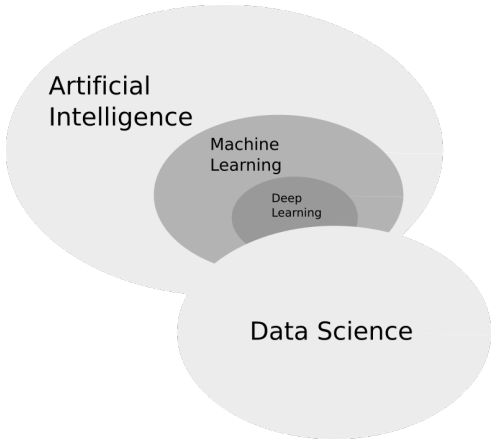


Figure 1: Where does Deep Learning stand in AI?

"Deep learning is a specific subfield of machine learning: a new take on learning representations from data that puts an emphasis on learning successive layers of increasingly meaningful representations. The "deep" in "deep learning" isn't a reference to any kind of deeper understanding achieved by the approach; rather, it stands for this idea of successive layers of representations."

François Chollet in Deep Learning with Python, Second Edition

Frameworks

What is Deep Learning Framework?

"Deep learning (DL) frameworks offer building blocks for designing, training, and validating deep neural networks through a high-level programming interface."

Nvidia

Most popular:

- PyTorch
- TensorFlow and Keras
- MXNet
- JAX

Introduction: Recommended Material

- Chapter 1, Deep Learning with Python, Second Edition by François Chollet
- Chapter 1, Dive into Deep Learning by Zhang A. et al.
- YouTube: INTRODUCTION TO PYTORCH
- Chapter 1, Neural Networks and Deep Learning by Michael Nielsen
- Introduction, Deep Learning by Yoshua Bengio, Ian Goodfellow and Aaron Courville
- GitHub: Awesome Deep Learning
- Chapter 1, Deep Learning with PyTorch: A practical approach to building neural network models using PyTorch by Vishnu Subramanian
- Chapter 1, Deep Learning with PyTorch: Build, Train, and Tune Neural Networks Using Python Tools by Eli Stevens, Luca Antiga, Thomas Viehmann

What is PyTorch?

"An open source machine learning framework that accelerates the path from research prototyping to production deployment"

PyTorch Webpage

- Tensors
- Datasets, Dataloaders and Transforms
- Autograd
- Vectorisation
- Computational Graph

PyTorch Ecosystem Tools

- Python API
- Ecosystem Tools
  - Lightning: Simplified PyTorch for Research
  - pyro and numpyro: Deep Universal Probabilistic Programming
  - BoTorch: Bayesian Optimization in PyTorch
  - fastai: fastai simplifies training fast and accurate neural nets using modern best practices
  - ONNX Runtime: Cross-platform inference and training machine-learning accelerator
  - Transformers by HuggingFace
  - Ray: A unified framework for scaling AI and Python applications
  - PyTorch NLP: NLP library in Python
  - detectron2: State-of-the-art object detection and segmentation algorithms
  - Optuna: Hyperparameter optimization framework

PyTorch Ecosystem Libraries

- torchaudio: audio and signal processing
- torchvision: popular datasets, model architectures, and common image transformations for computer vision
- torchtext: data processing utilities and popular datasets for NLP
- torchserve: model serving

Introduction to PyTorch, tensors, and operations

What is Tensor?

"A PyTorch Tensor is basically the same as a numpy array: it does not know anything about deep learning or computational graphs or gradients, and is just a generic n-dimensional array to be used for arbitrary numeric computation."

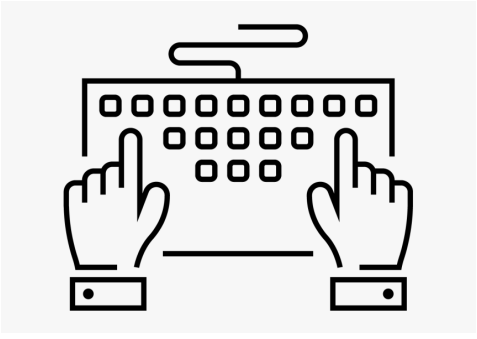
Source: PYTORCH: TENSORS

Torch tensor:

- Runs on either CPU or GPU
  - For GPU, cast tensor to a cuda datatype
  - More info on cuda python and accelerated computing
- Optimised for automatic differentiation; `grad_fn` property references the backward propagation function

numpy library and numpy array

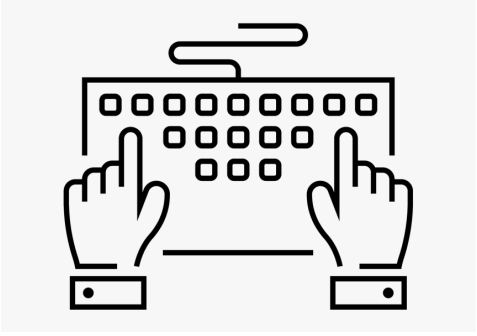
Session 2



Tensors and Operations

GitHub: tensors

Session 3



Autograd and Vectorisation

GitHub

- autograd
- vectorisation