



IT EDUCATION
CENTRE

Deep Learning



Artificial Intelligence

- An Introduction to Artificial Intelligence
- History of Artificial Intelligence
- Future and Market Trends in Artificial Intelligence
- Intelligent Agents – Perceive-Reason-Act Loop
- Search and Symbolic Search
- Constraint-based Reasoning
- Simple Adversarial Search (Game-Playing)
- Neural Networks and Perceptrons
- Understanding Feedforward Networks
- Boltzmann Machines and Autoencoders
- Exploring Backpropagation

Deep Networks and Structured Knowledge

- Deep Networks/Deep Learning
- Knowledge-based Reasoning
- First-order Logic Theory
- Rule-based Reasoning
- Studying Blackboard Systems
- Structured Knowledge: Frames, Cyc, Conceptual Dependency
- Description Logic
- Reasoning with Uncertainty

- Probability & Certainty-Factors
- What are Bayesian Networks?
- Understanding Sensor Processing
- Natural Language Processing
- Studying Neural Elements
- Convolutional Networks
- Recurrent Networks
- Long Short-Term Memory Networks

Machine Learning and Hacking

- Machine learning
- Reprise: Deep Learning
- Symbolic Approaches and Multiagent Systems
- Societal/Ethical Concerns
- Hacking and Ethical Concerns
- Behaviour and Hacking
- Job Displacement & Societal Disruption
- Ethics of Deadly AIs
- Danger of Displacement of Humanity
- The future of Artificial Intelligence

Natural Language Processing

- Natural Language Processing
- Natural Language Processing in Python
- Natural Language Processing in R
- Studying Deep Learning
- Artificial Neural Networks
- ANN Intuition
- Plan of Attack
- Studying the Neuron
- The Activation Function
- Working of Neural Networks
- Exploring Gradient Descent
- Stochastic Gradient Descent

Artificial and Conventional Neural Network

- Understanding Artificial Neural Network
- Building an ANN
- Building Problem Description
- Evaluating the ANN
- Improving the ANN
- Tuning the ANN
- Conventional Neural Networks

- **CNN Intuition**
- **Convolution Operation**
- **ReLU Layer**
- **Pooling and Flattening**
- **Full Connection**
- **Softmax and Cross-Entropy**
- **Building a CNN**
- **Evaluating the CNN**
- **Improving the CNN**
- **Tuning the CNN**

Recurrent Neural Network

- **Recurrent Neural Network**
- **RNN Intuition**
- **The Vanishing Gradient Problem**
- **LSTMs and LSTM Variations**
- **Practical Intuition**
- **Building an RNN**
- **Evaluating the RNN**
- **Improving the RNN**

Self-Organizing Maps

- ▶ Self-Organizing Maps
- ▶ SOMs Intuition
- ▶ Plan of Attack
- ▶ Working of Self-Organizing Maps
- ▶ Revisiting K-Means
- ▶ K-Means Clustering
- ▶ Reading an Advanced SOM
- ▶ Building a SOM

Boltzmann Machines

- ▶ Energy-Based Models (EBM)
- ▶ Restricted Boltzmann Machine
- ▶ Exploring Contrastive Divergence
- ▶ Deep Belief Networks
- ▶ Deep Boltzmann Machines
- ▶ Building a Boltzmann Machine
- ▶ Installing Ubuntu on Windows
- ▶ Installing PyTorch

AutoEncoders

- ▶ AutoEncoders: An Overview
- ▶ AutoEncoders Intuition
- ▶ Plan of Attack
- ▶ Training an AutoEncoder
- ▶ Overcomplete hidden layers
- ▶ Sparse Autoencoders
- ▶ Denoising Autoencoders
- ▶ Contractive Autoencoders
- ▶ Stacked Autoencoders

PCA, LDA, and Dimensionality Reduction

- ▶ Dimensionality Reduction
- ▶ Principal Component Analysis (PCA)
- ▶ PCA in Python
- ▶ PCA in R
- ▶ Linear Discriminant Analysis (LDA)
- ▶ LDA in Python
- ▶ LDA in R
- ▶ Kernel PCA
- ▶ Kernel PCA in Python
- ▶ Kernel PCA in R

Model Selection and Boosting

- K-Fold Cross Validation in Python
- Grid Search in Python
- K-Fold Cross Validation in R
- Grid Search in R
- XGBoost
- XGBoost in Python

GitHub

- Creating a Git Account
- Cloning the repository
- Adding the file
- Committing the file
- Git push
- Removing the file