**Machine Learning
With Python**

Alexander Jung

June 2019

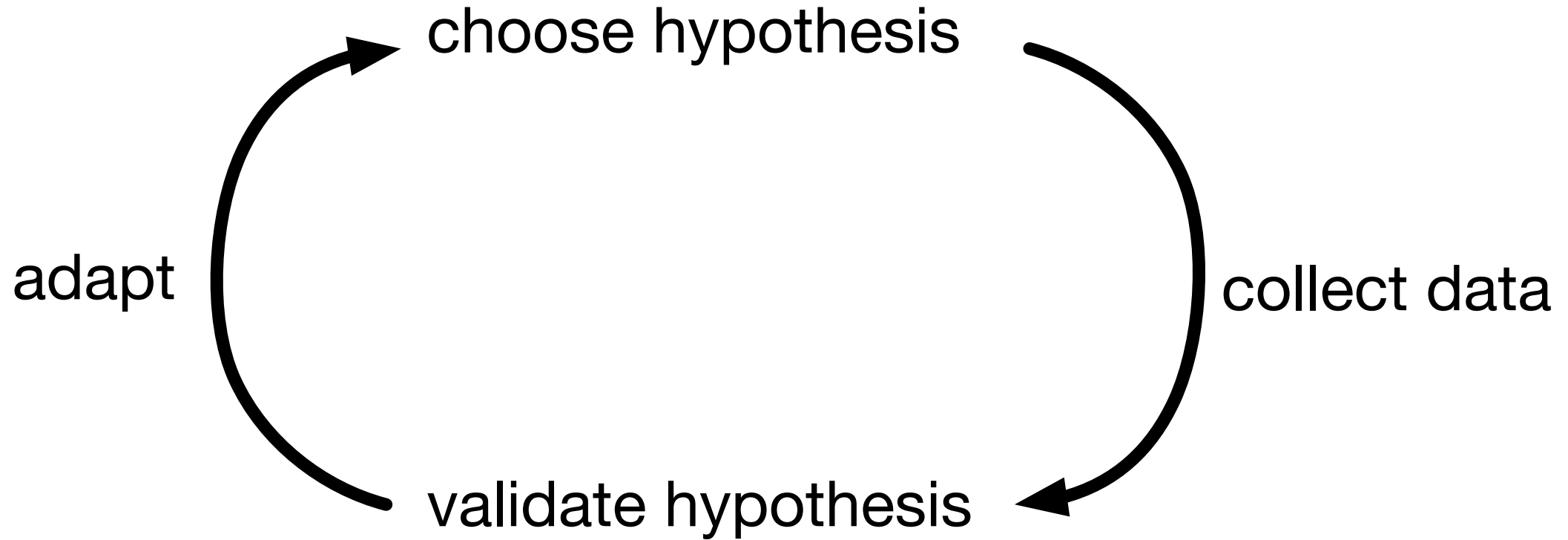# Machine Learning Transforms Our Life!

Personal Assistant

- tells where to find nearest shop

- analyzes skin patches for skin cancer

- predicts maximum temperature today

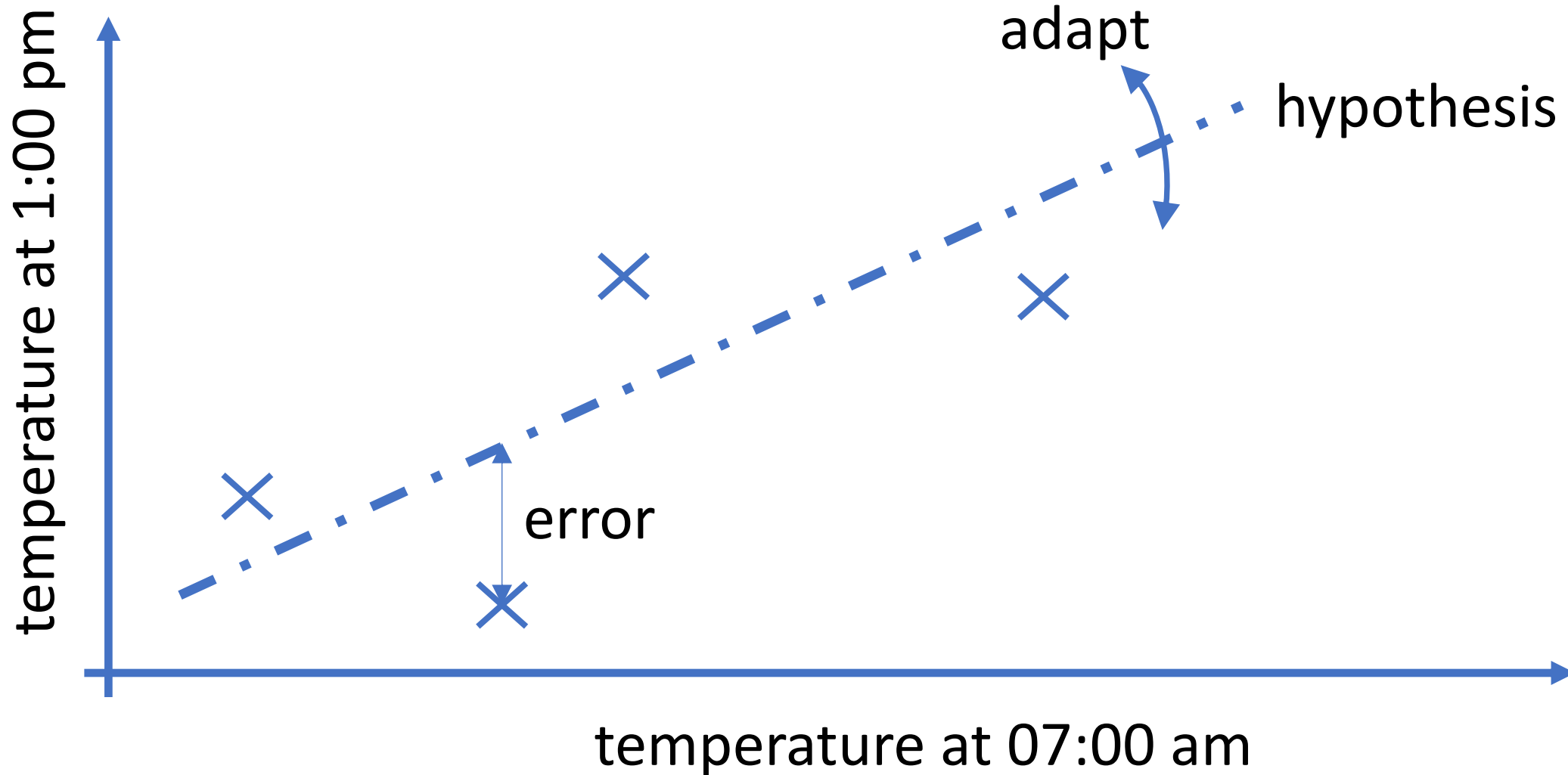- recommends restaurants, doctors, movies ...

ALL ENABLED BY MACHINE LEARNING !
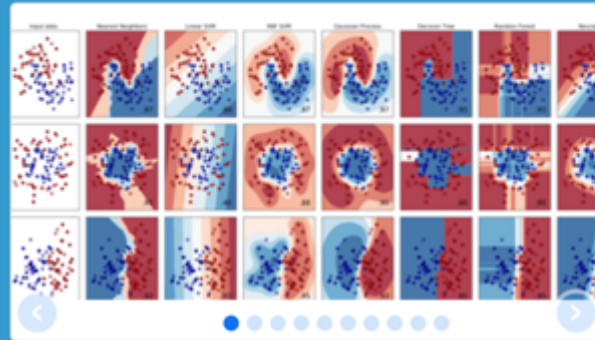
How Does it Work?

choose hypothesis

collect data

validate hypothesis

adapt

ML methods implement scientific principle ("trial and error")

Scientific Principle of ML

Machine Learning in Python

scikit-learn
Machine Learning in Python

- Simple and efficient tools for data mining and data analysis
- Accessible to everybody, and reusable in various contexts
- Built on NumPy, SciPy, and matplotlib
- Open source, commercially usable - BSD license

Classification

Identifying to which category an object belongs to.

Applications: Spam detection, Image recognition.
Algorithms: SVM, nearest neighbors, random forest, ...
— Examples

Regression

Predicting a continuous-valued attribute associated with an object.

Applications: Drug response, Stock prices.
Algorithms: SVR, ridge regression, Lasso, ...
— Examples

Clustering

Automatic grouping of similar objects into sets.

Applications: Customer segmentation, Grouping experiment outcomes
Algorithms: k-Means, spectral clustering, mean-shift, ...
— Examples

Dimensionality reduction

Reducing the number of random variables to consider.

Applications: Visualization, Increased efficien-

Model selection

Comparing, validating and choosing parameters and models.

Goal: Improved accuracy via parameter tuning

Preprocessing

Feature extraction and normalization.

Application: Transforming input data such as text for use with machine learning algorithms.

many ML methods available in Python libraries !

Why Python ?

- easy to learn (given previous programming experience)

- it's free !

- powerful ML libraries available

- current job market cries for Python skills

What
Job title, keywords, or company

machine learning python

Where
City, state, or zip code

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machine learning

java

python

matlab

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Salary Estimate

$100,000+ (11697)

$115,000+ (9318)

$125,000+ (7043)

$130,000+ (5853)

$145,000+ (2431)

Tip: Enter your zip code in the "where" box to show results in your area.

New! Join Indeed Prime - Get offers from great tech companies

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Artificial Intelligence/Machine Learning Scientist

Dow Jones ★★★★☆ 194 reviews

New York, NY 10176 (Murray Hill area)

Academic background in machine learning. Ability to incorporate NLP and machine learning into full-stack, user-facing applications....

8 days ago   save job   more...

Job match

Machine Learning Engineer

Cardinal Intellectual Property, Inc ★★★☆☆ 2 reviews

Chicago, IL +3 locations

Machine Learning Engineer, Evanston, IL. As a Machine Learning Engineer, you drive the vision to build and scale our machine learning and experimentation...

13 hours ago   save job   more...

R & Python, Machine and Deep Learning

Be the first to see new machine learning python jobs

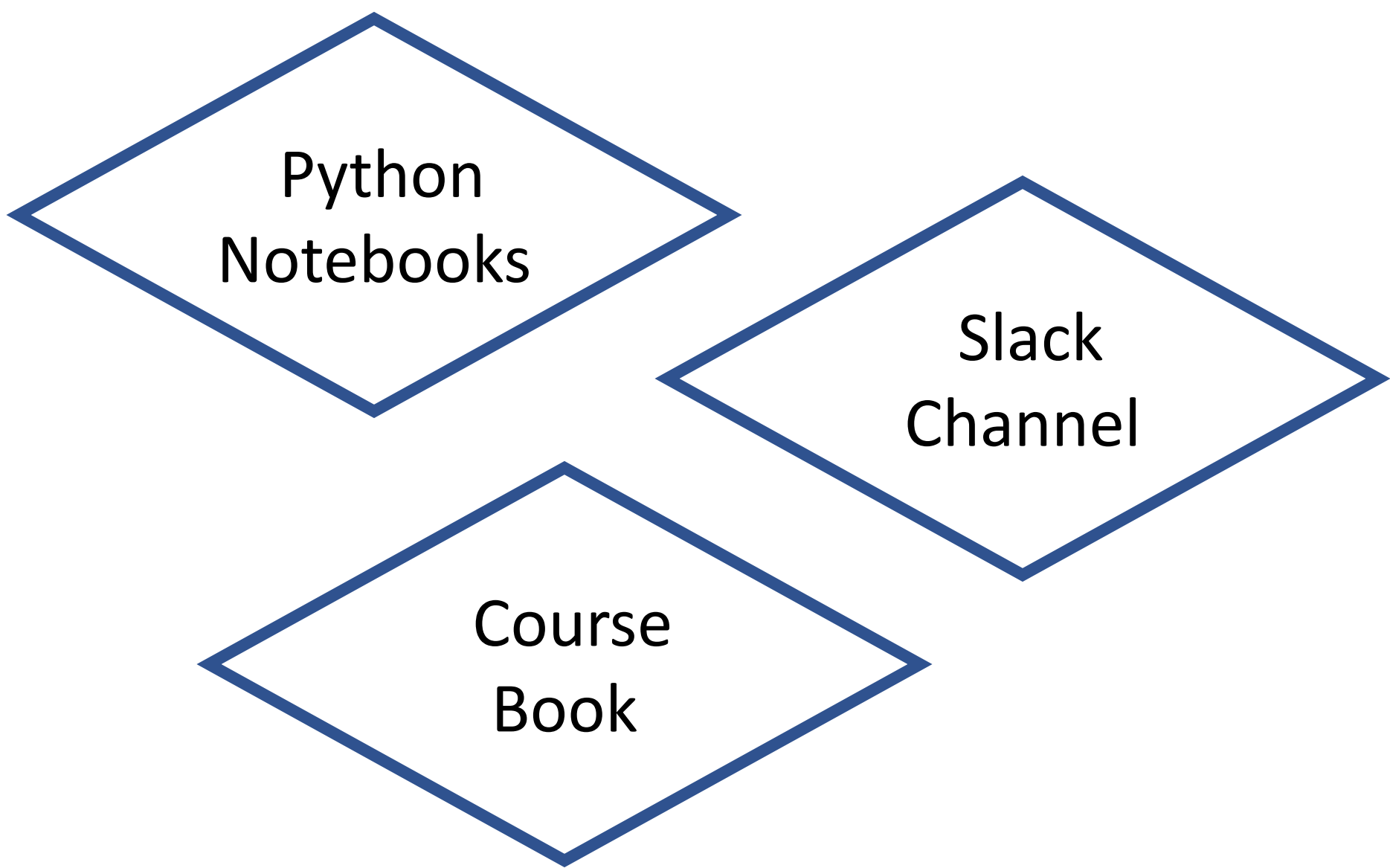My email:

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Activate

Machine Learning Engineer salaries in United States

$141,029 per year ⓘ

Based on 1,204 salaries

Min   Max

Python
Notebooks

Slack
Channel

Course
Book

Python (Jupyter) Notebooks

- Notebook ≈ document with embedded Python code

- binds together source code and documentation

- Notebooks executed/edited in any web browser!

2 Data

The dataset consists of $m = 55$ images, stored in the folder named `images`:

- 20 images of grass (stored in the files `image_1.jpg` to `image_20.jpg`)
- 20 images of soil (stored in the files `image_21.jpg` to `image_40.jpg`)
- 15 images of tiles (stored in the files `image_41.jpg` to `image_55.jpg`)

You can use the Python package `PIL` (=the Python Imaging Library) to determine typical image chara
are demonstrated below, so you can use those functions in the exercise.

```python
# Import most of the required libraries for this exercise

from PIL import Image
import numpy as np
import matplotlib.pyplot as plt
```

description

code snippet

Slack Channel

Machine Learni... ⌄ 🔔
● Alexander Jung

🔍 Jump to...

@ Threads

Channels ⊕
general
r1_introduction
r2_regression
r3_classification
r4_model_validation
r5_clustering
r6_dim_reduction
🔒 staff_private

+ Add a channel

Direct Messages ⊕
💚 Slackbot
● Alexander Jung (you)
● Ivan (TA)
○ Joakim (TA)
○ Juha Annanmaki
● Shaghayegh (TA)

Friday, June 7th

I checked a random notebook and I noti... ...ain vector is said to contain the even indices in the text but stores odd indices in the code. That's why no one has got full marks on this assignment. I'm not sure if we should inform the students to resubmit or change the notebooks (this distorts the plots)

Ivan (TA) 11:15 AM
In general, I think it would be a good idea to update the notebooks for all the mistakes/typos that have been discovered so far. This would be beneficial for next version of the course as well.

Hasti (TA) 11:17 AM
The question is that should we update the text, which will require the students to resubmit, or adjust the code so that no one has to resubmit; the latter changes the plots and I might need to change some of the hidden tests.

Alex Jung 1:55 PM
left staff_private. Also, Alexander Jung joined.

Alexander Jung 1:55 PM
now it works!

can we just take this problem into account when computing the grades?

by a "correction factor" ?

Hasti (TA) 2:04 PM
This could also happen but I don't know how it will affect the feedbacks!

Sunday, June 9th

Joakim (TA) 11:01 PM
Well, we can manually correct them

Monday, June 10th

🔍 Search   @

About 🔒 **staff_private**
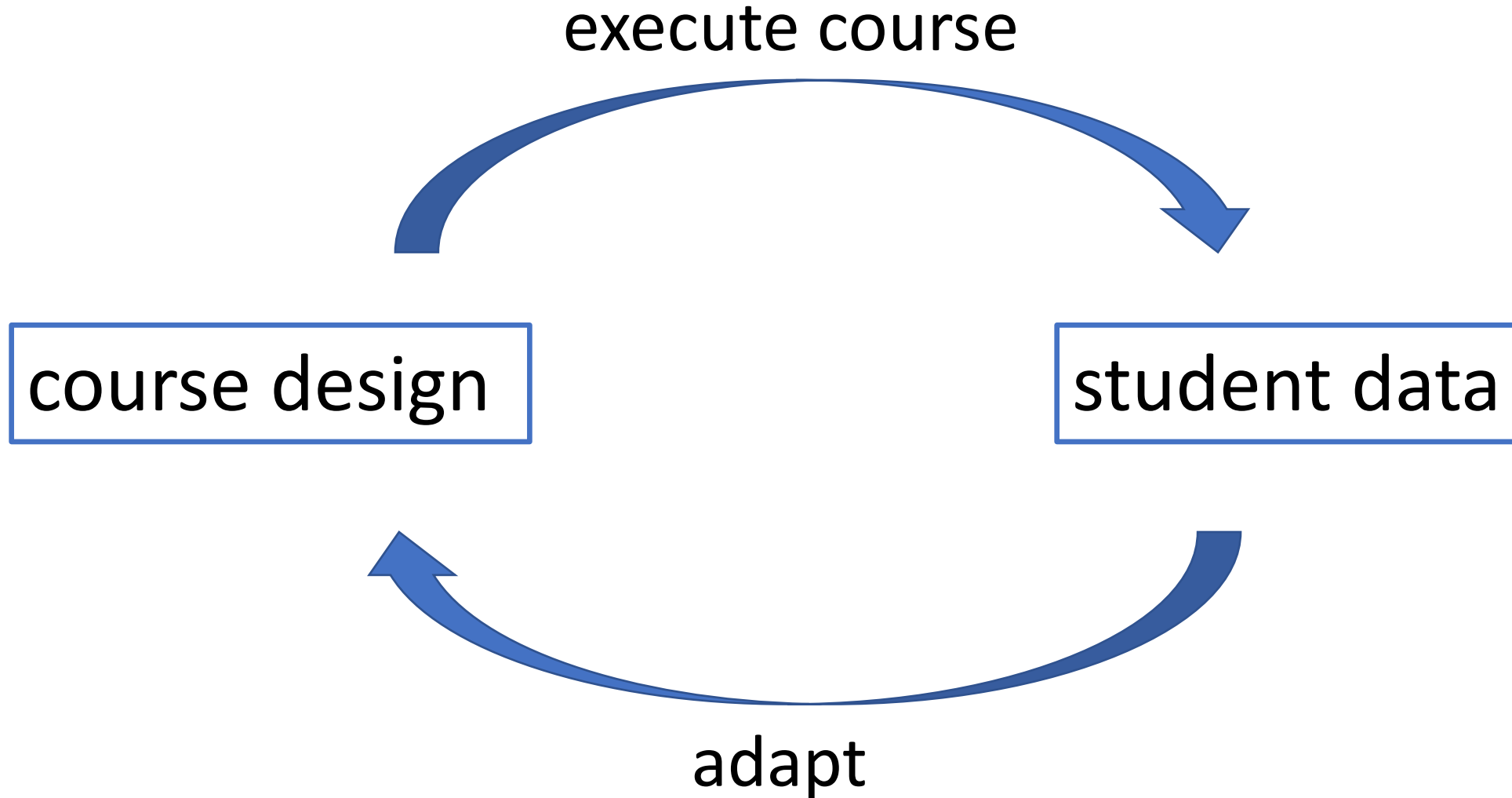
ⓘ Channel Details

✨ Highlights

📌 1 Pinned Item

👥 7 Members

● 🔴 Alexander Jung (you)
● 🟡 Ivan (TA)
● 👩 Shaghayegh (TA)
○ 🔴 Hasti (TA)
○ 🖼️ Huy Mai (TA)
○ 👤 Joakim (TA)
○ 🔴 Simone (TA)

Add more people...

Why Slack Channel?

- provide discussion forum for students

- students can discuss problems with each other

- discussion moderated by TAs

- bonus points for useful contributions

Future Development

Ideas for Next Edition

- rethink role of course book (maybe leave it out)

- make more use of ready-made ML libraries

- use different ML case studies

- optimize feedback channels to students

Questions ?