Lecture 8

Pandas Continued: Plotting and other Pandas Functions

What have we learned to do this week?

- Import data into python

- Introduced the Pandas python package

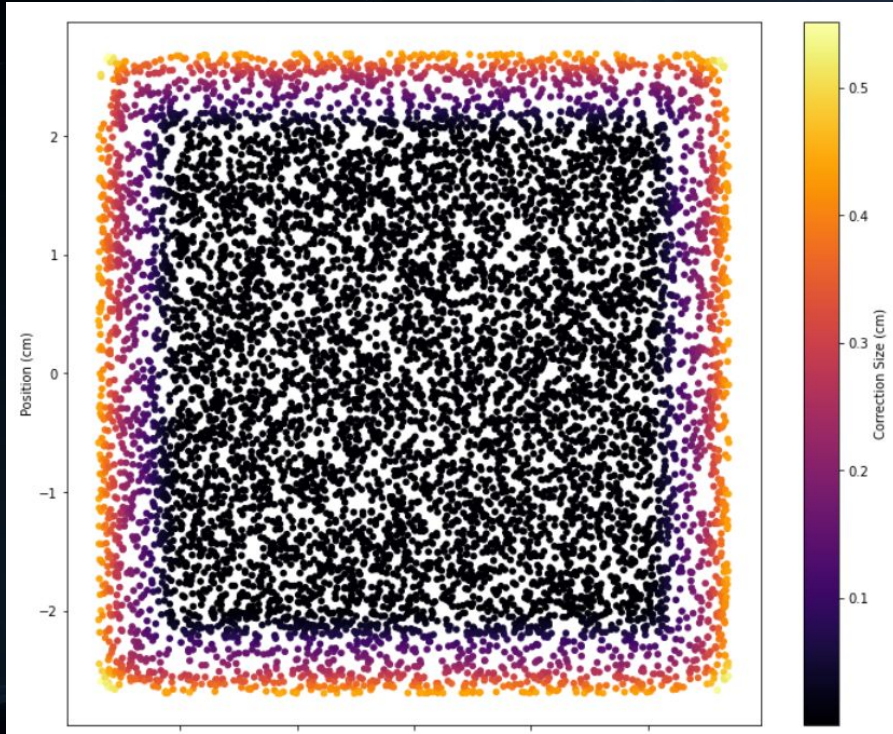- Learned to use these skills to manipulate and analyze data

What else can we do?

- Pandas has many built in tools you can use to help analyze your data
- Ex:
  - df.loc & df.iloc
  - pd.concat
  - df.dropna

- Today we are going to focus on what pandas can do with plotting

Plotting With Pandas

- Pandas makes it very easy for us to display our data in a meaningful way

- Easy to use built in plotting functions exist that can work in conjunction with matplotlib

Plotting With Pandas

- Plotting in pandas can also handle more than two variables at once
- This third value could pertain to error, or particle intensity on a detector, or light hitting a telescope
- The examples on the sides of the slides all show plots created with pandas where each point has a third value beyond position
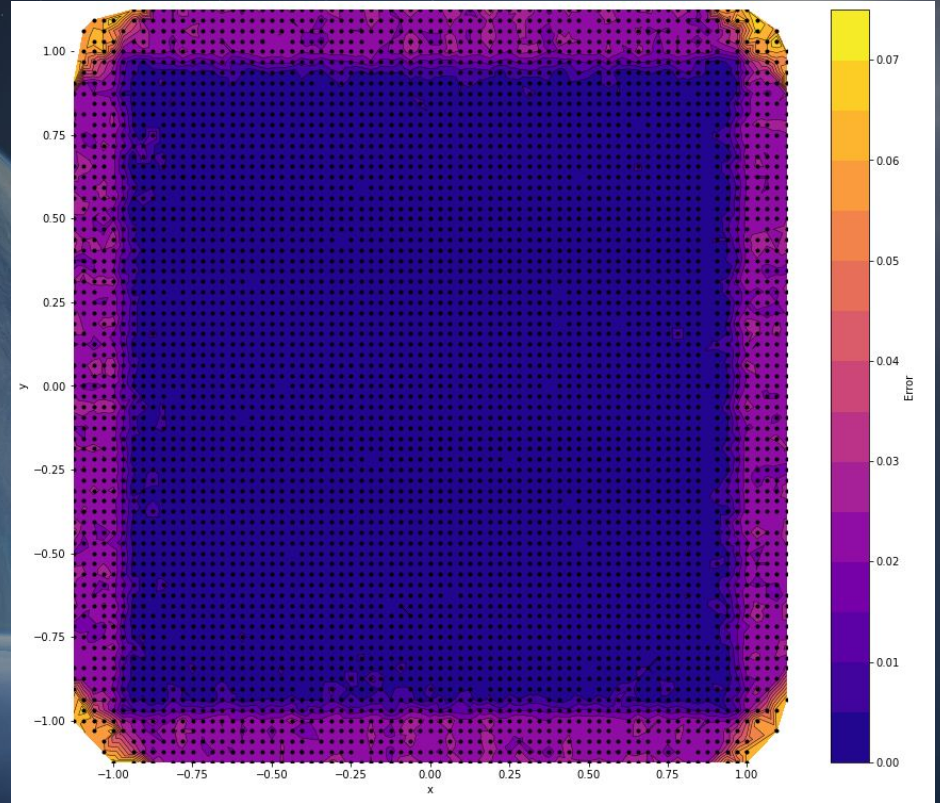
Plotting With Pandas

- Colored scatter plots aren't the only option

- Pandas has built in capabilities for a wide variety of plots, giving you plenty of options for ways to display your data

- All options can be found at: https://pandas.pydata.org/docs/user_guide/visualization.html
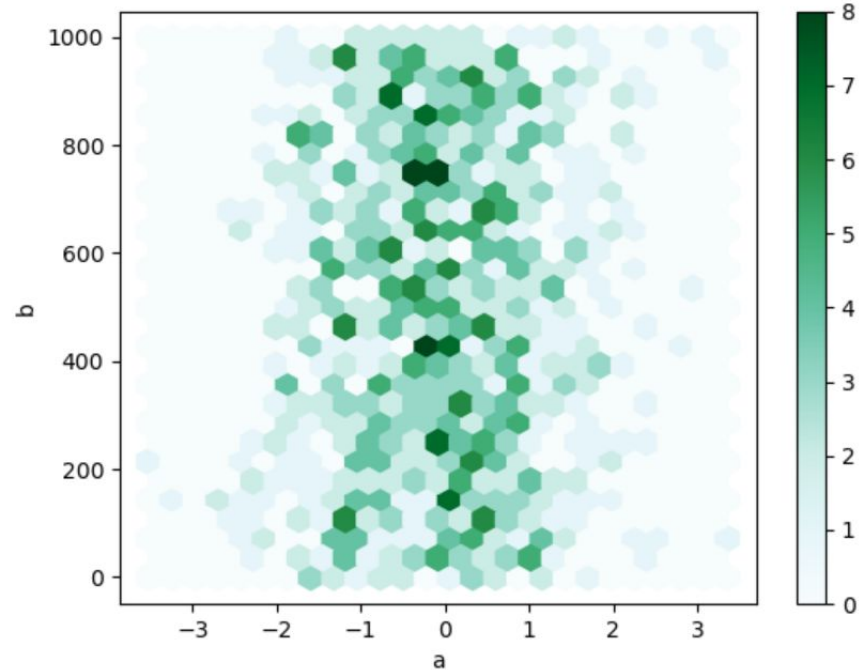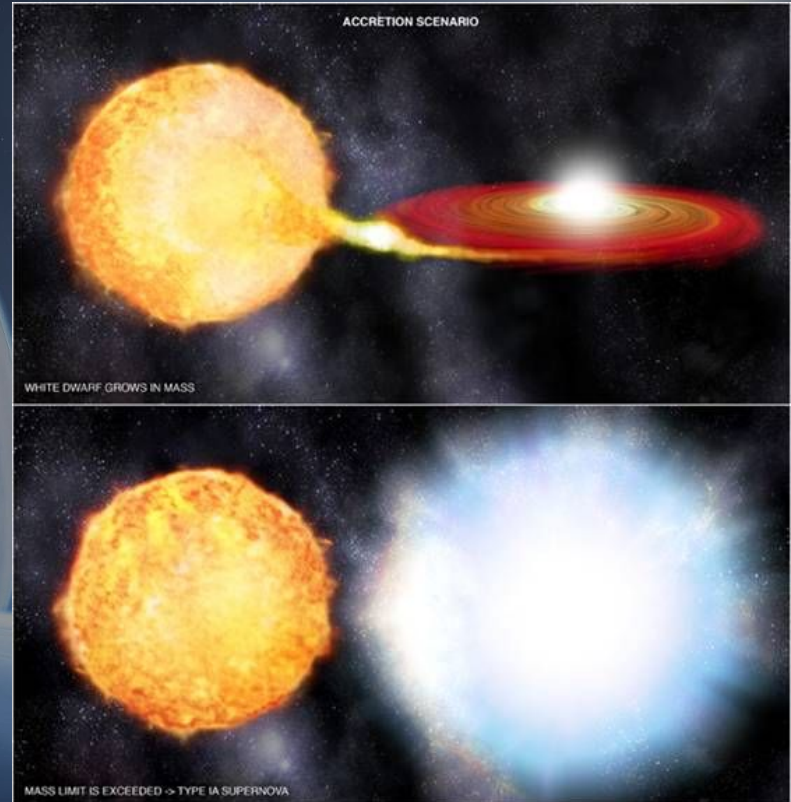
Coding Demo Part 1

Pandas Example: Type 1a Supernova

- These are specific type of supernovae
- Occur in binary star systems between a main sequence star and a white dwarf
- The dwarf star accretes mass from the partner star
- Once it reaches a critical mass, the star will explode

ACCRETION SCENARIO

WHITE DWARF GROWS IN MASS

MASS LIMIT IS EXCEEDED -> TYPE IA SUPERNOVA

Type-1a Lightcurve
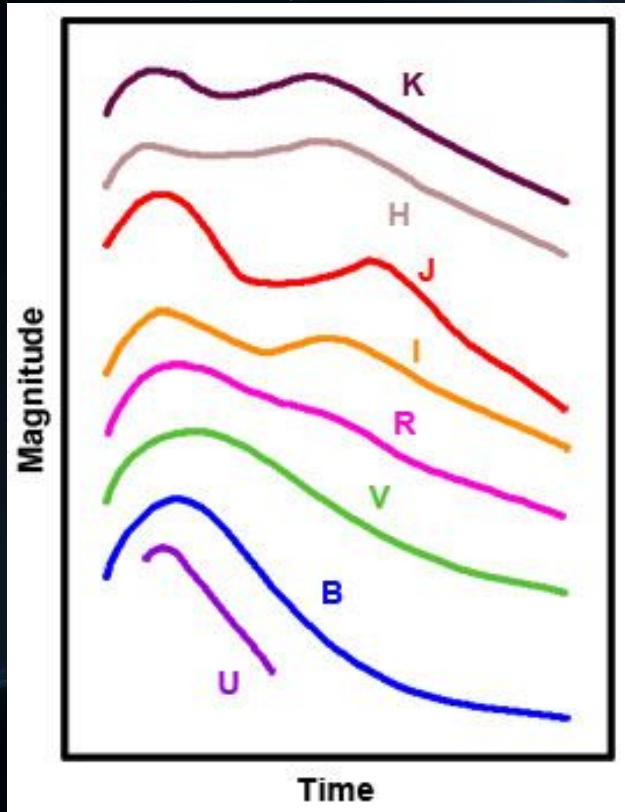
- What is interesting about these supernova is that they all have the same lightcurve
- We know how bright they should be, so we can tell how far away they are
- M = 5 + m-5logd
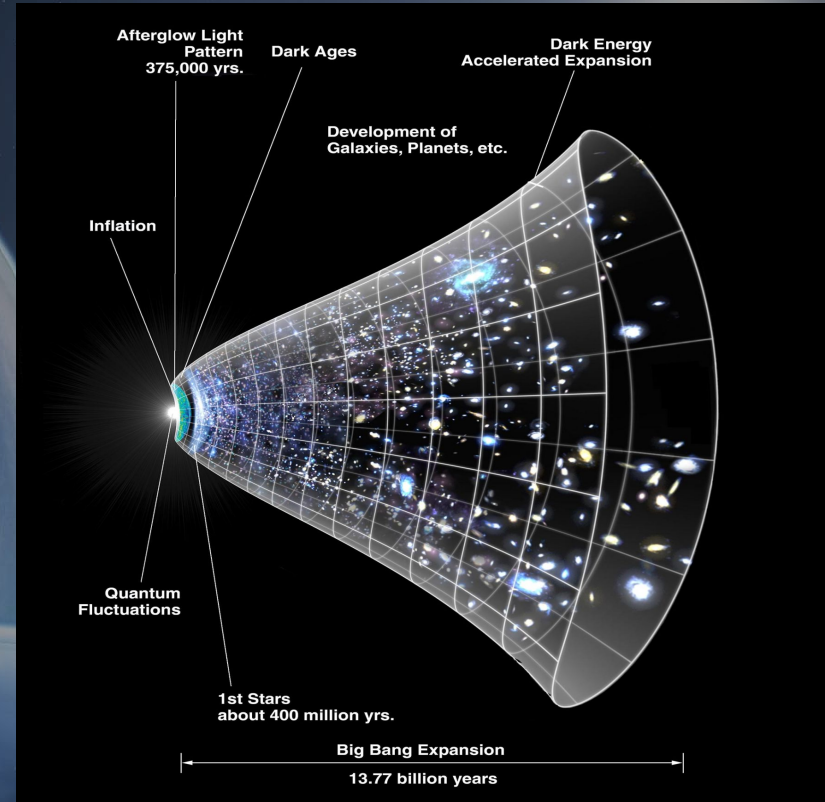- And, because they are so bright we can see them galaxies away

Why Do We Care?

- We don't have a lot of methods for measuring distances on an intergalactic scale

- With these supernovae, we can measure the distance along with the doppler shift of the home galaxy

OBJECT RECEDING: LONG RED WAVES

OBJECT APPROACHING: SHORT BLUE WAVES
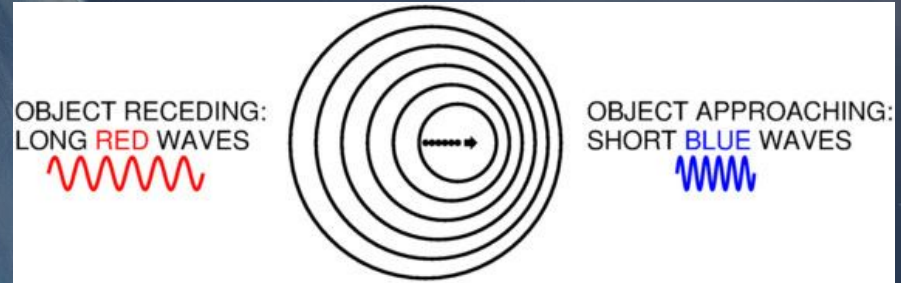
Why Do We Care?

- By measuring the doppler effect, we can tell what direction the galaxy is moving relative to us and how quickly
- Berkeley Professor Saul Perlmutter used this to discover that the rate of expansion of the universe is increasing (and win a Nobel Prize)

Afterglow Light Pattern 375,000 yrs.

Dark Ages

Dark Energy Accelerated Expansion

Development of Galaxies, Planets, etc.

Inflation

Quantum Fluctuations

1st Stars about 400 million yrs.

Big Bang Expansion
13.77 billion years

Coding Demo Part 2