

Numerical Analysis

Lab 1

4 March 2020

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Slides: <https://indico.ifj.edu.pl/event/312/>

Syllabus

- You have learned from Ilona what we will learn this semester...
- ... but beside the lecture we have also lab exercises: Thursday 9:15-10:45
- What shall we do:
 - Solve problems on blackboard
 - Write programs
- How familiar are you with Python?



Why Python?

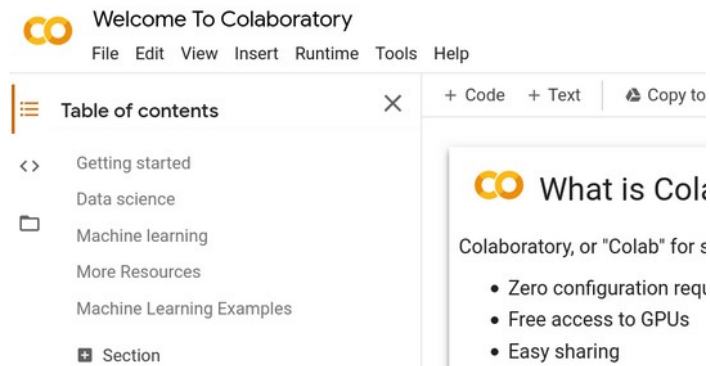
- *Python: easy-to-read code and simple syntax.*
- *Python: a leading language for data analysis and machine learning.*
- *Python: many libraries available.*
- ***IPython Notebook is great!***

How to run python?

- You can install python on your laptop...
- ... but you can also use FREE notebooks:
 - You do not need to install anything
 - You can share your code
 - You get free CPU or even GPU
- Notebooks available on WEB:
 - Google Colab (I use it) <https://colab.research.google.com>
 - Kaggle Notebook (use it as well) <https://www.kaggle.com/google-cloud>
 - Azure Notebooks from Microsoft <https://notebooks.azure.com/>
 - And some others, see:
<https://analyticsindiamag.com/5-alternatives-to-google-colab-for-data-scientists/>

Let's play with Google Colaboratory

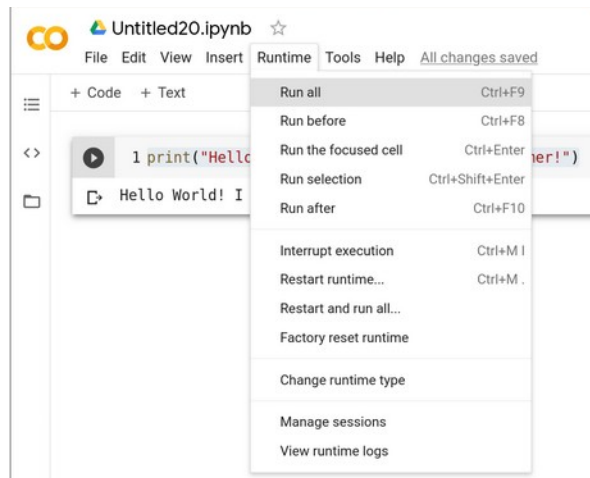
- Open: <https://colab.research.google.com>
- Sign in with your google account
- Click: File → New Notebook



- Paste the following code:


```
print("Hello World! I am an IPython programmer!")
```

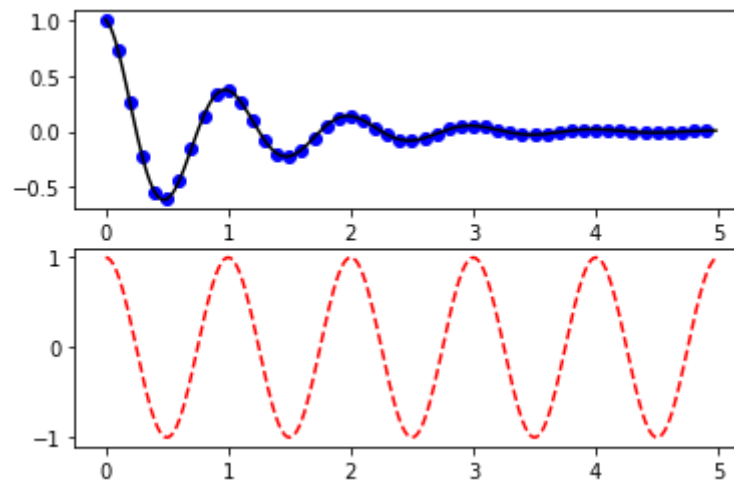
- Run the code:



Easy???

More complicated example

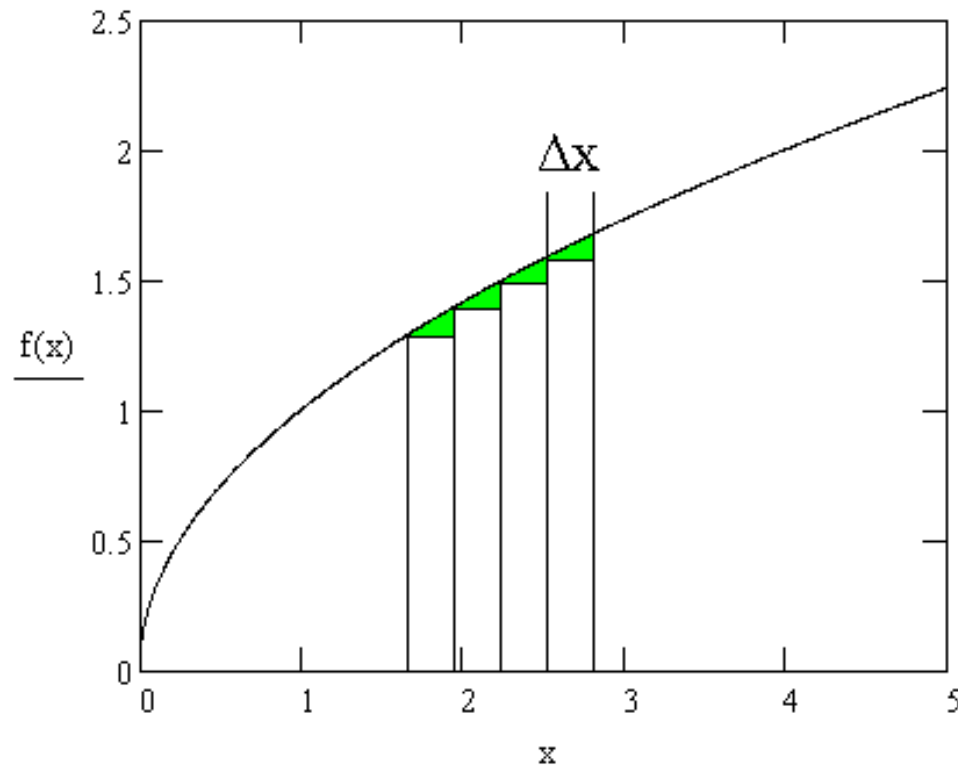
- Open a github repository:
<https://github.com/marcinwolter/NumericalAnalysis2020>
- Open a python notebook: VisualizationCode.ipynb
- Open it in Google Colab: 
- Run it!!!!
- Try to modify and play with the code. It shows how to use graphics.



Even more complicated example

- Numerical integration:

https://github.com/marcinwolter/NumericalAnalysis2020/blob/master/Numerical_Integration_Example.ipynb



C++

- If you are C++ addicted there is a WEB “notebook” for C++ as well:

https://rextester.com//cpp_online_compiler_gcc

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compile c++ gcc online

Language: C++ (gcc) Layout: Vertical

```
1 //g++ 5.4.0
2
3 #include <iostream>
4
5 int main()
6 {
7     std::cout << "Hello, world!\n";
8 }
```

Run it (F8) Save it ☐ Show compiler warnings [+] Compiler args [+] Show input Live cooperation Put on a wall F ?

Homework with python

1/

Take a list, say for example this one:

```
a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]
```

and write a program that prints out all the elements of the list that are less than 5.

2/

Write a program that asks the user how many Fibonacci numbers to generate and then generates them. (Hint: The Fibonacci sequence is a sequence of numbers where the next number in the sequence is the sum of the previous two numbers in the sequence. The sequence looks like this: 1, 1, 2, 3, 5, 8, 13, ...)

3/

Write a program (function!) that takes a list and returns a new list that contains all the elements of the first list minus all the duplicates. This list might be `a = [1,2,3,4,3,2,1]`