

# Mathematics and Computer Science for Modeling

## Unit 1: Introduction to Programming in Python

Daniel Sabinasz

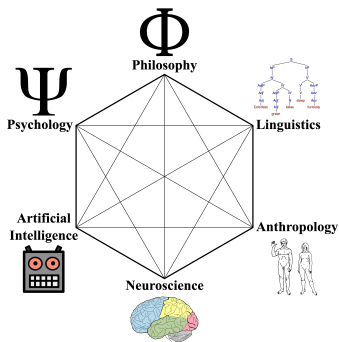
based on materials by Jan Tekülve and Daniel Sabinasz

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	<i>Variables, if Statements, Loops, Functions, Lists</i>
-	Full-Time Programming Session	<i>Deepen Programming Skills</i>
2	Functions in Math	<i>Function Types and Properties, Plotting Functions</i>
3	Linear Algebra	<i>Vectors, Trigonometry, Matrices</i>
4	Calculus	<i>Derivative Definition, Calculating Derivatives</i>



# Course Structure

<b>Unit</b>	<b>Title</b>	<b>Topics</b>
5	Integration	<i>Geometrical Definition, Calculating Integrals</i>
6	Differential Equations	<i>Properties of Differential Equations</i>
-	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](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

jupyter unit1 (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Not Trusted Python 3 (ipykernel)

**First steps**

**Print**

The `print` function writes something to the screen.

```
In [ ]: print("Hello World!")
```

**Scripts**

A script is a series of commands. Code is executed from top to bottom - one line after each other.

```
In [ ]: print("Hello There!")
print("Haven't seen you in a while.")
print("How are you?")
```

You can write comments in your code using the `#` character.

```
In [ ]: print("Hello!") #This is a comment
# Lines that start with # are ignored
print("How are you?")
#print("I am bored") This line is ignored
```

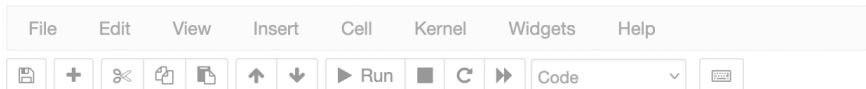
**Exercise: First steps**

Write a program that prints your name to the screen two times.

```
In [ ]:
```

# Getting Started

 jupyter unit1 (unsaved changes)



**1**  
click on a code cell  
to select it



## First steps

**2**  
click "Run" to  
execute the code



## Print

The `print` function writes something to the screen.

**3**  
observe  
the output of the  
code below the cell



```
In [1]: print("Hello World!")
```

Hello World!