What is Data Science?

What's in a name?

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What is Data Science?

First measure,
second estimate quantity,
third calculate,
fourth balance chances,
fifth succeed.

Sun Tzu, *The Art of War*, 500 BC

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What is Data Science?

Data Scientist is the Sexiest Job of the 21st Century (Harvard Business Review)

Data Scientist is “the most sought after job in America”, according to Market Watch

Glassdoor.com has listed Data Scientist as the best job in America two years in a row

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What is Data Science?

What is data science?

Why is data science new?

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What is Data Science?

What is data science?

Data science is the generalization of the scientific method

Why is data science new?

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What is Data Science?

What is data science?

Data science is the generalization of the scientific method

Why is data science new?

Data science is a "new" discipline because

1. **of an abundance of data outside of the traditional sciences**
2. **of tools to investigate these data**

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What is Data Science?

Decompose “Data Science” into “Data” and “Science”

What is Data Science?

Decompose “Data Science” into “Data” and “Science”

- **What is the scientific method?**
- **What is the nature of data?**

What is Data Science?

What's in a name?

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The Scientific Method

The Science in Data Science

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Observe and collect data

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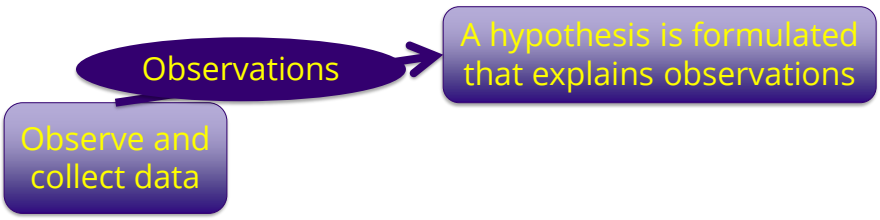

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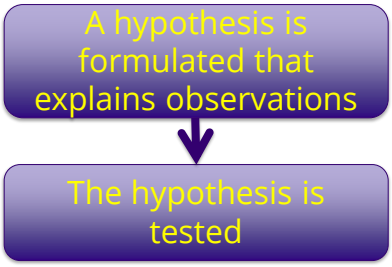

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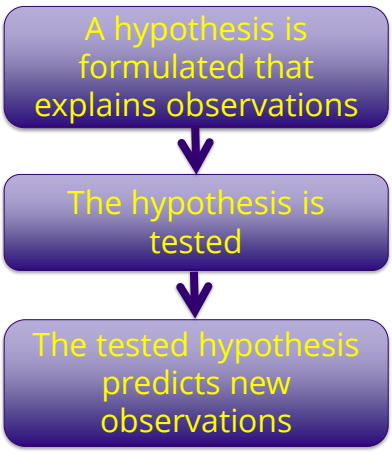

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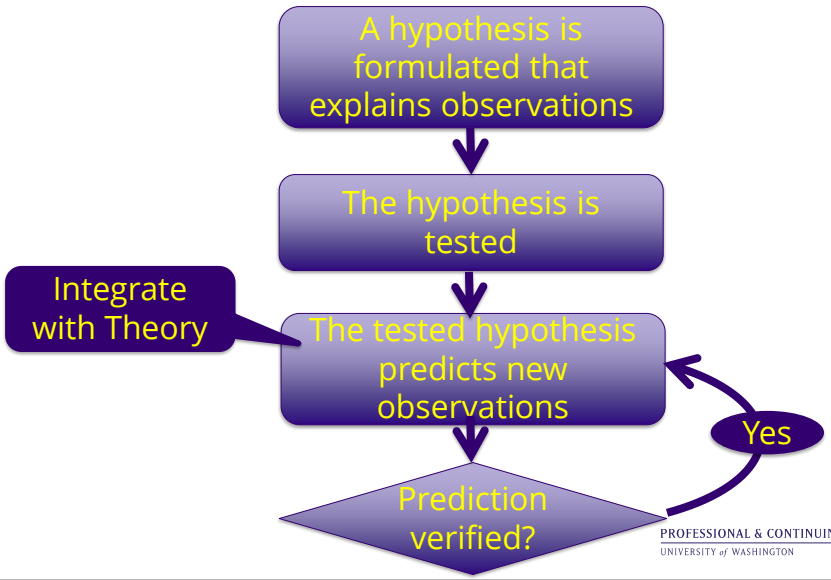

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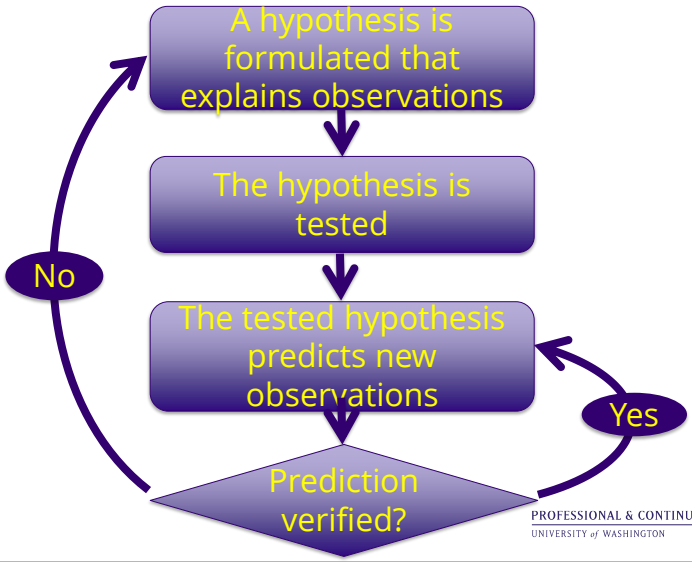

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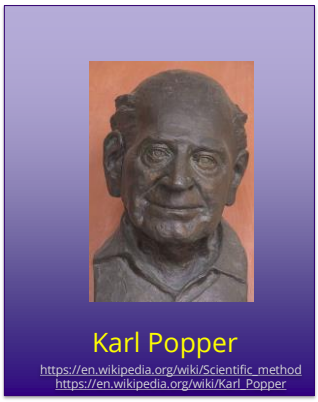
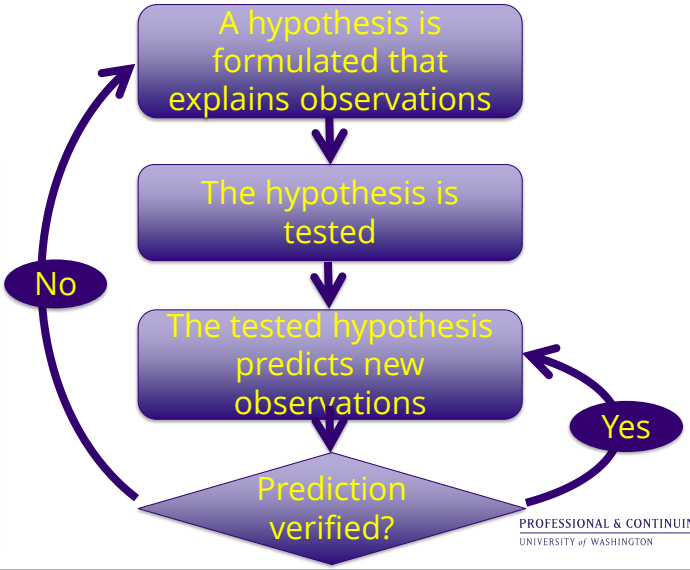


Karl Popper

https://en.wikipedia.org/wiki/Scientific_method
https://en.wikipedia.org/wiki/Karl_Popper



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Model as a Hypothesis

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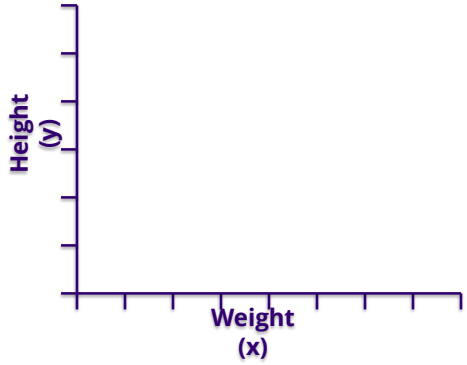
Model as a Hypothesis



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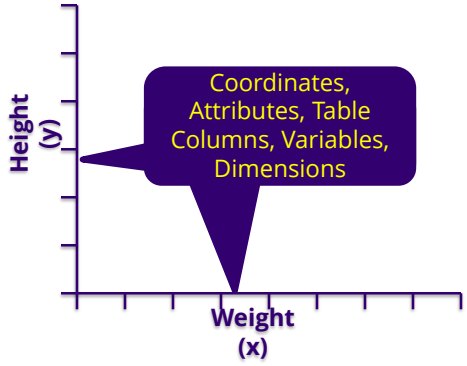
Model as a Hypothesis



Schema, Space;

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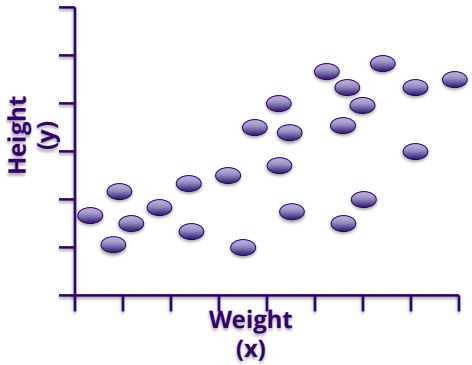
Model as a Hypothesis



Schema, Space;
This is a two dimensional space of weight and height

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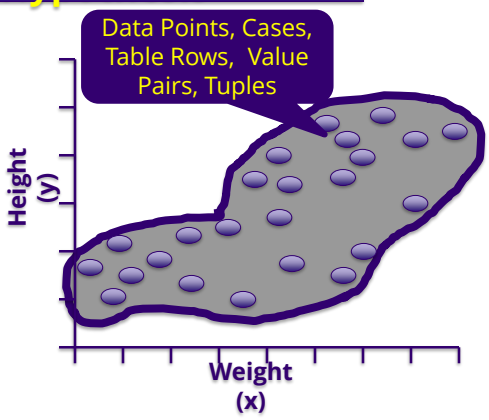
Model as a Hypothesis



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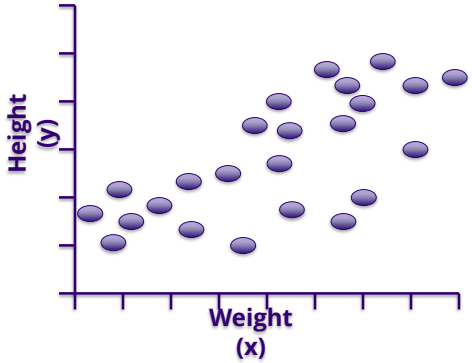
Model as a Hypothesis



Use these data to create a model.

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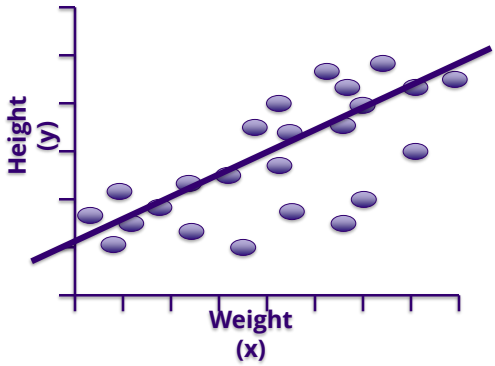
Model as a Hypothesis



The thick line is a model that represents the ideal data

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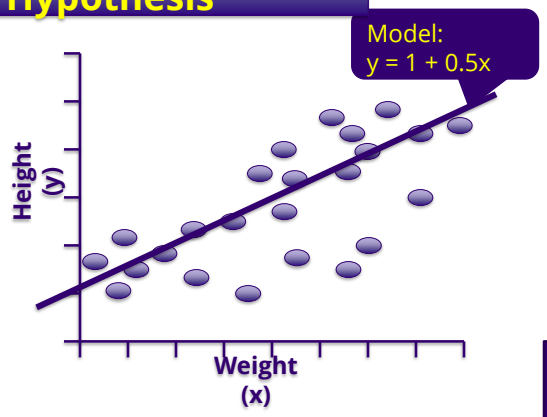
Model as a Hypothesis



The line can be formalized. The model is the formalized statement.

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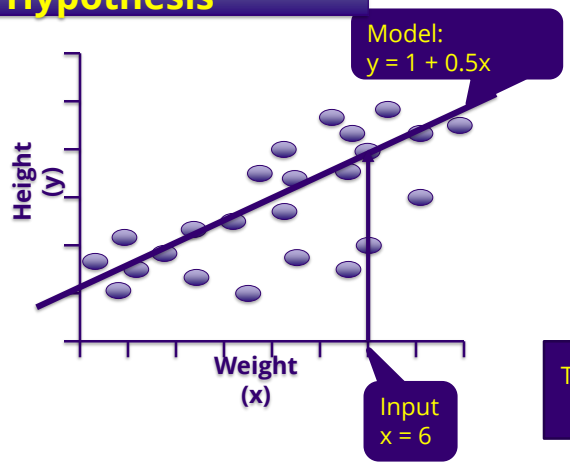
Model as a Hypothesis



The model requires an input.

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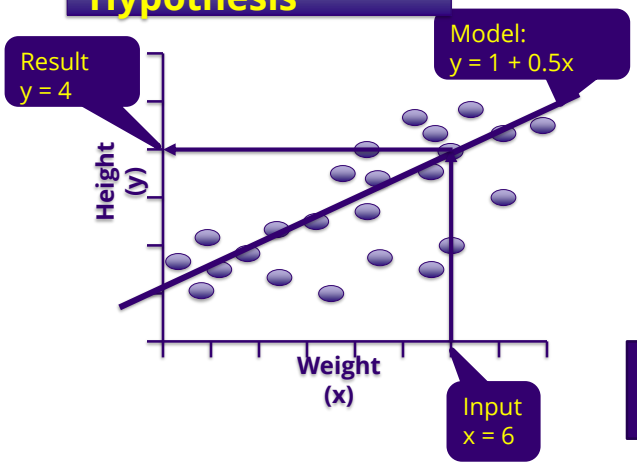
Model as a Hypothesis



Use the model to calculate result.

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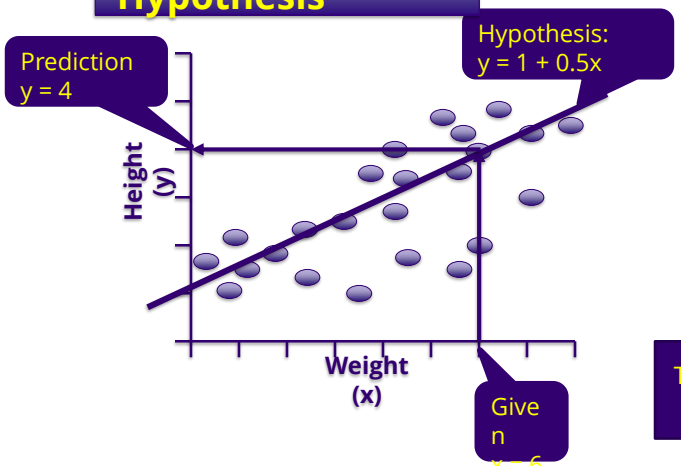
Model as a Hypothesis



The hypothesis makes a prediction.

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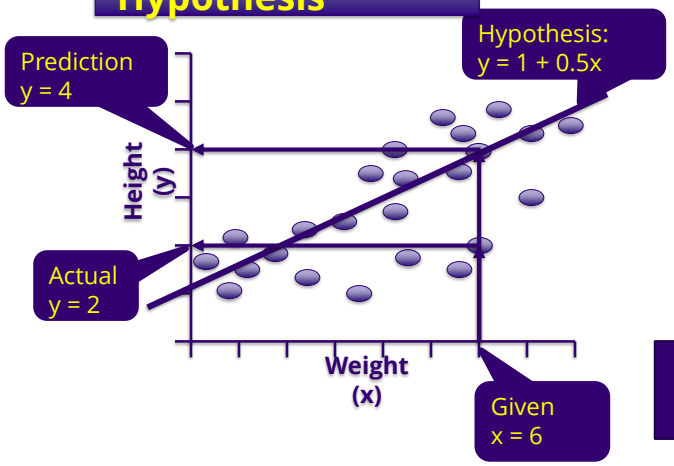
Model as a Hypothesis



Model is a Hypothesis

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Traditional Science

Examples of data in Traditional Sciences:
- Planetary motions
- Reaction Rate of Chemicals
- Genome Sequence

Examples of models in Traditional Sciences:
- F = m*a
- Molecular Models
- Breast Cancer Probability

Data Science

Examples of data in Data Science:
- Twitter Feeds
- Emails
- Patient Records

Examples of models in Data Science:
- Movie Sentiment
- Spam Filter
- Hospital Readmission

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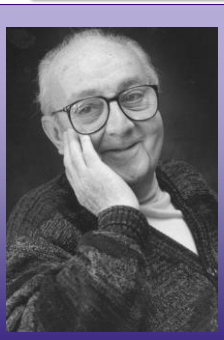
"All models are wrong but some are useful"



George Box

https://en.wikipedia.org/wiki/George_E._P._Box

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Statistical Modeling: The Two Cultures

https://projecteuclid.org/download/pdf_1/euclid.ss/1009213726

Leo Breiman

https://en.wikipedia.org/wiki/Leo_Brei

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"Predictive accuracy on test sets is the criterion for how good the model is"
https://projecteuclid.org/download/pdf_1/euclid.ss/1009213726

Leo Breiman
https://en.wikipedia.org/wiki/Leo_Brei
man

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Summary: Some Terminology

>Scientific Method
  –Body of techniques
>Model
  –Based on data & method
>Hypothesis
  –Explanation of a dataset
>Falsification
  –Process to disprove hypothesis
>Theory
  –Well-tested hypothesis
>Karl Popper
  –Predictive hypotheses
>George Box
  –Some models are useful
>Leo Breiman
  –2 cultures in statistics

The Scientific Method
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