Andre Ye

MACHINE LEARNING IN MEDICINE

Experience from the Najafian Lab

INVESTIGATING TECHNOLOGY + BIOLOGY

- How can machine learning aid developments in biology and medicine?
- What are the limitations of machine learning in biology and medicine?

The Real-World Benefits of Machine Learning in Healthcare

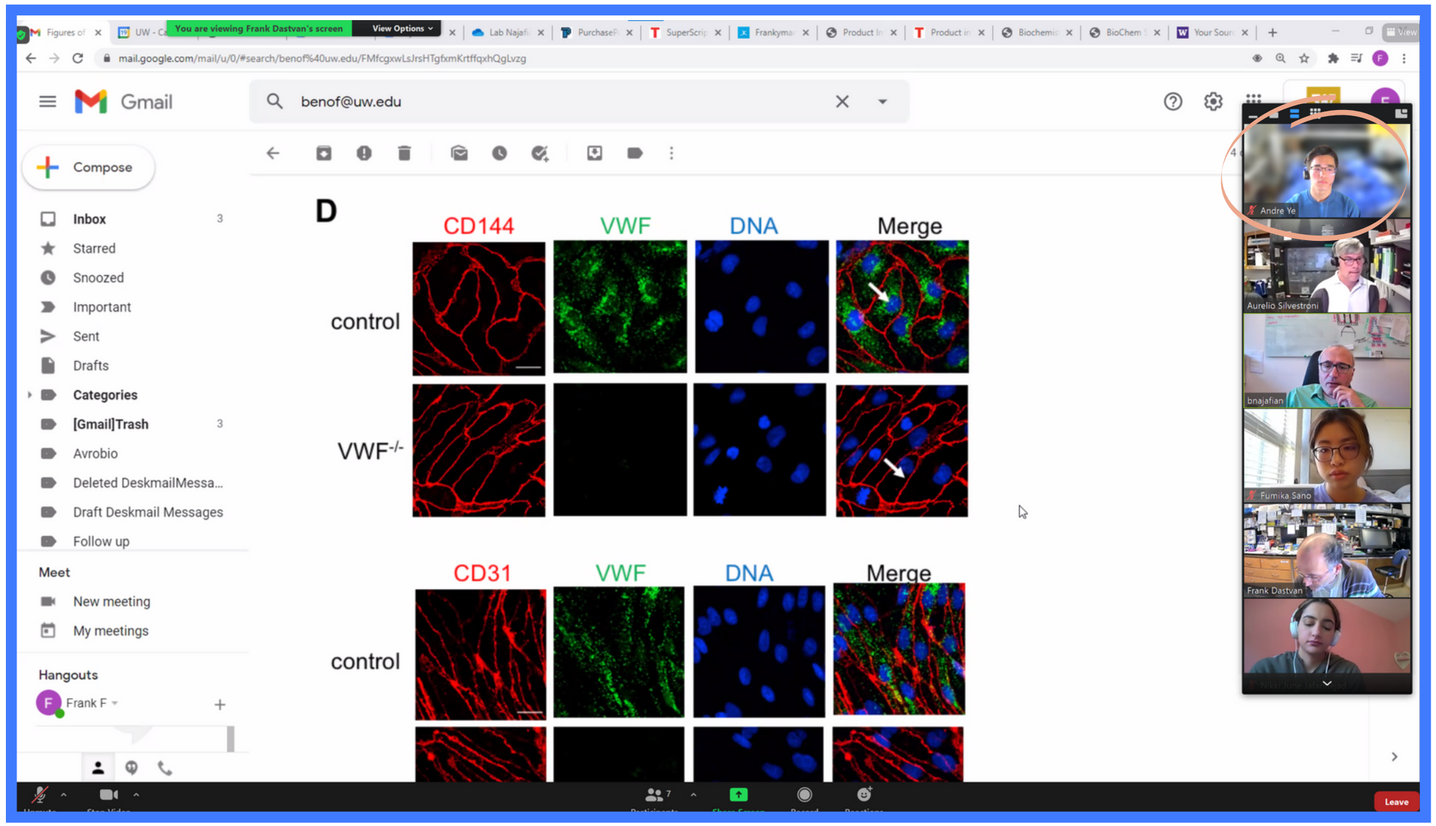
Ed Corbett, MD, Medical Officer

April 25, 2017 | Posted in AI .

- Medicine is full of manual processes that can and should be automated.
- Machine learning will aid, not replace, doctors and other medical personnel.
- Machine learning development is hindered by hesitance, ethical concerns, and data.

The Najafian Lab

Pathobiology of Kidney Diseases

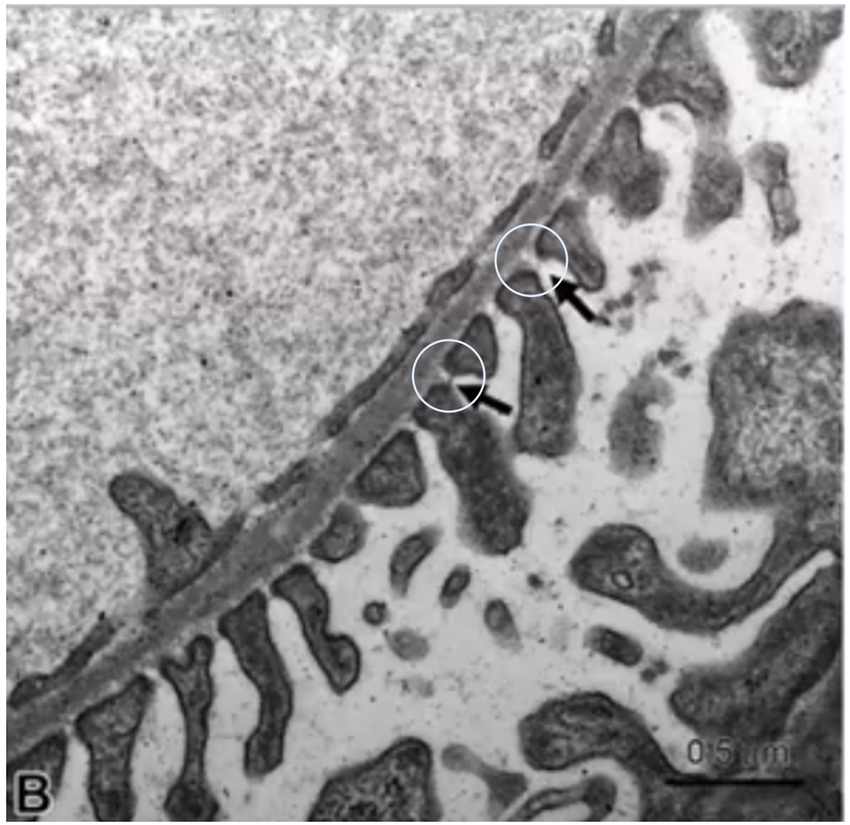


That's me!

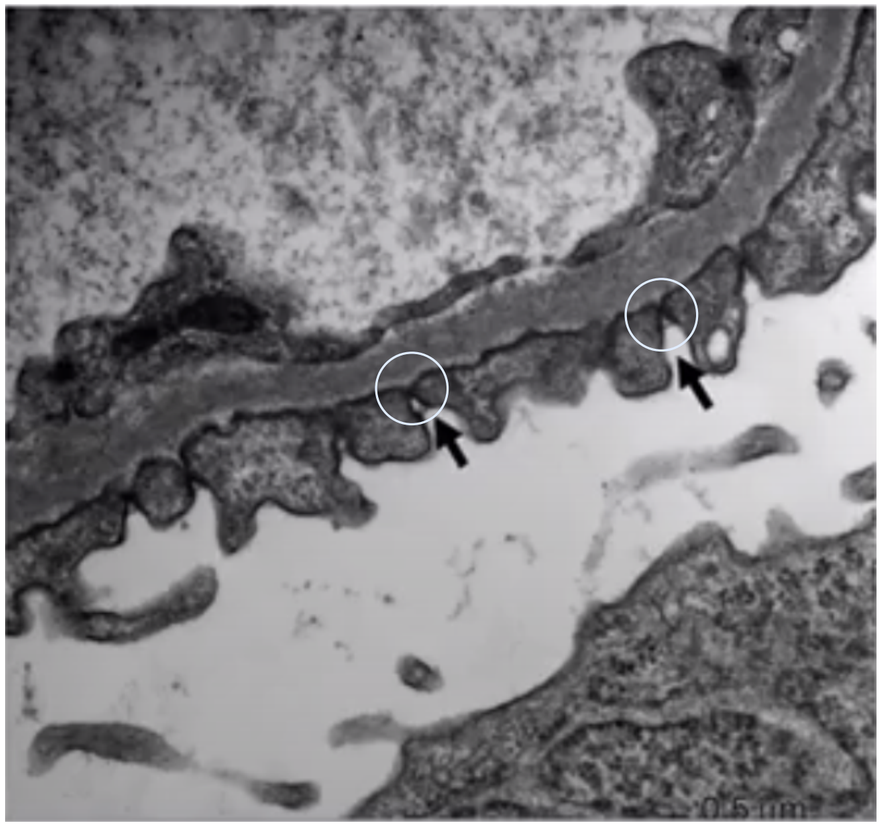
The Problem

Quantifying Podocyte Injury

Uninjured Podocyte



Injured Podocyte



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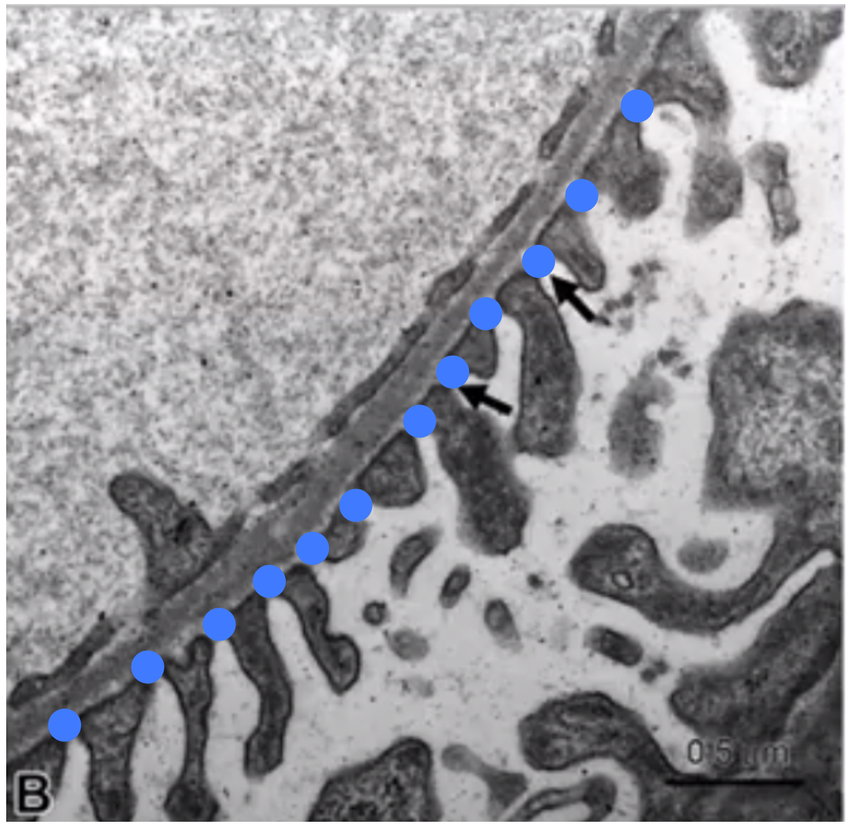
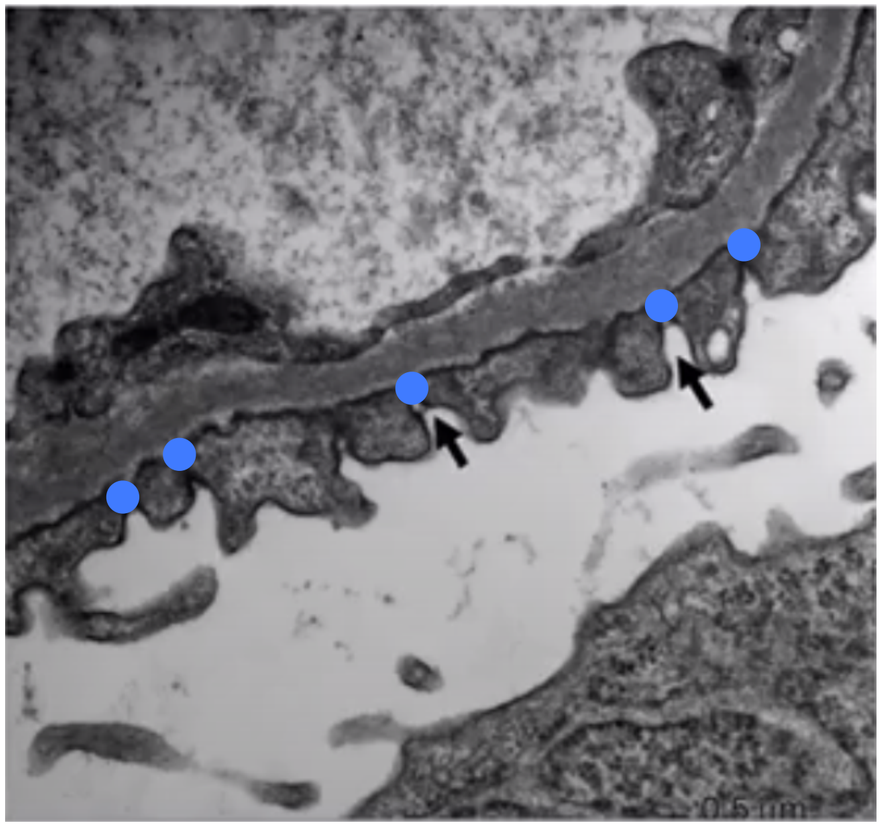
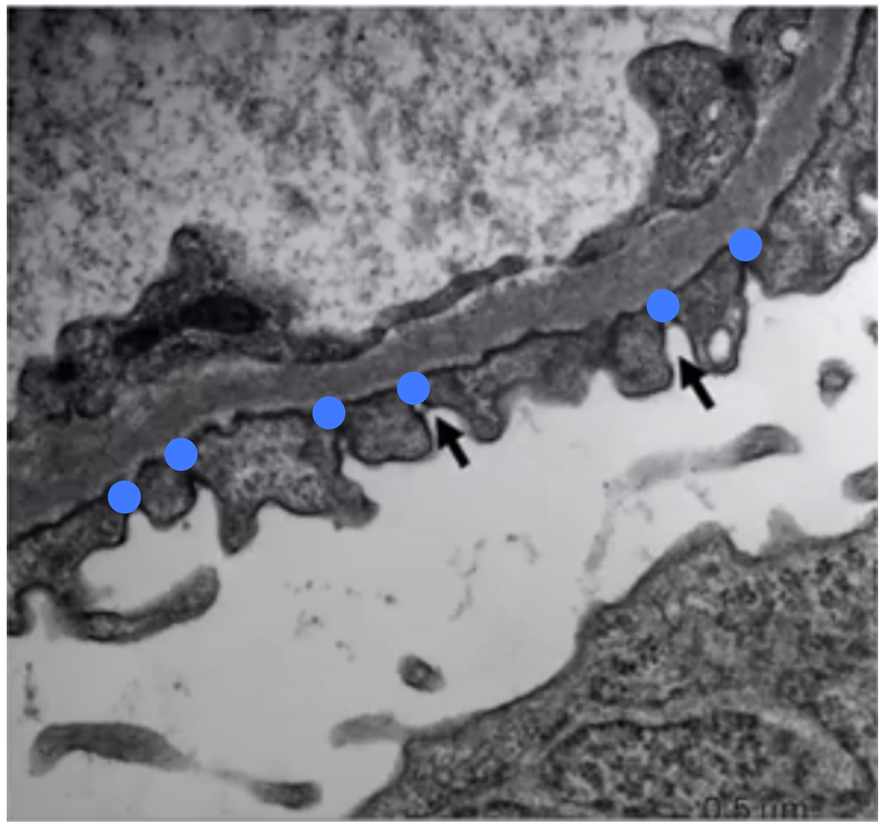


Injured Podocyte



The Problem

Quantifying Podocyte Injury



Task: Identify locations of slits to quantify podocyte injury.

Process:

1. Have humans label the locations of slits on images as training data.
2. Train a model to perform segmentation (visual identification) of slits.
3. Calculate average distance between slits.

Advantages & Limitations

Quantifying Podocyte Injury

Advantage: **Time**

Computers can quickly quantify podocyte damage from several EM images needed to make a diagnosis.

Limitations: **Data, Humans**

Computers are only as good as humans. Data is annotated by humans and aggregated from different medical datasets.

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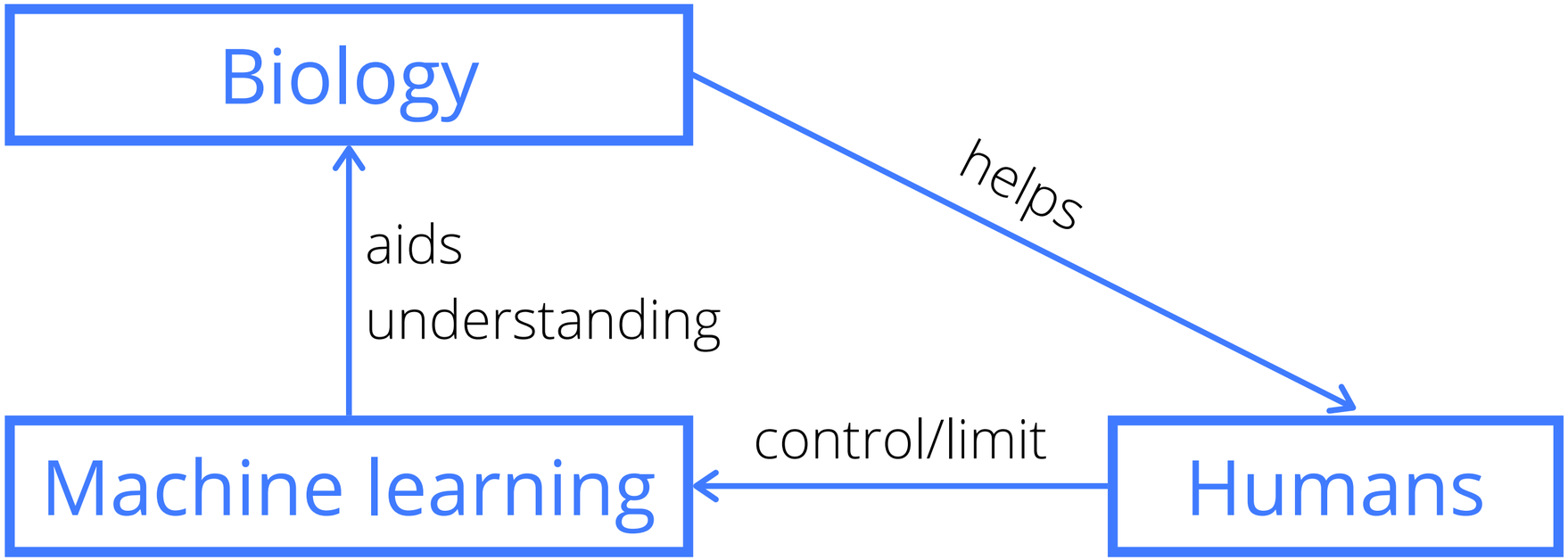
ML expands human capabilities.

ML is…		expands human…
more consistent, high-variance results	→	vision, decision-making, thinking
more controllable, optimizable, experimental	→	control, progress, speed of innovation
faster	→	time & brainpower

ML is limited by humans.

Humans		Data
human attitudes		data availability
human problem-solving		data type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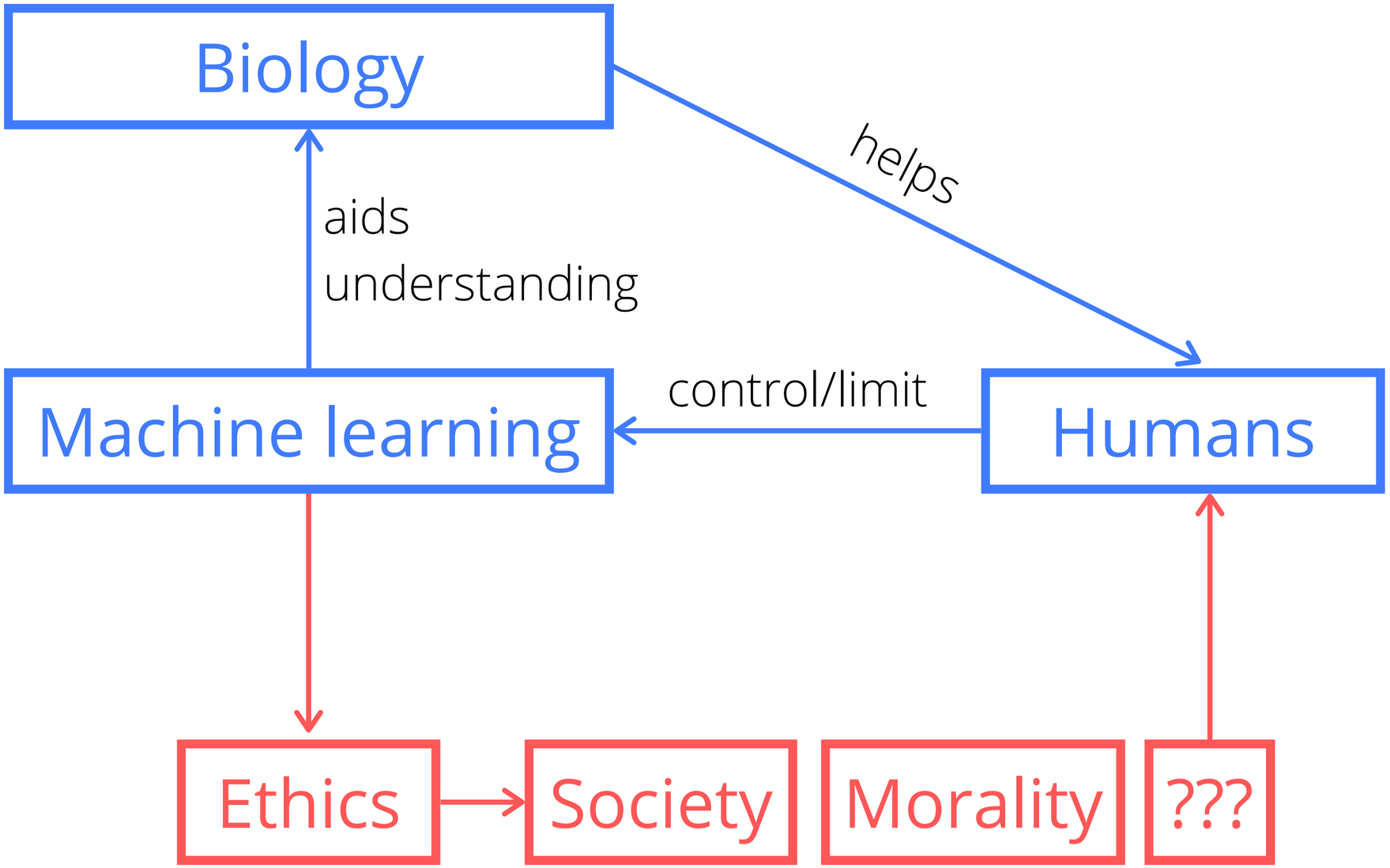
Biology
helps
aids
understanding
Machine learning
control/limit
Humans
Ethics
Society
Morality
???

THAT'S IT!

Machine Learning + Biology

References

Real-World Benefits of Machine Learning in Healthcare. HealthCatalyst; c2017 [accessed 2021 May 25]. www.healthcatalyst.com/clinical-applications-of-machine-learning-in-healthcare