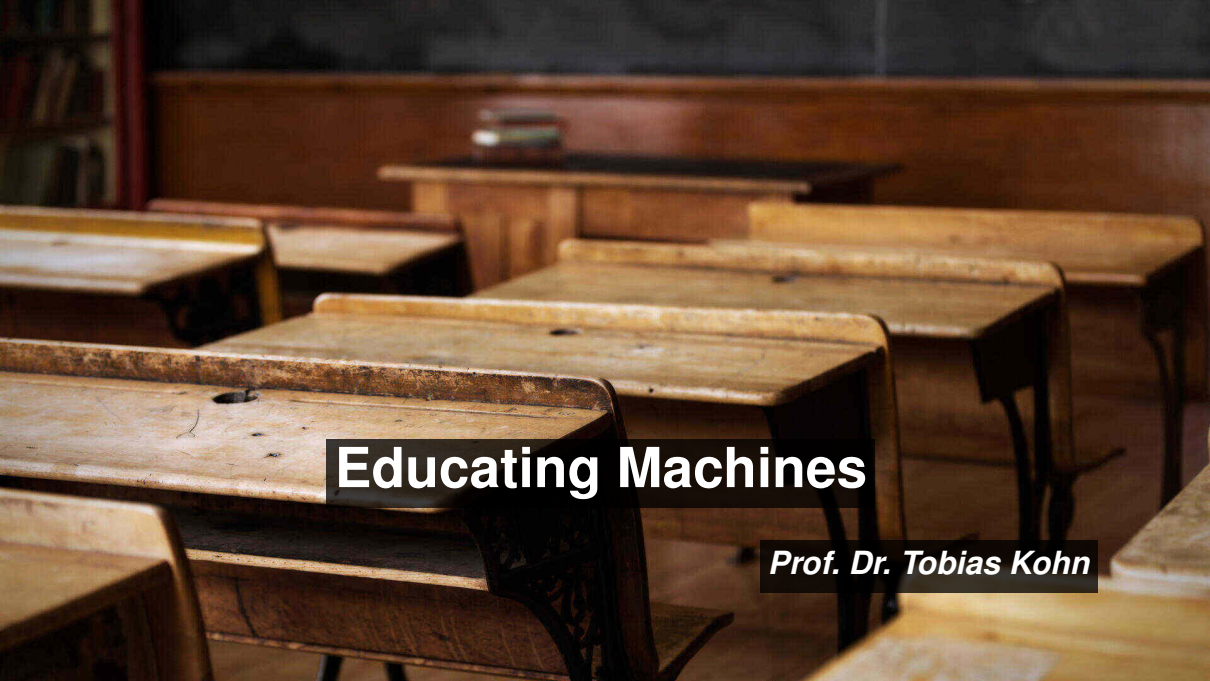




Educating Machines

Prof. Dr. Tobias Kohn



Education is easy...



... until it isn't!

A long-exposure photograph of a multi-tiered waterfall cascading through a lush green forest. The water flows over several levels of rock, creating a soft, silky texture. The surrounding trees and foliage are vibrant green, with sunlight filtering through the canopy, creating a dappled light effect. The overall scene is serene and natural.

How do we scale education?



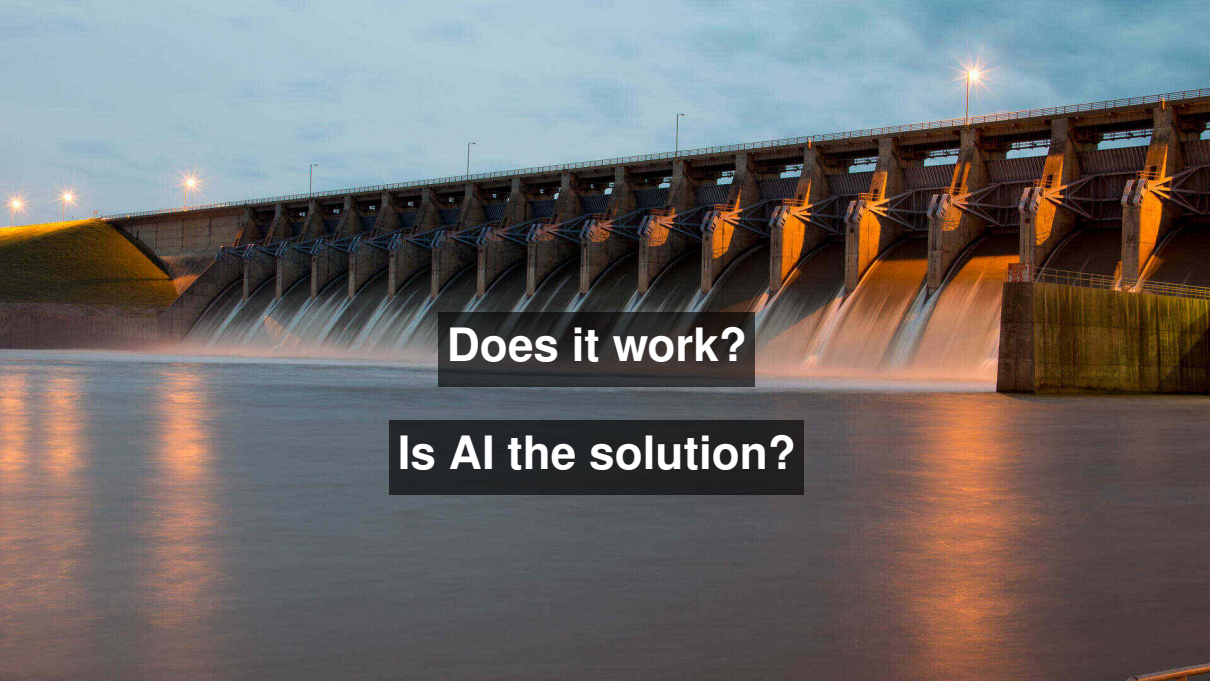
We mechanise it!

...and go big!



A wide-angle photograph of a large concrete dam at dusk. The dam features multiple spillways with water cascading over them, creating a misty spray at the base. The structure is illuminated by warm, golden lights, likely from the setting sun and some artificial lighting visible on top of the dam. The sky is a deep blue with some light clouds. The foreground shows the calm water of the reservoir, reflecting the lights from the dam. A dark rectangular box with white text is centered over the middle of the image.

Does it work?

A large concrete dam with multiple spillways is shown at dusk. Water is flowing over the spillways, creating a misty spray at the base. The dam is illuminated by several bright lights, which reflect on the calm water in the foreground. The sky is a deep blue with some light clouds.

Does it work?

Is AI the solution?



UNDERSTANDING LEARNING



**What is
learning?**

Invisible

Not measurable



Behaviourism

Stimulus

→ response

Input

(→ processing)

→ output

Organisms as
machines

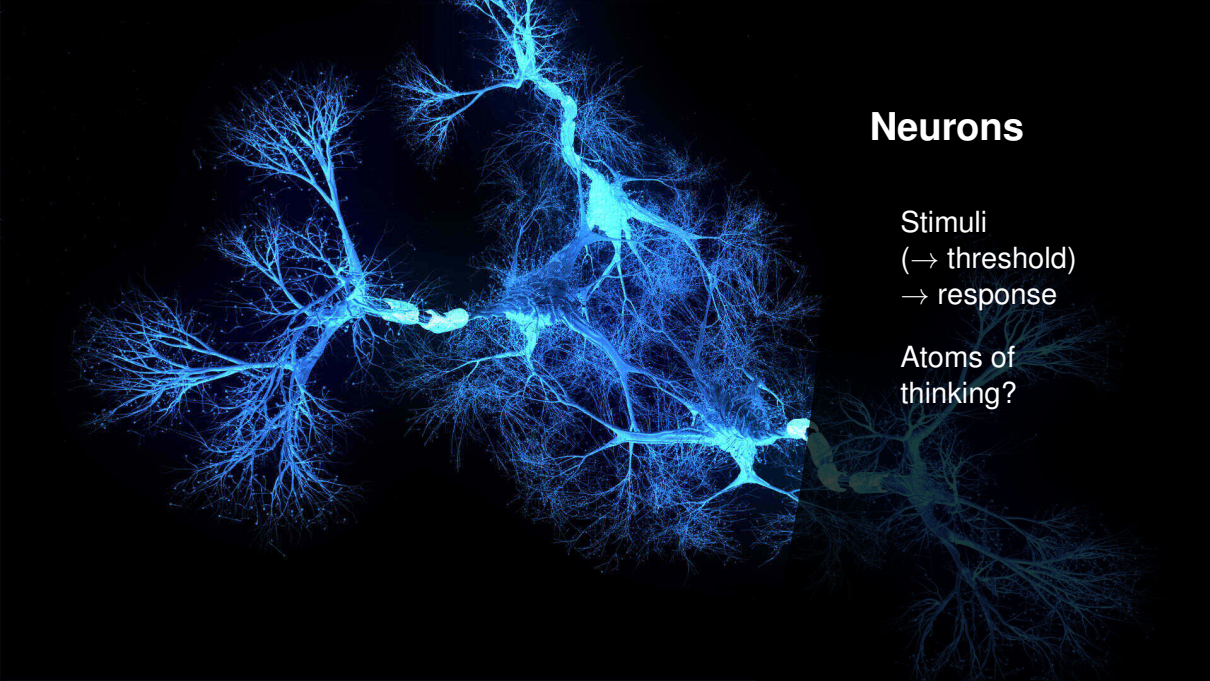


Behaviourism

Learning:

Conditioning /
reinforcement

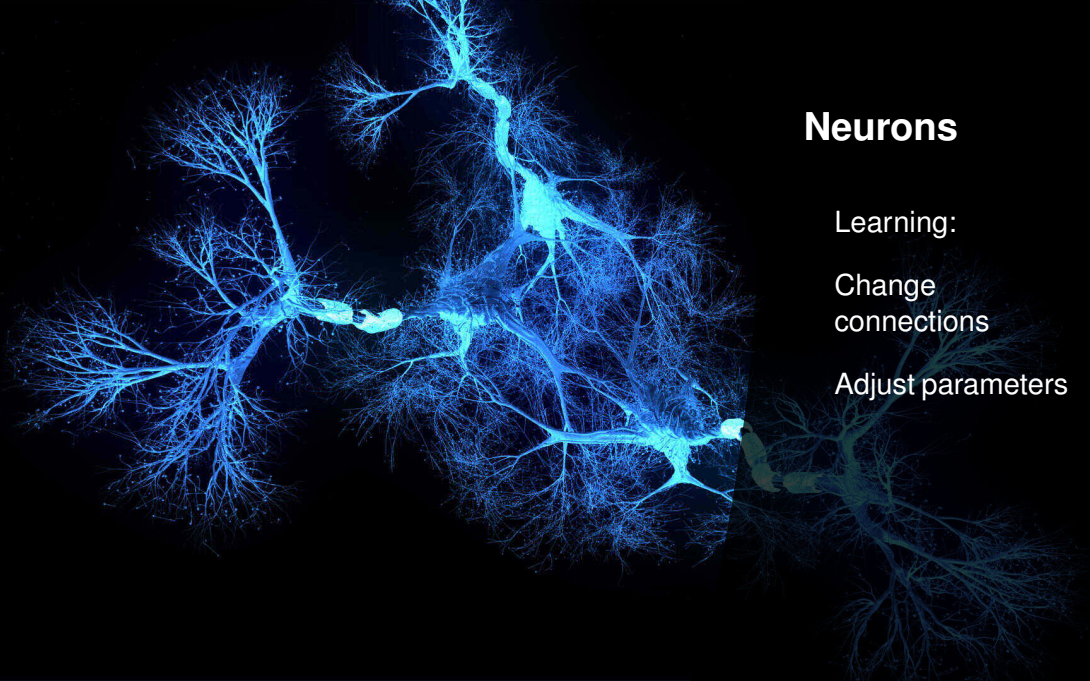
Fire together
Wire together



Neurons

Stimuli
(→ threshold)
→ response

Atoms of
thinking?



Neurons

Learning:

Change
connections

Adjust parameters



Learning

Mechanical
in nature

We can simulate
neurons

Build/copy it
to understand



Learning

We can model /
simulate learning

We can educate
machines

**Machine
learning**



Thinking

Do machines built
of neurons think?

Are machines
intelligent?

Are machines
conscious?



Thinking

Turing:
Wrong question!

Can submarines
swim?

Test observable
behaviour only!



Learning

Model is wrong!

(Still useful)

AI requires huge
amounts of data,
humans do not

Learning

Vygotsky:
a social activity!

Personal growth

We learn from
meaning, not data



A warm, brightly lit dance studio with large windows in the background. A female teacher in a maroon tank top and grey leggings is smiling as she assists a young female student in a high kick. The student is wearing a maroon leotard, a black tutu, white tights, and white ballet slippers. Three other young female students, also in maroon leotards and black tutus, stand in the background, watching the lesson. The text "We are *not* teaching machines" is overlaid on the image in a black box with white text.

We are *not* teaching machines



UNDERSTANDING AI



The greatest challenge of the 20th century



A clever solution



The carrier of dreams, hopes and fears



The dream of Auto-Mobility



What is a brain for?



What is intelligence?



Beware of pedestrians



Ethics: the «Trolley-Problem»



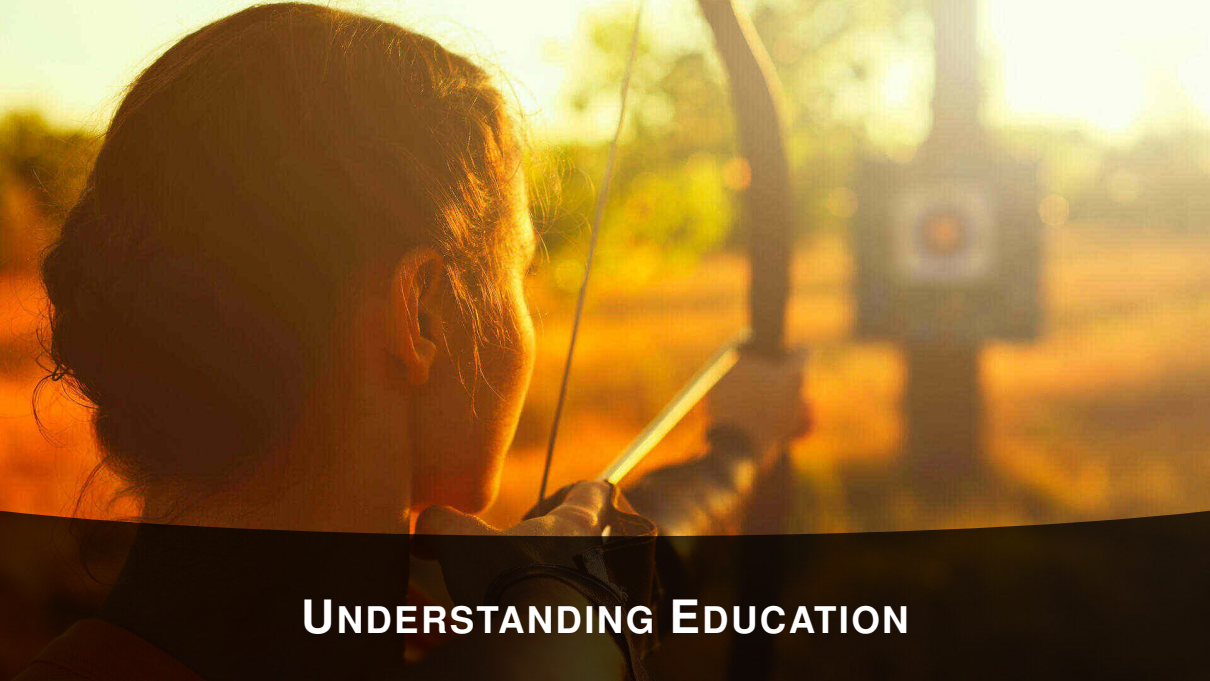
Solution: remove unpredictable elements



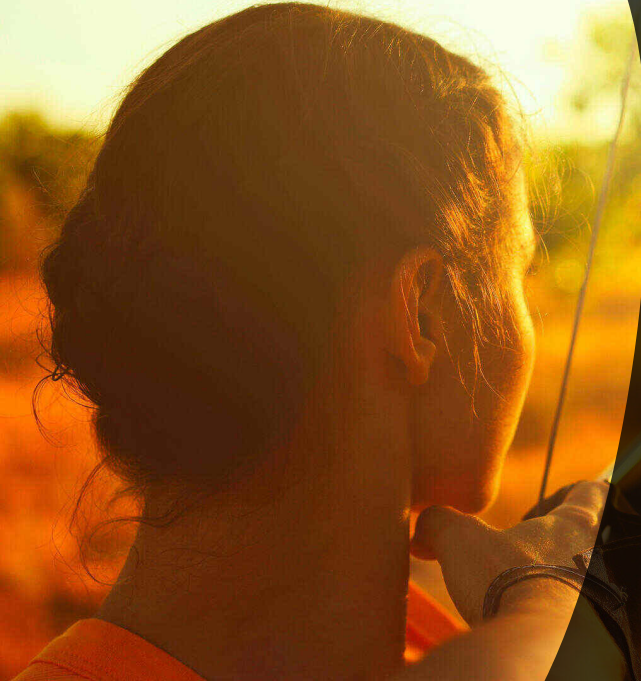
Spherical chickens in a vacuum



We cannot teach machines to be ethical



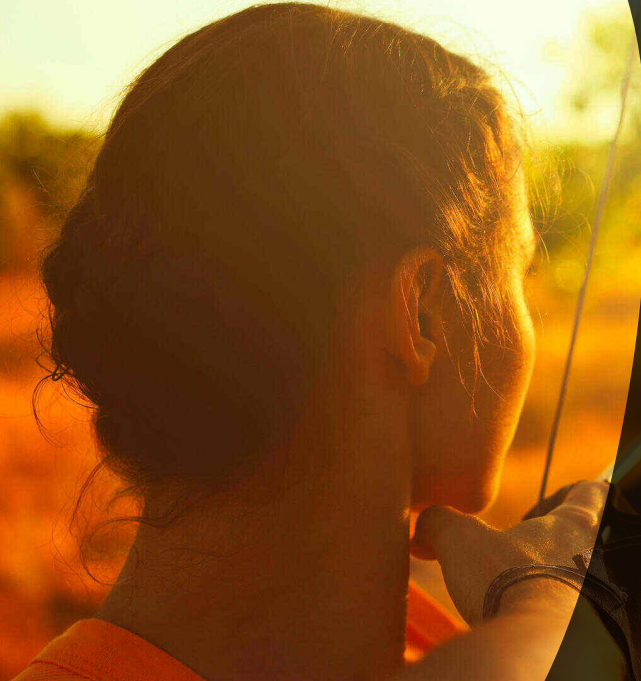
UNDERSTANDING EDUCATION



The Humanistic Aim

Growth of the character

Meaningful interaction with the world

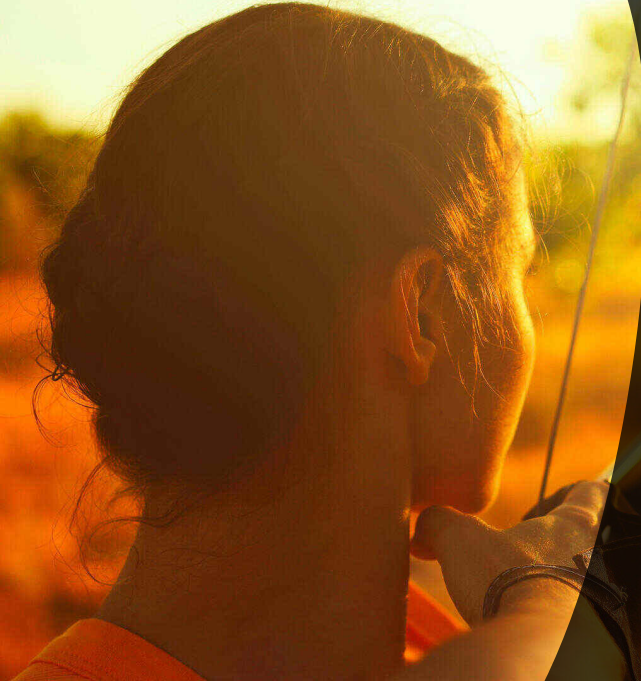


The Humanistic Aim

Growth of the character

Meaningful interaction with the world

AI is irrelevant



The Humanistic Aim

Growth of the character

Meaningful interaction with the world

**Education that has value,
has value irrespective of
tools**

The Utilitarian Aim

A person is shown in profile, aiming a bow at a target in a field of autumn trees. The scene is bathed in warm, golden light, suggesting a sunset or sunrise. The target is a circular bullseye on a wooden board. The person's face is in shadow, and their hands are visible holding the bow and arrow. The background is a soft-focus landscape with trees in shades of orange and yellow.

Job opportunities

Economic/societal utility

The Utilitarian Aim

Job opportunities

Economic/societal utility

AI is an important tool

Is it really, though?



The Utilitarian Aim

Job opportunities

Economic/societal utility

Universities as job-training centres?





Motivation: Why Are Students Learning?

A woman with brown hair tied back, wearing a blue and white striped shirt and a white apron, is smiling and looking down at her hands as she shapes a cookie. She is surrounded by three young children, all wearing white chef hats and white aprons over blue and white striped shirts. One child on the left is also shaping a cookie. Another child in the background is smiling. A third child on the right is looking intently at the woman's hands. They are in a kitchen with white cabinets and a window with sheer curtains. On the counter, there are various baking supplies including a rolling pin, a glass of milk, and several cookie cutters.

Motivation Lives in a Social Context

A Social Context

Be part of community

Follow role-models



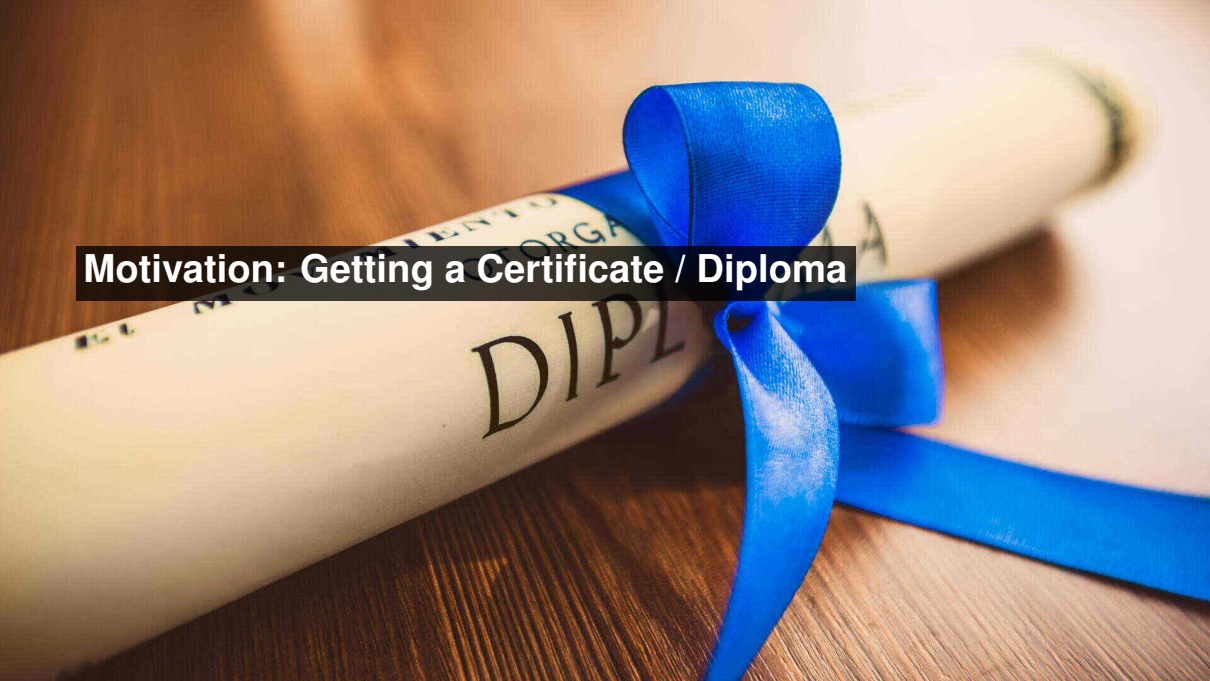
A Social Context

Be part of community

Follow role-models

**AI must not replace
crucial human interaction**



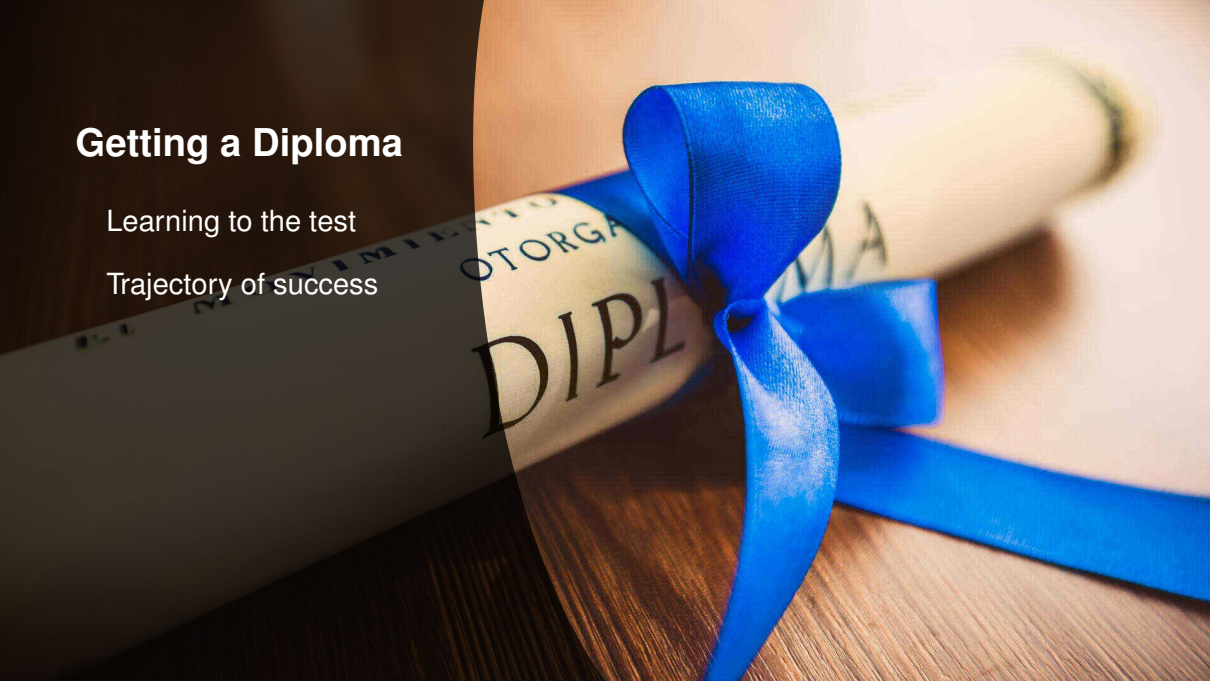


Motivation: Getting a Certificate / Diploma

Getting a Diploma

Learning to the test

Trajectory of success



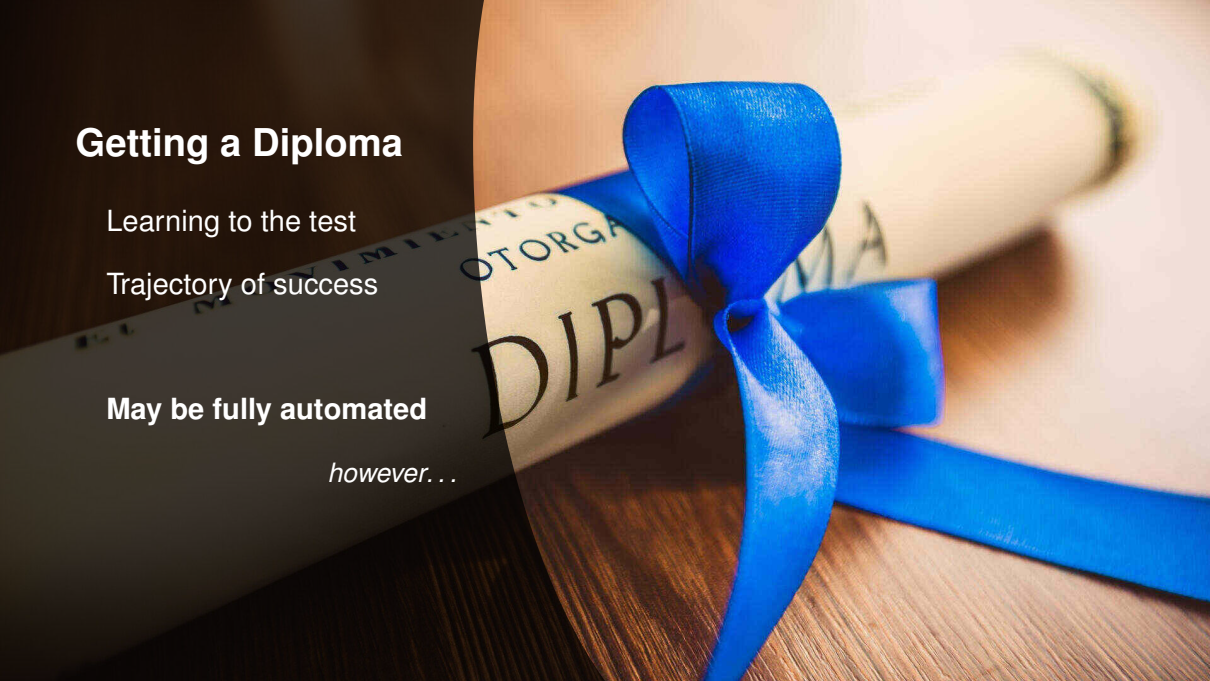
Getting a Diploma

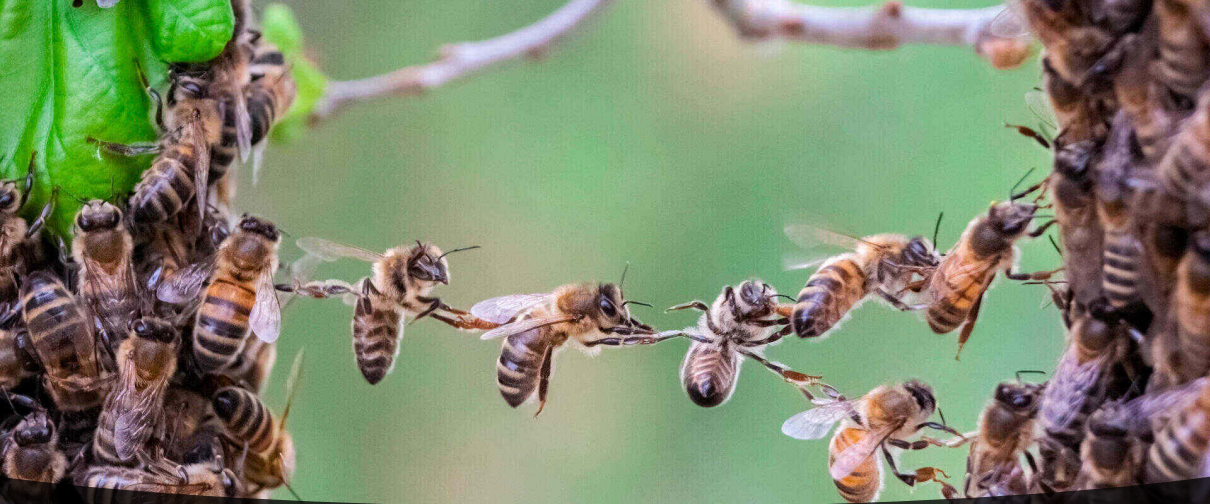
Learning to the test

Trajectory of success

May be fully automated

however...





Certification: Chain of Trust

Problem: The test-passing can also be fully automated!



THE CHALLENGES AHEAD



Anthropomorphisation is a two-way street



Building teaching machines with AI



Teaching about AI machines



Education is a *social* activity!