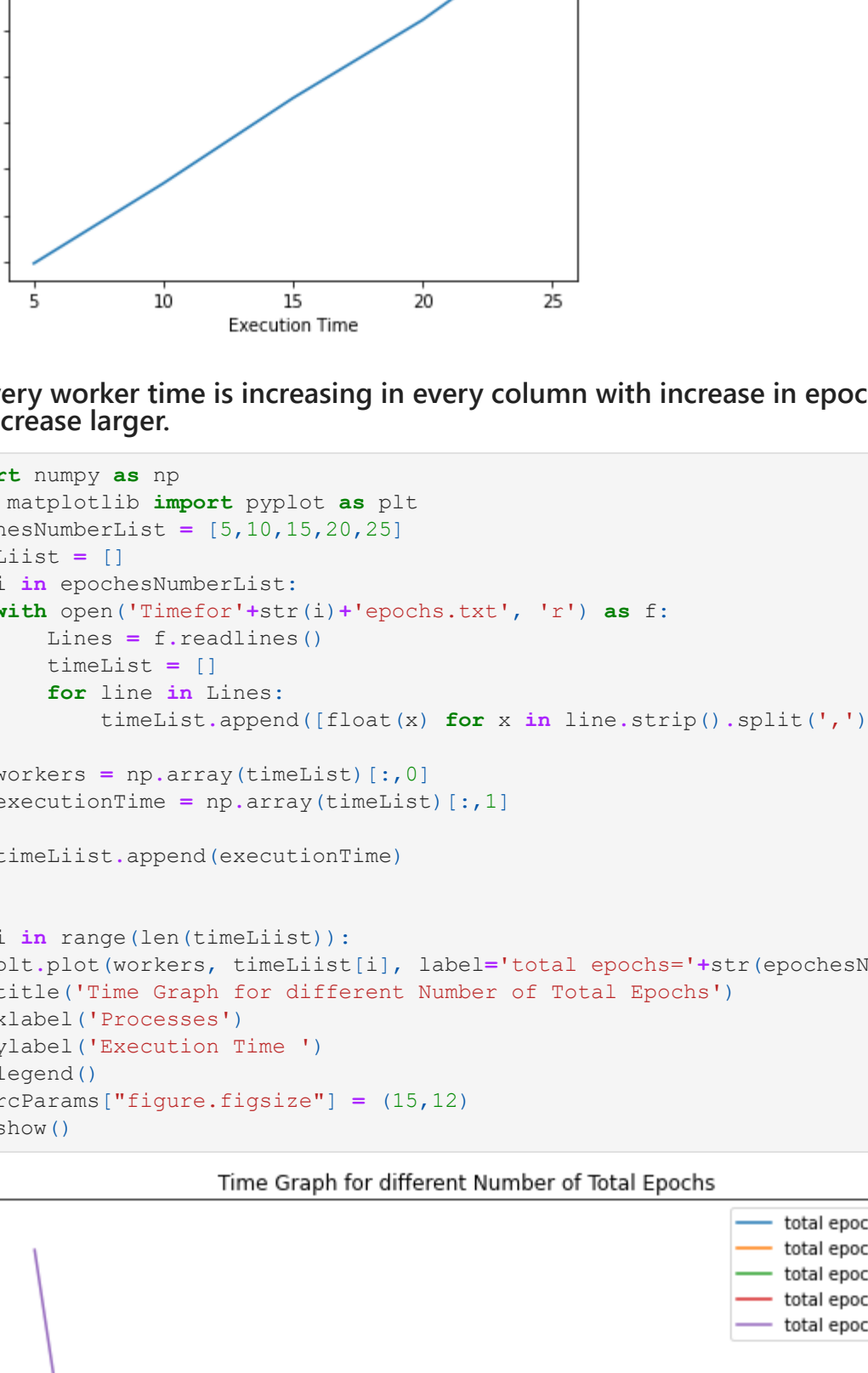
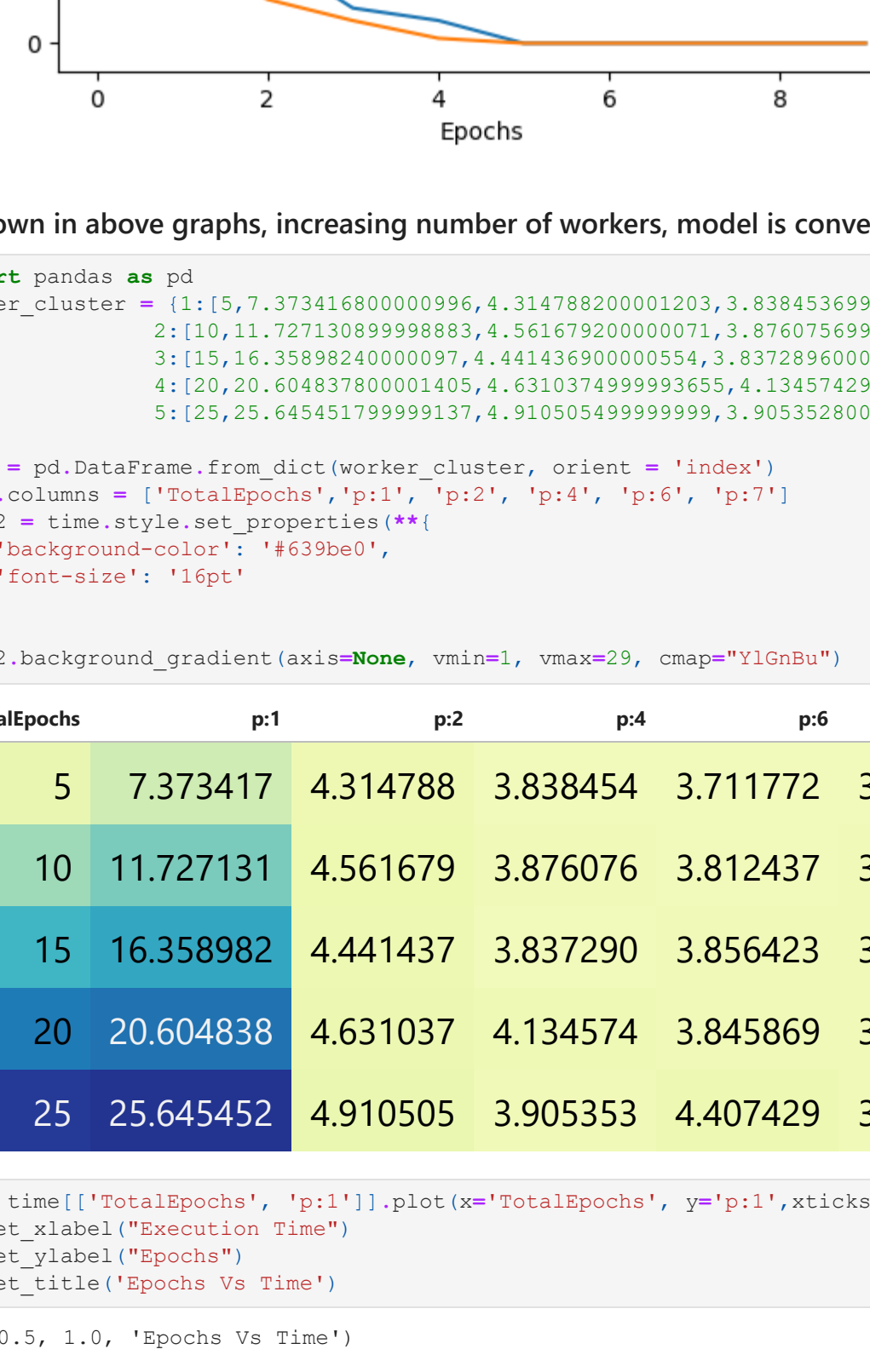
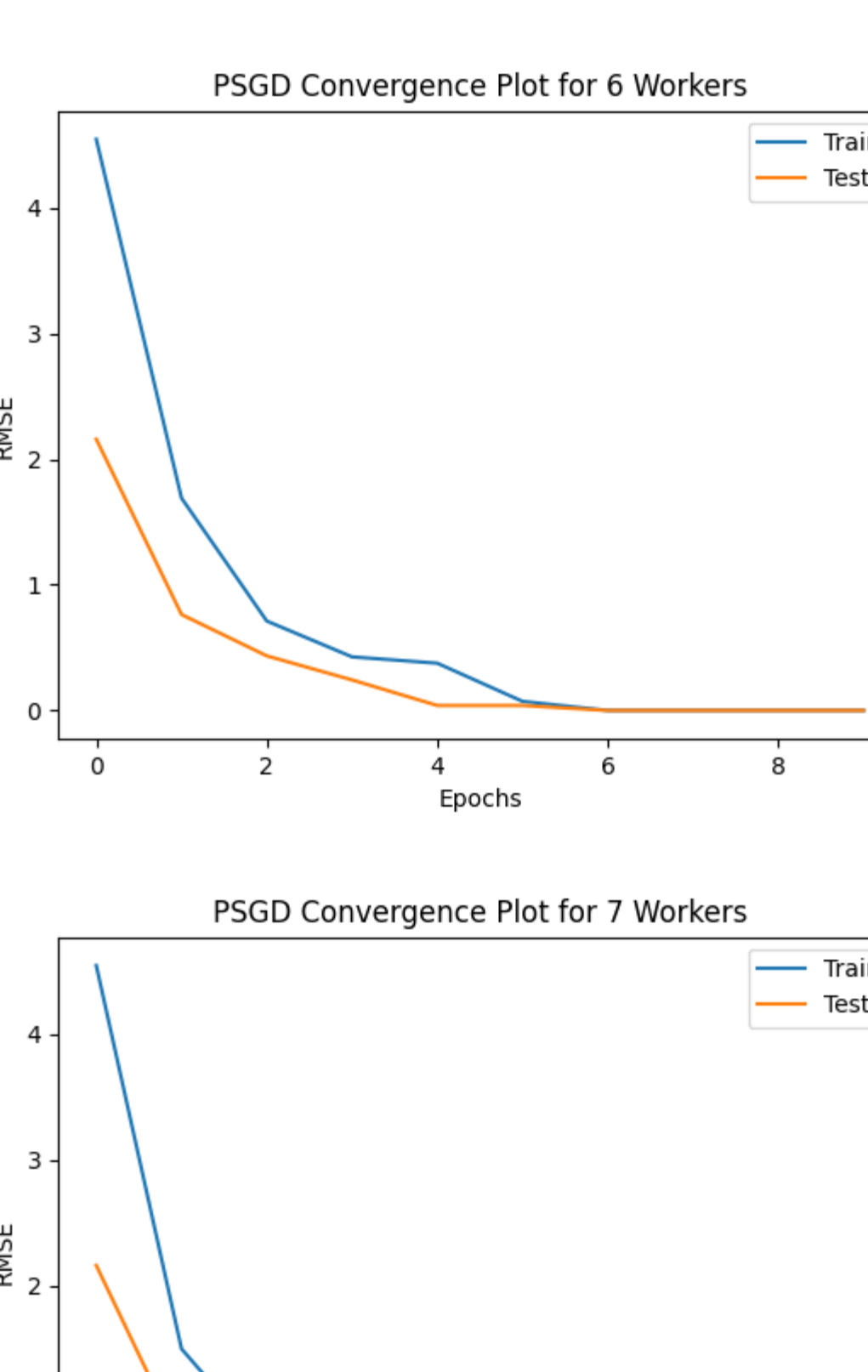
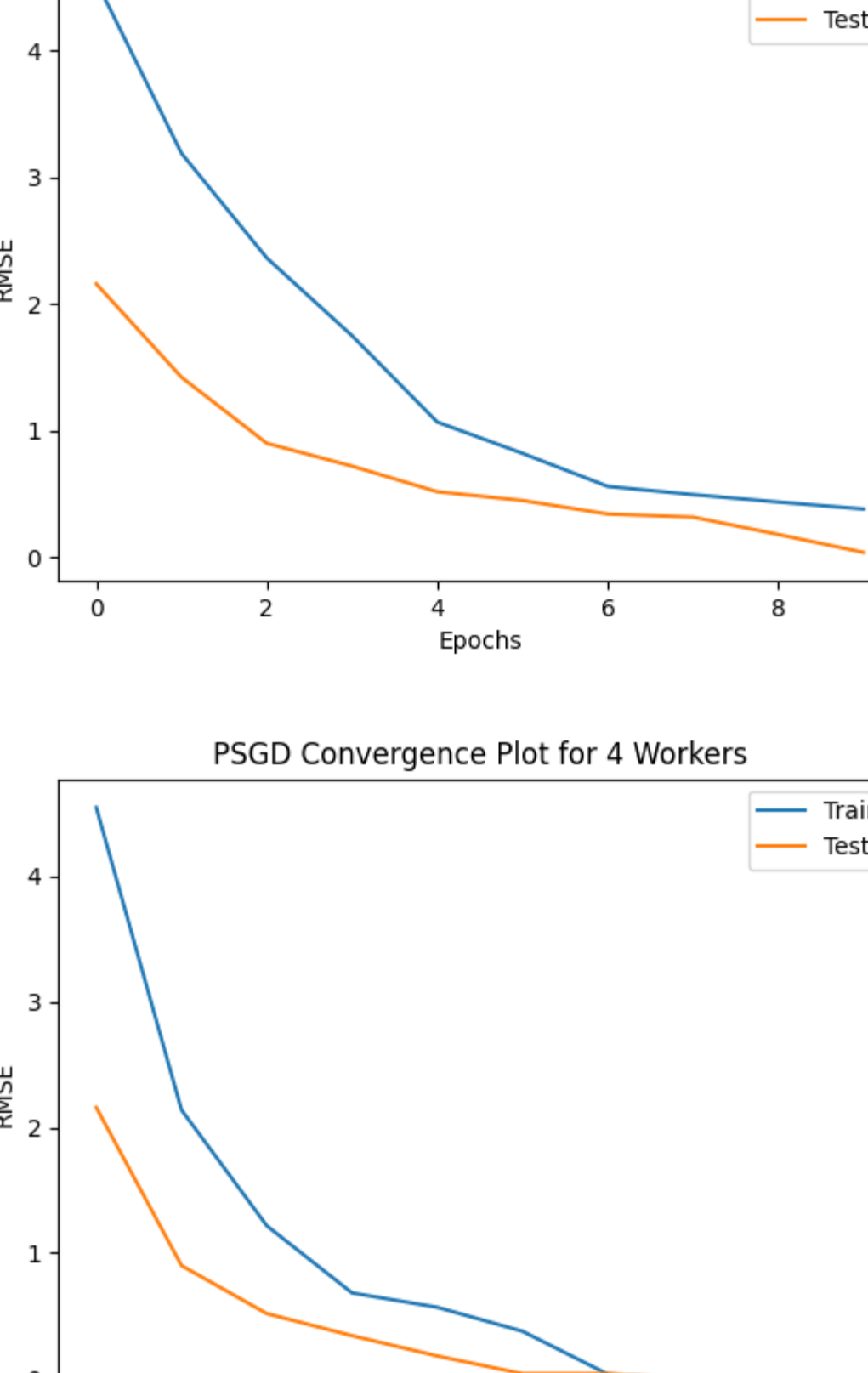


Parallel SGD converge for Different Workers and 10 Epochs



As shown in above graphs, increasing number of workers, model is converging in lesser epochs.

```
In [7]: import pandas as pd
worker_cluster = [(1,10,7.373416800009996,4.314788200001203,3.838453699998354,3.711772499998915,3.70039519999921,
2:[10,11.727130899998883,4.561679200000071,3.8760756999981822,3.8124372000002023,3.94855189999981,
3:[15,16.35898240000097,4.4414369000000554,3.8372896000000765,3.8564231999989715,3.84456409999981,
4:[20,20.604837800001405,4.6310374999993655,4.134574299998349,3.8458694000000813,3.8729034000001,
5:[25,25.645451799999137,4.910505499999999,3.90535280000004007,4.407428700000031,3.98208119999981,

time = pd.DataFrame.from_dict(worker_cluster, orient = 'index')
time.columns = ['TotalEpochs','p:1', 'p:2', 'p:4', 'p:6', 'p:7']
time2 = time.style.set_properties(**{
    'background-color': '#639db0',
    'font-size': '16pt'
})
time2.background_gradient(axis=None, vmin=1, vmax=29, cmap="YlGnBu")

Out[7]:
```

	TotalEpochs	p:1	p:2	p:4	p:6	p:7
1	5	7.373417	4.314788	3.838454	3.711772	3.700395
2	10	11.727131	4.561679	3.876076	3.812437	3.948556
3	15	16.358982	4.441437	3.837290	3.856423	3.844564
4	20	20.604838	4.631037	4.134574	3.845869	3.872903
5	25	25.645452	4.910505	3.905353	4.407429	3.982081

```
In [12]: ax = time[['TotalEpochs', 'p:1']].plot(x='TotalEpochs', y='p:1', xticks=[5,10,15,20,25])
ax.set_xlabel("Execution Time")
ax.set_ylabel("Epochs")
ax.set_title("Epochs Vs Time")

Out[12]: Text(0.5, 1.0, 'Epochs Vs Time')
```



For every worker time is increasing in every column with increase in epochs, but for sequential execution time this increase larger.

```
In [20]: import numpy as np
from matplotlib import pyplot as plt
epochesNumberList = [5,10,15,20,25]
timelist = []
for i in epochesNumberList:
    with open('timefor'+str(i)+'epochs.txt', 'r') as f:
        lines = f.readlines()
        timelist = []
        for line in lines:
            timelist.append(float(x) for x in line.strip().split(','))

workers = np.array(timelist)[5:0]
executionTime = np.array(timelist)[1:]

timelist.append(executionTime)

for i in range(len(timelist)):
    plt.plot(workers, timelist[i], label='total epochs='+str(epochesNumberList[i]))
plt.title('Time Graph for different Number of Total Epochs')
plt.xlabel('Processes')
plt.ylabel('Execution Time')
plt.legend()
plt.rcParams["figure.figsize"] = (15,12)
plt.show()
```

