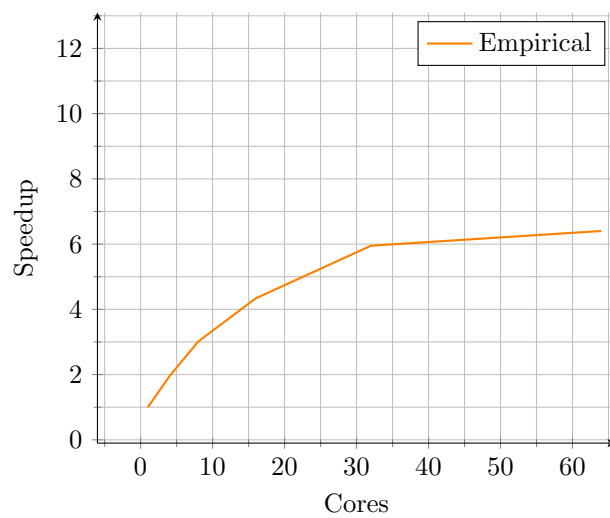# DAT470 Assignment 4

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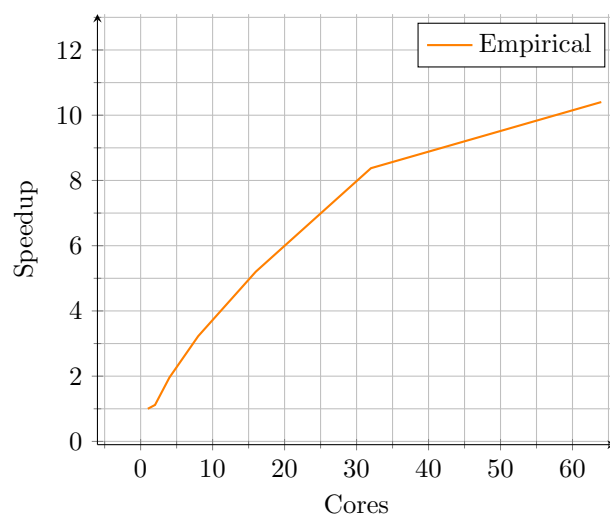
Problem 1

b)


```
num workers: 1
 total time: 39.914130449295044 seconds
```
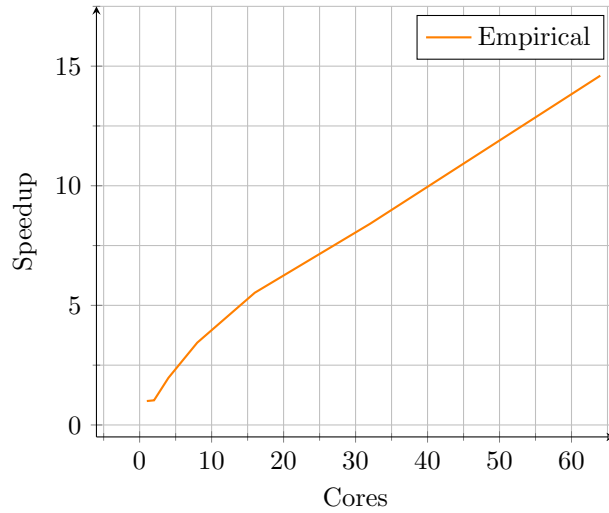
d)


```
num workers: 1
```

```
total time: 115.9669098854065 seconds
```

Problem 2

b)

c)

Note – this is not the same run as in b).

```
num workers: 1
total time: 853.4 s
time reading: 119.3 s
time computations: 734.1 s

num workers: 64
total time: 61.1 s
time reading: 10.0 s
time computations: 51.1 s
```

The fraction of time spent on computations is 86 % and 84 % for 1 core and 64 cores respectively. The speedup for the total time is ≈ 14, and the speedup for computation is ≈ 14.4.

d)

Station Code	Station Name	Slope (°F/d)
USC00364611	KITTANNING LOCK 7, PA US	108.5
USC00241993	COOKE, MT US	84.0
USC00211585	CLEARWATER, MN US	44.0
USC00114363	INA, IL US	34.5
USC00205667	MOUNT PLEASANT, MI US	33.0

Table 1: Top 5 temperature slope coefficients in the full data set.

Fraction of positive coefficients (slopes): 0.67

Fraction of positive differences (decadewise difference): 0.75

num workers: 64

total time: 270.1 s

Station Code	Station Name	Temperature Difference (°C)
RSM00024944	OLEKMINSK, RS	220.1
RSM00024641	VILJUJSK, RS	210.9
RSM00024266	VERHOJANSK, RS	200.5
RSM00021921	KJUSJUR, RS	186.8
KZ000035078	ATBASAR, KZ	103.1

Table 2: Top 5 temperature differences between 1910th and 2010th decade.

Min	Q1	Median	Q3	Max
-3.035×10^2	-2.982×10^{-4}	4.326×10^{-4}	1.281×10^{-3}	1.085×10^2

Table 3: Five-number summary for the slopes (°F/day).

Min	Q1	Median	Q3	Max
-176.0	-0.1	4.3	8.8	220.1

Table 4: Five-number summary for the decadewise temperature difference (°C).

e)

While the question of whether the climate is changing is impossible to answer based on the most extreme values from the recorded weather stations (top 5 cases) which are obvious outliers, the outliers can be taken into account in the five-number summaries. In the five-number summary for slopes, we observe that the median value is positive, indicating a climate warming. While Q1 is negative we have a larger value for Q3, indicating that a larger number of weather stations have a positive trend in slopes (also, the fraction of positive coefficients for the slopes are 67 %). Regarding the five-number summary for the temperature difference, we have a similar situation. The minimum as well as the maximum value are obvious outliers, while the median value indicates an increase of 4.3 degrees of that weather station. Again, the larger part (here 75 %) of the stations have a positive temperature difference, also indicating that the climate is warming.

To do a better analysis, one should clean the data from outliers and analyze the geographical positions of the weather stations that have recorded data. Furthermore, since not all weather stations had recorded data for both 1910 and 2010, we do not know if valuable data are missing. For example, one could do a comparison of data for weather stations close to those stations with missing data, if possible.