Mathematics and Computer Science for Modeling
Unit 1: Introduction to Programming in Python

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based on materials by Jan Tekülve and Daniel Sabinasz

Institut für Neuroinformatik, Ruhr-Universität Bochum

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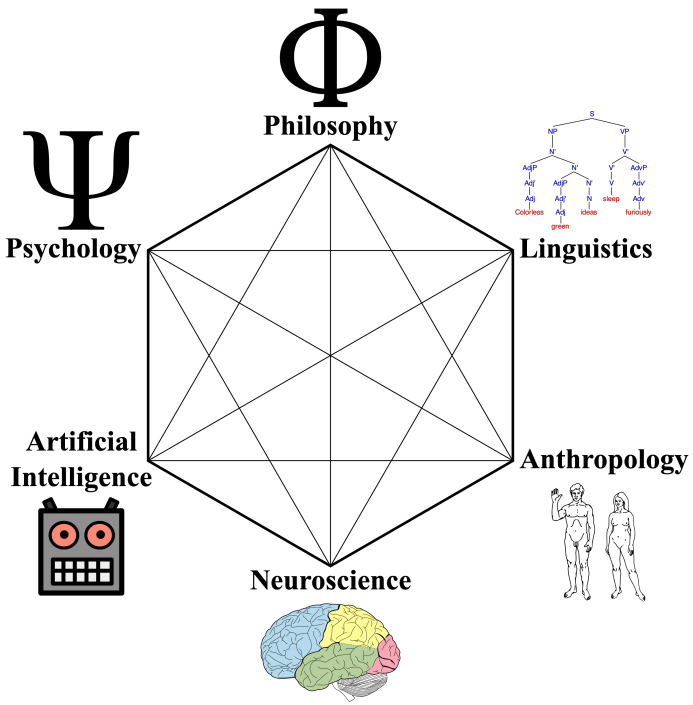
Why this course?

- Anyone with a Bachelor's degree in any of the cognitive sciences can start this Master's degree
- You will then be exposed to lectures from all of the cognitive science disciplines



Why this course?

- Not all of you will have the same level of background knowledge for all of the lectures
- The preparatory courses are here to help you bridge that gap
- Goal here: Bring you on a similar level regarding mathematics and computer science skills
- … which will hopefully make it easier for you to get through the Master programme
- The course is not mandatory, but highly recommended

Course concept

- The course is split into lecture parts and exercise parts

Exam

- At the end of the course, there will be a written exam (04.10. at 3 pm)
- The exam is graded, but this is only for your feedback and won't enter into your average grade

About Me

- My name is Daniel Sabinasz
- B.Sc. computer science and M.Sc. cognitive science
- PhD candidate at the Institute for Neural Computation
- Working on mathematical modeling of the neural processes that underlie language understanding
- Email me with any questions you might have: daniel.sabinasz@ini.rub.de

Dates

1. Mon 25.09. 15-17:30
2. Tue 26.09. 09:00-11:30, 15-17:30
3. Wed 27.09. 15-17:30
4. Thu 28.09. 15-17:30
5. Fri 29.09. 15-17:30
6. Mon 02.10. 09:00-11:30, 15-17:30
7. Wed 04.10. 15-17:30

Course Structure

Unit	Title	Topics
1	Intro to Programming in Python	*Variables, if Statements, Loops, Functions, Lists*
-	Full-Time Programming Session	*Deepen Programming Skills*
2	Functions in Math	*Function Types and Properties, Plotting Functions*
3	Linear Algebra	*Vectors, Trigonometry, Matrices*
4	Calculus	*Derivative Definition, Calculating Derivatives*

Course Structure

Unit	Title	Topics
5	Integration	*Geometrical Definition, Calculating Integrals*
6	Differential Equations	*Properties of Differential Equations*
-	04.10.23: Test	

Lecture Slides/Material

Use the following URL to access the lecture slides:

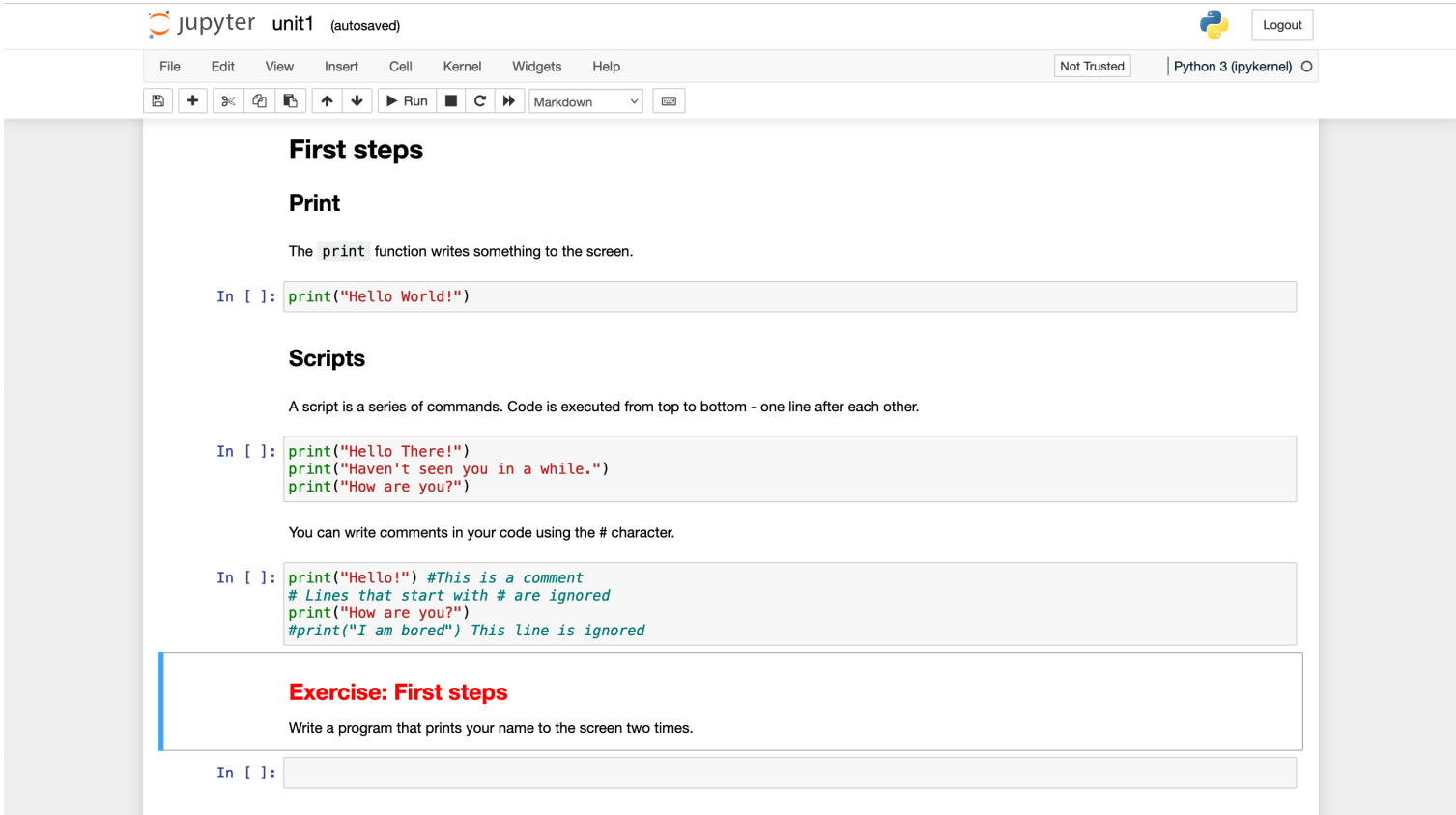
https://www.ini.rub.de/teaching/courses/preparatory_course_mathematics_and_computer_science_for_modeling_winter_term_2023

Getting Started

- Install Anaconda: https://www.anaconda.com/distribution/
- Download the document "Jupyter notebook" for Unit 1 (filename "unit1.ipynb") from the course website
- Start the program "Anaconda-Navigator". Find the application "Jupyter Notebook" and click on "launch".
- (Alternative: Start the program "Anaconda Prompt". Wait for a prompt to appear and then enter "jupyter notebook" into that prompt)
- Navigate to the directory where you saved the "unit1.ipynb" file and click on that file

Getting Started

- You are now presented with a so-called Jupyter Notebook, a document that allows you to execute existing Python code and write your own Python code while being guided by narrative text



Getting Started