

# Note-2

## Introduction to DAG

Haoyue

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**The basic settings of this introduction**

# The basic settings of this introduction

No  $\leftrightarrow$  causal relationships in our analysis

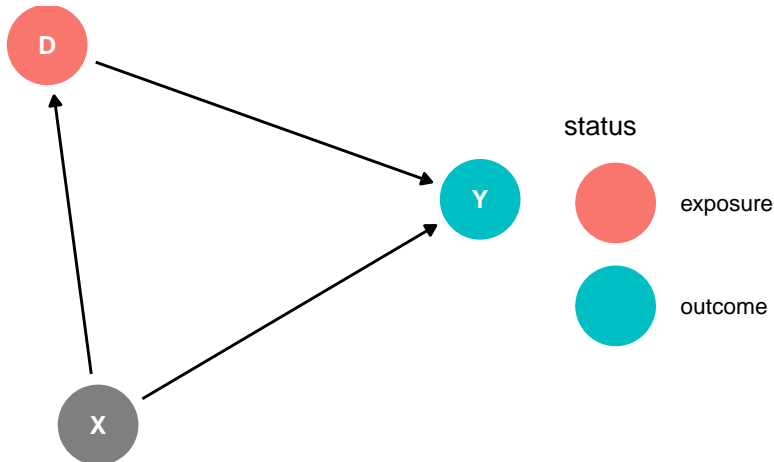
## Roadmap of this note 2

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- backdoor path
- collider path
- mediator path
- block the backdoor paths
- backdoor criteria

**Backdoor path**

# Backdoor path

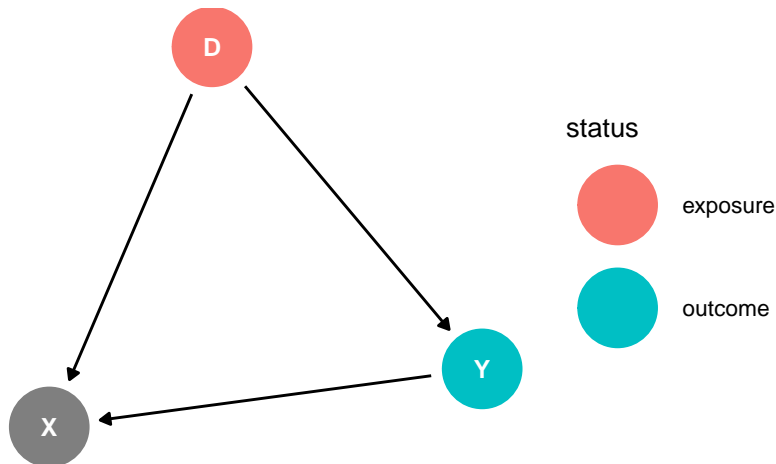


- $X$  is the variable contributing to the backdoor path
- The existence of  $X$  makes the regression  $y = \delta d + \varepsilon$  not accurate
- We need to include  $X$  to the regression



**Collider path**

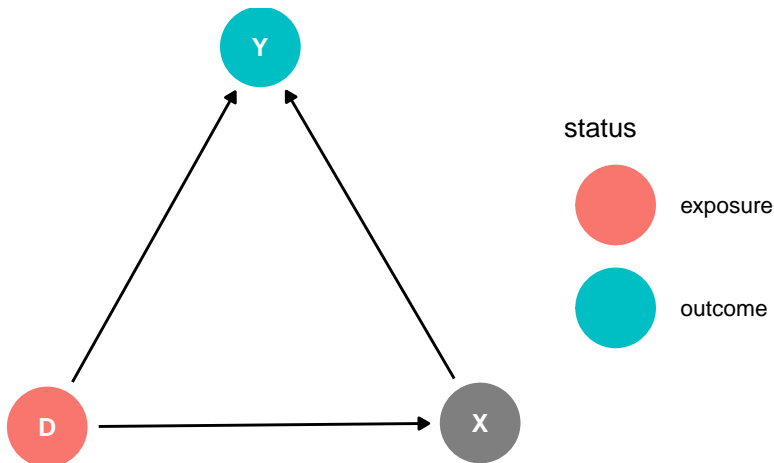
# Collider path



- collider path is blocked
- we should not include  $X$  into the regression
- even if there is  $X$ , the regression  $y = \delta d + \varepsilon$  is still accurate
- if we condition on the  $X$ , the closed collider path is open to create omitted variable bias in regression

## Mediator

# Mediator



the mediator path is usually used in a more complex graph to form backdoor path

**Block backdoor path**

## Block backdoor path

- block backdoor path by conditioning on the variable
- it means to add the variable into the regression formula



## Backdoor criteria

# Backdoor criteria

- by conditioning on several variables(as few as possible), we can
  - block all backdoor paths
  - we don't open a closed collider path