

SMAI-M20-L37: Programming and Practice of NN in PyTorch

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Announcements

- ① Winding up CRs and Home works. We have buffer for specific difficulties (like power cuts).
- ② Quiz 3: Academic office has agreed with 25, 9.30-10.30 (It will be Similar to Q2). Scope: Topics after Q1.
- ③ Absence/Requests/Special Issues from Q1 and Q2: Will be addressed after Q3. (< 5 students?)

Programming in PyTorch

Recap:

- **Matrix Factorization and Applications:** (i) SVD, (ii) Eigen Decomposition (iii) Matrix Completion (iv) LSI (v) Recommendations
- **Dimensionality Reduction and Applications:** (i) Feature Selection and Extraction (ii) PCA (iii) LDA (iv) Eigen face
- **Supervised Learning:** Formulation, Conceptual Issues, Concerns etc. (i) Loss Functions and Optimization (ii) Probabilistic View, Bayesian View, MLE (iii) Eigen Vector based optimization (iv) Gradient Descent: Stochastic and Batch GD (v) Classification and Regression
- **Classifiers:** (i) Nearest Neighbour, (ii) Notion of a Linear Classifier (iii) Perceptrons (iv) Bayesian Optimal Classifier (v) Logistic Regression (vi) Multiclass classification architectures (v) Decision Trees (vi) SVMs (hard margin, soft margin, kernel) (vii) Kernel trick and kernelized algorithms
- **Neural Network Architectures and Learning** (i) Neuron model, Single Layer Perceptrons (ii) SLP (iii) MLP (iv) Backpropagation (v) Chain rule (vi) Activations (vii) challenges in optimization (viii) Momentum (ix) Convolutional Layer (x) Recurrent/Feedback networks (xi) Auto-encoder and unsupervised learning
- **Beyond Simple Supervised Learning** (i) Paradigms of Learning (ii)

Practice of Neural Networks

- ① Programming in PyTorch
- ② Defining Neural Networks
- ③ Training Neural Networks
- ④ Overfitting
 - ① Data Augmentation
 - ② L1 and L2 Regularization
 - ③ Dropout
- ⑤ Fine Tuning
 - ① Re-Use of the intermediate representations $\phi(x)$.
 - ② Fine tuning/Refining for a new task.

This Lecture: In Class Problem Solving

- 1 Discuss within the class, Ask queries and clarifications.
- 2 Solve a new problem (where almost all the code is available from the previous notebook)
 - 1 https://colab.research.google.com/drive/1Et1SmUAcHc8eLta0MtvCuG_ppMkDxH8a?usp=sharing
 - 2 Submit the link to the notebook, pdf version of the notebook
 - 3 Write a brief report of what you observe and submit. (similar to the problem we solved on paper). (submit pdf; one or two pages; If appropriate, keep graphs and conceptual explanations).