**Syllabus for cycle 3,4:**

This is the syllabus and topics for cycle 3,4. we provided you with some resources you can explore for other resources also to boost your understanding skills. No need to submit the deliverables, just try to implement them to increase your understanding.

**Day 1 (July 30): Hyperparameter Tuning & Pipelines & Recommender Systems**

**Topics:**

* GridSearchCV, RandomizedSearchCV
* Pipeline, ColumnTransformer
* Model Serialization
* Collaborative Filtering
* Content-Based Filtering

**Deliverables**:

* Notebook using GridSearchCV on a classifier
* Save and load your model using joblib.
* Build a simple movie recommendation engine using pandas

**Resources:**

* [Hyperparameter tuning](https://scikit-learn.org/stable/modules/grid_search.html)
* [pipelines](https://scikit-learn.org/stable/modules/compose.html)
* [Recommender systems](https://towardsdatascience.com/recommender-systems-a-complete-guide-to-machine-learning-models-96d3f94ea748/)

**Day 2(July 31): Intro to Perceptron and Linear Classifier**

**Topics:**

* Perceptron Algorithm
* Binary classification with linear models

**Deliverables:**

* Code a basic perceptron from scratch in NumPy

**Resources:**

* [Perceptron](https://www.youtube.com/watch?v=ntKn5TPHHAk)

**Day 3(Aug 1): PyTorch Foundations**

**Topics:**

* Tensors, Autograd, Modules
* Optimizers, Training loop basics

**Deliverables:**

* Train a linear regression model using PyTorch
* Use .backward(), .step(), and nn.Module

**Resources:**

* [Pytorch foundations](https://docs.pytorch.org/tutorials/beginner/basics/intro.html)

**Day 4(Aug 2): Build Multi-Layer Perceptron from Scratch**

**Topics:**

* ReLU, Sigmoid, Tanh activation
* Backpropagation, vanishing gradient

**Deliverables:**

* Build MLP from scratch in NumPy (2 hidden layers)

**Resources:**

* [Mlp from scratch](https://www.youtube.com/watch?v=w8yWXqWQYmU)

**Day 5(Aug 3): Feed-Forward Networks in PyTorch**

**Topics:**

* Define custom networks in nn.Module
* Loss functions, Optimizers (SGD, Adam**)**

**Deliverables:**

* Build a digit classification model on MNIST or Fashion-MNIST
* Compare performance using different optimizers

**Resources:**

* [Neural networks](https://docs.pytorch.org/tutorials/beginner/blitz/neural_networks_tutorial.html)

**Day 6(Aug 4): CNN Basics + Features**

**Topics:**

* Convolutions (kernel, stride, padding)
* Pooling, Feature Maps
* BatchNorm, Dropout

**Deliverables:**

* Build a CNN in PyTorch

**Resources:**

* [Pytorch CNN](https://docs.pytorch.org/tutorials/beginner/blitz/cifar10_tutorial.html)

**Day 7(Aug 5): Intro to RNN & Attention**

**Topics:**

* RNNs, sequence modeling
* Introduction to Attention (conceptual only)

**Deliverables:**

* Simple character-level RNN in PyTorch

**Resources:**

* [Rnn](https://docs.pytorch.org/tutorials/intermediate/char_rnn_classification_tutorial.html)
* [Basics of tranformers](https://jalammar.github.io/illustrated-transformer/)