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INTRODUCTION TO THE FOUNDATIONS OF CAUSAL DISCOVERY

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The goal is to indicate that for a large variety of different settings the assumptions necessary and sufficient for causal discovery are now well understood.

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INTRODUCTION

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WINE AND CARDIOVASCULAR DISEASE

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RANDOMIZED ~~EXPERIMENT~~ ASSIGNMENT

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FISHER VS. NEWTON

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WHY CAUSALITY

Causal relations are of interest because only an understanding of the underlying causal relations can support predictions about how a system will behave when it is subject to intervention.

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AMBIGUITY OF PROBABILISTIC REPRESENTATION

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DO CALCULUS

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CAUSAL GRAPHICAL MODELS

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SET OF VARIABLES

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DEFINITIONS

path
directed path
descendent
child
collider
non-collider

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ASSUMPTIONS

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KINDS OF INFERENCE

Statistical inference
Causal discovery
Causal inference

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CAUSAL DISCOVERY

> *... the problem of identifying as much as possible about the causal relations of interest (ideally the whole graph G) given a dataset of measurements over variables $\mathbf{V}$.*

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CAUSATION DOES NOT IMPLY CORRELATION

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D-SEPARATION

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CAUSAL MARKOV ASSUMPTION

- why it makes sense
- when it appears violated (quantization!)

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FAITHFULNESS ASSUMPTION

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LINEAR GAUSSIAN AND MULTINOMIAL

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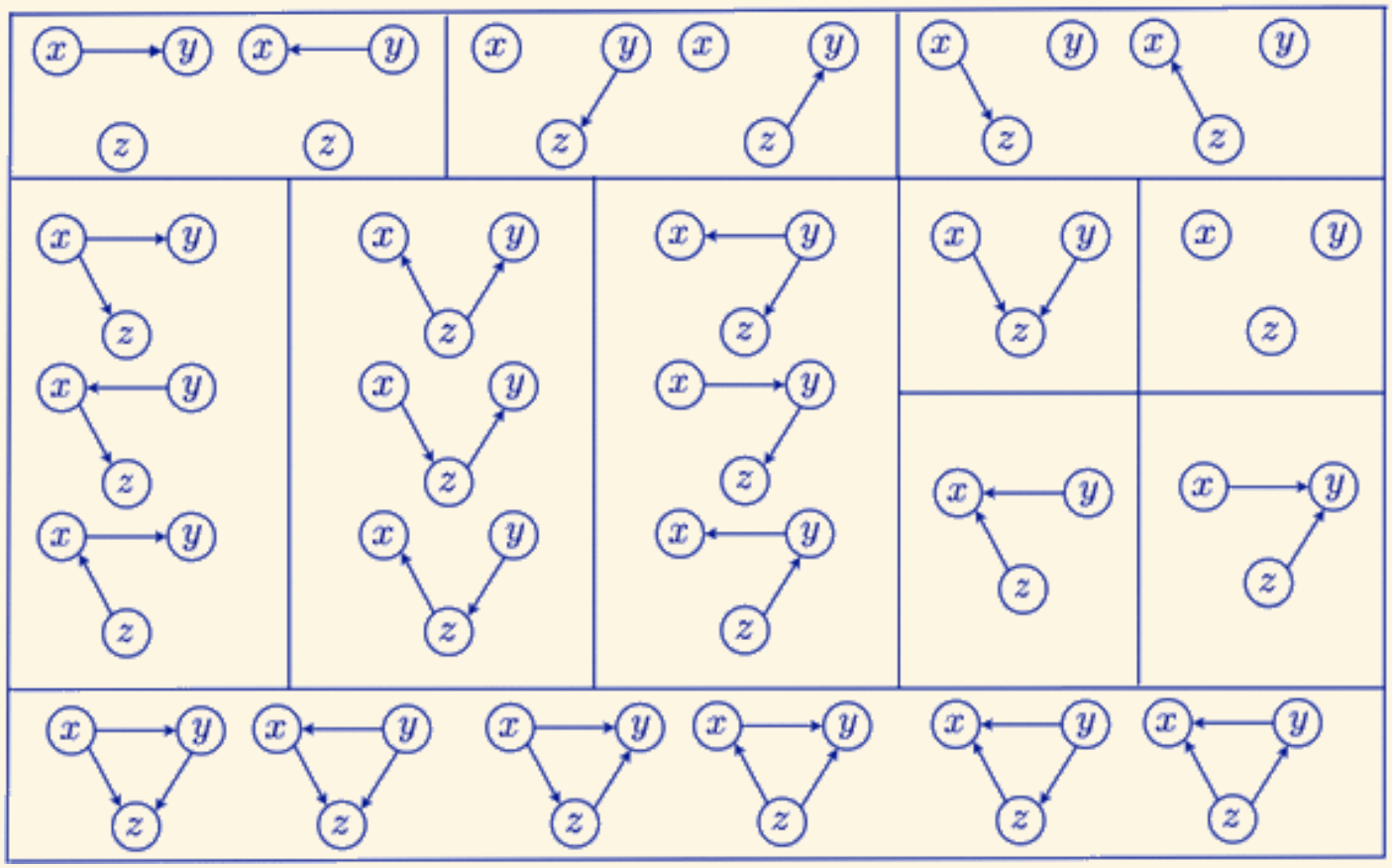

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LINEAR NON-GAUSSIAN

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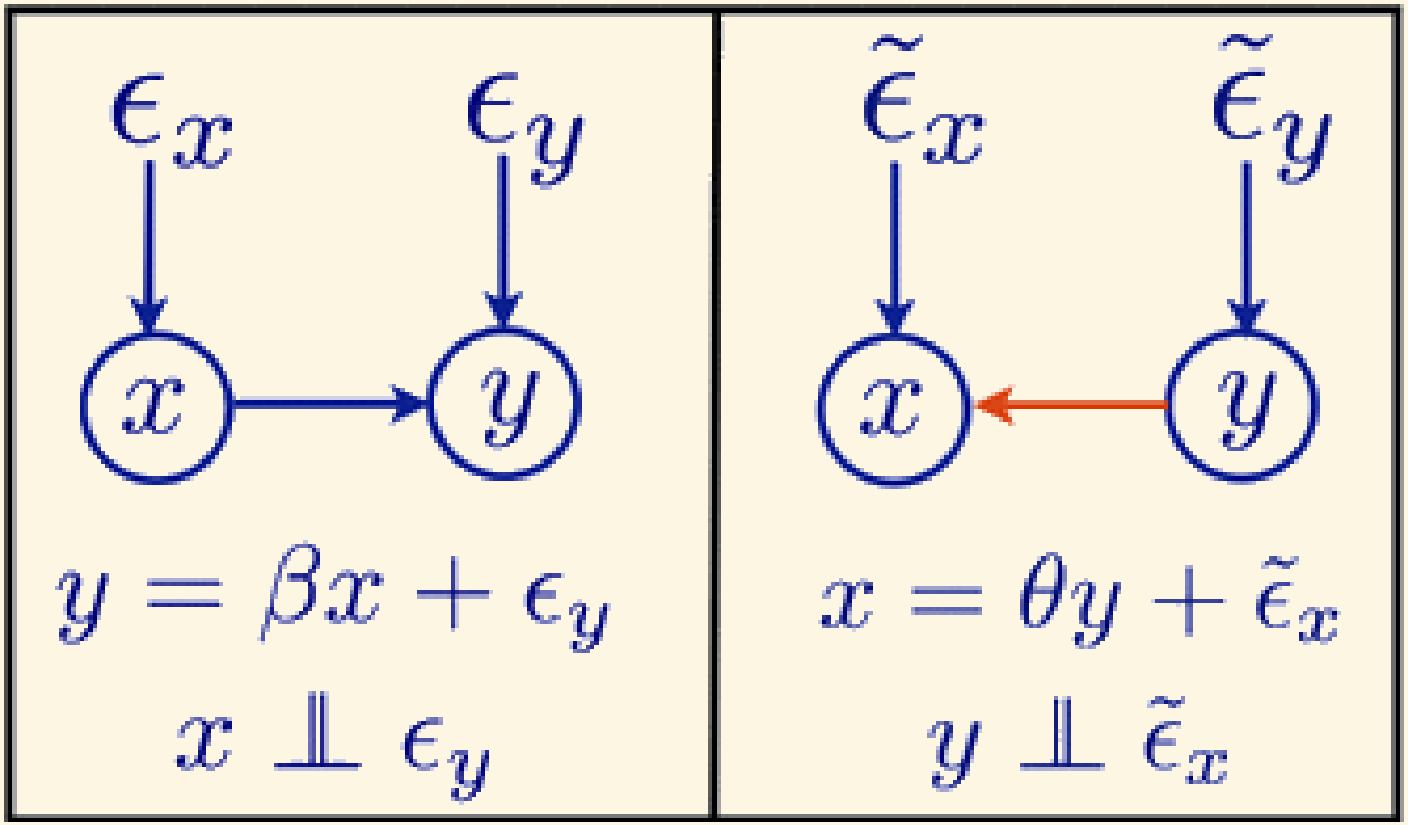

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NONLINEAR ADDITIVE NOISE

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