

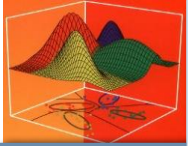
MLAI 504

NEURAL NETWORKS & DEEP LEARNING

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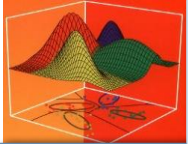




Course Outline (1/3)

Part 1: Introduction to Neural Networks (4 hours)

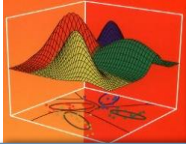
- Introduction about Machine Learning
- Introduction about Neural Networks
- Neuron and Perceptron Models
- Single-Layer Perceptrons
- Multi-Layer Perceptrons (MLPs)



Course Outline (1/3)

Part 2: Deep Learning Fundamentals

- Introduction to Deep Learning
- Deep Neural Networks (DNNs)
- Activation Functions in Deep Networks
- Regularization and Optimization
- Introduction to Convolutional Neural Networks (CNNs)
- CNN Training and Transfer Learning



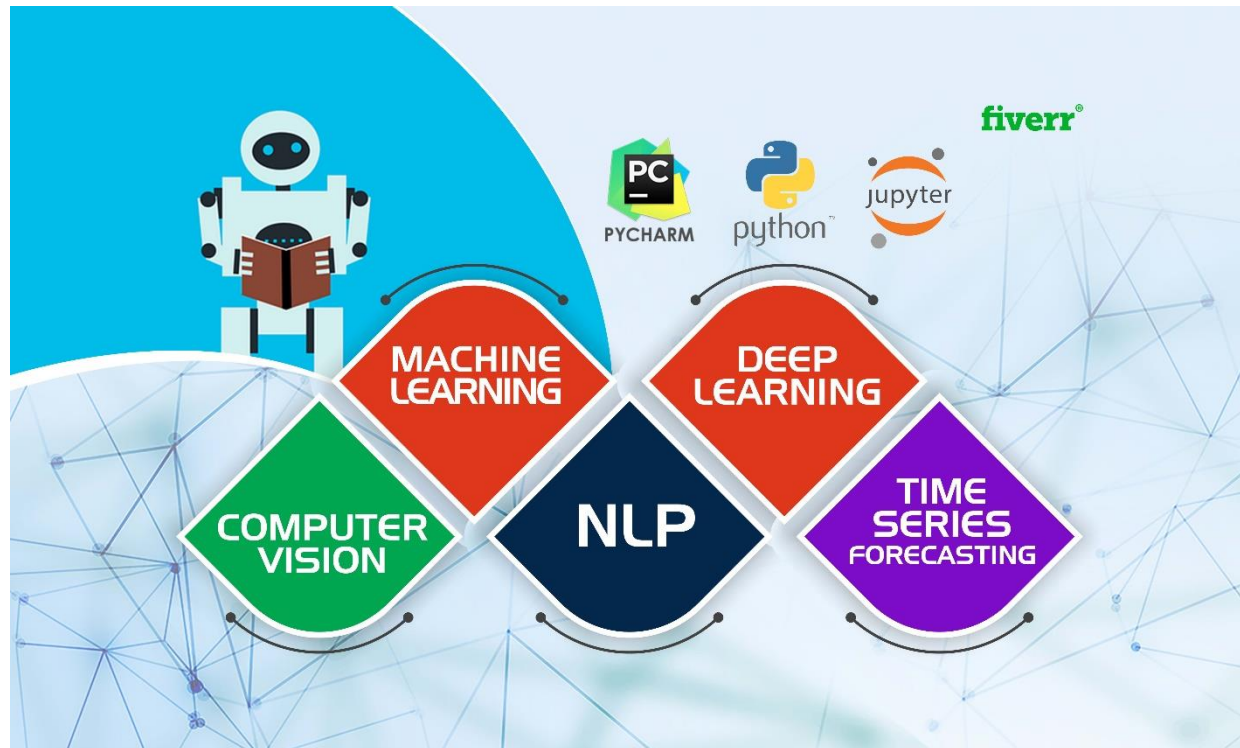
Course Outline (1/3)

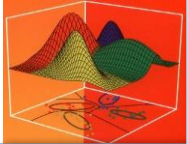
Part 3: Advanced Topics

- Introduction about Recurrent Neural Networks (RNNs) & LSTM
- Generative Adversarial Networks (GANs)
- Autoencoders and Variational Autoencoders (VAEs)

Course Evaluation

- Course:
 - Lectures + Practical exercises
 - Lab
- Evaluations:
 - Final
 - Project





Development Environments

➤ Python-based Development Environment



Python IDE



IDLE



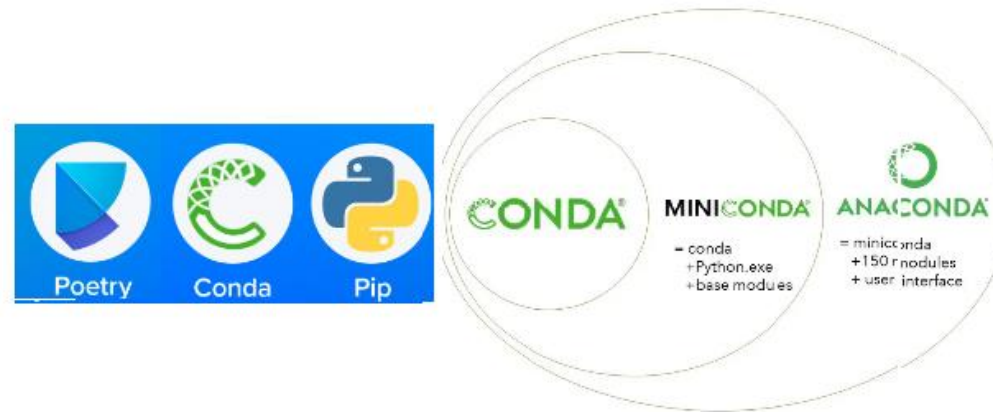
Pydev (Eclipse)



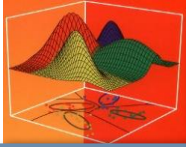
SPYDER

Development Environments

➤ Python Packages manager



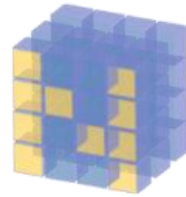
Installation	Python		Anaconda	Miniconda
	pip	virtualenv	Conda	
Purpose	Package Management	Virtual Environments	Package Management	
			Virtual Environments	
Usage	All purposes		Data Analysis/Data Science	



Development Environments

➤ Python Well-Known Libraries

Pandas



NumPy

 PyTorch



plotly

matplotlib

theano



TensorFlow

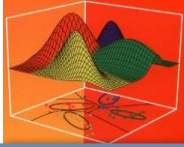


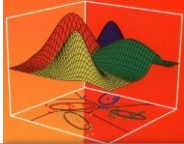
Keras



python™

Natural Language Analyses
with NLTK





Development Environments

➤ Python Well-Known cloud services

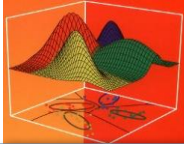
kaggle



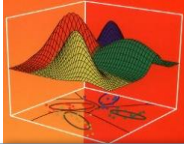
Google Cloud Platform



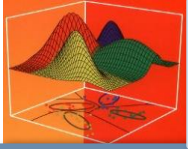
Azure Notebooks



Feature	Google Colab	Amazon SageMaker	Microsoft Azure	IBM Watson Studio	Paperspace Gradient
Libraries and Frameworks	TensorFlow, PyTorch, Keras	TensorFlow, PyTorch, MXNet, Scikit-learn	TensorFlow, PyTorch, Keras, CNTK	TensorFlow, PyTorch, Keras, scikit-learn	TensorFlow, PyTorch, fast.ai
Compute Resources	CPU, GPU (limited), TPU (limited)	CPU, GPU, P3, P4, Inf1 (Inferentia)	CPU, GPU, FPGA, TPU	CPU, GPU	CPU, GPU
Free Tier Availability	Yes	Yes	Yes	Yes	No
Notebooks and IDEs	Jupyter Notebooks	Jupyter Notebooks, IDE	Jupyter Notebooks, Azure ML Studio	Jupyter Notebooks, IDE	Jupyter Notebooks, Web-based IDE
Data Storage and Management	Google Drive	Amazon S3, Amazon EBS	Azure Blob Storage, Azure SQL DB	IBM Cloud Object Storage	Paperspace Volumes
AutoML and Model Deployment	Yes (limited)	Yes	Yes	Yes (limited)	No
Integration with ML Services	TensorFlow Extended (TFX)	Amazon SageMaker Components	Azure Machine Learning	Watson Machine Learning	-
Collaboration and Sharing	Yes	Yes	Yes	Yes	Yes
Security and Compliance	-	VPC, IAM, KMS, Encryption	Azure AD, Role-Based Access Control	IBM Cloud Identity and Access Management	-



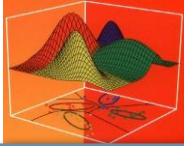
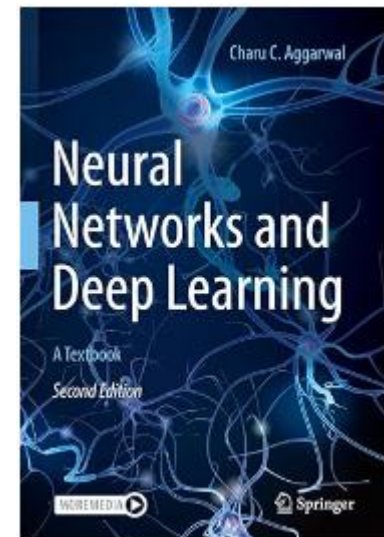
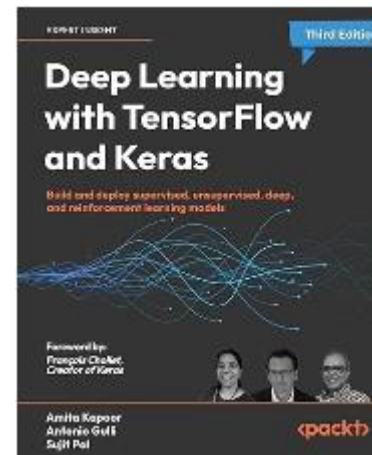
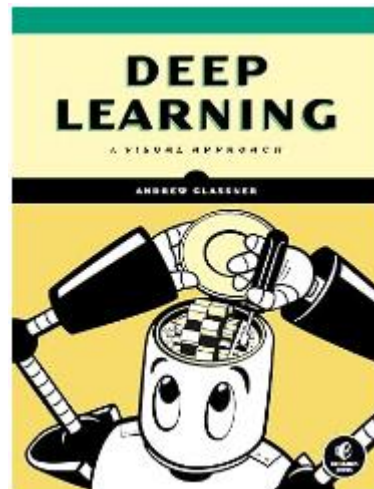
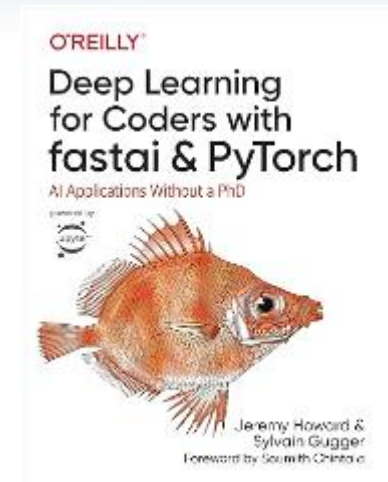
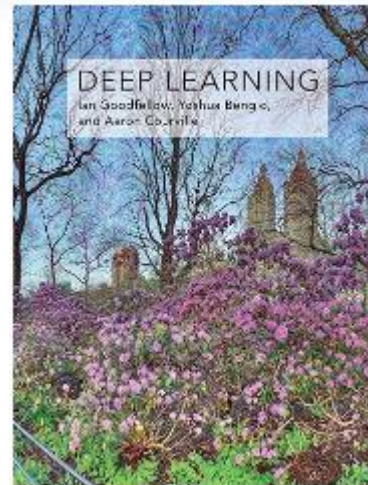
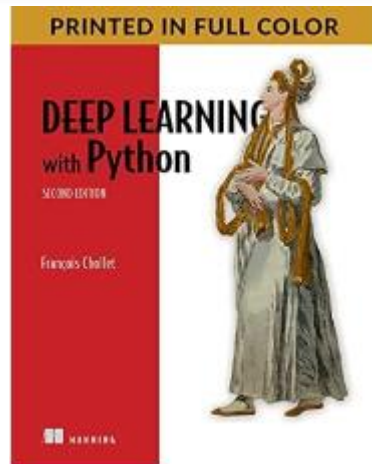
Cloud Service	Libraries	CPU	GPU	TPU	Free Time	Other Features
Colab	TensorFlow, PyTorch, Keras, Scikit-learn, etc.	2 cores	1 NVIDIA Tesla K80	1 TPUv2	12 hours per session	Integrated with Google Drive and GitHub, supports Jupyter notebooks
Sagemaker	TensorFlow, PyTorch, MXNet, Scikit-learn, etc.	Up to 96 vCPUs	Up to 8 NVIDIA V100	No	250 hours per month for the first 2 months	Supports distributed training, hyperparameter tuning, model deployment, etc.
Azure	TensorFlow, PyTorch, Scikit-learn, ONNX, etc.	Up to 128 vCPUs	Up to 4 NVIDIA V100	No	100 hours per month for the first 12 months	Supports automated machine learning, MLOps, Azure Databricks, etc.
Watson	TensorFlow, PyTorch, Scikit-learn, etc.	Up to 56 vCPUs	Up to 8 NVIDIA V100	No	50 hours per month	Supports natural language processing, computer vision, speech recognition, etc.
Gradient	TensorFlow, PyTorch, Keras, Scikit-learn, etc.	Up to 96 vCPUs	Up to 8 NVIDIA V100	No	6 hours per session	Supports Jupyter notebooks, Paperspace, Kubernetes, etc.
Oracle	TensorFlow, PyTorch, MXNet, Scikit-learn, etc.	Up to 64 vCPUs	Up to 2 NVIDIA V100	No	300 hours for the first 30 days	Supports data science projects, model catalog, AutoML, etc.
Databricks	TensorFlow, PyTorch, Scikit-learn, Spark MLlib, etc.	Up to 64 vCPUs	Up to 8 NVIDIA V100	No	14 days trial	Supports Apache Spark, Delta Lake, MLflow, etc.

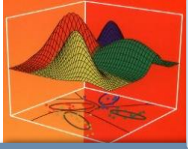


ML Communities

- Kaggle → Competitions
- Hugging Face → NLP
- Github
- Google AI Platform
- Microsoft Azure
- OpenAI
- nVIDIA
- H2O.ai
- AWS
- Fotor
- TensorFlow

References





End of Lecture !

This is the end of the lecture!

Do you have any question ?



The end !