Introduction to Data Science

Data Science Essentials

Goals for today

- **Review last session coding tasks**
- **Exploratory data analysis**

Review last session coding tasks

week2_review notebook

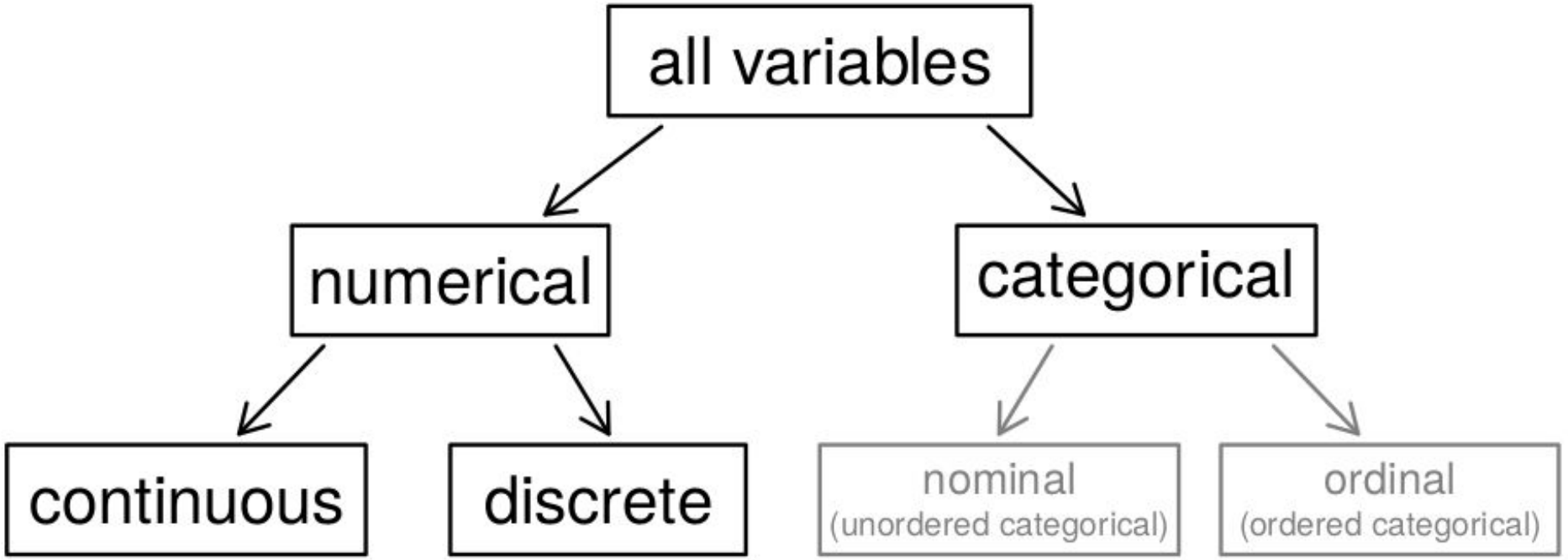
Data

Data are characteristics or information gathered through observation.

When conducting a study, we will be collecting data about **observations/cases/subjects**.

We will often collect a number of **variables** (height, weight, age, sex, annual income, favorite color, number of pets, etc.).

Types of Variables



Borrowed from the OpenIntro Stats Book:
https://leanpub.com/openintro-statistics

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Types of Variables

Numerical Variables: Also called quantitative variables. A *measurement* with numerical meaning. Numerical variables can be measured using a scale or count.

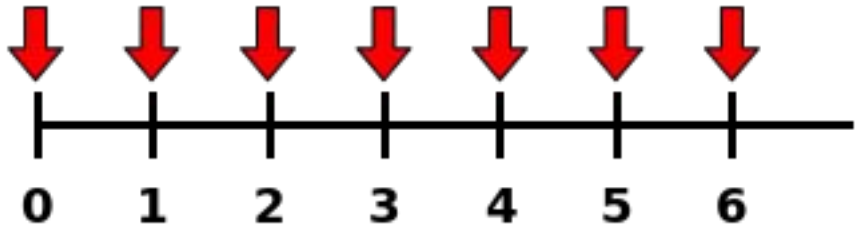
Divided into two types:

1. **Discrete Variables:** All possible outcomes can be listed
2. **Continuous Variables:** Can take on any value in a range

Types of Variables

Number of Pets:

Limited set of distinct values, meaning that it is a *discrete* variable. (You can't have 2.83 pets)



Temperature:

We can't list all possible temperatures, so it is *continuous* variable.

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Types of Variables

Categorical Variables: Also called qualitative variables. Non-numeric data which falls into some number of **levels**.

Caution: sometimes categorical variable are coded with a number

(eg. 0 = small, 1 = medium, 2 = large)

Divided into two types:

1. **Ordinal Variables:** Have a natural/intrinsic ordering (eg. grade level, small/medium/large)
2. **Nominal Variables:** No natural ordering (eg. gender, religious affiliation)

Types of Variables

	Number of Motor Vehicles	Number of Injuries	Hit and Run	Collision Type Description	Zip	Latitude	Longitude
0	1.0	0	N	NOT COLLISION W/MOTOR VEHICLE-TRANSPORT	37076.0	36.1769	-86.5971
1	3.0	1	N	ANGLE	37213.0	36.1770	-86.7746
2	4.0	1	Y	Front to Rear	37214.0	36.1411	-86.6280
3	2.0	0	N	ANGLE	37201.0	36.1622	-86.7744
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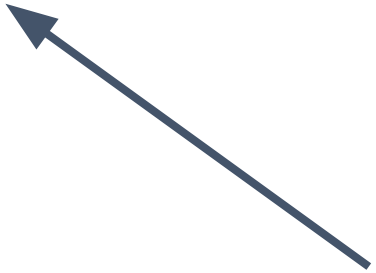

Discrete Numeric

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Nominal Categorical

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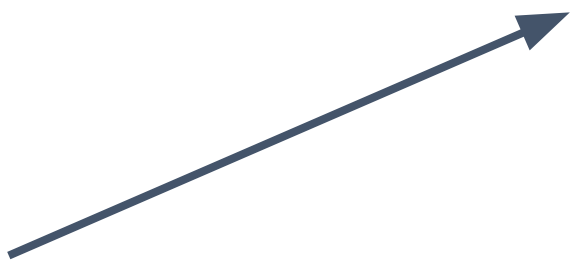

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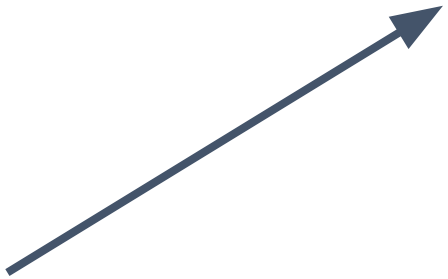

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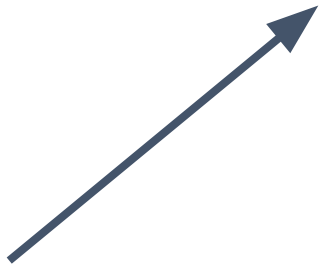

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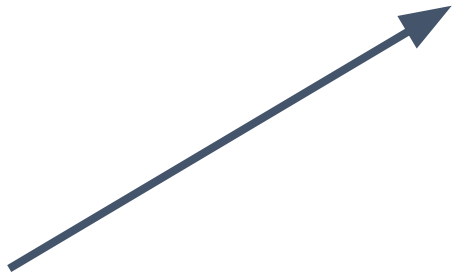

Continuous Numeric

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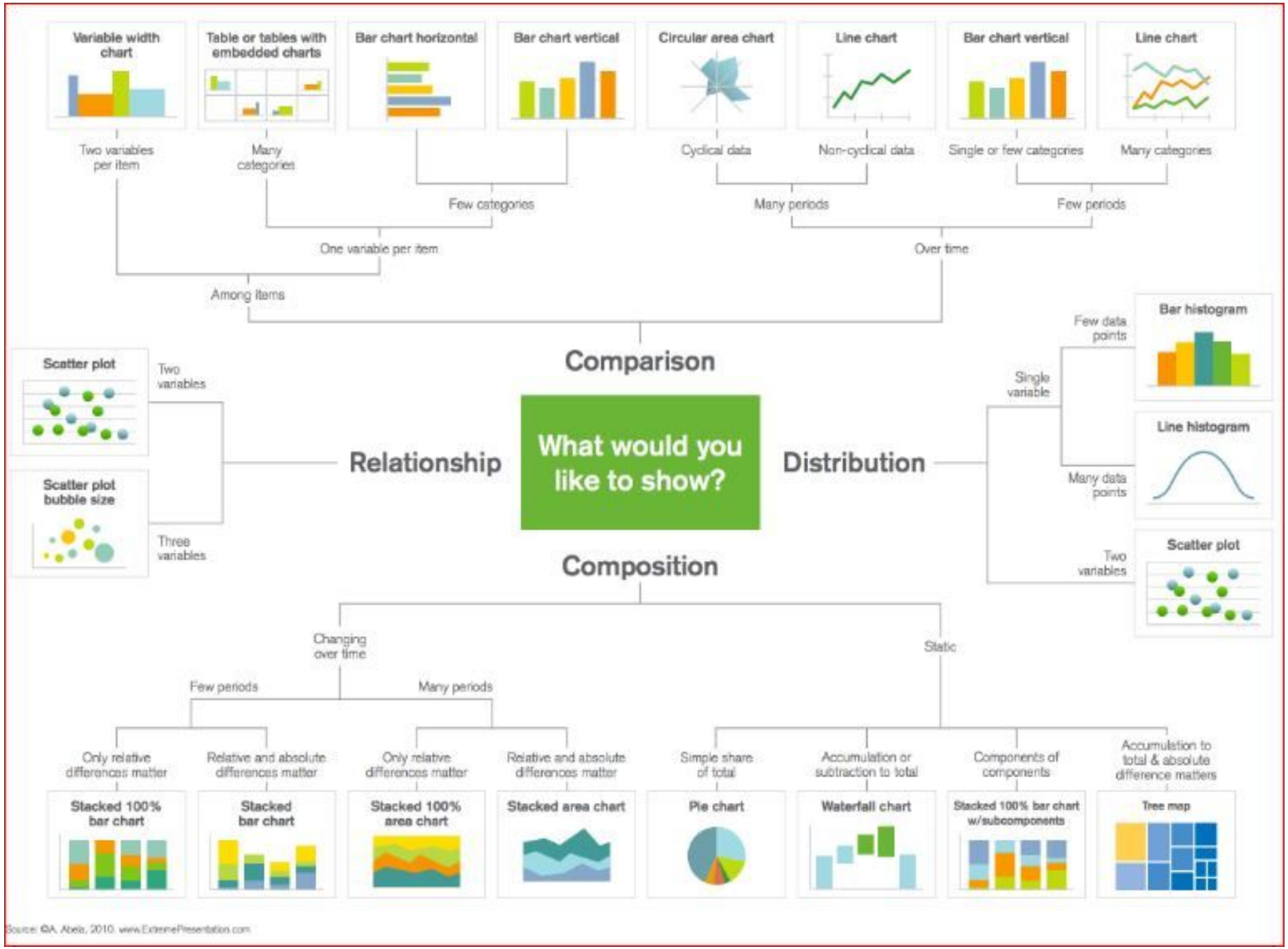
Exploratory Data Analysis

When we encounter a new dataset, we will often want to familiarize ourselves with the properties of that dataset.

It is very hard to understand characteristics of your dataset just by looking at it in tabular form, especially if you have more than a handful of observations (which you almost always will).

Exploratory Data Analysis (EDA) is the process of analyzing a dataset in order to summarize the main characteristics and generate potential ideas and hypotheses.

EDA can be done through plots or charts (visual EDA) or through numeric summaries (numeric EDA).



Source: @A. Abela, 2010. www.ExtremePresentation.com

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Questions?