

# ECS659U/P Coursework – The problem

## The Problem

- Fashion-MNIST classification
- Classify every image in terms of 1 out of 10 classes
- Standard task for lectures & labs
- You will build a model on the training set & evaluate it on the test set



# ECS659U/P Coursework – Your Task

## **Your Task**

1. Implement a specific model (see later) to solve the problem
  - If you solve it using your own model you will get no marks
2. Implement the training pipeline to train the model
3. Explore techniques from weeks 5-8, and from external resources
4. Goal to get the highest possible accuracy

## **Special note**

- This is an individual assignment.
  - No collaboration is allowed.
  - Do not use public slack channels to ask a question.
  - Contact us in private.

# ECS659U/P Coursework – Deliverables

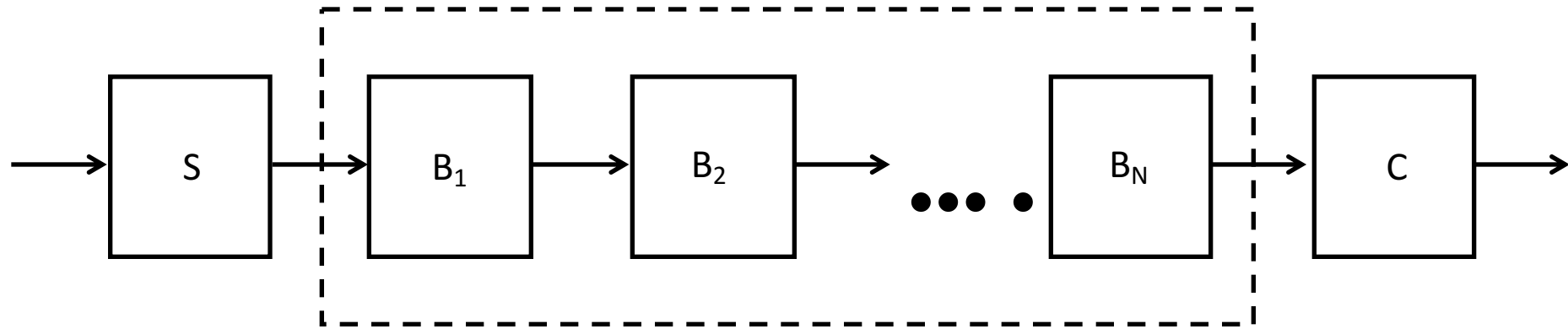
## **Deliverables**

- They are detailed in the CW sheet.

# ECS659U/P Coursework – The Model

## Overview of model

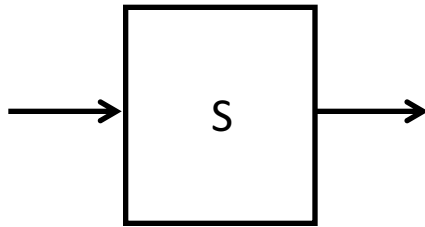
- An architecture to process images based on MLPs
- A more advanced version of Lecture 5 model
- Model architecture consists of Stem, Backbone ( $B_1, \dots, B_N$ ), Classifier



# ECS659U/P Coursework – The Stem

## The Stem

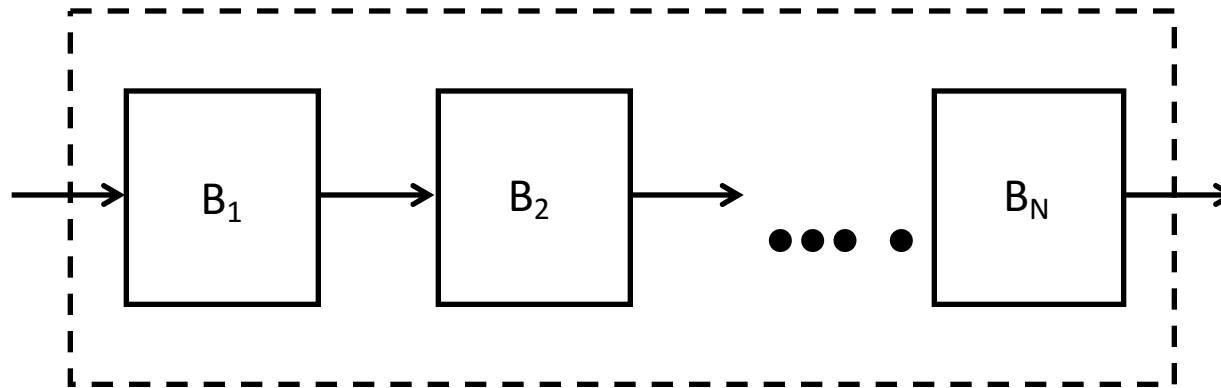
- Takes as input an image  $I$  of size  $H \times W$  and divides it into  $N_p$  *non-overlapping* patches.
- Each patch  $p_{i,j}$  has dimensions  $K \times K$ .
- Each patch is vectorized, and then transformed to a feature vector of dimensions  $d$ :  $x_{i,j} = f(p_{i,j})$
- $f$  can be a linear layer or a single hidden layer MLP.
- All features are stored in matrix  $X \in \mathcal{R}^{N_p \times d}$ .



# ECS659U/P Coursework – The Backbone

## The Backbone

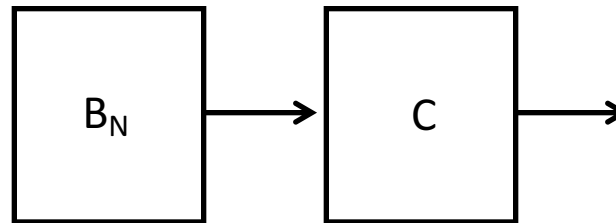
- Consists of  $N$  Blocks. The basic (minimum) implementation for each block  $B_i$  consists of two MLPS.
- The first MLP is:  $O_1 = g(X^T W_1) W_2$ , where  $g$  is a non-linear activation function.
  - Next step is  $O_1 \leftarrow O_1^T$ .
- The second MLP is:  $O_2 = g(O_1 W_3) W_4$ .
- Other components can be added based on the lectures of Weeks 5-8!!



# ECS659U/P Coursework – The Classifier

## The Classifier

- Takes as input the output  $O_2 \in \mathcal{R}^{N_p \times d_o}$  of the last block  $B_N$
- Then, it computes a mean feature  $x \in \mathcal{R}^{d_o}$
- Finally, it feeds this feature to a classifier
  - can be a softmax regression classifier,
  - check also Weeks 5-8.



# ECS659U/P Coursework – Assessment

## Assessment

1. Read dataset and create dataloaders: 5%.
2. Create the model: 40% (Stem: 10%, Backbone: 30%).
3. Create the loss and optimizer: 5%.
4. Write the training script to train the model. Provide in the report: 30%
  - the curves for the evolution of loss
  - the curves for the evolution of training and validation (test) accuracies.
  - all training details including hyper-parameters used.
5. Final model accuracy on **Fashion-Mnist Validation Set**:
  - $acc > 90\%$  : 20%
  - $85 < acc < 90\%$  : 15%
  - $80 < acc < 85\%$  : 10%
  - $70 < acc < 80\%$  : 5%
  - $acc < 70\%$  : 0%