

# Assignment 0: Environment Setup & Reproducibility Checklist + Syllabus Agreement

**Due:** January 23, 2026

**Submission:** Brightspace Assignment 0

**Weight:** 5% (part of Assignments grade)

## Objective

This assignment ensures that you:

- Set up a consistent development environment for deep learning and reinforcement learning.
- Implement reproducibility best practices in machine learning experiments.
- Practice best practices in plotting learning curves for clarity and interpretability.
- Confirm your understanding of the course policies and expectations by completing the syllabus agreement.

## Tasks

### Part A: Environment & Reproducibility Checklist

#### Environment Setup

- Create a virtual environment and export `requirements.txt`.
- Document OS, Python version, and GPU availability.

#### Reproducibility Script

- Set random seeds for Python, NumPy, and PyTorch.
- Configure PyTorch for deterministic behaviour.
- Train **five independent small MLP models on MNIST** for **3 epochs each**, using different seeds.

- Checkpoint your model by saving the weights halfway through training and at the end of training.
- Log training loss and accuracy for each run.

## Plot Learning Curves

Generate **three sets of plots** using Matplotlib:

### 1. Mean $\pm$ Standard Deviation

- Compute the mean training curve across all runs and shade  $\pm 1$  standard deviation.
- Shows variability across runs (model stability).

### 2. Mean $\pm$ Standard Error

- Compute the mean curve and shade  $\pm 1$  standard error of the mean.
- Indicates confidence in the mean estimate given the number of runs.

### 3. All Individual Learning Curves

- Overlay all five runs for transparency and to visualize run-to-run differences.

## Requirements:

- Include **two subplots per figure**:
  - Training Loss vs. Iterations
  - Training Accuracy vs. Iterations
- Apply best practices:
  - Clear axis labels and titles (verify font size).
  - Include legends where multiple curves are shown.
  - Use consistent color schemes and line types.
- Save plots as **.png** or **.pdf** and include them in your submission.

## Explanation: Standard Deviation vs. Standard Error

- **Standard Deviation (SD):**  
Measures variability across runs at each iteration. A large SD indicates unstable training or sensitivity to initialization.
- **Standard Error (SE):**  
Measures uncertainty in the mean estimate.  $SE = SD / \sqrt{n}$ , where  $n$  is the number of runs. A small SE means the mean curve is estimated precisely, but does not imply low variability.
- **Why both matter:**  
SD shows stability; SE shows confidence in the mean. Always include individual curves for transparency, especially with small  $n$ .

## Documentation

- Provide a README with setup instructions.
- Include a config file (`config.yaml`) for hyperparameters.
- Attach logs and plots.

## Part B: Syllabus Agreement Form

- Complete the Syllabus Agreement Form posted in Quizzes on Brightspace.
- If you have any concerns or questions about the syllabus, you must discuss them with the professor prior to the Assignment 0 due date.
- Submission of the form is mandatory to receive credit for Assignment 0.

## Submission

Upload a **zip file** containing:

- Part A files:
  - `requirements.txt`
  - `repro_check.py`
  - `README.md`
  - `config.yaml`
  - Model checkpoints
  - 3 plots (`.png` or `.pdf`)

- Output logs (`run1.log`, `run2.log`)
- Confirmation that you completed the syllabus agreement form (Brightspace will track this automatically).

## Grading Scheme (Total: 10 points)

Component	Points
<b>Part A: Environment Setup</b>	1
<b>Part A: Reproducibility Script</b>	3
<b>Part A: Plotting Best Practices</b>	3
<b>Part A: Documentation</b>	2
<b>Part A: Code Quality</b>	1
<b>Part B: Syllabus Agreement</b>	Required for assignment 0 credit

## Important Notes

- This assignment is individual.
- Late submissions will not be graded.
- Plagiarism and uncredited AI use are academic offences.
- You may use official documentation and tutorials, but all code must be your own.
- Failure to complete Part B will result in zero credit for Assignment 0.