HAS Tools:
basic timeseries stuff

September 27, 2024

First, just checking in - how's everyone doing?

- We have a super wide range of folks in this class
- I want to make sure it's working for the most of us
- I also want to make sure you are meeting eachother

- I put together a short (<10min) survey to make get feedback - it is anonymous and not required, but greatly appreciated:
  - https://forms.gle/hFEXhUwL7VzXcwQz9

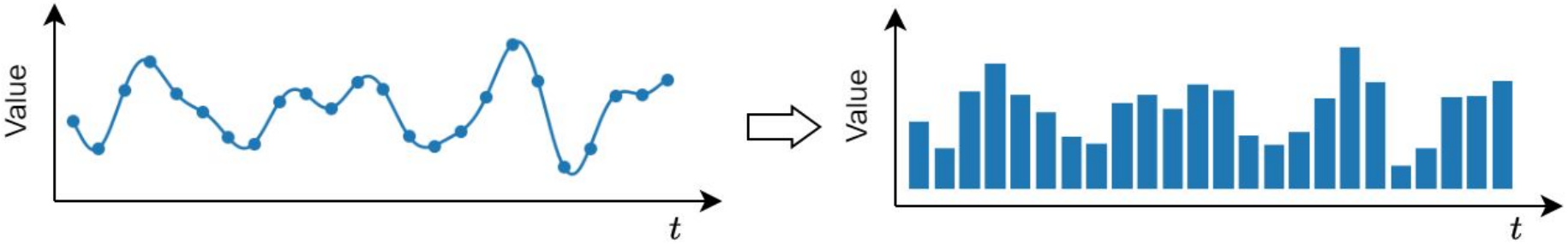
Current conditions: hw4, cmwr, & you

- REMINDER: hw4 is due next Monday!
- Also, I will be participating in the CMWR conference next week and not super available
- We will run a truncated class schedule:
  - Plan for 10:15 - 10:45, I'll do my best
  - Feel free to gather normally
- No class Friday - Memorial for Tom Meixner
- I think we need more time to cover some basics of modeling & forecasting to assign the first forecast assignment
- In lieu of this I'll record and post intro videos on basic regression analysis for next week, no assignments due.

Okay, back to regular programming

I want to talk a bit about “time series” data

- You have already seen it: the snow data is timeseries
- It’s just a sequence of data points organized in order of time
- Often sampled at regular intervals, but not always



https://github.com/FilippoMB/python-time-series-handbook

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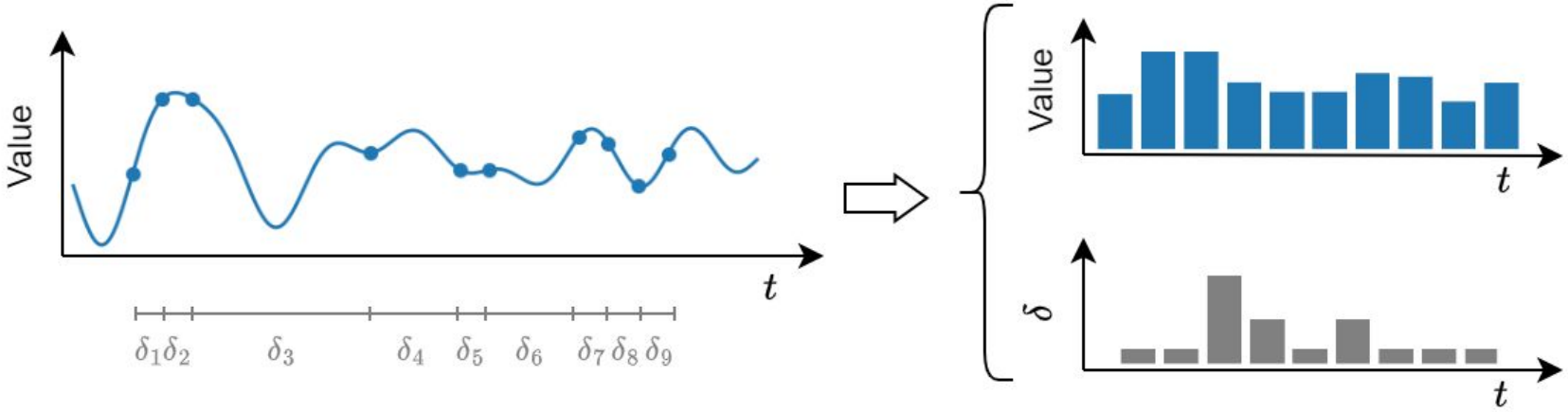

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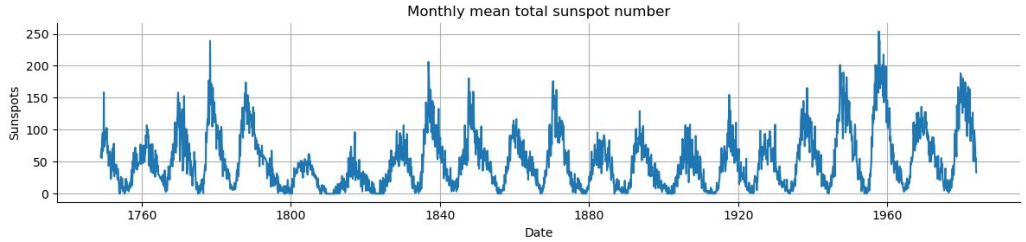
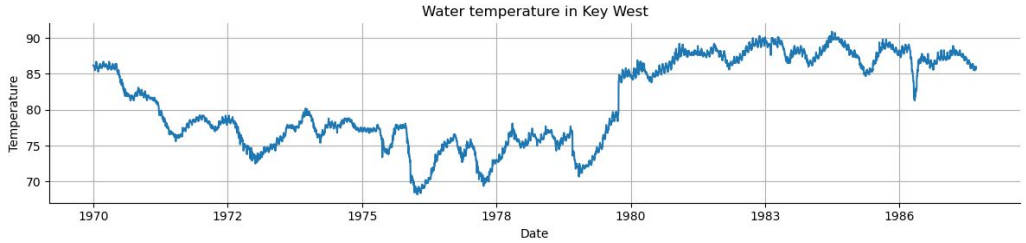
This is a ubiquitous “data representation”!

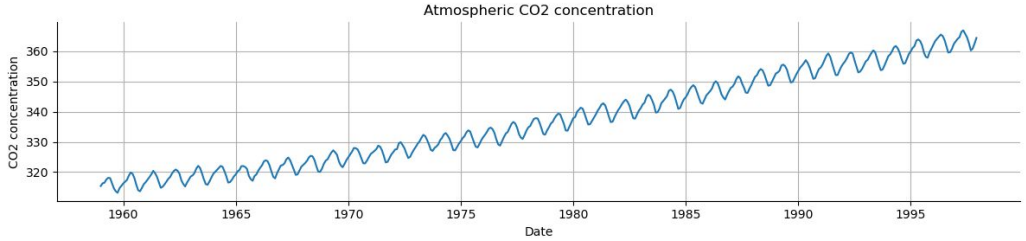
You can find examples across almost all domains of science and beyond

From these examples you should be able to discern some key patterns of timeseries data

What are you seeing here?







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What’s in a timeseries?

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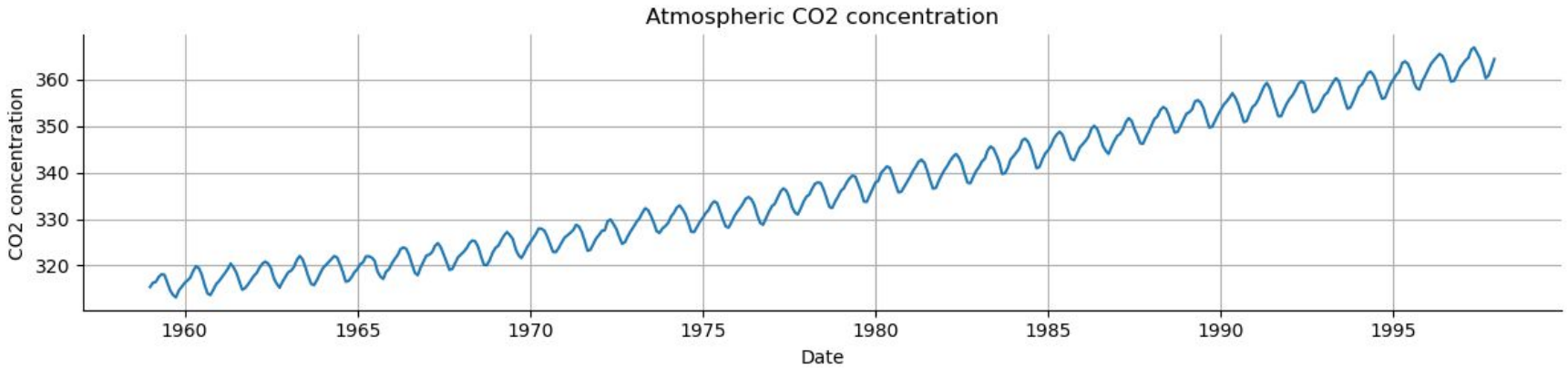
Side note - trends need not be linear



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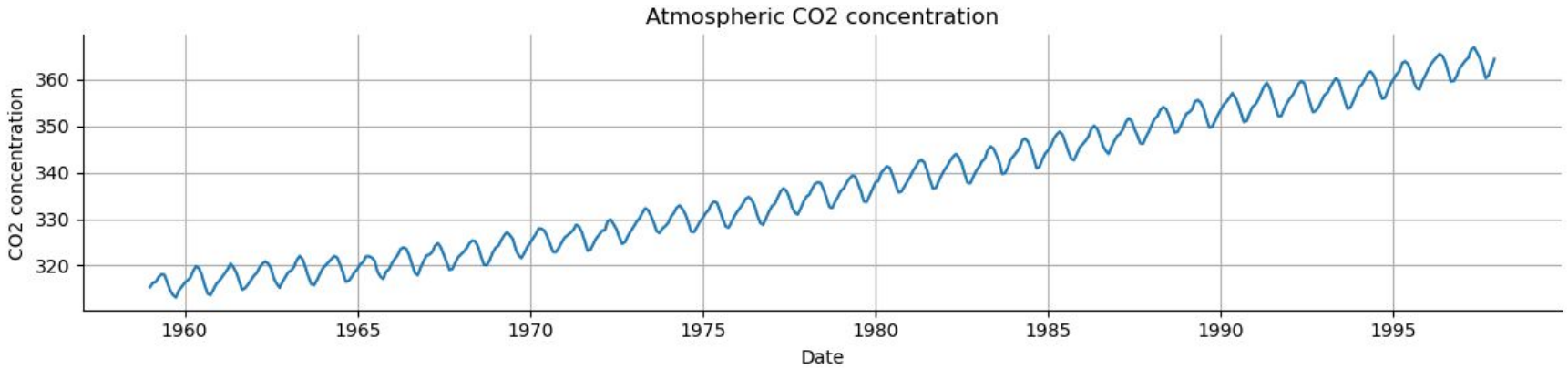
But also obvious from this plot - seasonality!



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What's in a timeseries?

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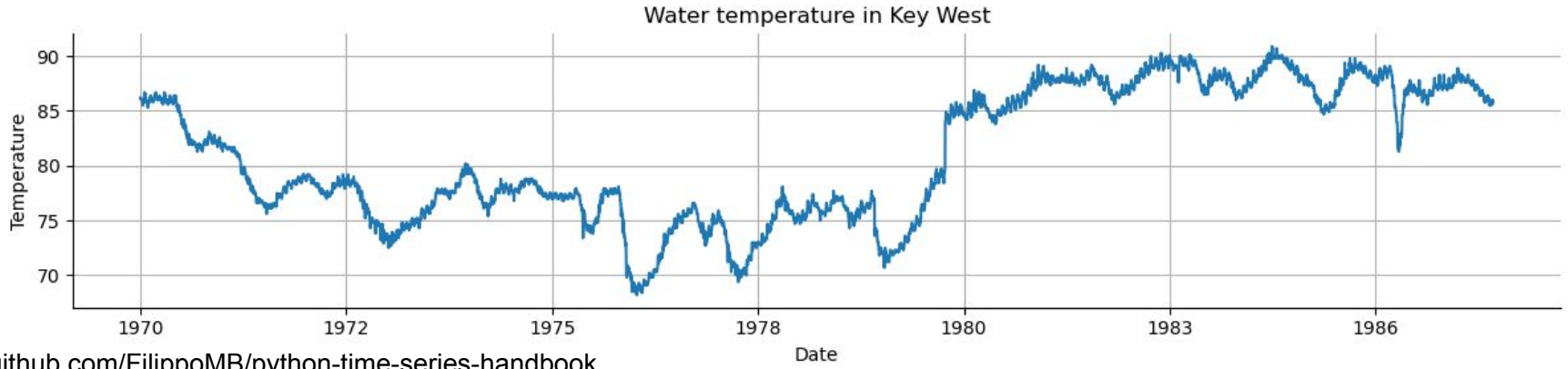
Side note - trends need not be linear
But also obvious from this plot - seasonality!
Finally, random variation/stochasticity/noise



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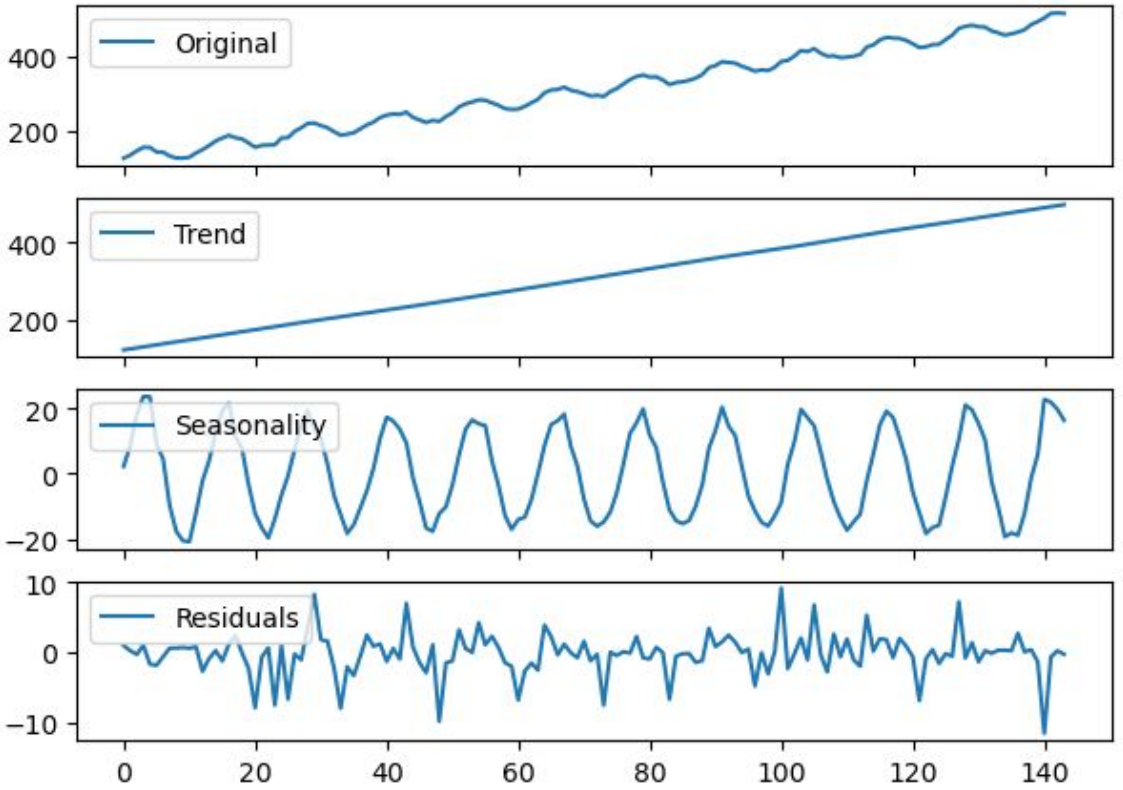
What's in a timeseries – synthesis

We can highlight this with a synthetic example

Decomposing things into these categories should be familiar to those who have seen Fourier transforms before 🤔

There are many ways to do similar things - we are glossing over a huge field!



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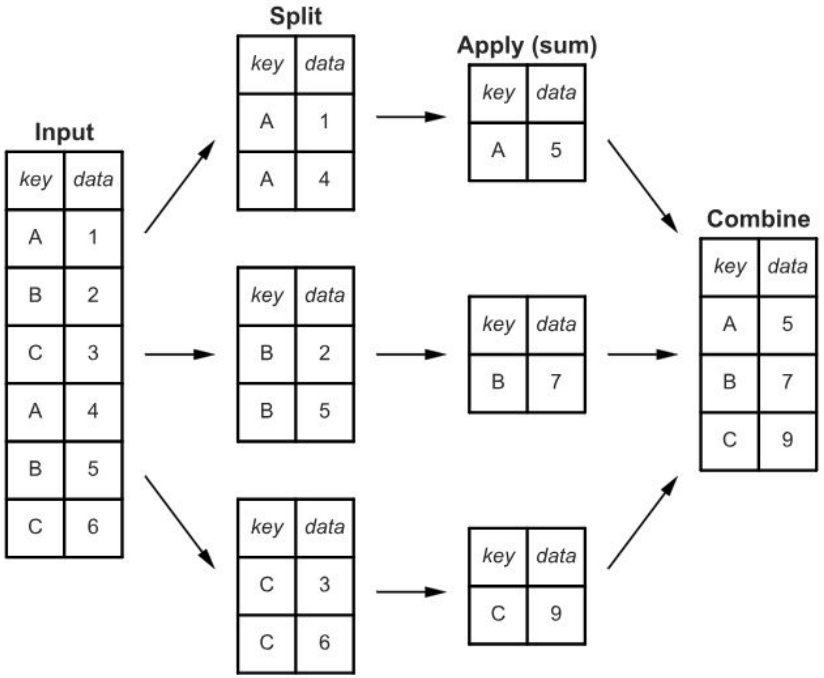
groupby vs resample

- These two methods of modifying your dataframes can be confusing
- groupby is used to “group” things by some category
- groups do not need to be “local” to each other in the data!



https://jakevdp.github.io/blog/2017/03/22/group-by-from-scratch/

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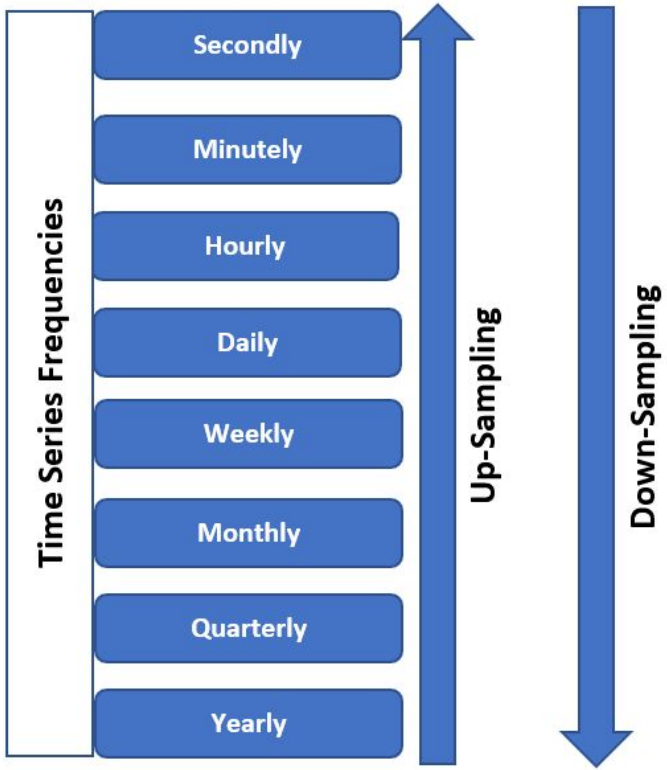
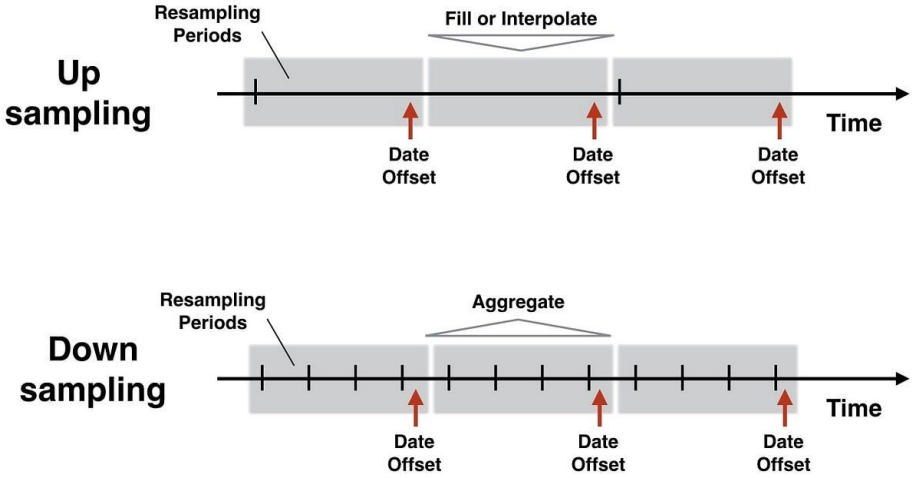
- resampling changes the “frequency” of the index



groupby vs resample

- These two methods of modifying your dataframes can be confusing
- resampling changes the “frequency” of the index
- when up sampling (higher frequency) you need to fill or interpolate
- when down sampling (lower frequency) you need to aggregate



That’s all,
work time for hw4