

## Practice Problems for PyTorch. Advanced Machine Learning

1. You are working classification problem with 10 input variables and 3 output classes.
  - (a) Write a model in PyTorch that can be used for this task.
  - (b) Write a training loop in PyTorch that can train this model. If you don't remember exact PyTorch please describe every line.

```
def train_model(model, optimizer, train_dl, epochs=10):
    for i in range(epochs):
        model.train()
        total = 0
        sum_loss = 0
        for x, y in train_dl:
            batch = y.shape[0]

            total += batch
            sum_loss += batch*(loss.item())
        train_loss = sum_loss/total
    return train_loss
```

2. Write a function that given a model and a data loader computes balanced accuracy. Assume you have a binary classification problem. Hint: you can use the `balanced_accuracy_score` from sklean.
3. What is the **shape** of the tensor *out*?

```
embed = nn.Embedding(5, 7)
x = torch.LongTensor([[1,0,1,4,2,1]])
out = embed(x)
```

4. What is the **value** of the tensor *x.grad* after running the next few lines?

```
x = torch.tensor([1, 3, 2], requires_grad=True)
L = (3*x + 7).sum()
L.backward()
```

5. Create the following tensors with shape (2,2,2): all zeros, all ones, random with normal distribution.
6. Describe what each of the following lines of code are doing during a training loop.

```
loss.backward()
optimizer.step()
```