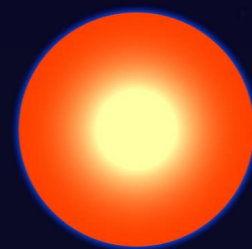


February 6, 2020  
SwissCognitive, ETH RETHINK

# Enhancing Human Learning with Machine Learning

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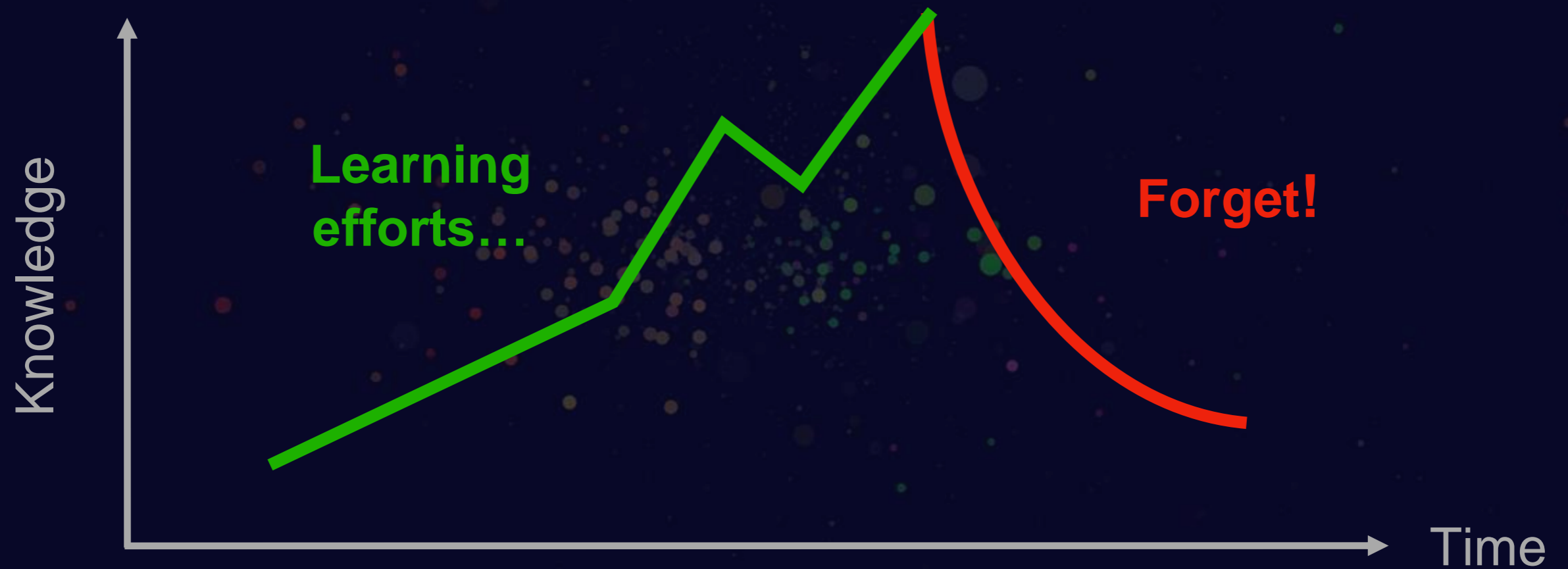
**MAGMA**

L e a r n i n g

MAGMA Learning © 2020

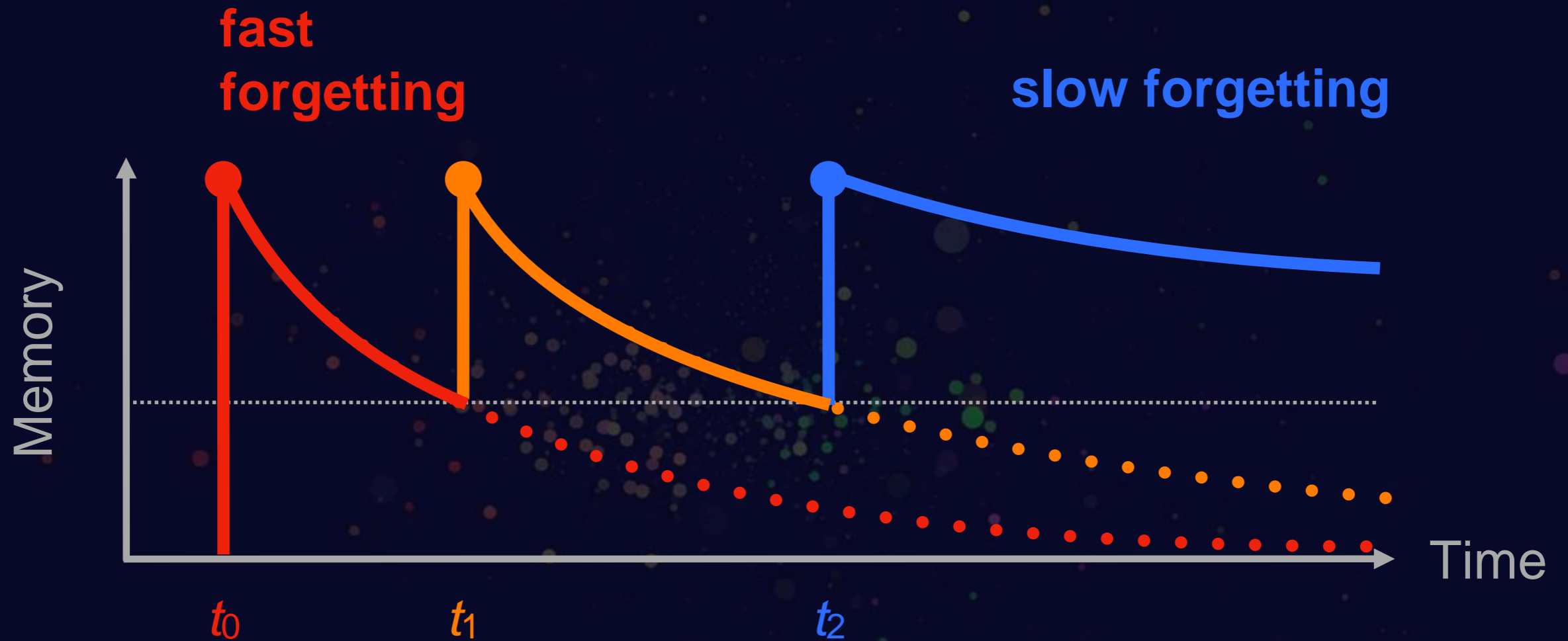
# The unreasonable ineffectiveness of learning

What to learn? How to learn? When to learn?



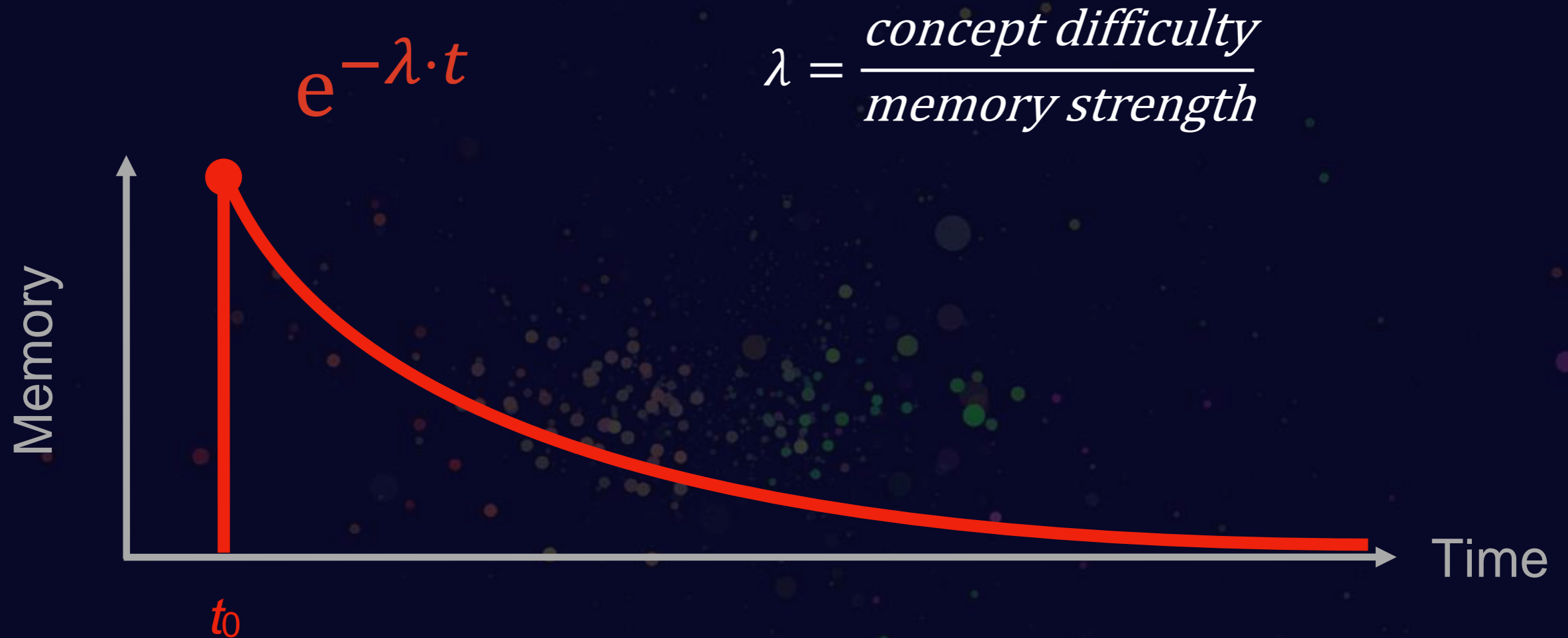
[Ebbinghaus 1885]

# Spaced repetition



Revise just before forgetting — no sooner, no later!

# Optimize revision times with ML



Use ML to determine  $\lambda$  for **each user** and for **each concept**

# Make knowledge visible

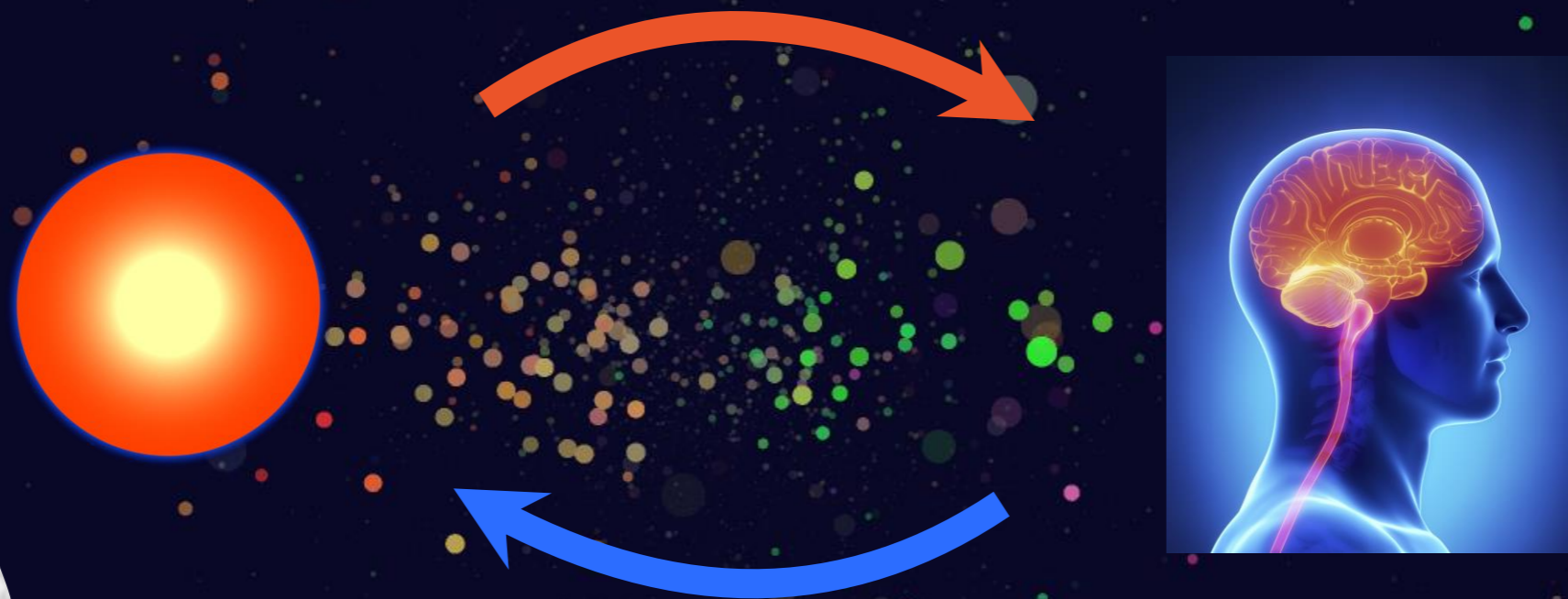
Word embedding spaces from Natural Language Processing are useful to learn



Nearby vertices = related topics

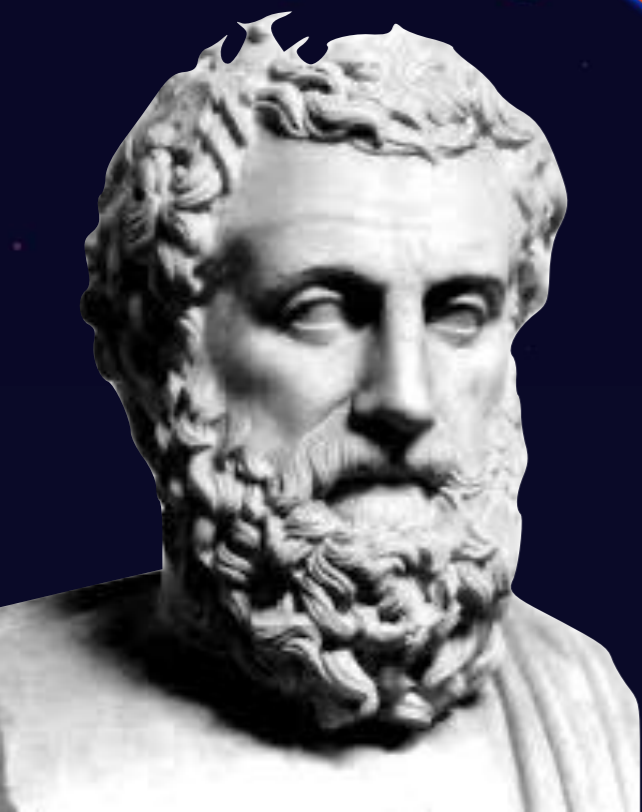
# Use case: ARI 9000 at EPFL

ARI = ARistotle + ARTificial Intelligence



**Personalized learning**

Ari9000.com with key = "EPFL"





# Screenshots

← Puzzle

What is it?

In statistics, \_\_\_\_\_ is an approach to analyzing data sets to summarize their main characteristics, often with visual methods.

Forecasting

Estimation of covariance matrices

Computer vision    Survey methodology

Exploratory data analysis

← Recall rate

80.2%

You have seen **72%** of the concepts relevant to your courses. Keep learning!

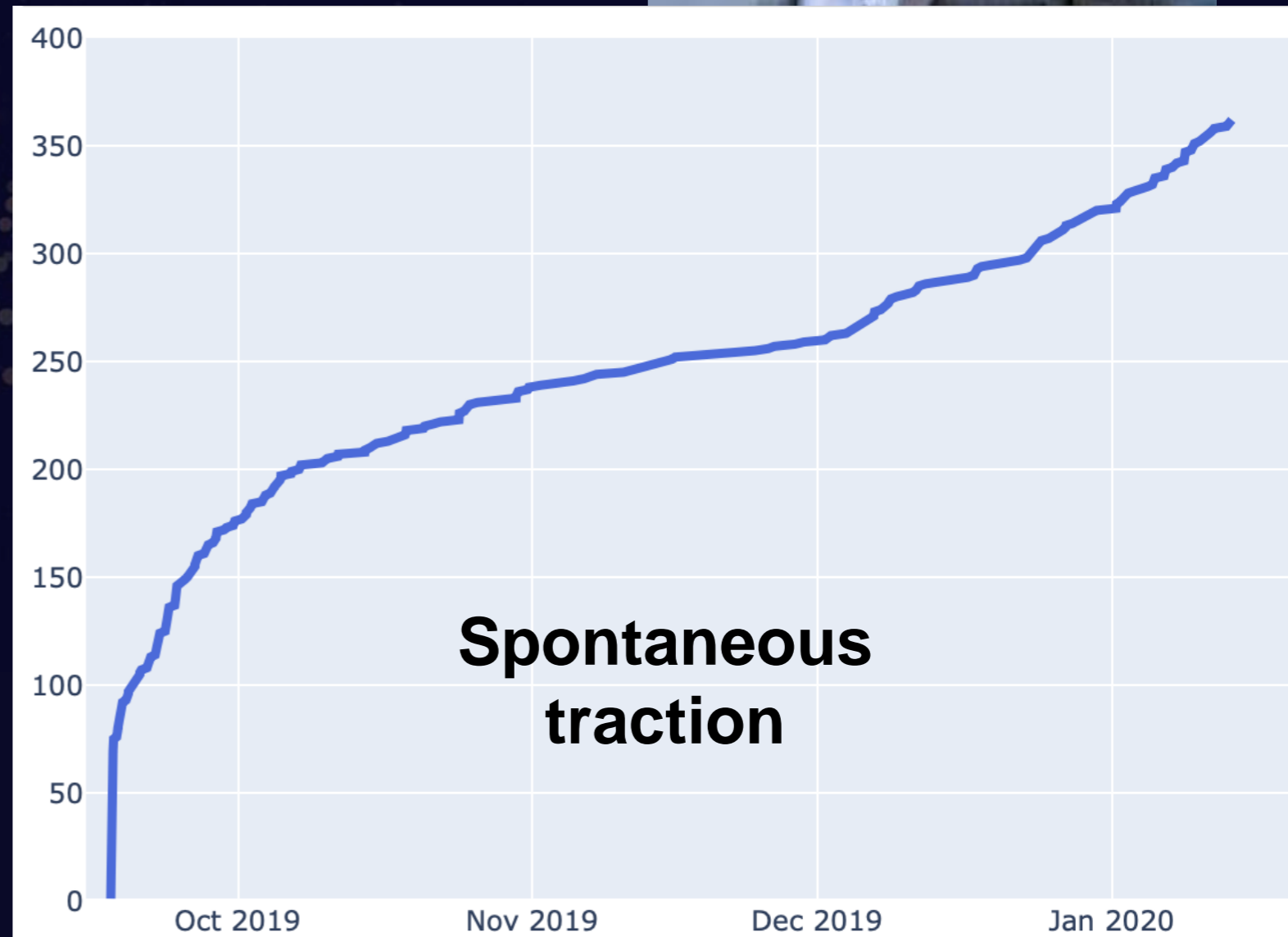
Month	Recall Rate (%)
Oct 2019	100
Nov 2019	72
Dec 2019	58

WEEK    MONTH    ALL TIME

# ML course at EPFL



- Prof. Martin Jaggi, head of MLO Lab
- Master's course during Fall semester 2019
- 70% of 500 students signed up
- 30-day retention = 23%
- Average session duration = 9 minutes
- 20k puzzles solved





## Testimonies from EPFL students

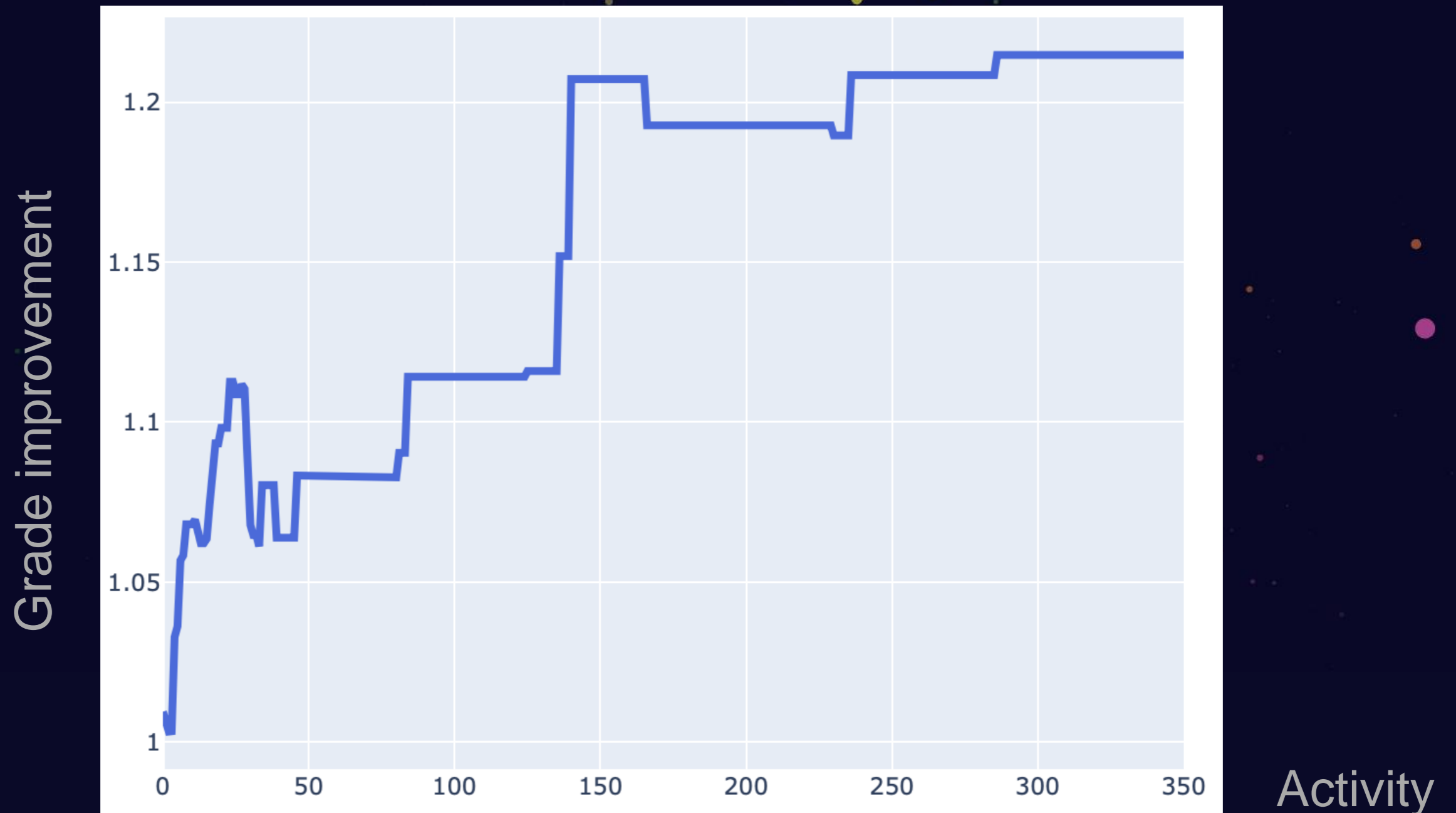
“I use **ARI** to learn whenever I have a break in my day.” — Julie

“I really feel that **ARI** knows what I should revise!” — Thomas

**The more they use ARI, the more they enjoy  
personalized learning**

# Results

Up to **20%** improvement in exam grades for regular users





**Thank you!**

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