Deep Learning Teaching Kit Syllabus

Module 1: Introduction to Machine Learning

Lecture Slides

- **1.1** Course Introduction
- **1.2** Introduction to Machine Learning
- **1.3** Introduction to Neural Networks

Module 2: Introduction to Deep Learning

Lecture Slides

- **2.1** Introduction to Deep Learning
- **2.2** Deep Supervised Learning (modular approach) – Part 1
- **2.3** Deep Supervised Learning (modular approach) – Part 2

Module 3: Convolutional Neural Networks

Lecture Slides

- **3.1** History of Convolutional Networks
- **3.2** Convolutional Networks and Computer Vision, Audio and Other Domains
- **3.3** Structural Prediction and Natural Language Processing

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Module 4: Energy-based Learning

Lecture Slides

- **4.1** Energy--based Learning
- **4.2** Unsupervised Learning
- **4.3** Sparse Coding

Module 5: Optimization Techniques

Lecture Slides

- **5.1** Efficient Learning and Second-order Methods

Module 6: Learning with Memory

Lecture Slides

- **6.1** Recurrent Neural Network Basics
- **6.2** Advanced Recurrent Neural Networks
- **6.3** Embedding Methods for NLP: Unsupervised and Supervised Embeddings
- **6.4** Embedding Methods for NLP: Embeddings for Multi-relational Data
- **6.5** Deep Natural Language Processing

Module 7: Future Challenges

Lecture Slides

- **7.1** Future Challenges

Labs and Solutions

Lab 1

- **1.1** Backpropagation
  - Logistic regression
  - Softmax expression
- **1.2** MNIST Handwritten Digit Recognition (Torch) **(programming)**

Lab 2

- **2.1** More Backpropagation
- **2.2** STL-10: Semi-supervised Image Recognition **(programming)**
  - Visualizing filters and augmentations
  - tSNE

Lab 3

- **3.1** General Questions
- **3.2** Softmax regression
- **3.3** Chain Rule
- **3.4** Variants of Pooling
- **3.5** Convolution
- **3.6** Optimization
- **3.7** Top-k Error
- **3.8** t-SNE
- **3.9** Proximal Gradient Descent

Lab 4

- **4.1** nngraph **(programming)**
- **4.2** Language Modeling **(programming)**

Quiz/exam Sample Problem Sets

Quiz/exam Sample Problem Set 1

- **1.1** Quick Basic Knowledge Questions
- **1.2** Multinomial Logistic Regression
- **1.3** Metric Learning with NCA
- **1.4** Sparse Coding
- **1.5** Convolutional Networks
- **1.6** Dataset Features
- **1.7** Backpropagation
- **1.8** More Backpropagation
- **1.9** Convergence of Linear Regression

Quiz/exam Sample Problem Set 2

- **2.1** General Questions
- **2.2** Sort module
- **2.3** Softmax
- **2.4** Shared Weights
- **2.5** ConvNet
- **2.6** Energy-Based Learning
- **2.7** Sparse Coding
- **2.8** Auto-Encoders
- **2.9** Optimization
- **2.10** Optimization in Multi-layer Nets

Quiz/exam Sample Problem Set 3

- **3.1** General Questions
- **3.2** Pooling
- **3.3** ConvNet Basics
- **3.4** ConvNets: Object Detection
- **3.5** ConvNets: Weak Supervision
- **3.6** Word, Text, and Image Embedding
- **3.7** Recurrent Nets
- **3.8** Energy-Based Learning: Weakly Supervised Object Localization
- **3.9** Unsupervised Learning and Auto-Encoders
- **3.10** Optimization