Homework 6

1. Changes are made in the given PyTorch implementation code so as to incorporate the functionality of English to French translation instead of the already coded-in French to English translation.
2. The list named pairs which contains pairs of English sentences and their corresponding French translation is split into train_pairs and test_pairs lists at a test ratio of 0.2.
3. **Version 1:** The English to French encoder-decoder network is trained for **T= 25k epochs**. The testing loss is also included.

```
Starting Training Process...

1m 57s (- 7m 51s) (5000 20%) 3.4144
3m 54s (- 5m 51s) (10000 40%) 2.7443
5m 49s (- 3m 52s) (15000 60%) 2.3936
7m 42s (- 1m 55s) (20000 80%) 2.0862
9m 35s (- 0m 0s) (25000 100%) 1.8621

Starting Testing Process...

Loss for 20k epochs: 18.369781494140625
```

- Testing error was calculated subsequently for training at **T-15k, T-10k, T-5k epochs**.

```
Starting Training Process...

0m 49s (- 3m 17s) (2000 20%) 1.7021
1m 34s (- 2m 22s) (4000 40%) 1.6165
2m 20s (- 1m 33s) (6000 60%) 1.5387
3m 6s (- 0m 46s) (8000 80%) 1.5278
3m 58s (- 0m 0s) (10000 100%) 1.4521

Starting Testing Process...

Loss for T - 15k epochs: 17.547191619873047
```

```
Starting Training Process...

1m 26s (- 5m 45s) (3000 20%) 1.3552
2m 36s (- 3m 54s) (6000 40%) 1.2348
3m 46s (- 2m 30s) (9000 60%) 1.2015
4m 57s (- 1m 14s) (12000 80%) 1.1640
6m 7s (- 0m 0s) (15000 100%) 1.0676

Starting Testing Process...

Loss for T - 10k epochs: 17.38478660583496
```

```
Starting Training Process...

1m 35s (- 6m 23s) (4000 20%) 1.0080
3m 9s (- 4m 43s) (8000 40%) 0.9631
4m 44s (- 3m 9s) (12000 60%) 0.9008
6m 18s (- 1m 34s) (16000 80%) 0.8310
7m 52s (- 0m 0s) (20000 100%) 0.8245

Starting Testing Process...

Loss for T - 5k epochs: 17.284622192382812
```

4. **Version 2:** The autoencoder was trained using which we are updating the encoder and its parameters were frozen. Then, the decoder was trained for translation. The testing error was calculated for training for **T-15k, T-10k, T-5k**

```
Starting Training Process...

Autoencoder Training...

0m 46s (- 3m 5s) (2000 20%) 3.0119
1m 41s (- 2m 31s) (4000 40%) 2.1956
2m 28s (- 1m 39s) (6000 60%) 1.8542
3m 14s (- 0m 48s) (8000 80%) 1.5474
4m 0s (- 0m 0s) (10000 100%) 1.3184

Translation Training...

4m 47s (- 19m 9s) (2000 20%) 3.5346
5m 40s (- 8m 30s) (4000 40%) 3.0134
6m 33s (- 4m 22s) (6000 60%) 2.7950
7m 27s (- 1m 51s) (8000 80%) 2.6307
8m 20s (- 0m 0s) (10000 100%) 2.5327

Starting Testing Process...

Loss for T - 15k epochs: 17.183837890625
```

```
Starting Training Process...

Autoencoder Training...

1m 22s (- 5m 29s) (3000 20%) 1.3180
2m 40s (- 4m 0s) (6000 40%) 0.9237
4m 13s (- 2m 48s) (9000 60%) 0.7672
5m 48s (- 1m 27s) (12000 80%) 0.6184
7m 9s (- 0m 0s) (15000 100%) 0.5265

Translation Training...

8m 26s (- 33m 47s) (3000 20%) 2.7147
9m 44s (- 14m 37s) (6000 40%) 2.3541
10m 56s (- 7m 17s) (9000 60%) 2.2575
12m 10s (- 3m 2s) (12000 80%) 2.1311
13m 25s (- 0m 0s) (15000 100%) 2.0031

Starting Testing Process...

Loss for T - 10k epochs: 17.297351837158203
```

```
Starting Training Process...


Autoencoder Training...

1m 39s (- 6m 39s) (4000 20%) 0.7106
3m 14s (- 4m 51s) (8000 40%) 0.5140
4m 54s (- 3m 16s) (12000 60%) 0.4505
6m 51s (- 1m 42s) (16000 80%) 0.3166
8m 47s (- 0m 0s) (20000 100%) 0.2470

Translation Training...

10m 40s (- 42m 42s) (4000 20%) 2.3426
12m 35s (- 18m 53s) (8000 40%) 1.9994
14m 15s (- 9m 30s) (12000 60%) 1.8834
15m 48s (- 3m 57s) (16000 80%) 1.8306
17m 19s (- 0m 0s) (20000 100%) 1.6959

Starting Testing Process...

Loss for T - 5k epochs: 17.14909553527832
```

5. **Version 3:** Using Glove 6B, we have trained the model for T-15k.

```
Starting Training Process...


Autoencoder Training...

1m 39s (- 6m 39s) (4000 20%) 0.7106
3m 14s (- 4m 51s) (8000 40%) 0.5140
4m 54s (- 3m 16s) (12000 60%) 0.4505
6m 51s (- 1m 42s) (16000 80%) 0.3166
8m 47s (- 0m 0s) (20000 100%) 0.2470

Translation Training...

10m 40s (- 42m 42s) (4000 20%) 2.3426
12m 35s (- 18m 53s) (8000 40%) 1.9994
14m 15s (- 9m 30s) (12000 60%) 1.8834
15m 48s (- 3m 57s) (16000 80%) 1.8306
17m 19s (- 0m 0s) (20000 100%) 1.6959

Starting Testing Process...

Loss for T - 5k epochs: 17.14909553527832
```