KOENIG
step forward

KOENIG SOLUTIONS · COURSE OUTLINE

TensorFlow: CNN, RNN & Reinforcement Learning

Learn to build and train neural networks with TensorFlow, covering CNNs, RNNs, autoencoders, GANs and reinforcement learning.

9	73	21
MODULES	TOPICS	HANDS-ON LABS

COURSE OVERVIEW

This course begins with the TensorFlow architecture, installation and core tensor operations before introducing artificial neural networks built with the sequential and functional APIs. It then covers training deep neural networks, addressing challenges such as vanishing gradients, initialization, regularization and dropout, along with data loading and preprocessing using the Data API and TFRecord format. Subsequent modules apply convolutional neural networks to computer vision and recurrent neural networks, including LSTM and GRU architectures, to sequence and natural language processing tasks such as text generation, sentiment analysis and machine translation. The course concludes with representation and generative learning using autoencoders and GANs, and with reinforcement learning concepts including policy search, Markov decision processes and Q-learning.

WHO THIS COURSE IS FOR

Machine Learning Engineers | **Data Scientists** | **AI Developers** | **Software Engineers** | **Research Analysts**

LEARNING OBJECTIVES

- Explain the architecture and core components of TensorFlow
- Build artificial neural networks using sequential and functional APIs
- Apply techniques to address vanishing and exploding gradients
- Implement data loading and preprocessing with the Data API
- Develop convolutional neural networks for computer vision tasks
- Develop recurrent neural networks including LSTM and GRU for sequences
- Apply autoencoders and GANs for representation and generative learning
- Implement reinforcement learning methods such as Q-learning

COURSE SYLLABUS

9 Modules, 73 Topics

01

3 Labs

Introduction

TOPICS

Introduction to TensorFlow · Architecture of Tensorflow · Installation on Local Machine · Using TensorFlow in Google Colab · Working with Tensors and Operations · Keras Low level api

02

3 Labs

Introduction to Artificial Neural Networks

TOPICS

- From Biological to Artificial Neurons
- Different activation functions
- What is perceptron?
- Multilayer perceptron and back propagation
- Working with sequential api
- Working with the functional api
- Using callbacks
- Tensorboard for visualization

03

3 Labs

Training Deep Neural Nets

TOPICS

- Challenges of Deep Neural Networks
- Vanishing and Exploding gradients
- Glorot and He Initialization
- Non Saturating Activation Functions
- Different activation functions effect on deep neural nets
- Batch normalization
- Reusing the pre-trained layers in Neural nets
- Faster optimizers
- L1 and L2 regularization
- Dropouts and their purposes

04

3 Labs

Loading and Preprocessing the Data

TOPICS

The data api · Chaining transformations · Pre-processing the data · TFR record format and compressed files · Introduction to protocol buffer · Processing the Input features · TF transform · Tensorflow datasets project

05

3 Labs

Computer Vision Using CNN

TOPICS

Inspiration to the CNN · Architecture of CNN · Convolution layers in CNN · Filters in CNN · Pooling layer in CNN · Depth pooling in CNN · Different architectures of CNN

06

Lab

Processing Sequences Using RNN

TOPICS

Single neuron RNN · Working with RNN neural network · Input and Output Sequences in RNN · Introduction to Deep RNN · Forecasting using RNN · Unstable gradient problem · Architecture of LSTM · Architecture of GRU

07

2 Labs

Natural Language Processing

TOPICS

- Introduction to Natural Language processing
- Shakespear text generation using char RNN
- Stateless and stateful RNN
- Concept of sentiment analysis
- Encoder and Decoder Network for Neural Machine Translation
- Pre-processing required for encoder and decoder
- Concept of Beam Search
- Overview of attention mechanism

08

2 Labs

Representative Learning and Generative Learning Using Autoencoders and GANs

TOPICS

- Introduction to Autoencoders and GAN
- Efficient data representation
- Dimensionality reduction using autoencoders
- Introduction to stacked autoencoders
- Training one autoencoder at a time
- Recurrent autoencoders
- Sparse autoencoders
- Generative adversarial networks
- Deep Convolutional GANs

09

Lab

Reinforcement Learning

TOPICS

- Introduction to reinforcement learning
- Learning to optimize rewards
- Policy Search
- Introduction to OpenAI Gym
- Neural Network Policies
- Credit Assignment Problem
- Markov Decision Process
- Q Learning
- Deep Q Learning

HANDS-ON LABS

Practise What You Learn

#	MODULE	ACTIVITY
01	**Introduction**	■ Installing tensorflow on local machine ■ Working with google colab ■ Working with tensors and numpy
02	**Introduction to Artificial Neural Networks**	■ Classification on iris dataset using perceptron model ■ Image classification on fashion MNIST dataset using sequential and functional API ■ Improving the model using callbacks
03	**Training Deep Neural Nets**	■ Classification of MNIST dataset and performance of models by the use of different activation functions ■ Classification by using pre-trained layer of model to reduce the computation time ■ Reducing the overfitting through the use of regularization in various models
04	**Loading and Preprocessing the Data**	■ Implementation of basic functions like repeat, batch, shuffle required for preprocessing ■ Implement interleave() so as to read many files at a time using tensorflow for improving the performance ■ Storing and accessing the files stored in tfrecord format for better processing
05	**Computer Vision Using CNN**	■ Implementing different filters to find the different patterns from the image ■ Progressively reduce the spatial size of an image ■ Classifying the fashion MNIST dataset by using CNN
06	**Processing Sequences Using RNN**	Forecasting using simple RNN, Deep RNN, LSTM and GRU
07	**Natural Language Processing**	■ Generating Shakespearean text using character RNN, Bidirectional RNN ■ Sentiment analysis of IMDB dataset
08	**Representative Learning and Generative Learning Using Autoencoders and GANs**	■ Autoencoder for the dimensionality reduction ■ Reconstruction of images using recurrent auto encoder
09	**Reinforcement Learning**	Train a Deep Q network with TF agent(Cartpole Environment)

WHAT IS INCLUDED

Everything You Need to Succeed

- Koenig course material for every module
- Delivery by certified instructors and subject matter experts
- Hands-on exercises throughout the course
- Course completion certificate from Koenig

ABOUT KOENIG

Who We Are

Established in 1993, Koenig Solutions is a globally recognised training provider with 35+ technology partnerships, 5,000+ training programmes and a network of certified instructors and subject matter experts, supporting individuals and enterprise teams worldwide.

FLEXIBLE DELIVERY

Learn the Way That Suits You

Classroom Training | Live Online Classes (ILO) | Fly-Me-A-Trainer (FMAT) | Flexi (Self-Paced) | 1-on-1 Training

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