Lab 3. Perceptron, MLP, PyTorch

Jan 29, 2026

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Outline

Outline

Lab Overview

To-do list

- In this lab, we will practice things related to (1) simple perceptron (2) MLP, and (3) PyTorch tutorial, topics we covered on Tuesday
  - Section 1: Simple perceptron
  - Section 2: MLP - XOR problem
  - Section 3: PyTorch
- Please read the guidelines and the provided code carefully.

XOR (Exclusive OR)

- Binary operation on two inputs
- Output = 1 iff inputs are different

$$x_1 \oplus x_2 = \begin{cases} 1 & x_1 \neq x_2 \\ 0 & x_1 = x_2 \end{cases}$$

Truth Table

x_1	x_2	XOR
0	0	0
0	1	1
1	0	1
1	1	0

XOR should be solved with MLP

- Single-layer perceptrons cannot learn XOR
- Adding a hidden layer enables non-linear separation
- XOR motivates multi-layer neural networks

Evaluation Criteria

- Each section is worth **2 points**.

Section	Credit (2)	Partial (1)	No Credit (0)
1	Complete	Partial	None
2	Complete	Partial	None
3	Complete	Partial	None

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Timeline

1. Identify team member (Due: 2/5, assignment)
2. Project group meeting (3/3, in class)
3. Project proposal presentation (3/5, in class)
4. Project proposal (Due: 3/13, assignment)
5. Background presentation (3/31, 4/2 in class)
6. Midway report (Due: 4/3, assignment)
7. Final presentation (4/21, 23 in class)
8. Final paper (Due: 5/5, final paper)

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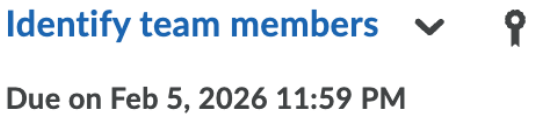
1. Identify Team Members



- *Only one person per team needs to submit.
- In the submitted file, please include:
  - Names of all team members
  - Brief description of your brainstormed ideas
  - (Optional) Additional details to receive more detailed feedback from me

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2. Project proposal

- *Only one person per team needs to submit.
- **Topic / Area**
  - One sentence stating the focus
  - 3-5 keywords
- **Research Question / Problem**
  - 1-2 sentences clearly stating the core question or hypothesis
- **Mini Annotated Bibliography**
  - **Full citation** (use a consistent style (e.g., APA, `acl_natbib`)
  - **1-sentence contribution** (key finding/idea)
  - **Relevance** (why it might be matter for your project) (*optional*)
  - **Method/Data** (e.g., corpus, model, experiment) (*optional*)

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2. Project proposal

3/5	Project proposal presentation		Lab 7
3/10	**Spring break (No class)**		
3/12			Project proposal

- On March 5, you will participate in a group rotation to present your project idea to peer groups. (So, it would be great if you can prepare a rough idea of your project.)
- Based on peer/instructor feedback, you will time to refine your ideas and submit a project proposal by March 13th.

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Outline

Next Week

- **Tuesday**: Dependency parsing — Presenter: Duvarakanath, Matthew & Valbona
- **Thursday**: Lab 4 — Dependency parsing (*async*)