

What does AI do to Research ?

AI MeetUp in Bern

2024-09-04 18:30-19:00 (20 min talk)

Sigve Haug, Data Science Lab

University of Bern

www.dsl.unibe.ch



[Link to presentation on google with animations](#)

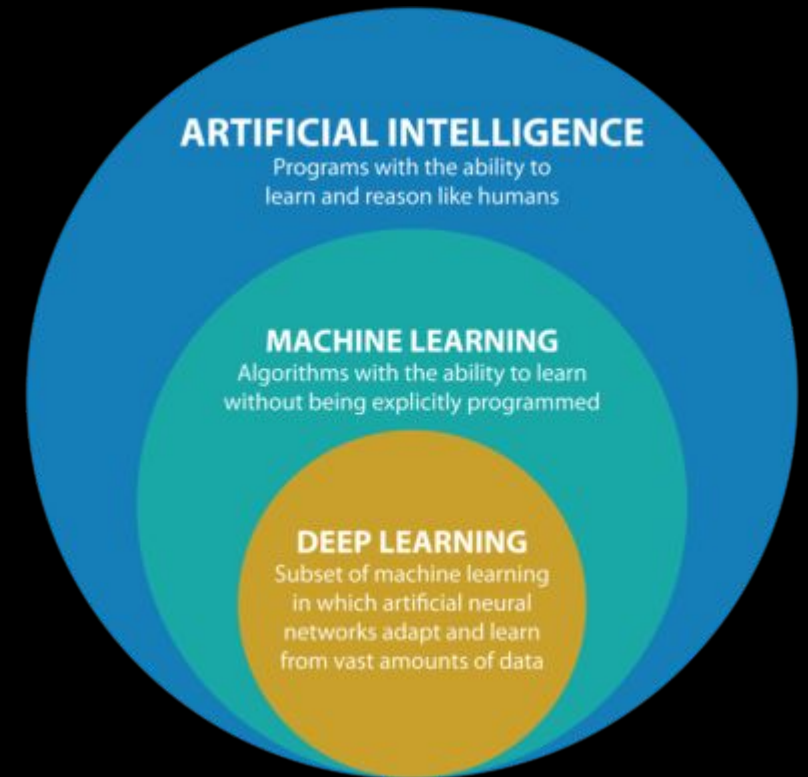
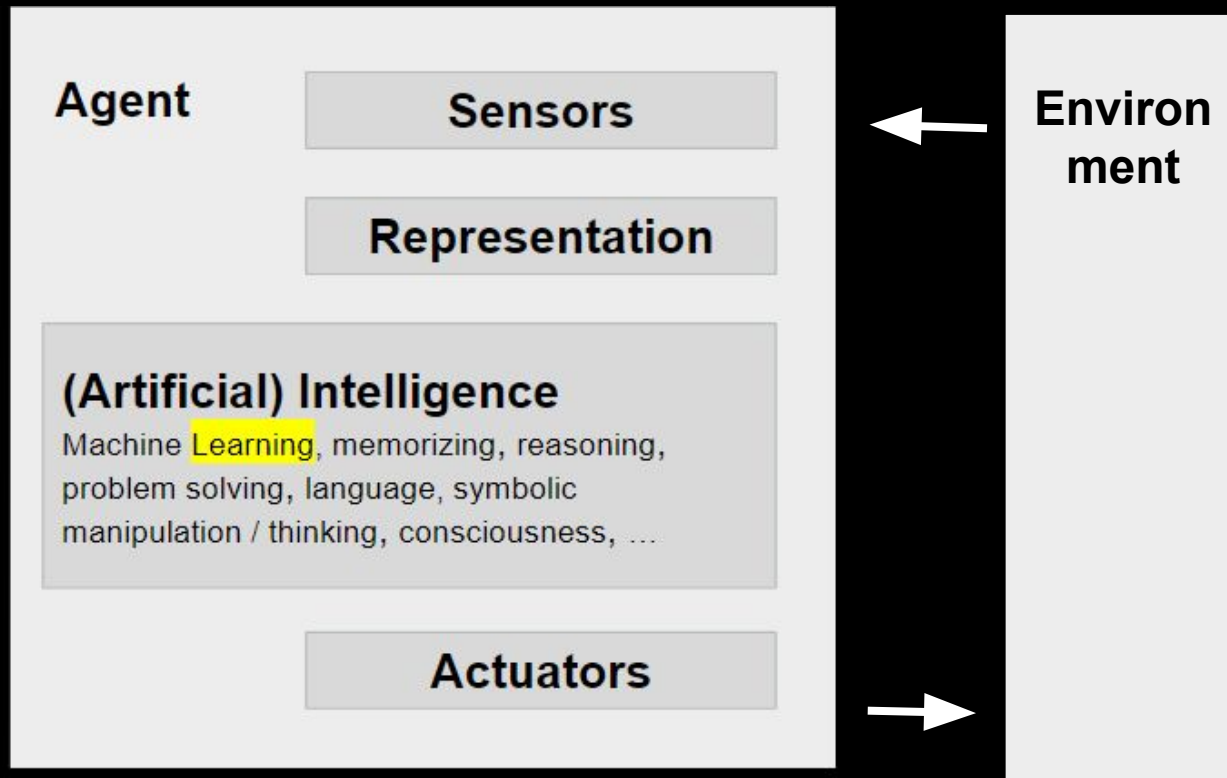
Objectives and Outline

Hypothesize answers to how AI changes research

- AI and ML definitions in this context
- The scientific process
- Hypotheses



Agency, (A) I and ML



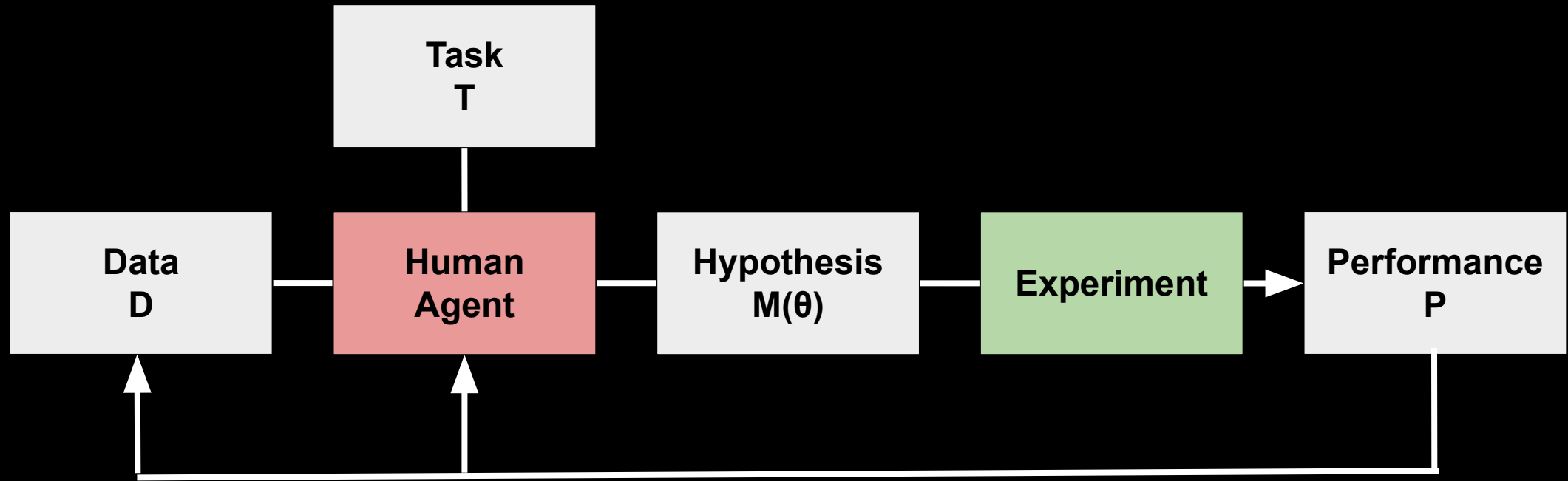
See Norvig and Russel : "AI - A modern approach" Chapter 2

Often used ML Definition

Mitchell, T. (1997):

"A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P , if its performance at tasks in T , as measured by P , improves with experience E ."

The Scientific Process



The ideal attributed to Galileo Galilei and company. Normatively described by e.g. K. F. Popper.

Scientific Process - Example

Newton's second law and calculus (Principia 1687)

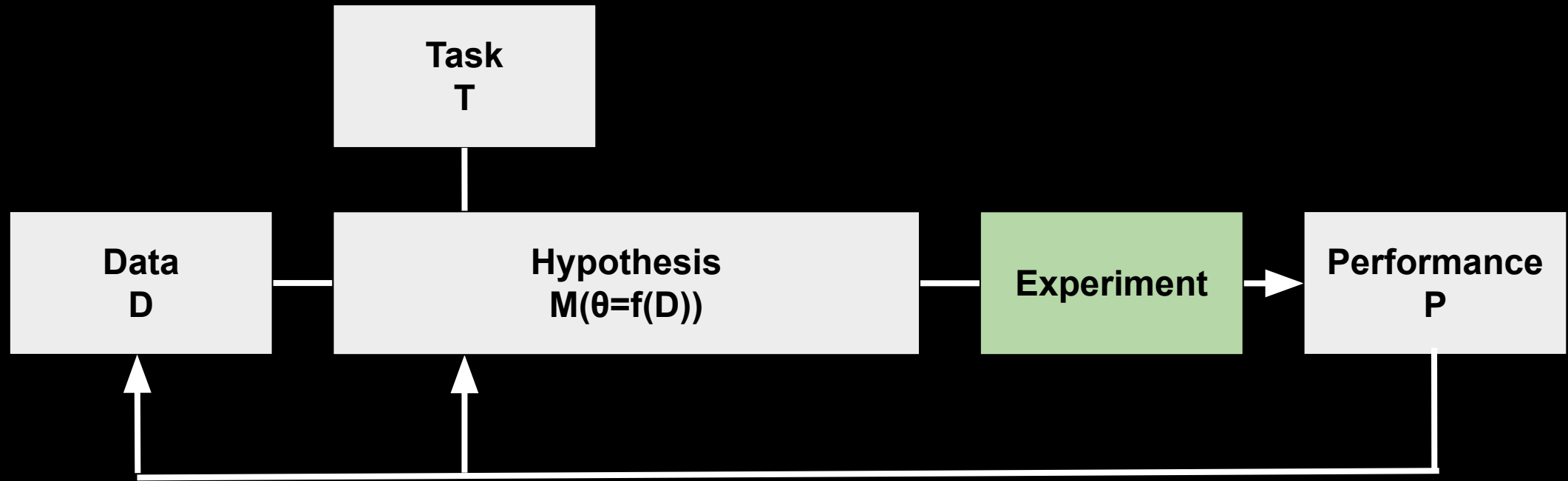
$$\vec{F} = m\vec{a}$$

$$\vec{v}(t) = \vec{a}t + \vec{v}_0$$

$$\vec{x}(t) = \frac{1}{2}\vec{a}t^2 + \vec{v}_0t + \vec{x}_0$$

The genius researcher derives from observations laws that can explain the full universe

Hypothesis 1



With AI we are increasingly removing the human agent from the process - **death of the genius**

Hypothesis 1 - Example

Discovery of Physics From Data: Universal Laws and Discrepancies



Brian M. de Silva^{1*}



David M. Higdon²



Steven L. Brunton³



J. Nathan Kutz¹

¹ Applied Mathematics, University of Washington, Seattle, WA, United States

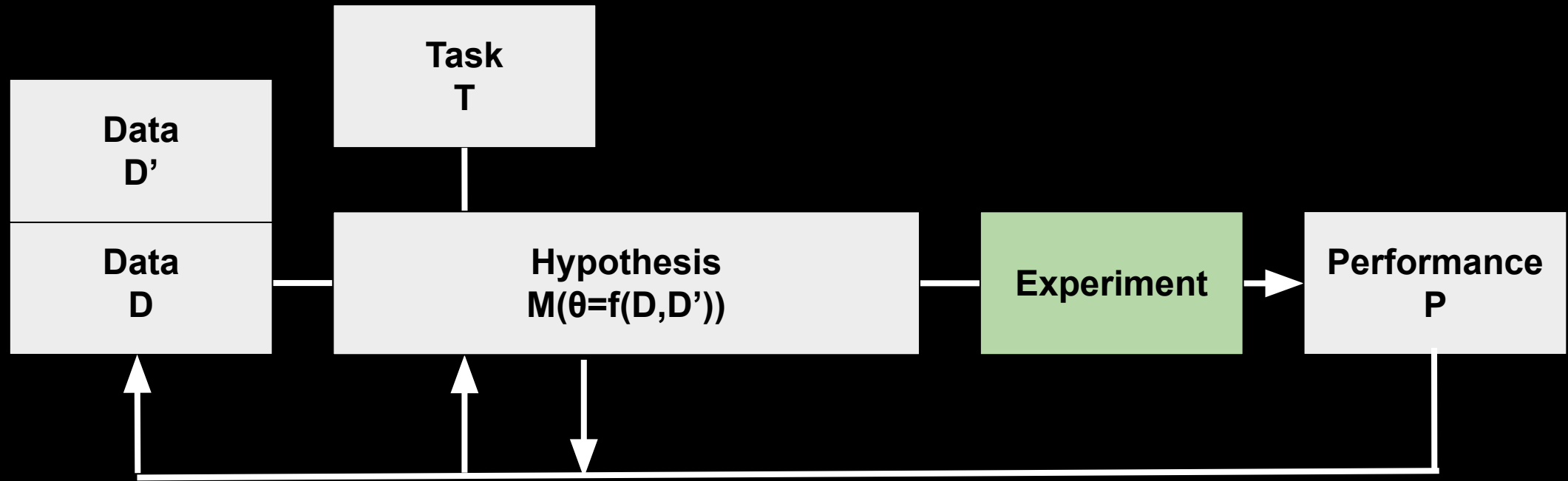
² Department of Statistics, Virginia Polytechnic Institute and State University, Blacksburg, VA, United States

³ Mechanical Engineering, University of Washington, Seattle, WA, United States

Machine learning (ML) and artificial intelligence (AI) algorithms are now being used to automate the discovery of physics principles and governing equations from measurement data alone. However, positing a universal physical law from data is

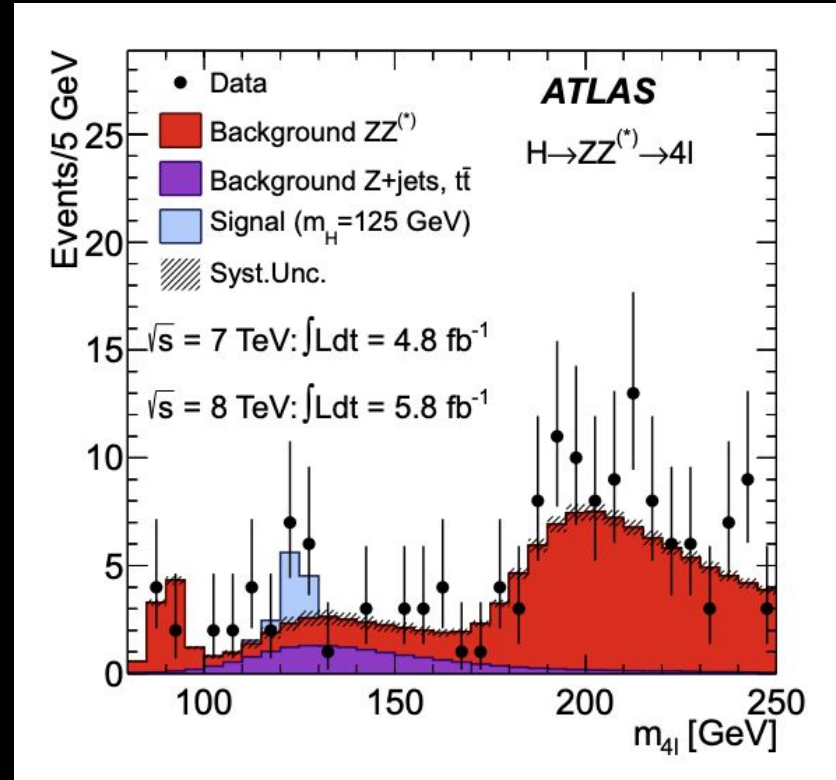
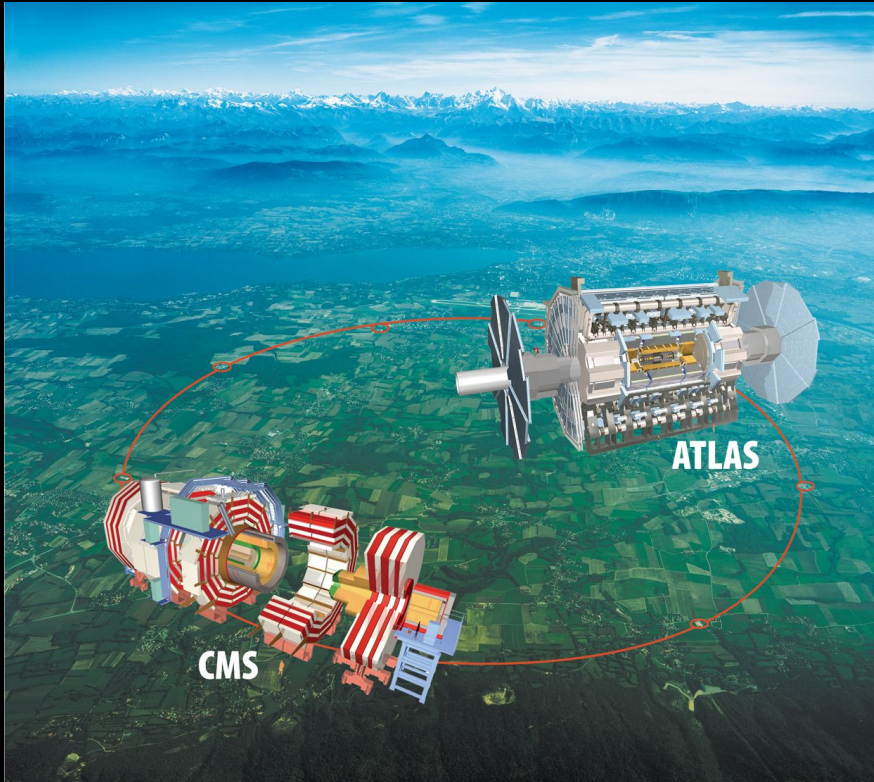
(One of many papers on this topic)

Hypothesis 2



We will see an inflation of synthetic data

Hypothesis 2 - Example



- The ATLAS experiment at LHC at CERN produces about 2-3x more synthetic than detector measured data [[ref](#)]

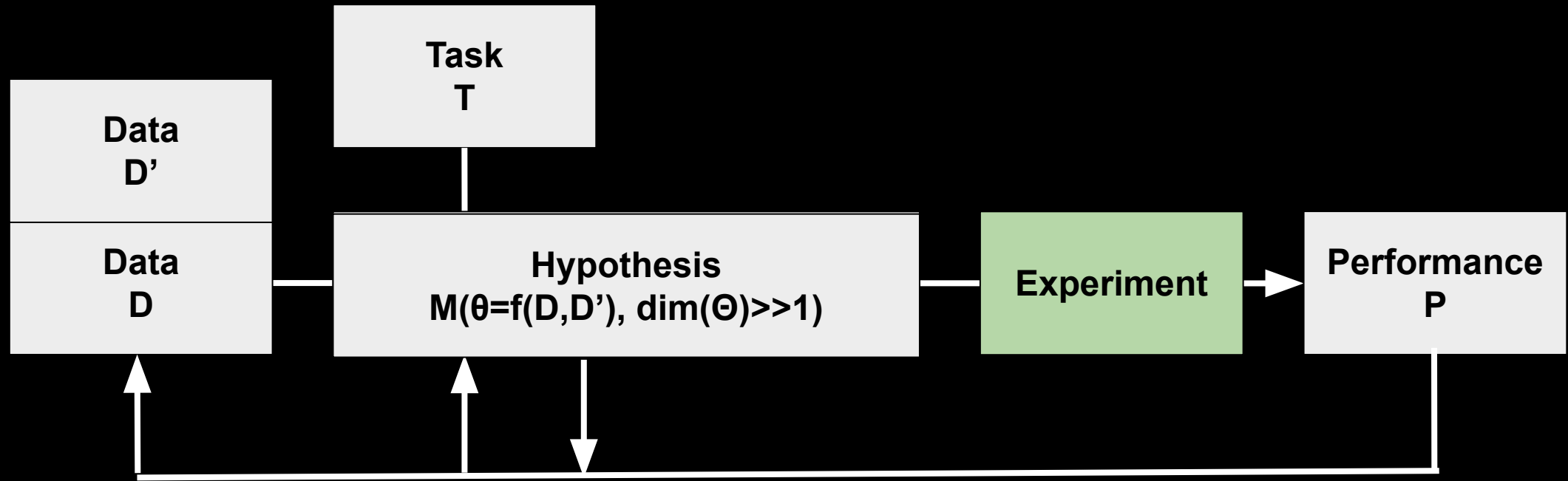
Hypothesis 2 - Example

Other scientific fields are following



Generative AI extends the use of synthetic to all fields

Hypothesis 3



Correlation without causality - tacit or oracle knowledge

Hypothesis 3 - Example



Sigve Haug

Did Einstein have a phd from the University at Bern? Yes or no please.



ChatGPT

Yes.



Sigve Haug

The full name of this person please?



ChatGPT

Albert Einstein.

Maja Einstein had a
phd from the
University of Bern

The last answer is incorrect - why is the model getting it wrong?

Summary

Hypotheses

- Researcher displaced from the scientific loop
- More artificial than real data
- More correlation - at the cost of less causality ?

More research, however, with a different quality

Continuing Education at UniBE

You fancy a CAS programs on extended intelligence

- CAS Applied Data Science
- CAS Natural Language Processing
- CAS AI for Creative Practices
- CAS AI for Teachers
- CAS Advanced Machine Learning

