

ECE1724H S2: Empirical Software Engineering

Experimentation



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Experiments and Causation

Cause: Inus condition – insufficient but nonredundant part of an unnecessary but sufficient condition

Cause – Inus Condition

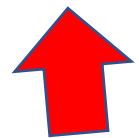
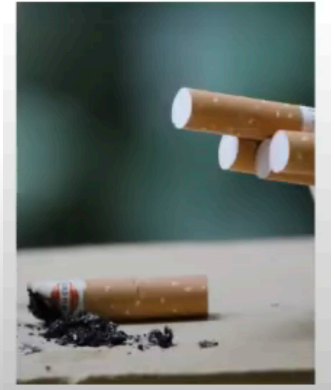
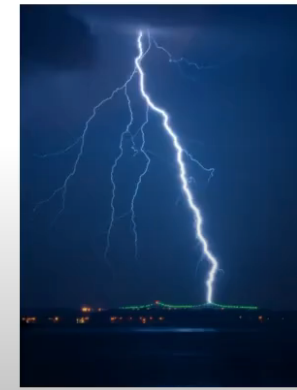
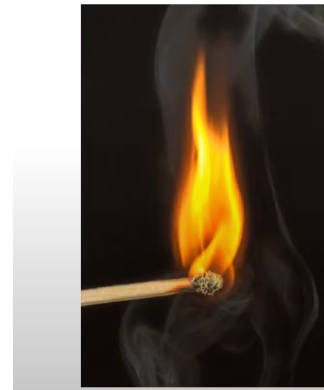


1. None of the causes is necessary to start a fire
2. None of the causes is sufficient to start a fire

► The cause of a fire

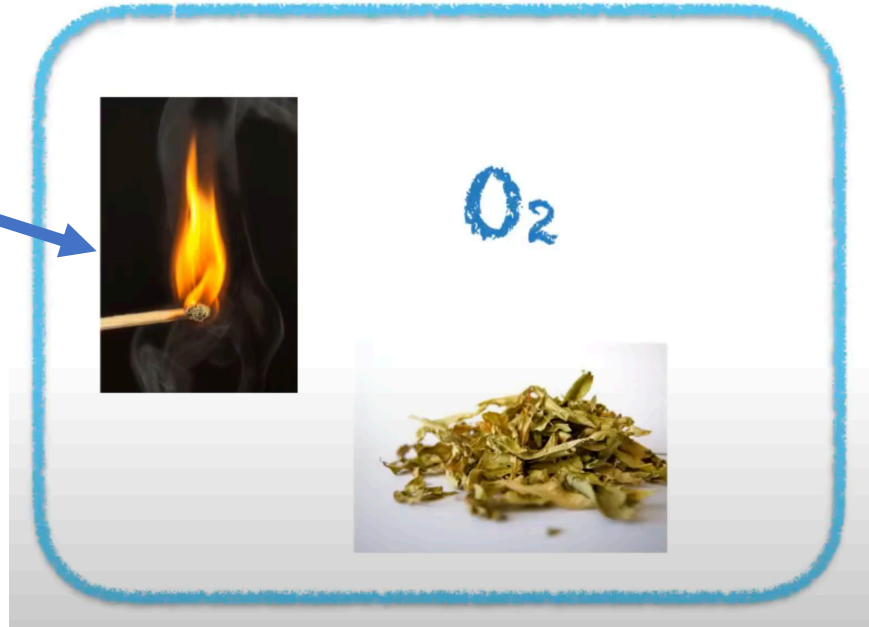


Various causes

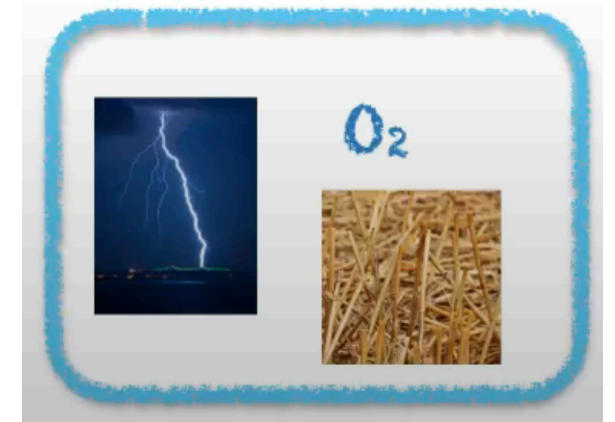


Cause – Inus Condition

Inus Condition



→ insufficient but nonredundant part of an unnecessary but sufficient condition



Experiments and Causation

Cause: Inus condition – insufficient but nonredundant part of an unnecessary but sufficient condition

- most causes are inus conditions
 - many factors are required for an effect to occur



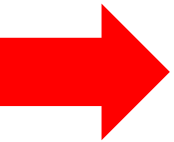
Deterministic: If A occurs ... B will occur

Probabilistic: If A occurs ... B will be more likely to occur

Experiments and Causation

Cause: Inus condition – insufficient but nonredundant part of an unnecessary but sufficient condition


- most causes are inus conditions
 - many factors are required for an effect to occur



Effect: counterfactual

i.e., what would have happened to these subjects had the cause not been present?

Causal relationships

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- The cause preceded the effect
 - The cause was related to the effect
 - We can find no plausible alternative explanation for the effect other than the cause
 - ❖ Mirror what happens in experiments
 - ❖ No other scientific method regularly matches the characteristics of causal relationships so well

Correlation does not prove causation!

- Which variable came first?
- Are there alternative explanations for the presumed effect?
 - Example: income \sim education or education \sim income?
 - Confounding variable: intelligence, family socioeconomic status (causes both high education and high income)

