

SYLLABUS DEEP LEARNING



**Learn to replicate human
brain actions using
algorithms.**





THE PROGRAM

"Deep Learning - The Fundamentals"

Training duration: 8 weeks

The training begins with the Fundamentals of Deep Learning, **introducing you to the concept**, some use cases, and the tools you'll be using, namely Keras and TensorFlow.



1 - Deep Learning - The fundamentals

Deep Learning with Keras,
Convolutional Neural Network with Keras.



2 - TensorFlow and application

Introduction to TensorFlow,
Application on face detection (object detection model)



3 - Deep Learning for Time Series

Preprocessing and feature engineering,
Time series regression,
Time series classification



4 - Introduction To PyTorch

Introduction to Pytorch,
CNN and RNN
Transfer Learning

En savoir plus

The Fundamentals of Deep Learning - *Duration: 40 hours*

Deep Learning with Keras

- What is Deep Learning?
- Review of optimization and linear regression.
- Connecting linear regression and artificial neurons.
- Dense Layer with Keras.
- Solving regression and classification problems with Keras.
- Influence of different hyperparameters.

Convolutional Neural Network with Keras.

- Convolutional Layer.
- Pooling Layer.
- Convolutional Neural Networks.
- Data Augmentation and Dropout Layer.
- Introduction to Transfer Learning with the VGG16 model.

Skills Acquired Upon Completion.

- Understand the power and challenges of deep learning.
- Understand how a neural network works.
- Build and train a neural network in Keras for a regression or classification problem.
- Build and train a convolutional neural network in Keras.
- Understand and optimize the impact of parameters on model performance.
- Add regularization mechanisms or data augmentation to address overfitting.
- Use Transfer Learning to improve the performance and robustness of your models.

TensorFlow and application - *duration 20h*

Introduction to TensorFlow

- Concept of tensor, operations, and graph.
- Write linear and polynomial regression on TensorFlow.
- Comparison with the Keras framework.
- Datasets, iterators, and generators in TensorFlow.
- Customize models and loss functions for your specific problem.
- Add and customize callbacks to meticulously control model training.
- Use TensorBoard to visualize model progression.

Application on face detection (object detection model)

- Introduction to the object detection problem.
- Feasibility validation with the from-scratch development of a simple model.
- Detection of key points (nose, mouth, etc.) on a face.
- From-scratch implementation of a simplified Yolo algorithm.
- Study and correct biases in different model versions.

Skills Acquired Upon Completion.

- Acquire a solid foundation in TensorFlow.
- Optimize memory and training time with TensorFlow datasets.
- Build and customize layers of a neural network.
- Build and customize the training of a neural network.
- Gain experience in customizing and training models.
- Acquire basic knowledge in signal processing.
- Build an audio command detection model.
- Build a speech recognition model.
- Implement data augmentation solutions tailored to your specific problem.

3 - Deep Learning for Time Series- *durée 15h*

Preprocessing and feature engineering.

- Cyclic transformation of time variables.
- Cyclic transformation of angular variables.
- Fourier Transform.
- Time Lagged Features and Cross Correlation.
- Statistics with moving window and expensive window.

Time series regression

- Multi-Layer Perceptron (MLP).
- Univariate and multivariate CNN.
- Univariate RNN.
- Autoregression and time series extrapolation.
- Prediction with a moving window.

Time series classification

- Human Activity Recognition and medical anomaly detection.
- Video classification.
- ConvLSTM architecture.

Skills Acquired Upon Completion.

- Build a solid foundation in time series preprocessing.
- Master the different time series regression architectures, their limitations, and various use cases.
- Explore time series classification problems.
- Get hands-on experience with the ConvLSTM architecture.

Introduction to PyTorch - *duration 5h*

Introduction to PyTorch

- Constants, variables, operations, and gradients with PyTorch.
- Optimization with PyTorch.
- Datasets, generators, and dataloaders.
- Comparison with TensorFlow framework and equivalent functions.
- Transfer learning with VGG16 on PyTorch.
- Introduction to RNN.

Skills Acquired Upon Completion.

- Optimize memory and training time with PyTorch.
- Build and customize the layers of a neural network.
- Build and customize the training of a neural network.
- Gain experience in customizing and training models.