

## Output

- **k\_means\_cluster('yeast\_test.txt',2,5)**
  - After initialization: error = 123.5507
  - After iteration 1: error = 114.0571
  - After iteration 2: error = 112.4397
  - After iteration 3: error = 111.4776
  - After iteration 4: error = 111.0202
  - After iteration 5: error = 110.6653
- **k\_means\_cluster('yeast\_test.txt',3,5)**
  - After initialization: error = 123.6067
  - After iteration 1: error = 106.8956
  - After iteration 2: error = 102.6098
  - After iteration 3: error = 101.3766
  - After iteration 4: error = 101.1552
  - After iteration 5: error = 101.1204

## Optional Task 1

### ➤ `k_means_cluster('yeast_test.txt',2,5)`

After initialization: error = 123.6324

After iteration 1: error = 111.4850

After iteration 2: error = 110.4920

After iteration 3: error = 110.3895

After iteration 4: error = 110.3718

After iteration 5: error = 110.3584

After iteration 6: error = 110.3571

After iteration 7: error = 110.3506

After iteration 8: error = 110.3346

After iteration 9: error = 110.3264

After iteration 10: error = 110.3264

After iteration 11: error = 110.3264

**Cluster converge at 11<sup>th</sup> iteration**

### ➤ `k_means_cluster('yeast_test.txt',3,5)`

After initialization: error = 123.4011

After iteration 1: error = 105.3667

After iteration 2: error = 102.2557

After iteration 3: error = 101.3588

After iteration 4: error = 101.1758

After iteration 5: error = 101.1610

After iteration 6: error = 101.0840

After iteration 7: error = 100.9539

After iteration 8: error = 100.8914

After iteration 9: error = 100.8298

After iteration 10: error = 100.7647

After iteration 11: error = 100.6943

After iteration 12: error = 100.6839

After iteration 13: error = 100.6755

After iteration 14: error = 100.6743

After iteration 15: error = 100.6687

After iteration 16: error = 100.6687

**Cluster converge at 16<sup>th</sup> iteration**