Leibniz Universität Hannover

Interactive Systems (ISY)

Hörsaalübung 01

Human-Computer Interaction Group

Jan Feuchter
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Leibniz Universität Hannover

ORGANISATORISCHES

Personen

- Vorlesung
  - Michael Rohs

- Übungsleitung
  - Jan Feuchter

Präsenzübung

- Dienstag 09:45-11:15
- Vertiefung der Vorlesungsinhalte
- Beispiele
- Praktische Übungen
- Nachbesprechung Hausübungen

Ressourcen

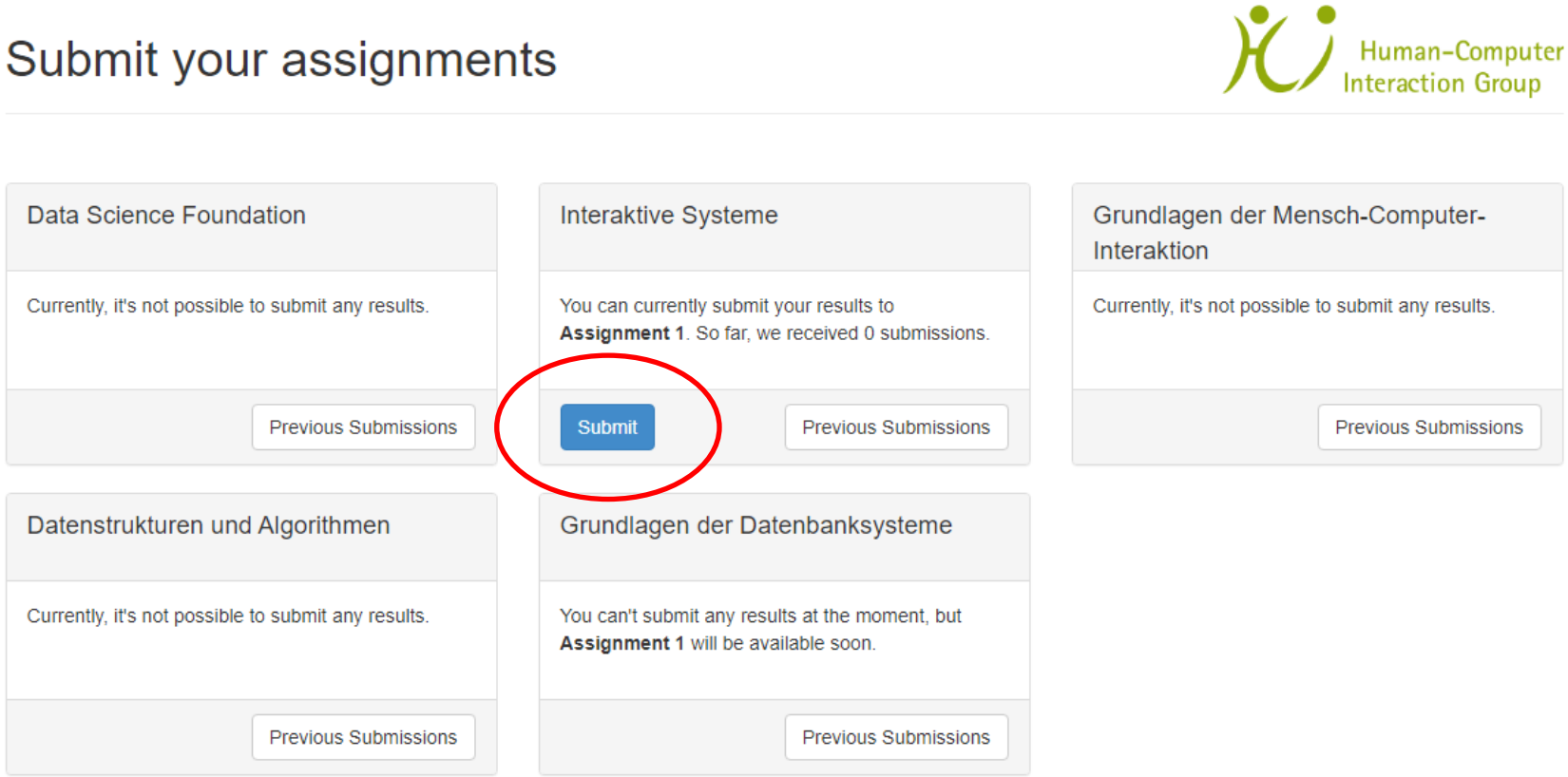
- Kurs Homepage
  - Kursplan, Referenzen
  - https://www.pi.uni-hannover.de/de/hci/lehre/sommer-2024/interaktive-systeme
- Stud.IP
  - Foliensätze, Aufgaben, Ankündigungen, Diskussionen, Feedback
  - https://studip.uni-hannover.de/
- Upload Tool
  - Abgabe der Hausübung
  - https://assignments.hci.uni-hannover.de

Übungen und Scheinbedingungen

- Übungen
  - (meist) wöchentlich, Aufgaben lösen
  - Bearbeitung erfolgt einzeln (außer explizit erlaubt)
  - Abgabe per Submission-System
  - Bonuspunkte für Klausur (max. 20% auf erreichte Klausurpunkte)
  - Bonus gilt nur für das Semester, in dem der Bonus erarbeitet wurde
  - Bonus hilft nicht beim Bestehen
- Klausur
  - Schriftlich, 90 Minuten
- Scheinbedingungen
  - Bestehen der Klausur
  - Schein ist benotet

Abgabe der Übungen

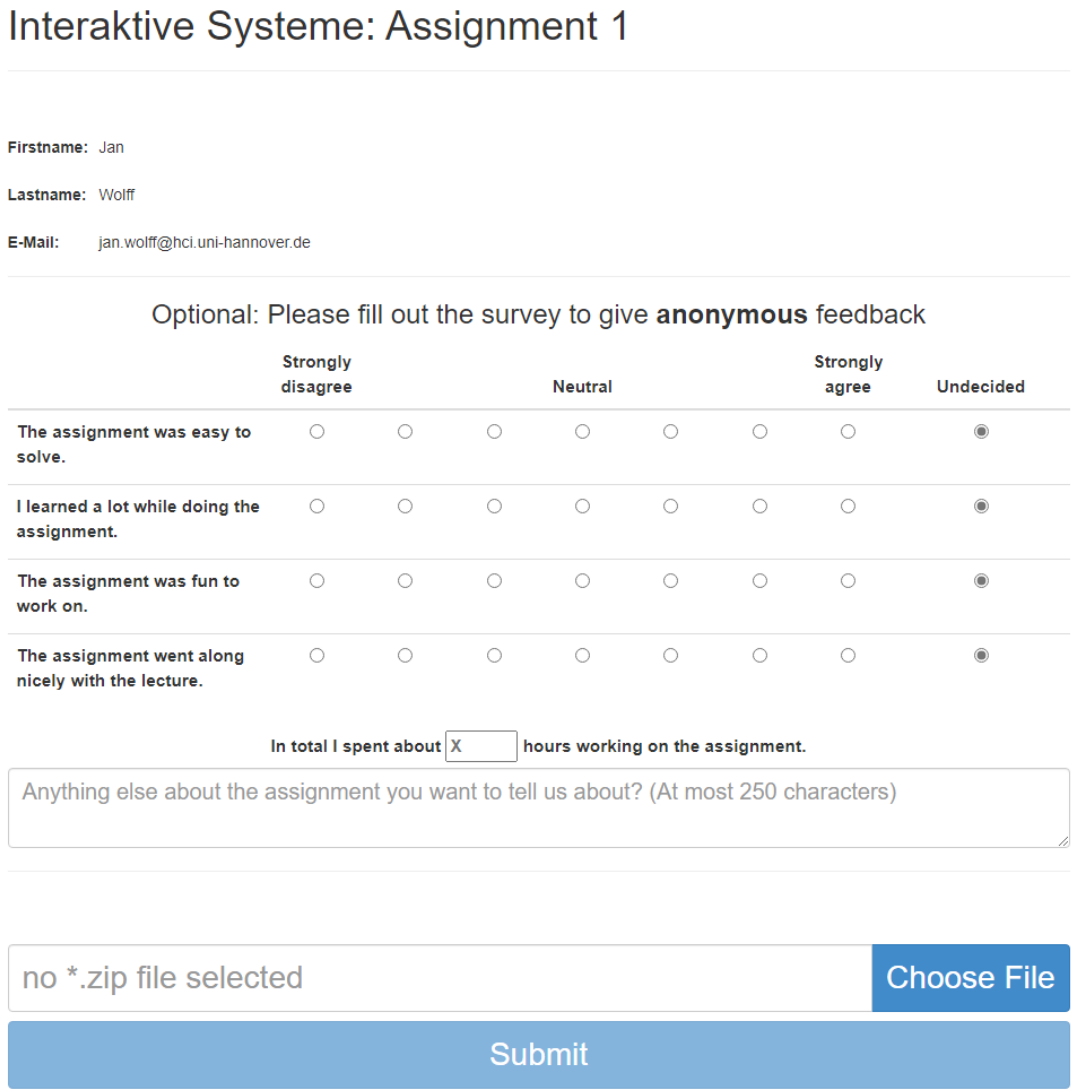
- https://assignments.hci.uni-hannover.de



Abgabe der Übungen (2)

- Abgabe der Übung als .zip Archiv
  - Archiv enthält alle relevanten Dateien
- Deadline stets montags um 23:59

- Textaufgaben:
  - Nur PDF!
- Programmieraufgaben:
  - Jeweils in Aufgabe beschrieben
  - z.B. Export aus IntelliJ



Interaktive Systeme: Assignment 1

Firstname: Jan

Lastname: Wolff

E-Mail: jan.wolff@hci.uni-hannover.de

Optional: Please fill out the survey to give **anonymous** feedback

	Strongly disagree			Neutral			Strongly agree	Undecided
The assignment was easy to solve.	○	○	○	○	○	○	○	◉
I learned a lot while doing the assignment.	○	○	○	○	○	○	○	◉
The assignment was fun to work on.	○	○	○	○	○	○	○	◉
The assignment went along nicely with the lecture.	○	○	○	○	○	○	○	◉

In total I spent about X hours working on the assignment.

Anything else about the assignment you want to tell us about? (At most 250 characters)

no *.zip file selected Choose File

Submit

Lectures

Session	Date	Topic	Details
1	2.4.	Introduction	human performance, empirical research, modeling
2	9.4.	Interaction elements	input devices, interaction elements, states, layouts
	16.4.	Event handling	events, bindings, reactive programming, scene graph
3	23.4.	Scene graphs	event delivery, coordinate systems, nodes, animation, concurrency
4	30.4.	Interaction techniques	alignment and pointing techniques
5	7.5.	Interaction techniques	
6	14.5.	Web-based user interfaces	document object model, client-server issues
	21.5.	Pfingstwoche	
7	28.5.	Web-based user interfaces	reactive Programming for the Web
8	4.6.	Experiments and data analysis	designing experiments, hypothesis testing
9	11.6.	Modeling interaction	descriptive and predictive models, keystroke-level model, regression
10	18.6.	Visualization	visual encodings, perceptual accuracy, treemaps, dynamic queries
11	25.6.	Human-Centered AI	introduction to human-centered AI, human control and automation, examples
12	2.7.	Deep learning in HCI	guidelines for human-AI interaction, neural networks
13	9.7.	Deep learning in HCI	convolutional and recurrent NNs, face recognition, gesture recognition

Exkurse

- Reactive Programming
  - JavaFX
  - HTML, CSS, JavaScript
  - Web Frameworks: Vue.js, Svelte
- Statistics and Evaluation of Experiments
  - Python
  - Jupyter Notebooks
  - Seaborn, Pandas, etc.
- Deep Learning
  - Python
  - TensorFlow (Keras)

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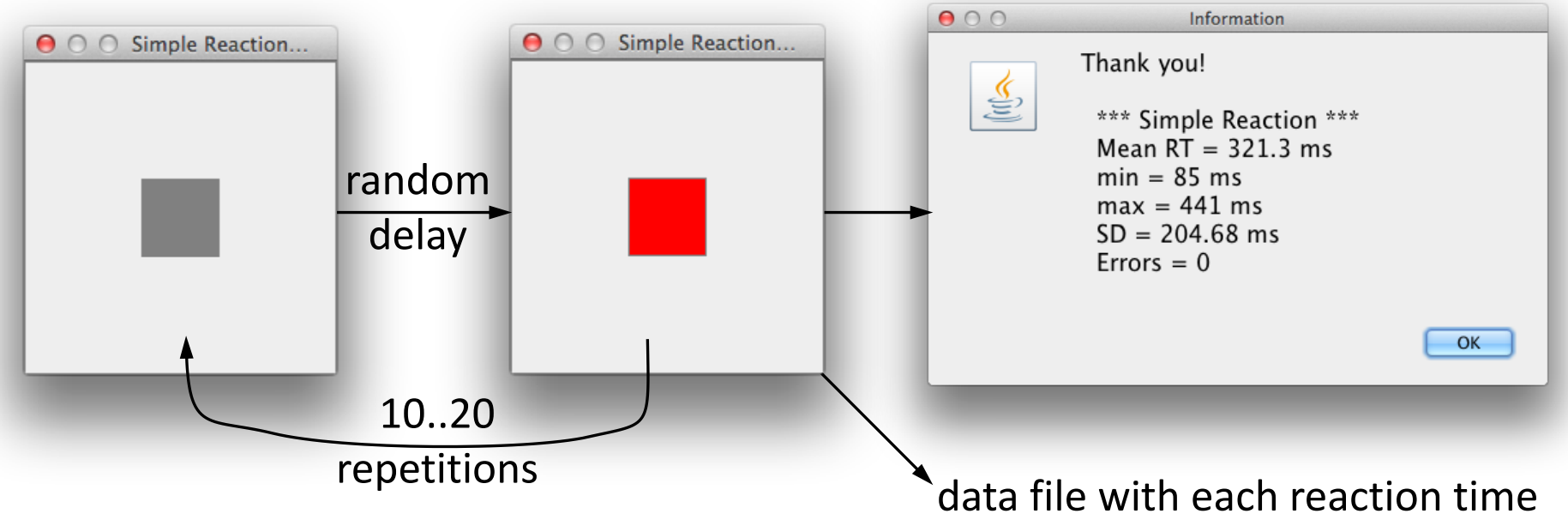
KURZE WIEDERHOLUNG

Simple Reaction Time

- Java ReactionTimeExperiment
  - modified from MacKenzie: http://www.yorku.ca/mack/HCIbook/



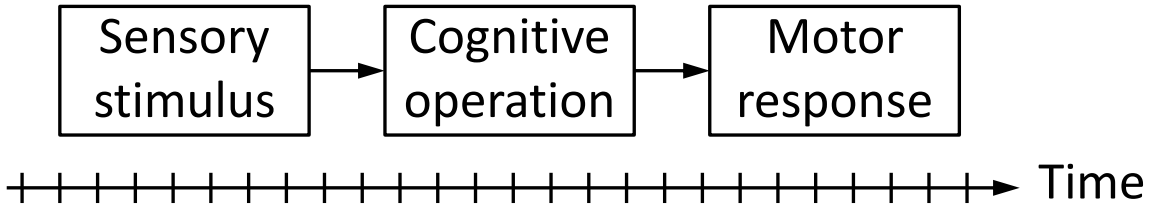
- Press key as quickly as possible after red box appears

Fragen

- Sie fahren auf eine Ampel zu und diese springt von grün auf gelb.

- Ist dies ein Beispiel für einen Simple Reaction Task?

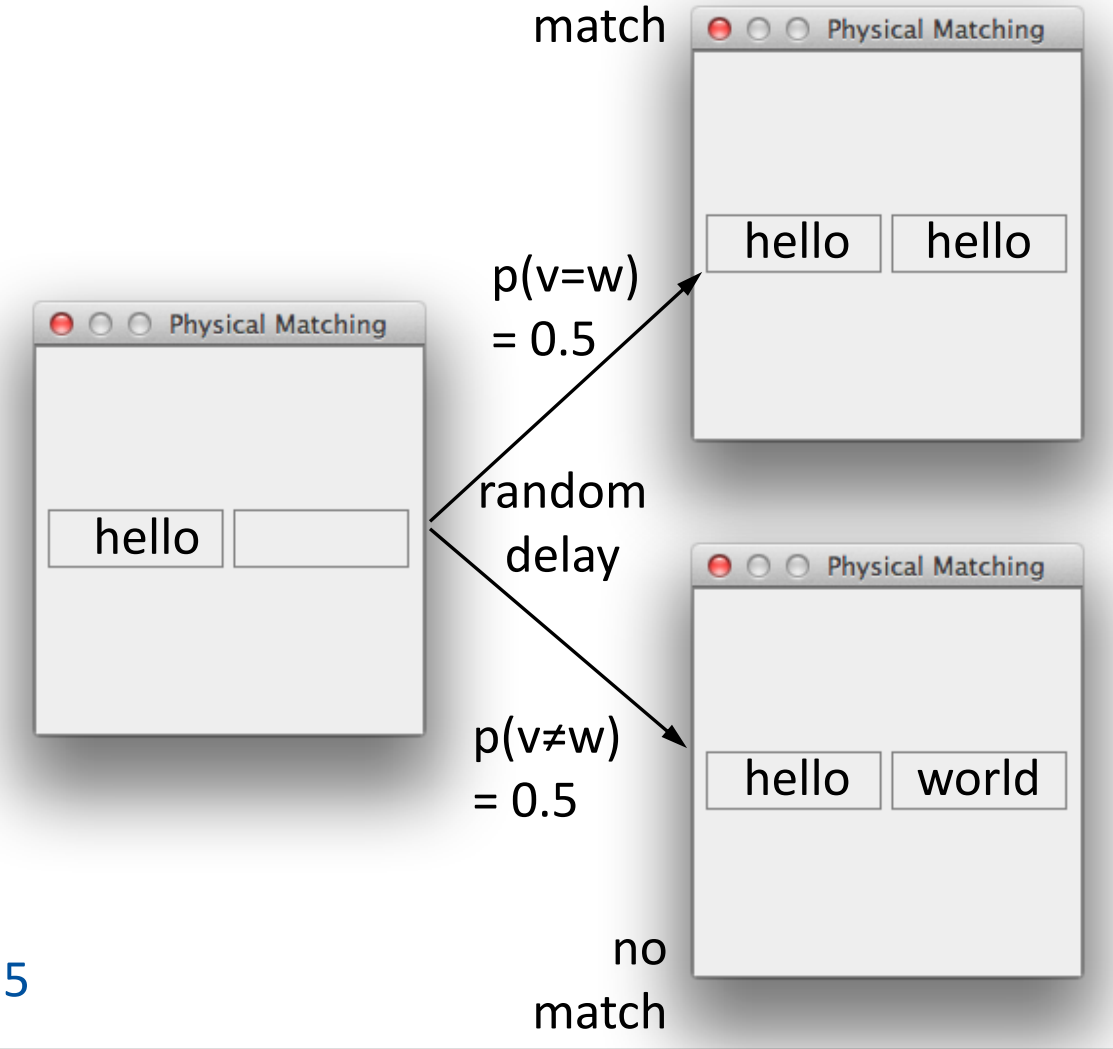
Cognitive Operation in a Reaction Time Task



- Example: visual stimulus, button press as response
  - Retina converts light to nerve impulses
  - Transmitted to brain for perceptual processing
  - Neural activations in motor cortex
  - Nerve signals transmitted to hand
  - Muscle transforms nerve signal to physical movement
- Sensory stimuli and motor responses exist in outside world
  - Relatively easy to measure
- Cognitive operations within human brain
  - Difficult to measure

Physical Matching

- Stimulus 1: five-letter word w
- Random delay
- Stimulus 2: either w or v (v ≠w)

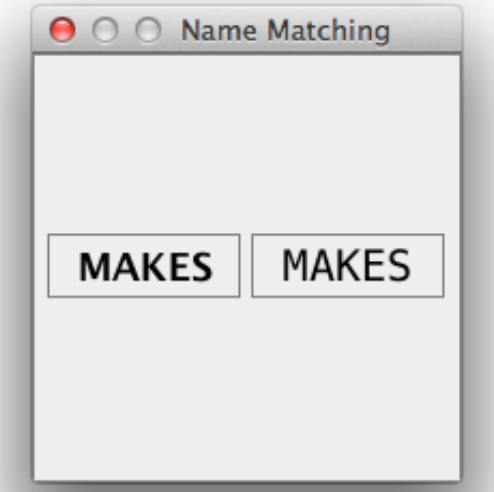


- User presses key_1 if $S_1 = S_2$, else presses key_2
- Probability p(v=w) = p(v≠w) = 0.5

Name Matching

- Same as physical matching (match if v = w),
  except that appearance of second stimulus is different
  - UPPERCASE or lowercase, plain or **bold**, 18 or 20 point, etc.
- Cognitive demand is higher, because of appearance differences need to be decoded before symbolic comparison

match



no match

Class Matching

- Stimulus 1: letter or digit (exclude ‘O’, ‘0’, ‘I’, ‘1’)
- Stimulus 2: letter or digit (exclude ‘O’, ‘0’, ‘I’, ‘1’)
- As in name matching there may be appearance differences
- Match if both stimuli are letters or if both are digits
- Cognitive demand is higher than for name matching, because consultations of long-term memory required

match

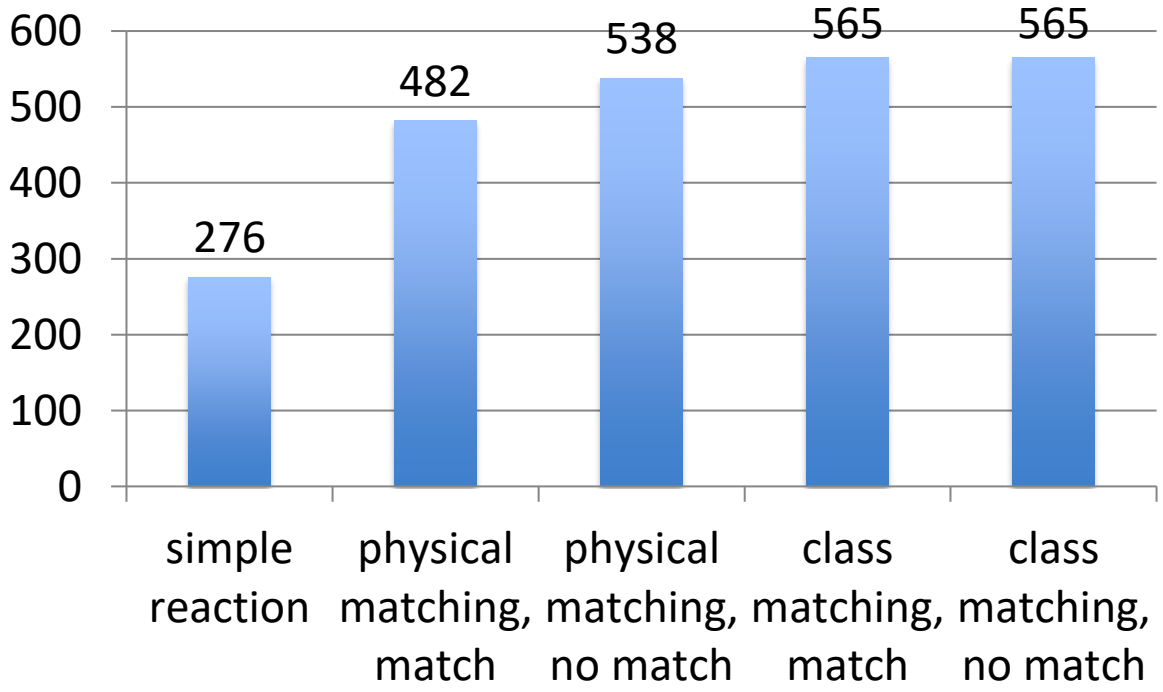
no match

Fragen

- Wodurch wird die Schwierigkeit von "class matching" bestimmt?
- Beispiel für schwierigeres class matching als Ziffern vs. Buchstaben?

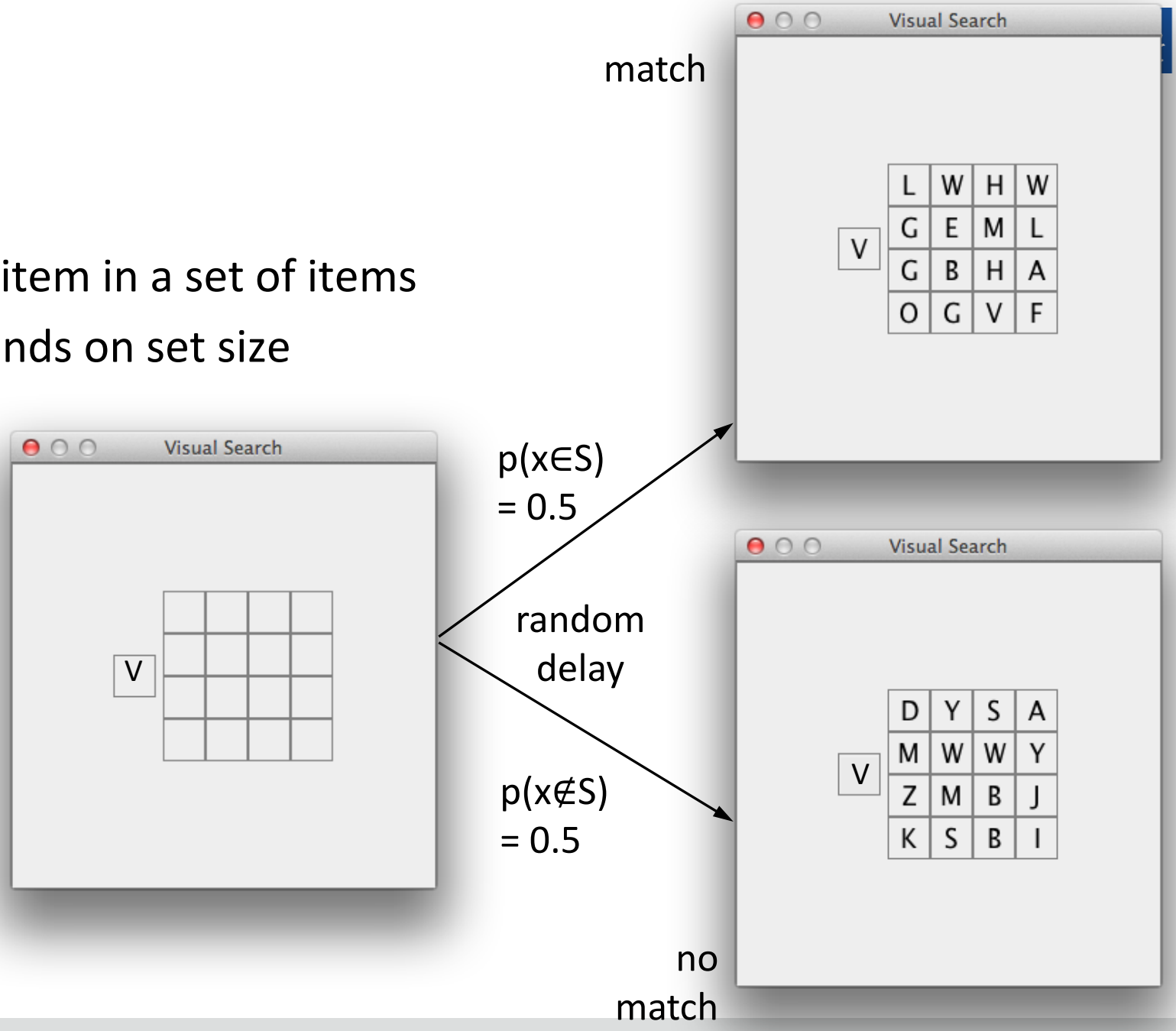
Results of Experiment on Reaction Tasks (MacKenzie)

- 14 students
- 3 blocks of 10 trials each (1st block practice)
- 2 orders (simple, physical, name, class)
- Mean times
  - Simple reaction:
    276 ms
  - Physical matching:
    482 ms (match)
    538 ms (no match)
  - Class matching:
    565 ms (mach)
    565 ms (no match)



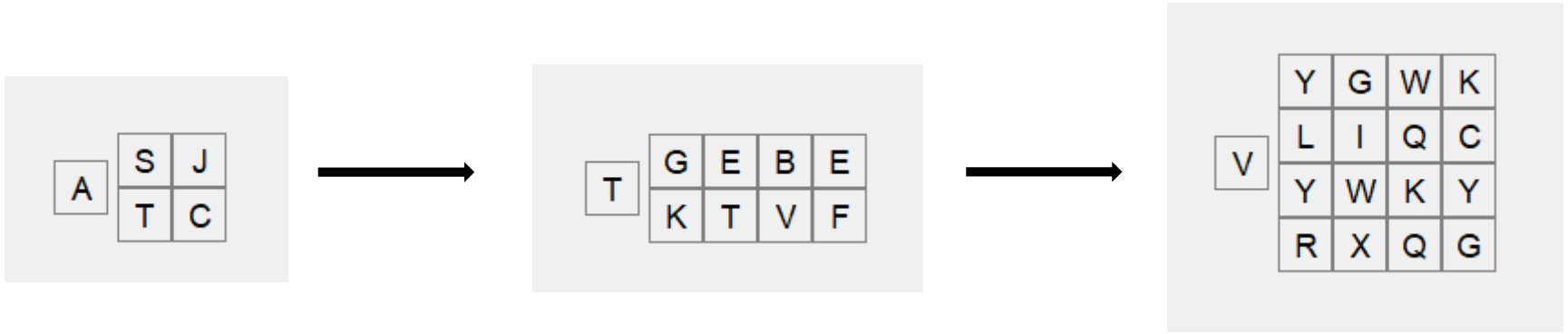
Visual Search

- Search for target item in a set of items
- Search time depends on set size



Visual search time is ... the size of the search set.

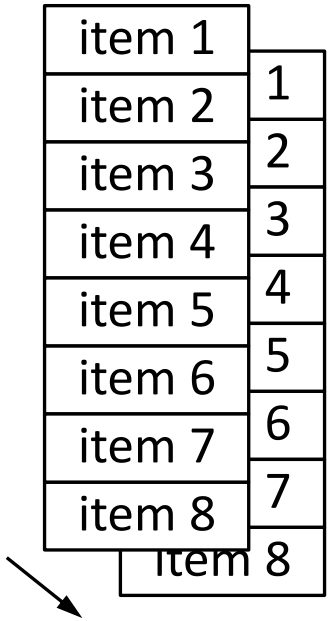
A. is independent of
B. is a linear function of
C. is a quadratic function of
D. is a … function of
E. has an unknown relationship to



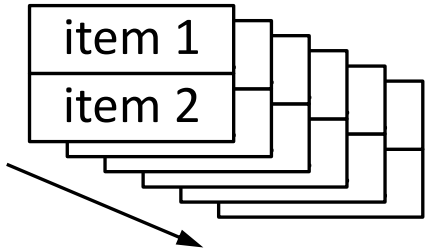
Which menu design is better?

64 menu items

A. 8 items on each menu, 2 levels deep

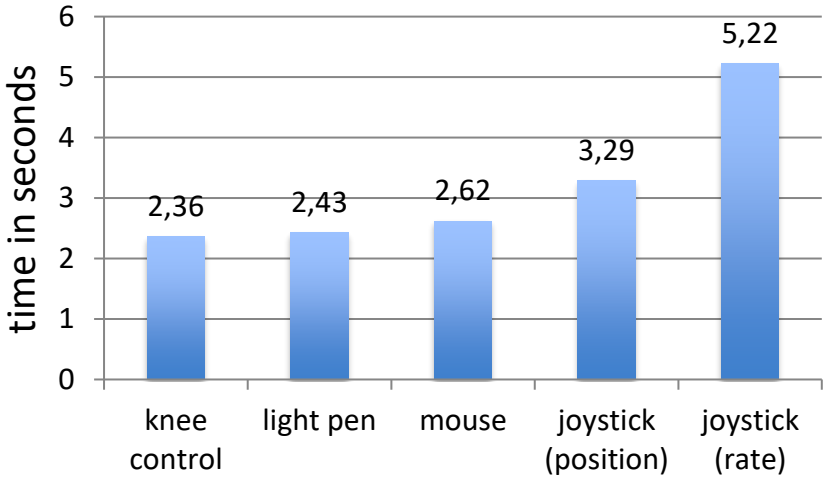


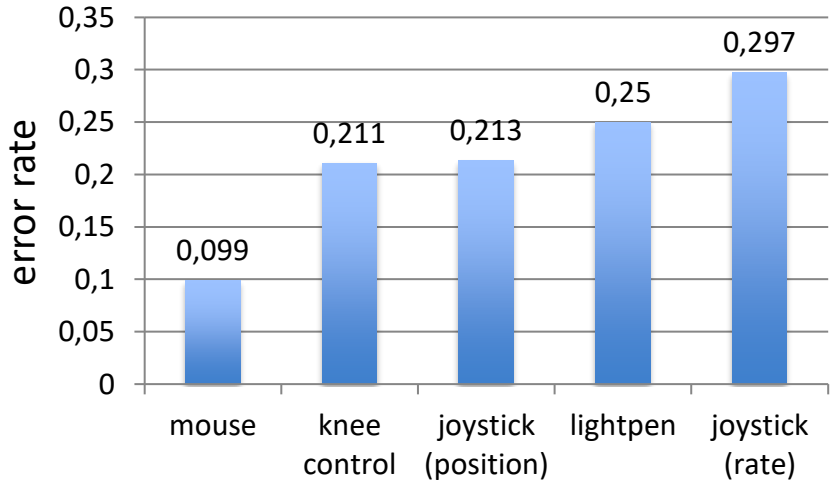
B. 2 items on each menu, 6 levels deep



Which of those is the best input device? Why?

- Task completion time
  - seconds
- Error rate
  - ratio of missed selections to all selections



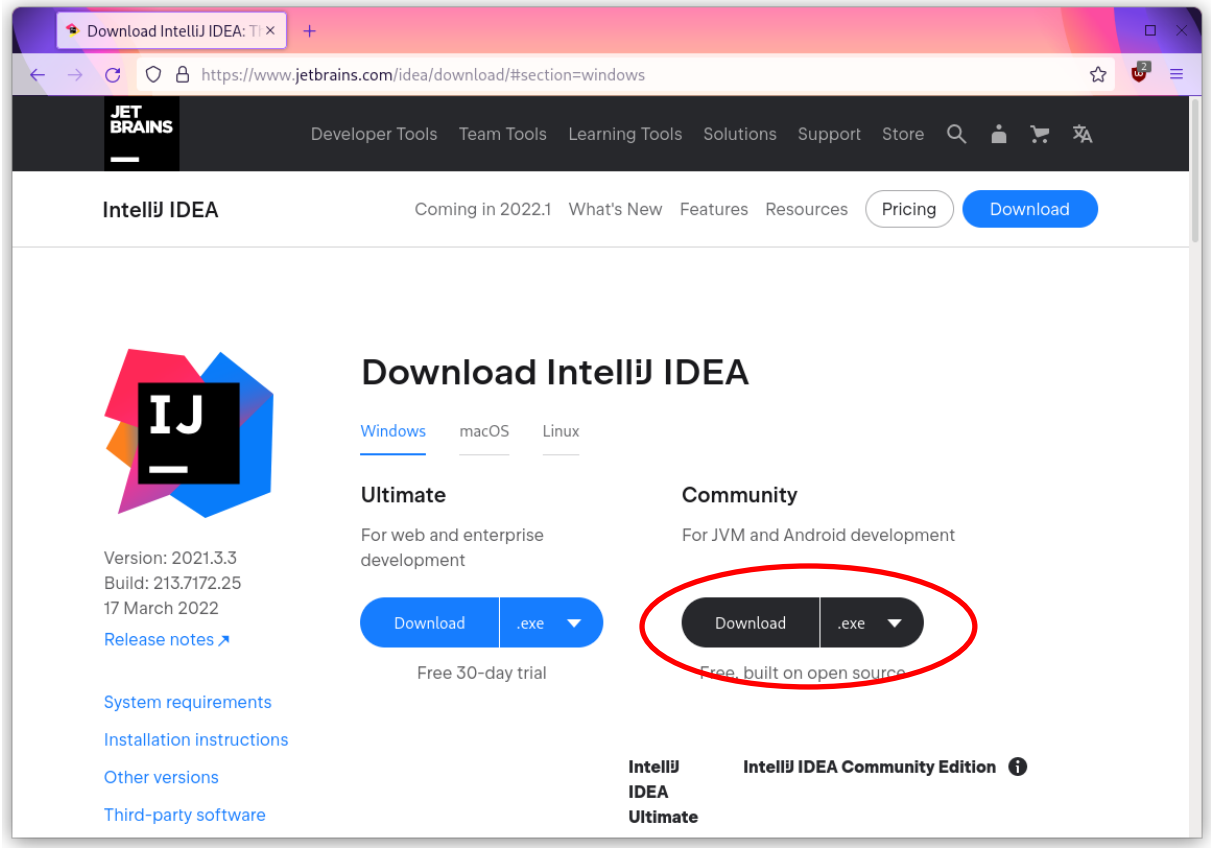


Data is from the first study on input devices:
English, Engelbart, Berman. Display selection techniques for Text Manipulation. IEEE Trans. on Human Factors in Electronics. 1967.

SOFTWARE

Java: IntelliJ IDEA

- https://www.jetbrains.com/idea/download

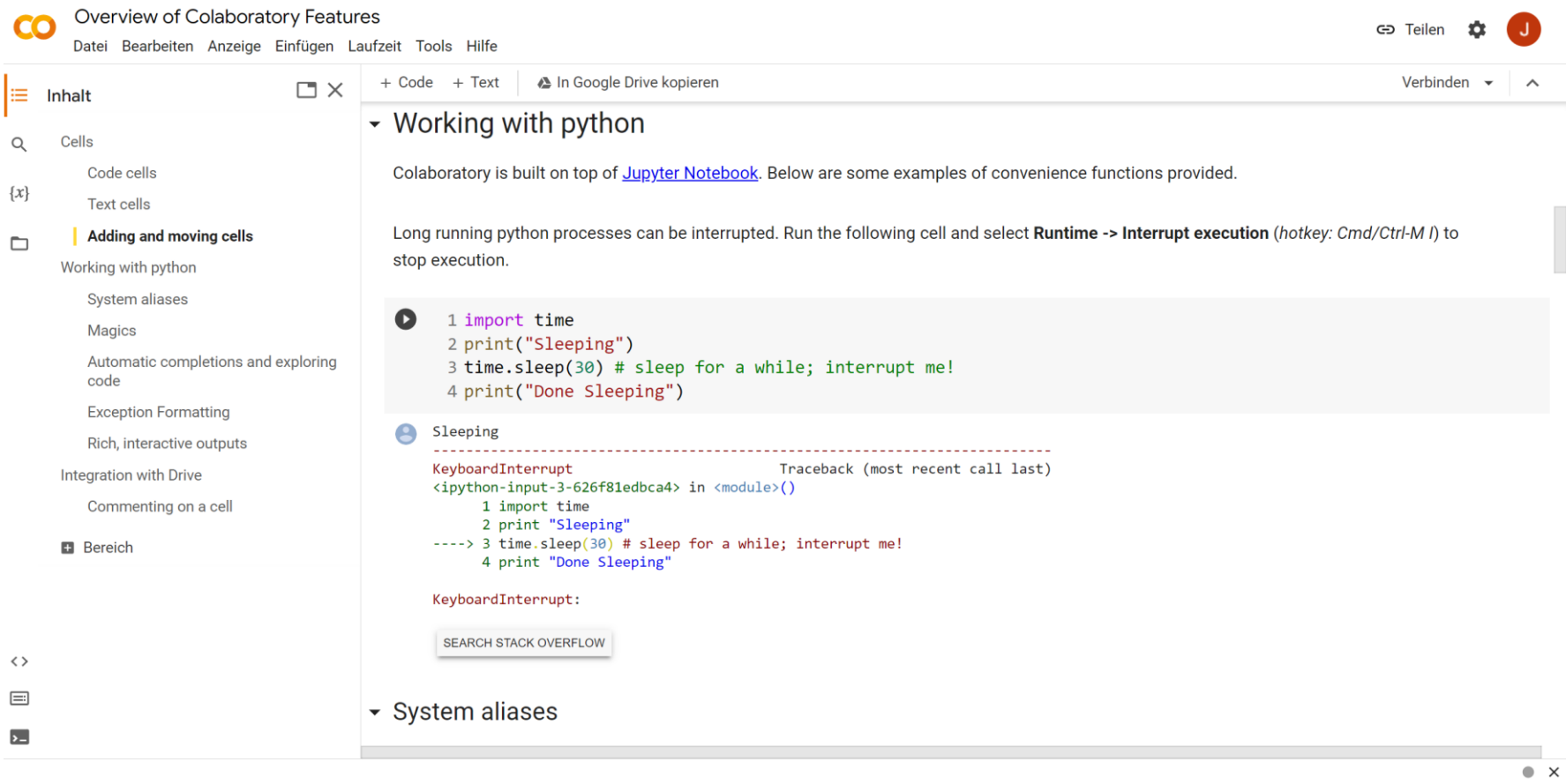


Java: OpenJDK und JavaFX

- OpenJDK 11
  - Installation provided by IntelliJ
  - Or via Oracle
    - https://www.oracle.com/java/technologies/downloads/#java11
  - Or via third parties
    - https://www.microsoft.com/openjdk#11
    - https://docs.aws.amazon.com/corretto/latest/corretto-11-ug/downloads-list.html
- OpenJFX 11 (JavaFX)
  - https://gluonhq.com/products/javafx/

Jupyter Notebook & Python

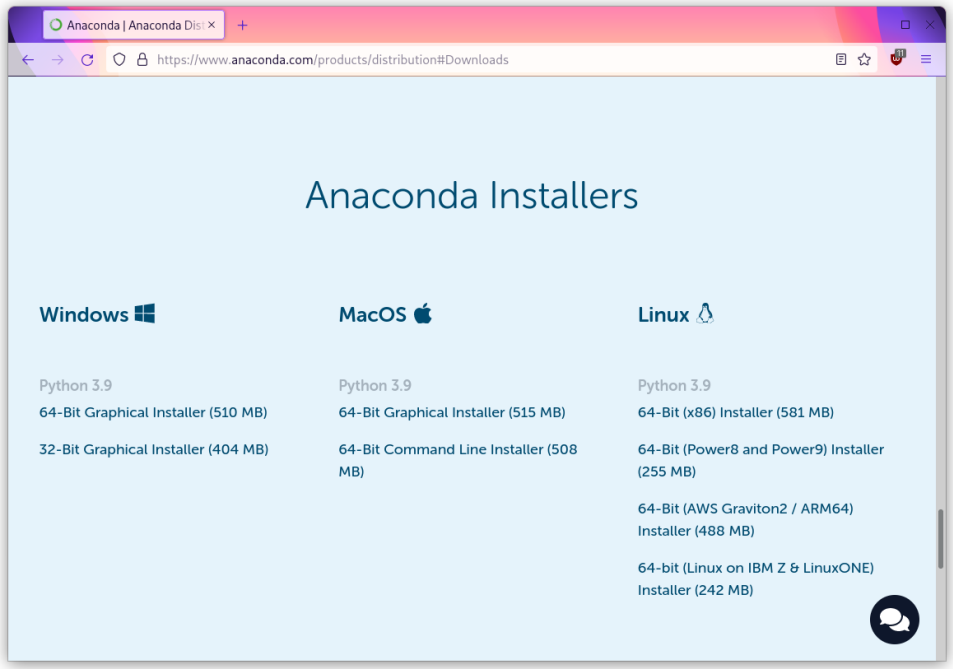
- https://colab.research.google.com/



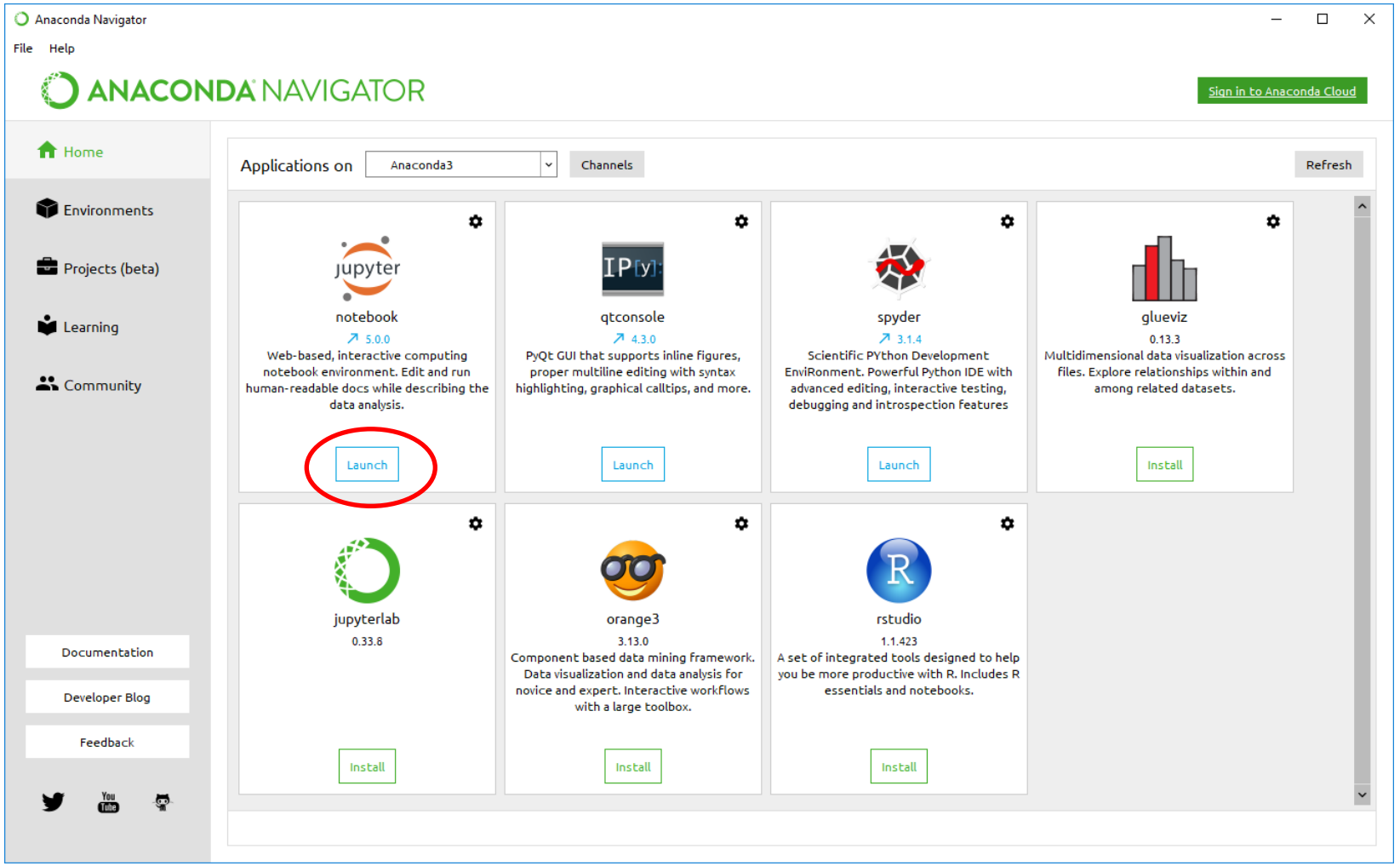
Jupyter Notebook & Python (lokale Alternative)

Anaconda:

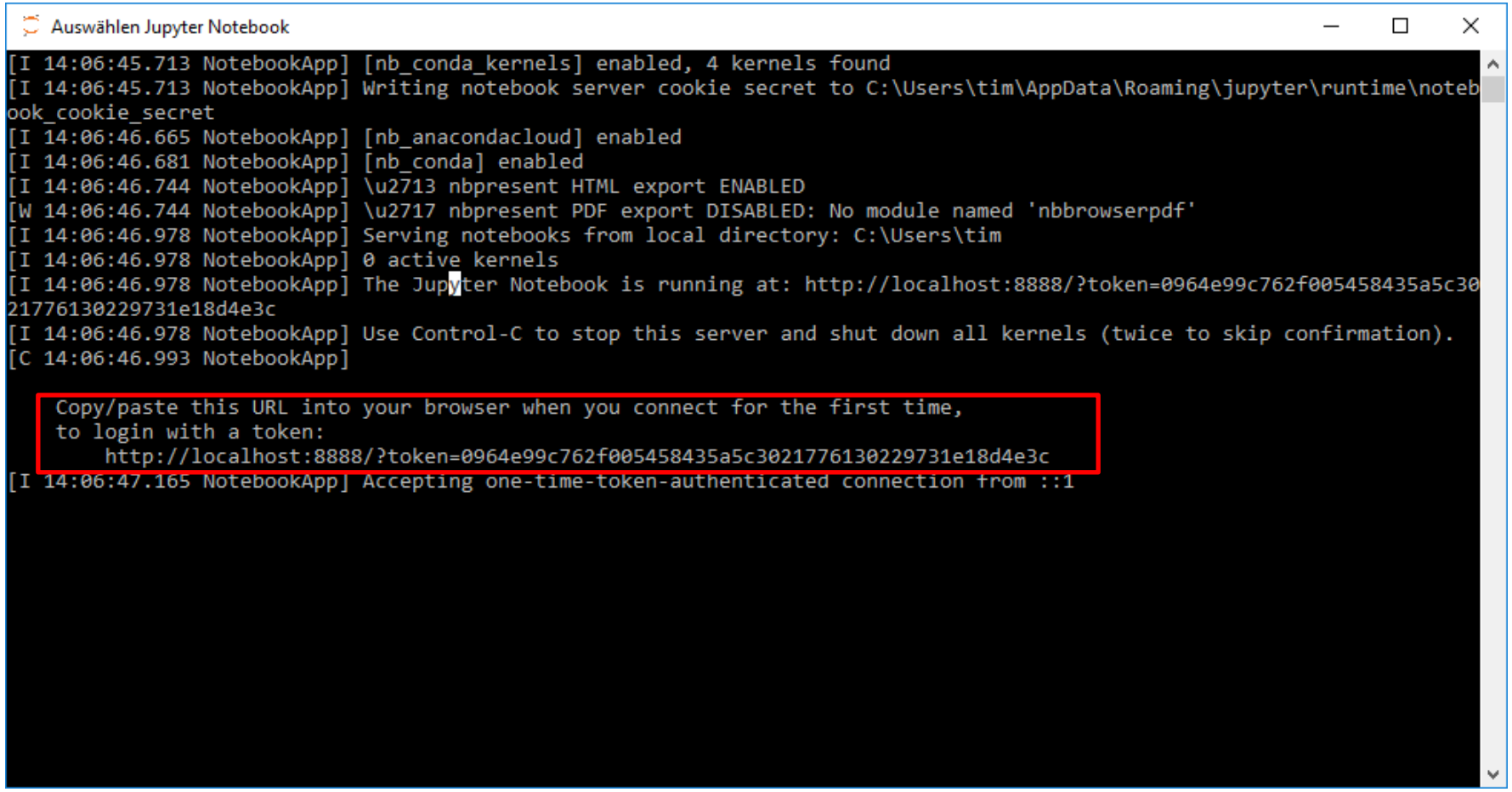
https://www.anaconda.com/products/distribution#Downloads



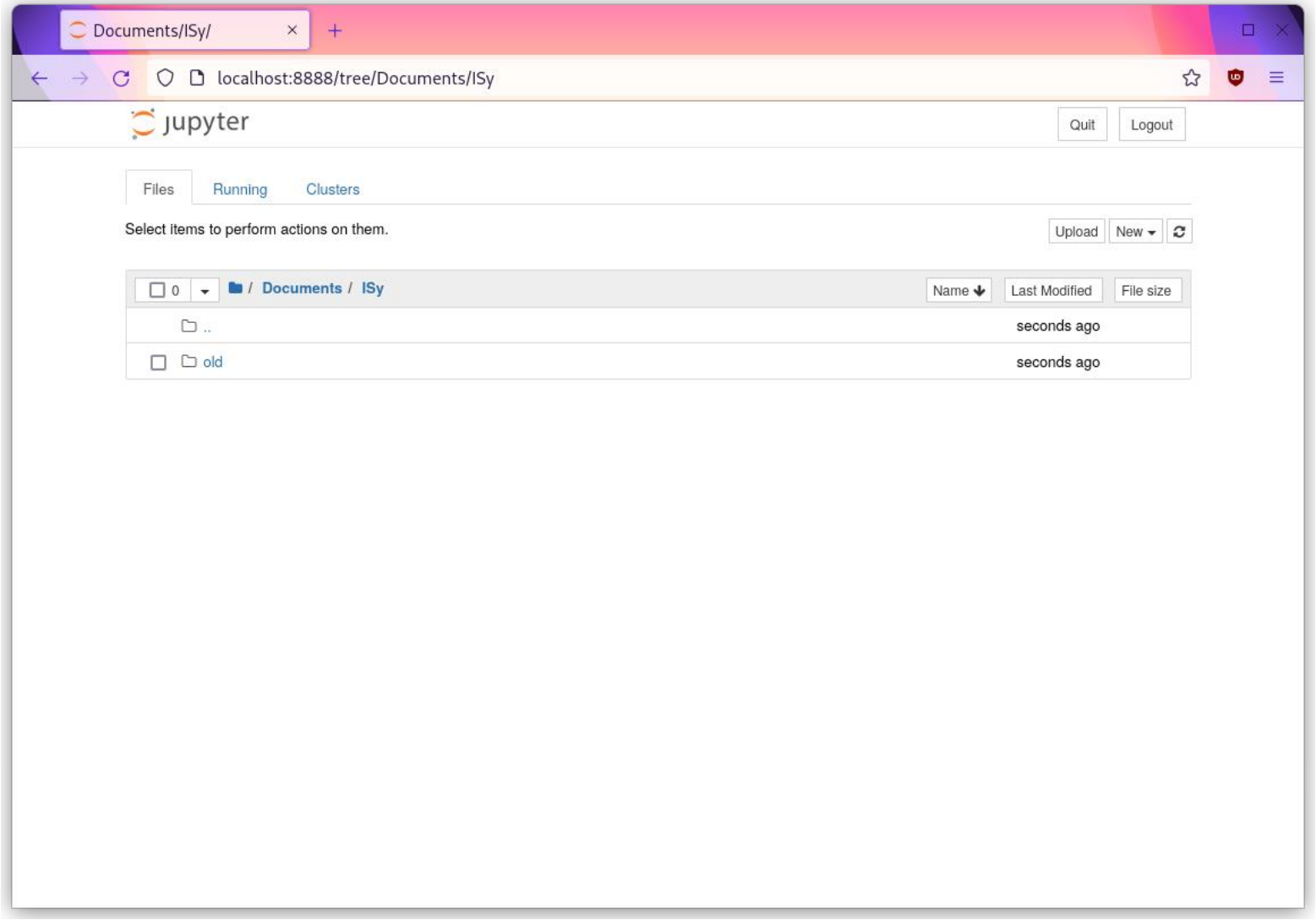
Jupyter Notebook



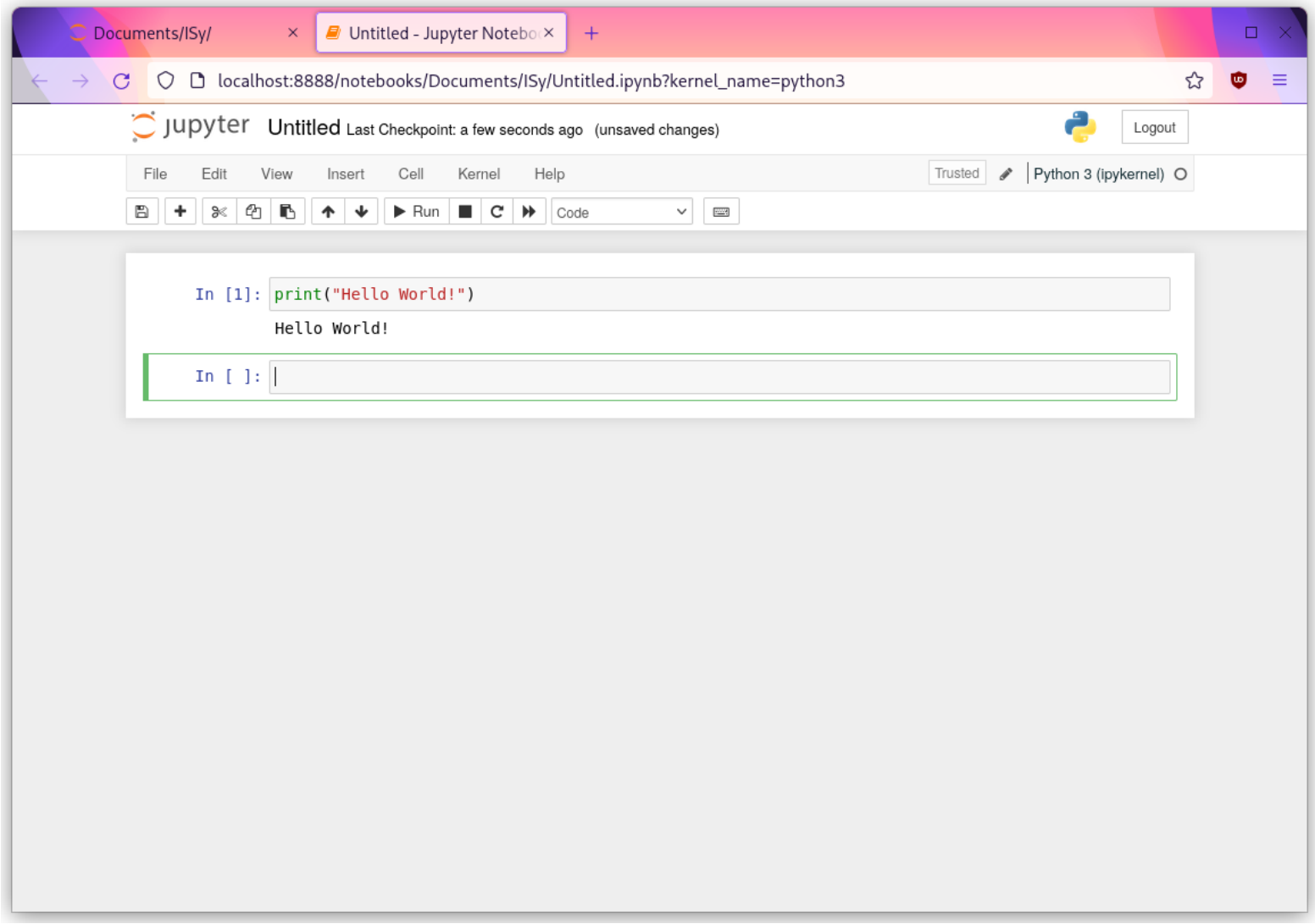
Jupyter Notebook



Jupyter Notebook



Jupyter Notebook



Tutorial: Pandas, Seaborn, Numpy

- http://pandas.pydata.org/pandas-docs/stable/
- https://seaborn.pydata.org/examples/index.html
- https://www.numpy.org/devdocs/

NÄCHSTES ASSIGNMENT

Assignment 01

- Durchführen vom *Reaction Time Experiment* an Ihnen selbst
- Auswertung und Plotten der Messdaten via Python
- Teilen der Messwerte (anonym) in gemeinsames Google Spreadsheet
  - Nächste Woche: Arbeiten mit gemeinsam erfassten Messwerten

Assignment 01

- Abgabe bis Montag, 08.04., 23:59 Uhr
  via https://assignments.hci.uni-hannover.de/

- Abgabe besteht aus folgendem:
  - Eintragen der Daten in das Online Spreadsheet
  - Abgabe der aufgenommenen sowie angepassten CSV-Dateien
  - Abgabe der Jupyter Notebook Dateien für die einzelnen Aufgaben

Ab kommender Woche

- Interaktive Übungen während Hörsaalübung
  - Durchführung/Auswertung von Experimenten
  - Vertiefung von Konzepten durch Beispiele
  - Lösen und Vorstellen von kleineren Aufgaben
- Hilfreich für Bearbeitung der Assignments

- Bestenfalls Laptop mit eingerichteter Entwicklungsumgebung mitnehmen