

DAGs



THE simple visual framework
for understanding causality in any study

Dr. Alexander Bauer

www.statswithalex.com

Causality



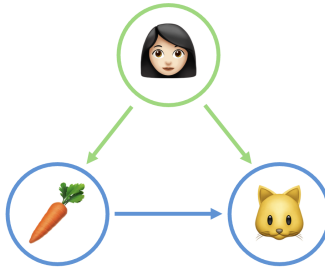
Research question

How does a vegan diet influence the health of cats?

Underlying causality

The nutrition causes (and temporally precedes) the cat's health

Causality



Research question

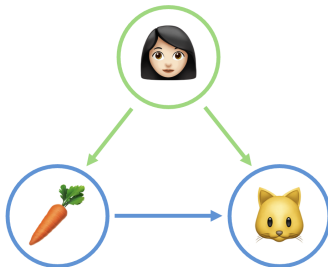
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Problem

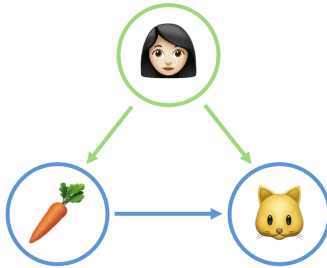
Third variables, like the diet of the human



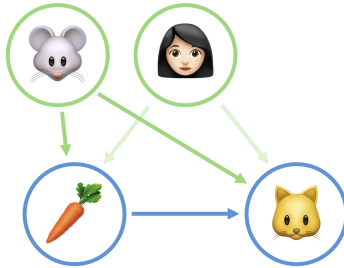
So now what?

- **(Randomized) Experiment**
... but often too many practical and ethical constraints
- **Panel study**
... but often still too expensive
- **Cross-sectional study**
... BUT no observed temporality “First X, then Y”

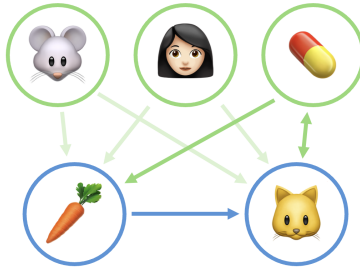
Causality



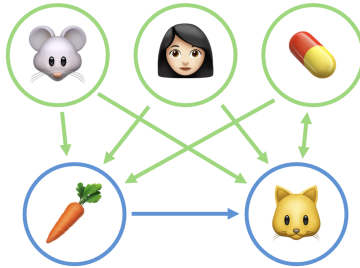
Causality



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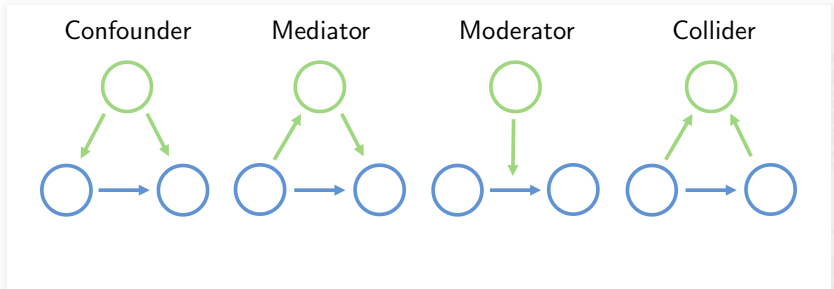
Causality



Solution

DAGs (Directed Acyclic Graphs)

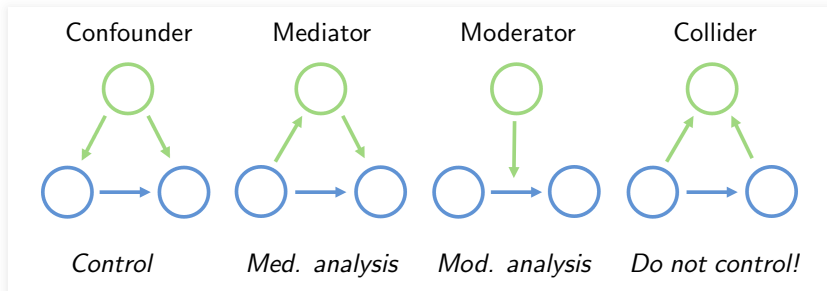
The DAG framework builds on **visual patterns** in the graphs:



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DAGs (Directed Acyclic Graphs)

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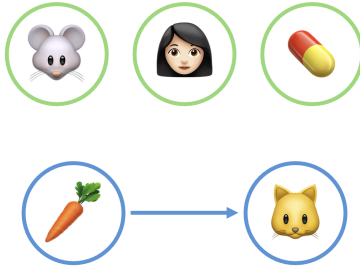


... and defines how to statistically handle the third variables.



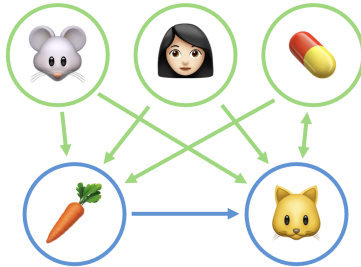
Practical approach

1. Define your research question



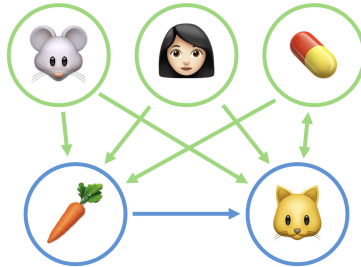
Practical approach

1. Define your research question
2. Define all third variables that might influence the process



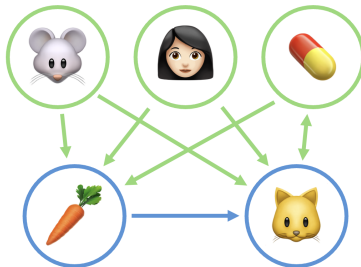
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1. Define your research question
2. Define all third variables that might influence the process
3. Define all association structures



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4. Apply the guidelines on how to estimate the association



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1. Define your research question
2. Define all third variables that might influence the process
3. Define all association structures
4. Apply the guidelines on how to estimate the association
⇒ Here: Control for all third variables, e.g. through regression or matching

Further Reading

DAGs

Directed acyclic graphs for clinical research: a tutorial (Byeon & Lee, 2023)

Vegan cat (and dog) diets

www.sustainablepetfood.info (Prof. Andrew Knight)