PSC 400
SYRACUSE UNIVERSITY

DATA ANALYTICS FOR POLITICAL SCIENCE

GETTING STARTED WITH R

CLASS WEBSITE

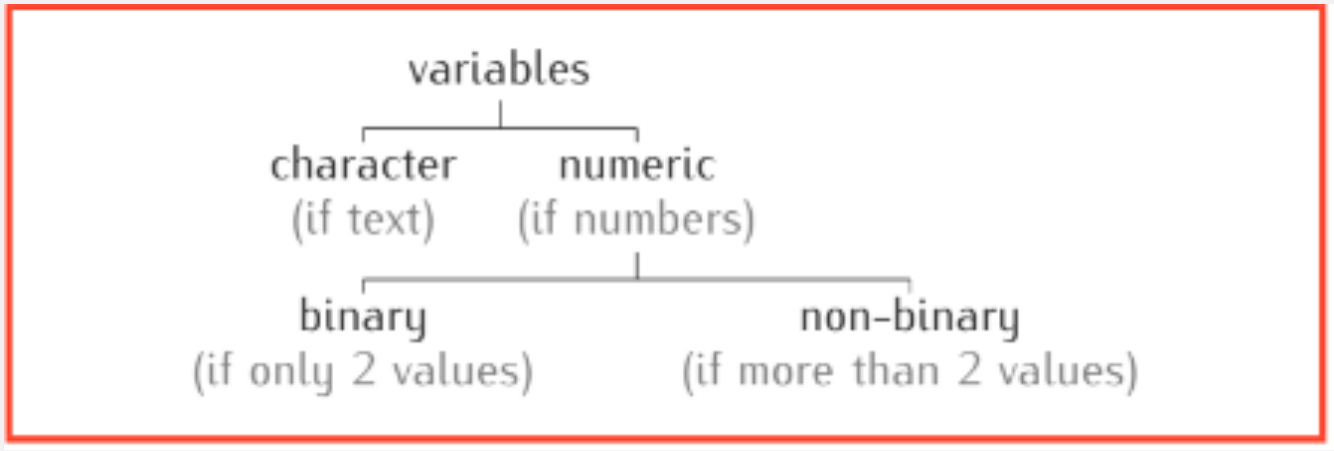
- https://simonweschle.github.io/psc400.html

- Refresh using
  - Windows: ctrl + F5
  - Mac/Apple: Apple + R or command + R

DATASET: STAR.CSV

variable	description
classtype	class size the student attended: "small" or "regular"
reading	student's 3rd-grade reading test scores (in points)
math	student's 3rd-grade math test scores (in points)
graduated	identifies whether the student graduated from high school: 1=graduated or 0=did not graduate

VARIABLE TYPES



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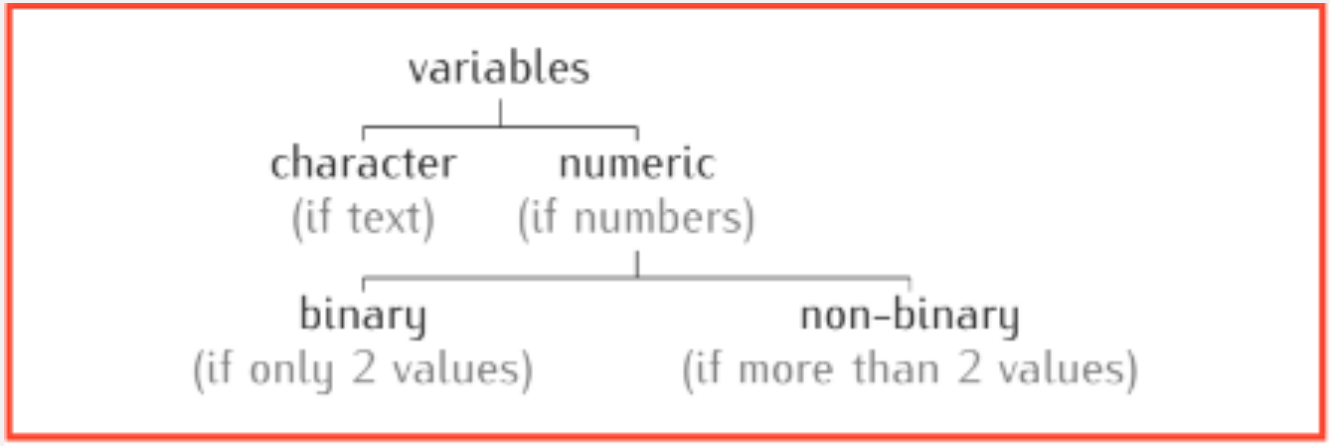

- **What kind of variable is classtype?**

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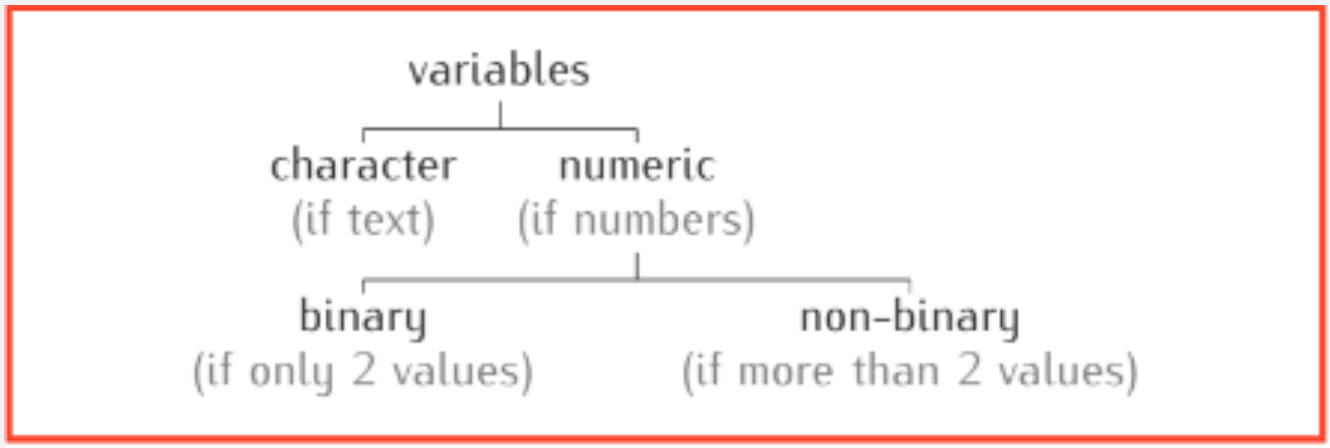

- **What kind of variable is graduated? Summarize it!**

DATASET: TURNOUT.CSV

Variable	*Description*
`year`	election year
`ANES`	ANES estimated turnout rate
`VEP`	voting eligible population (in thousands)
`VAP`	voting age population (in thousands)
`total`	total ballots cast for highest office (in thousands)
`felons`	total ineligible felons (in thousands)
`noncitizens`	total noncitizens (in thousands)
`overseas`	total eligible overseas voters (in thousands)
`osvoters`	total ballots counted by overseas voters (in thousands)

- Data on US elections from 1980 to 2008

CAUSAL EFFECT

- Goal: Estimate causal effect of X on Y
  - Y: outcome variable, dependent variable
  - X: treatment variable, independent variable

CAUSAL EFFECT

- Goal: Estimate causal effect of college attendance on future earnings

CAUSAL EFFECT

- Goal: Estimate causal effect of college attendance on future earnings
  - outcome variable: earnings at age 30
  - treatment variable: attended college or not

INDIVIDUAL CAUSAL EFFECT

- **Earnings of Mary if attended college - Earnings of Mary if did not attend college**

AVERAGE CAUSAL EFFECT

- Take average of:
  - Earnings of Mary if attended college - Earnings of Mary if did not attend college
  - Earnings of Joe if attended college - Earnings of Joe if did not attend college
  - Earnings of Lisa if attended college - Earnings of Lisa if did not attend college
  - Earnings of Bob if attended college - Earnings of Bob if did not attend college
  - …

FUNDAMENTAL PROBLEM

- **Fundamental problem of causal inference: We can never observe outcome in counterfactual scenario**
  - **Observe either income if someone attended college**
  - **Or observe income if they did not attend college**
  - **But never both**

ALTERNATIVE?

- Mary and Joe attended college, Lisa and Bob did not
- Average earnings of Mary and Joe - average earnings of Lisa and Bob
  - Does this capture casual effect of attending college on earnings?

PROBLEM

- Mary and Joe *chose* to attended college, Lisa and Bob *chose* to not attend
- People who choose to attend college are different from people who choose not to attend college
- These differences interfere with our ability to compute the causal effect of attending college

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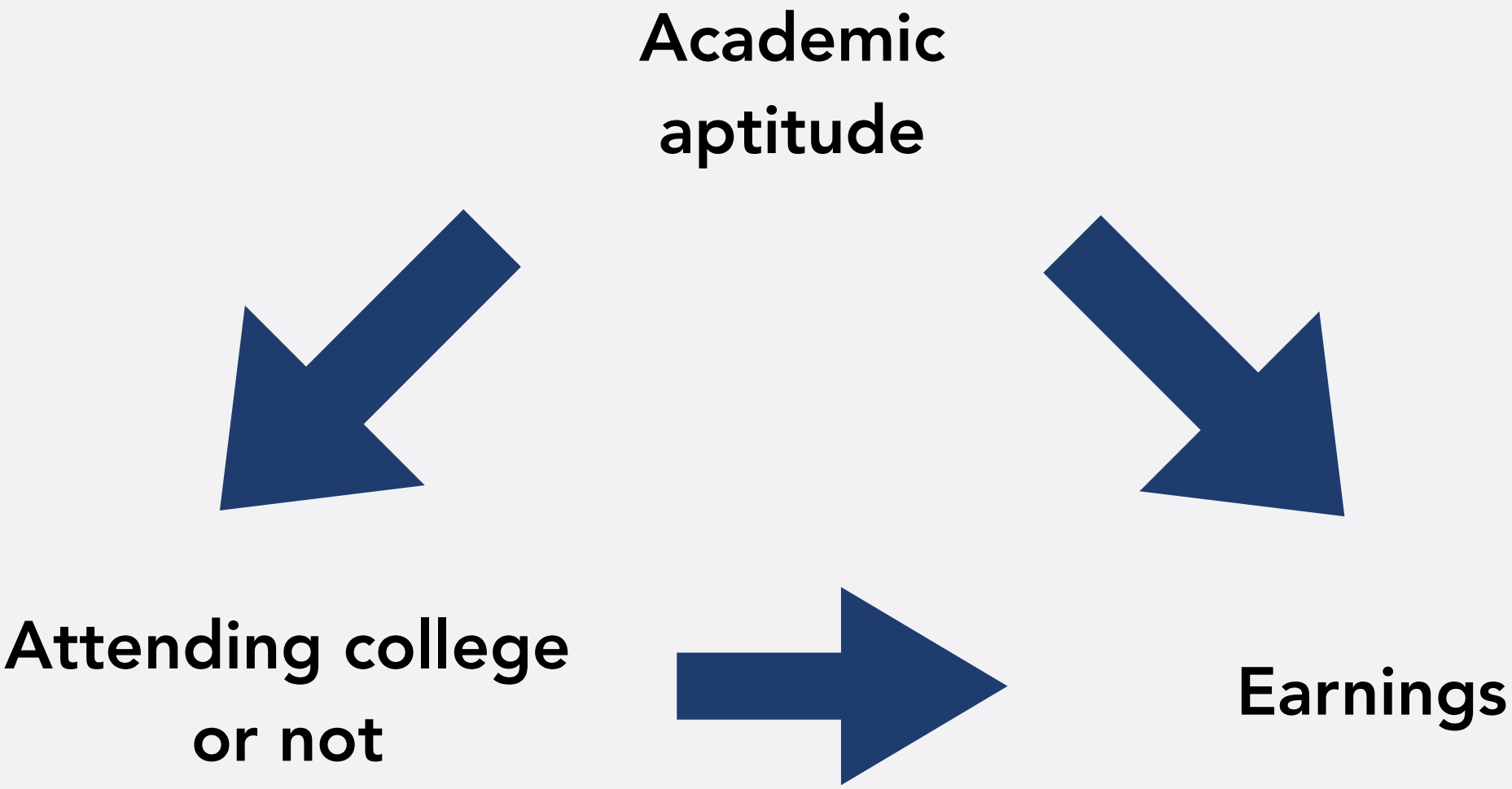

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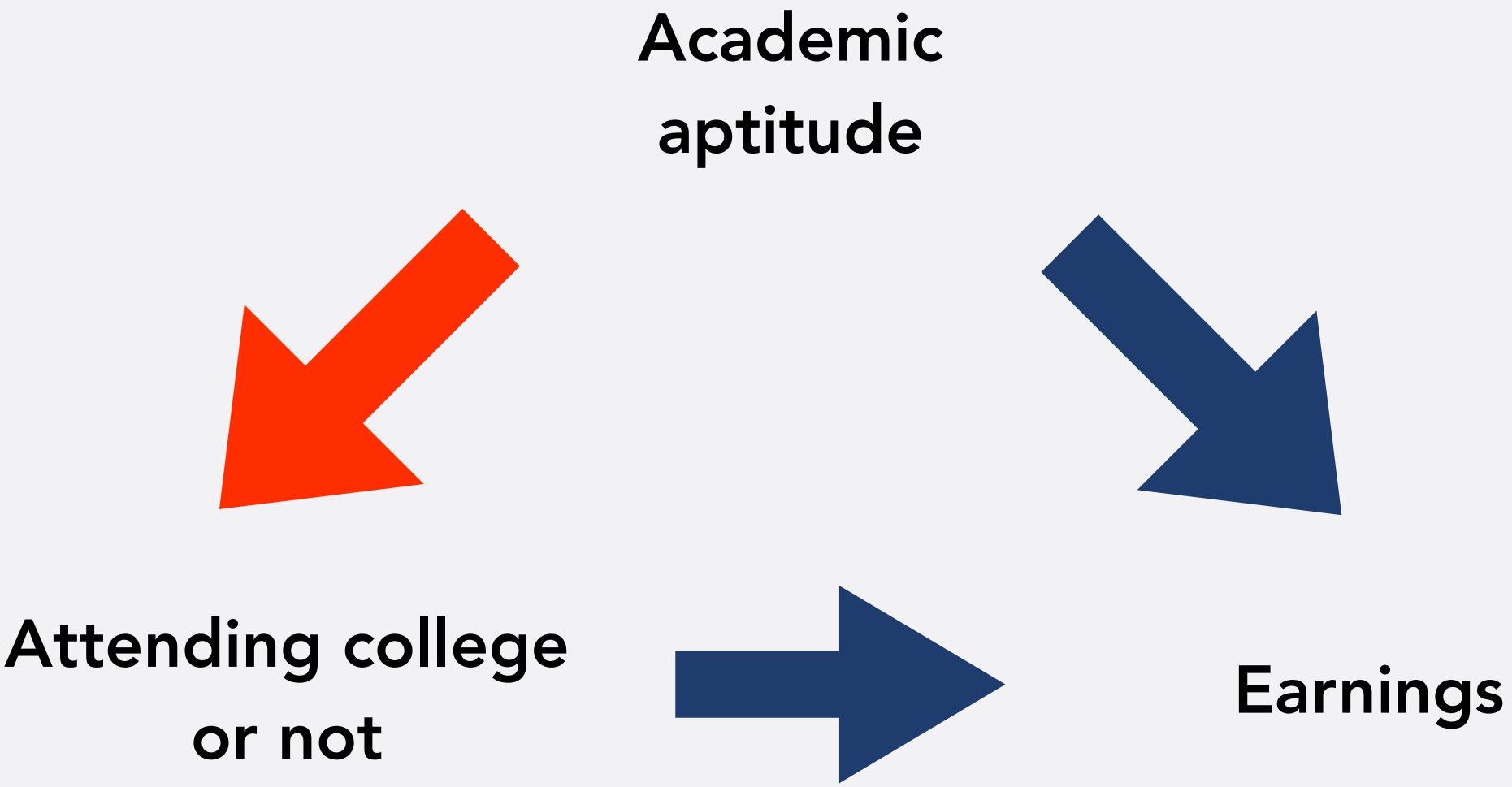

- People with higher academic aptitude are more likely to attend college

PROBLEM

- So if people who attend college have higher earnings, this could be due to:
  - Attending college
  - Having higher academic aptitude
  - Many other potential differences (e.g. parents' income)

EXPERIMENT

- Randomly assign treatment
- Randomly assign people to either attend college or not

EXPERIMENT

- People who are randomly assigned to attend college on average will be the same as people randomly assigned not to attend college on everything (except attending college)
  - Similar academic aptitude
  - Similar parental wealth
  - etc.

AVERAGE CAUSAL EFFECT

- Average earnings of people randomly assigned to attend college - Average earnings of people randomly assigned to not attend college
  - Average causal effect
  - Also known as average treatment effect (ATE)