# Causal Inference UConn Sports Analytics Symposium

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### Introduction to Causal Inference

1. What is the goal of causal inference?

2. How is causation different from correlation (i.e. an association)?

### Table 1—Examples of Tasks Conducted by Data Scientists Working with Electronic Health Records

#### **Data Science Task**

	Description	Prediction	Causal inference
Example of scientific question	How can women aged 60–80 years with stroke history be partitioned in classes defined by their characteristics?	What is the probability of having a stroke next year for women with certain characteristics?	Will starting a statin reduce, on average, the risk of stroke in women with certain characteris- tics?
Data	Eligibility criteria     Features (symptoms, clinical parameters)	<ul> <li>Eligibility criteria</li> <li>Output (diagnosis of stroke over the next year)</li> <li>Inputs (age, blood pressure, history of stroke, diabetes at baseline)</li> </ul>	<ul> <li>Eligibility criteria</li> <li>Outcome (diagnosis of stroke over the next year)</li> <li>Treatment (initiation of statins at baseline)</li> <li>Confounders</li> <li>Effect modifiers (optional)</li> </ul>
Examples of analytics	Cluster analysis	Regression Decision trees Random forests Support vector machines Neural networks	Regression Matching Inverse probability weighting G-formula G-estimation Instrumental variable estimation

Figure 1: Hernan, Hse, and Healy 2019

## Fundamentals of Causal Inference

Traditional conditional probability notation cannot distinguish between causation and association.

Counterfactuals and	the Potential	Outcomes	Framework
Confounding			

## Causal Diagrams

1. Confounding

2. Collider

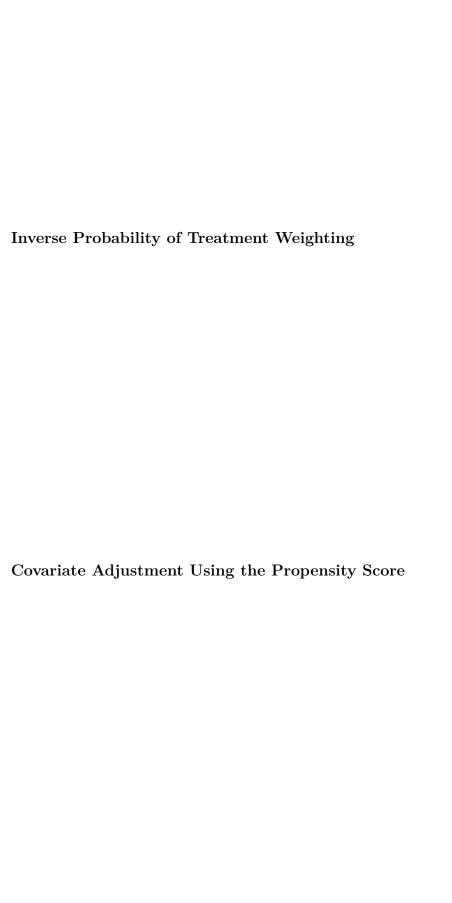
### Assumptions of Causal Inference

• SUTVA (Stable Unit Treatment Value Assumption)

• Ignorability

• Positivity

Methods for Causal Inference
Matching
Propensity Score Matching
Stratification on the Propensity Score



### **Applications**

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** add slides **
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#### References

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