

# Welcome



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University of Stuttgart



## Digital Methods in Water Resources Engineering and Research











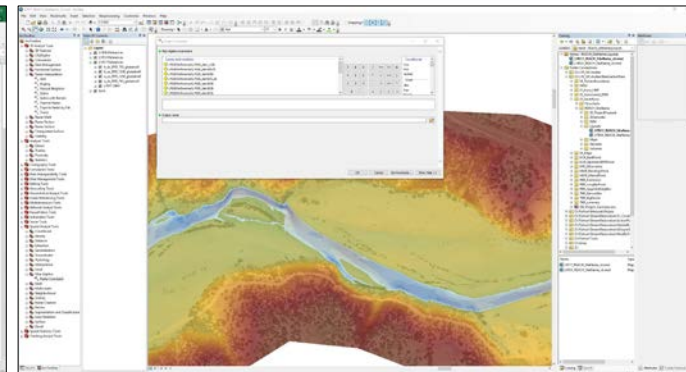
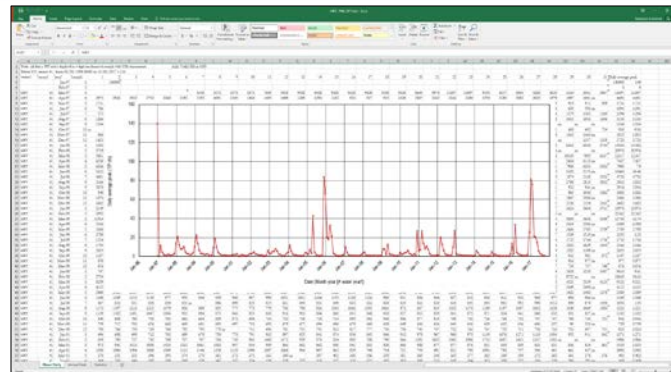






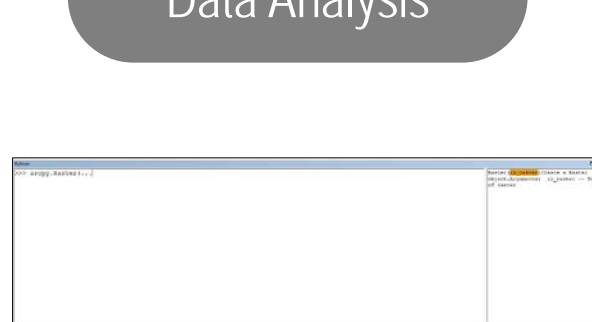
# Data Analysis in Water Resources Engineering

| Name                         | Date modified    | Type                  | Size   |
|------------------------------|------------------|-----------------------|--------|
| 01105_Timestamps_US.xls      | 10/12/2015 18:18 | Microsoft Excel 97... | 33 KB  |
| Ultrasonic_sensors_00001.lvm | 10/12/2015 06:29 | LVM File              | 127 KB |
| Ultrasonic_sensors_00002.lvm | 10/12/2015 09:07 | LVM File              | 260 KB |
| Ultrasonic_sensors_00003.lvm | 10/12/2015 09:21 | LVM File              | 192 KB |
| Ultrasonic_sensors_00004.lvm | 10/12/2015 09:34 | LVM File              | 289 KB |
| Ultrasonic_sensors_00005.lvm | 10/12/2015 10:05 | LVM File              | 394 KB |
| Ultrasonic_sensors_00006.lvm | 10/12/2015 10:35 | LVM File              | 150 KB |
| Ultrasonic_sensors_00007.lvm | 10/12/2015 10:48 | LVM File              | 305 KB |
| Ultrasonic_sensors_00008.lvm | 10/12/2015 10:58 | LVM File              | 248 KB |
| Ultrasonic_sensors_00009.lvm | 10/12/2015 11:19 | LVM File              | 151 KB |
| Ultrasonic_sensors_00010.lvm | 10/12/2015 11:26 | LVM File              | 102 KB |
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| Ultrasonic_sensors_00012.lvm | 10/12/2015 11:56 | LVM File              | 251 KB |
| Ultrasonic_sensors_00013.lvm | 10/12/2015 12:45 | LVM File              | 194 KB |
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| Ultrasonic_sensors_00024.lvm | 10/12/2015 16:33 | LVM File              | 589 KB |
| Ultrasonic_sensors_00025.lvm | 10/12/2015 16:58 | LVM File              | 236 KB |
| Ultrasonic_sensors_00026.lvm | 10/12/2015 17:03 | LVM File              | 97 KB  |
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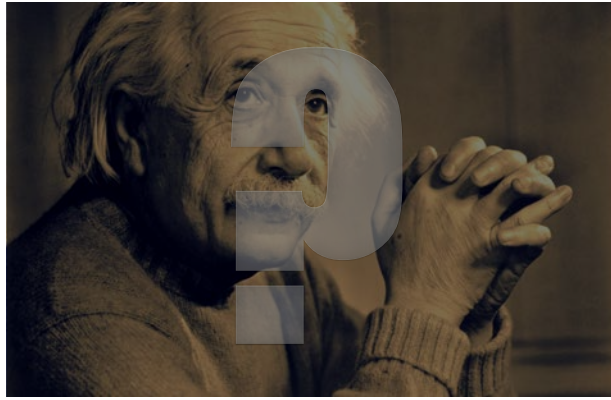
## Data Analysis

| Species | Lifestage | MCW  | HSC  | Depth | HSC  | Substrate | HSC  | Cover | HSC | Date              |
|---------|-----------|------|------|-------|------|-----------|------|-------|-----|-------------------|
| Chinook | Spawning  | 0.07 | 0.00 | 0.00  | 0.00 | 31        | 0.00 | n/a   | n/a | 8-20-2012 (D.V.S) |
| Chinook | Spawning  | 0.20 | 0.20 | 0.14  | 0.10 | 32        | 1.00 |       |     |                   |
|         |           | 0.40 | 0.62 | 0.20  | 0.20 | 188       | 1.00 |       |     |                   |
|         |           | 0.47 | 1.00 | 0.23  | 0.50 | 186       | 0.00 |       |     |                   |
|         |           | 0.90 | 1.00 | 0.29  | 1.00 |           |      |       |     |                   |
|         |           | 0.99 | 0.60 | 0.61  | 1.00 |           |      |       |     |                   |
|         |           | 1.62 | 0.00 | 0.91  | 0.20 |           |      |       |     |                   |
|         |           |      |      | 1.48  | 0.02 |           |      |       |     |                   |
|         |           |      |      | 2.98  | 0.02 |           |      |       |     |                   |
|         |           |      |      | 2.41  | 0.00 |           |      |       |     |                   |



| Species | Lifestage | MCW  | HSC  | Depth | HSC  | Substrate | HSC  | Cover | HSC | Date              |
|---------|-----------|------|------|-------|------|-----------|------|-------|-----|-------------------|
| Chinook | Spawning  | 0.07 | 0.00 | 0.00  | 0.00 | 31        | 0.00 | n/a   | n/a | 8-20-2012 (D.V.S) |
| Chinook | Spawning  | 0.20 | 0.20 | 0.14  | 0.10 | 32        | 1.00 |       |     |                   |
|         |           | 0.40 | 0.62 | 0.20  | 0.20 | 188       | 1.00 |       |     |                   |
|         |           | 0.47 | 1.00 | 0.23  | 0.50 | 186       | 0.00 |       |     |                   |
|         |           | 0.90 | 1.00 | 0.29  | 1.00 |           |      |       |     |                   |
|         |           | 0.99 | 0.60 | 0.61  | 1.00 |           |      |       |     |                   |
|         |           | 1.62 | 0.00 | 0.91  | 0.20 |           |      |       |     |                   |
|         |           |      |      | 1.48  | 0.02 |           |      |       |     |                   |
|         |           |      |      | 2.98  | 0.02 |           |      |       |     |                   |
|         |           |      |      | 2.41  | 0.00 |           |      |       |     |                   |

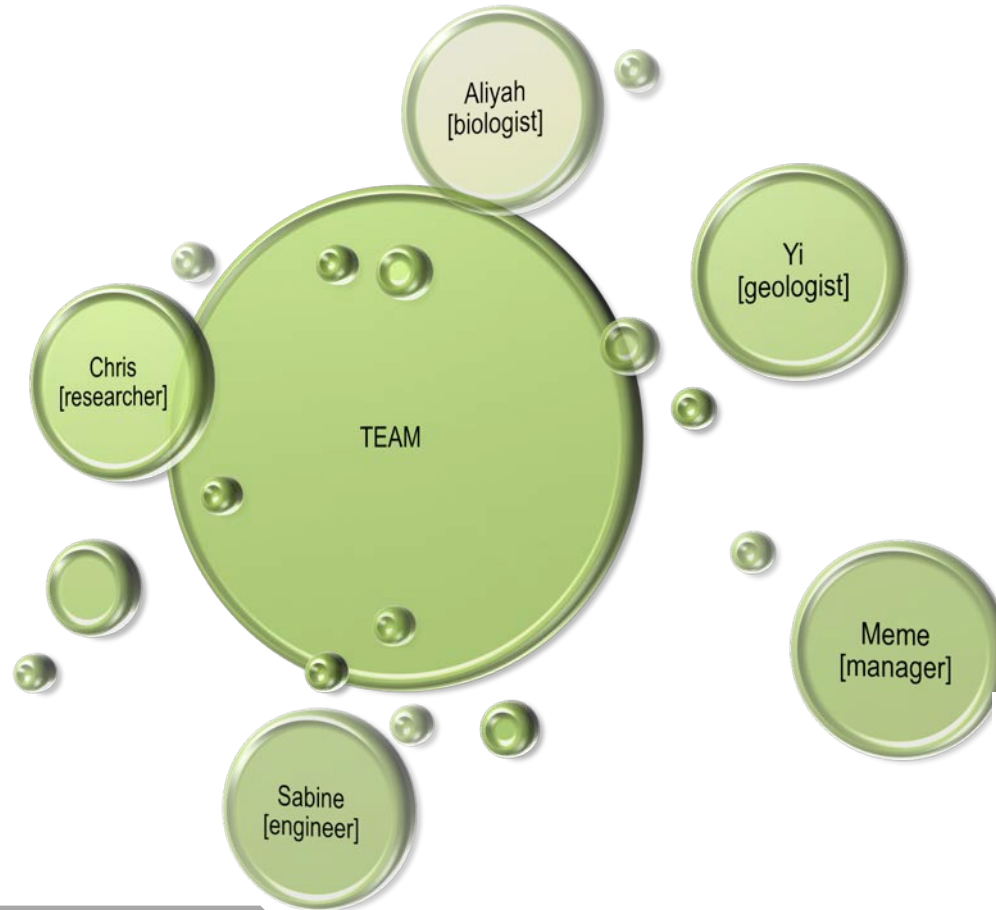




source: <https://jrbenjamin.com>

"Insanity is doing the same thing over and over again and expecting different results."







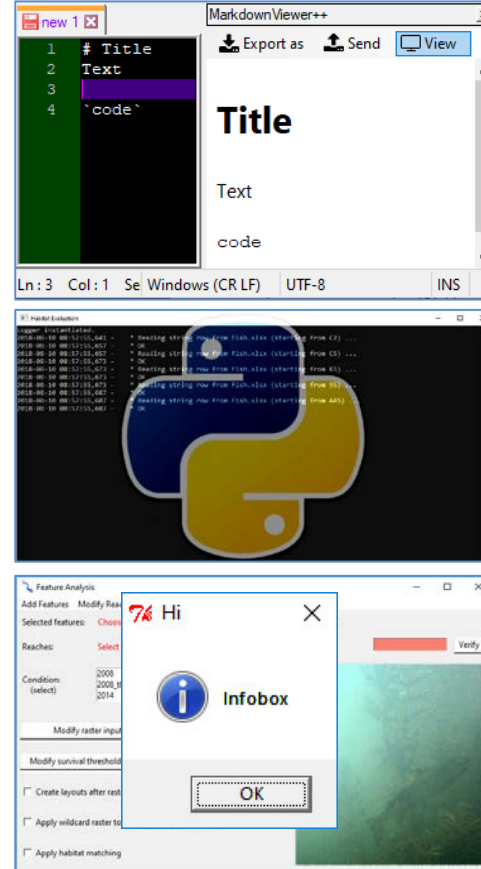
# Tools

## Working in teams, share data, and promote projects

- ▶ Introduction to git 
- ▶ Documentation in Markdown language

## Object-oriented programming with Python 3

- ▶ Install and create programming environments
- ▶ Data types, package import and simple scripting
- ▶ Functions and Classes
- ▶ Open/load, manipulate and write data files
- ▶ Create a Graphical User Interface (GUI)
- ▶ Geospatial programming



# Your Project?

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?





Software





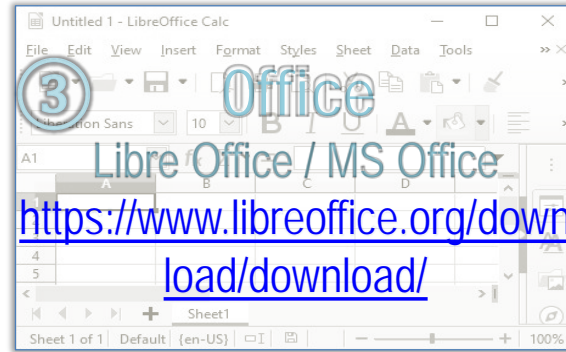
1 Python Anaconda 3

<https://www.anaconda.com/distribution/>



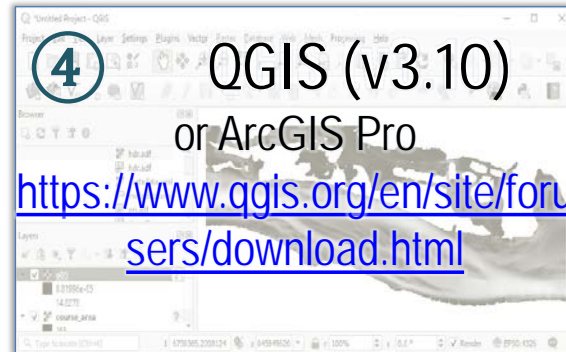
2 PyCharm  
Community Edition

<https://www.jetbrains.com/pycharm/download/>



3 Office  
Libre Office / MS Office

<https://www.libreoffice.org/download/download/>



4 QGIS (v3.10)  
or ArcGIS Pro

<https://www.qgis.org/en/site/forusers/download.html>

## Optional



GitBash

<https://git-scm.com/downloads>



Notepad++  
with MarkdownViewer

<https://notepad-plus-plus.org/>  
<https://github.com/nea/MarkdownViewerPlusPlus>





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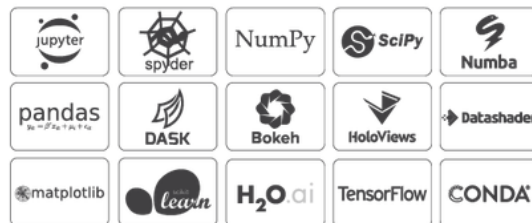
## Anaconda Distribution

The World's Most Popular Python/R Data Science Platform

[Download](#)

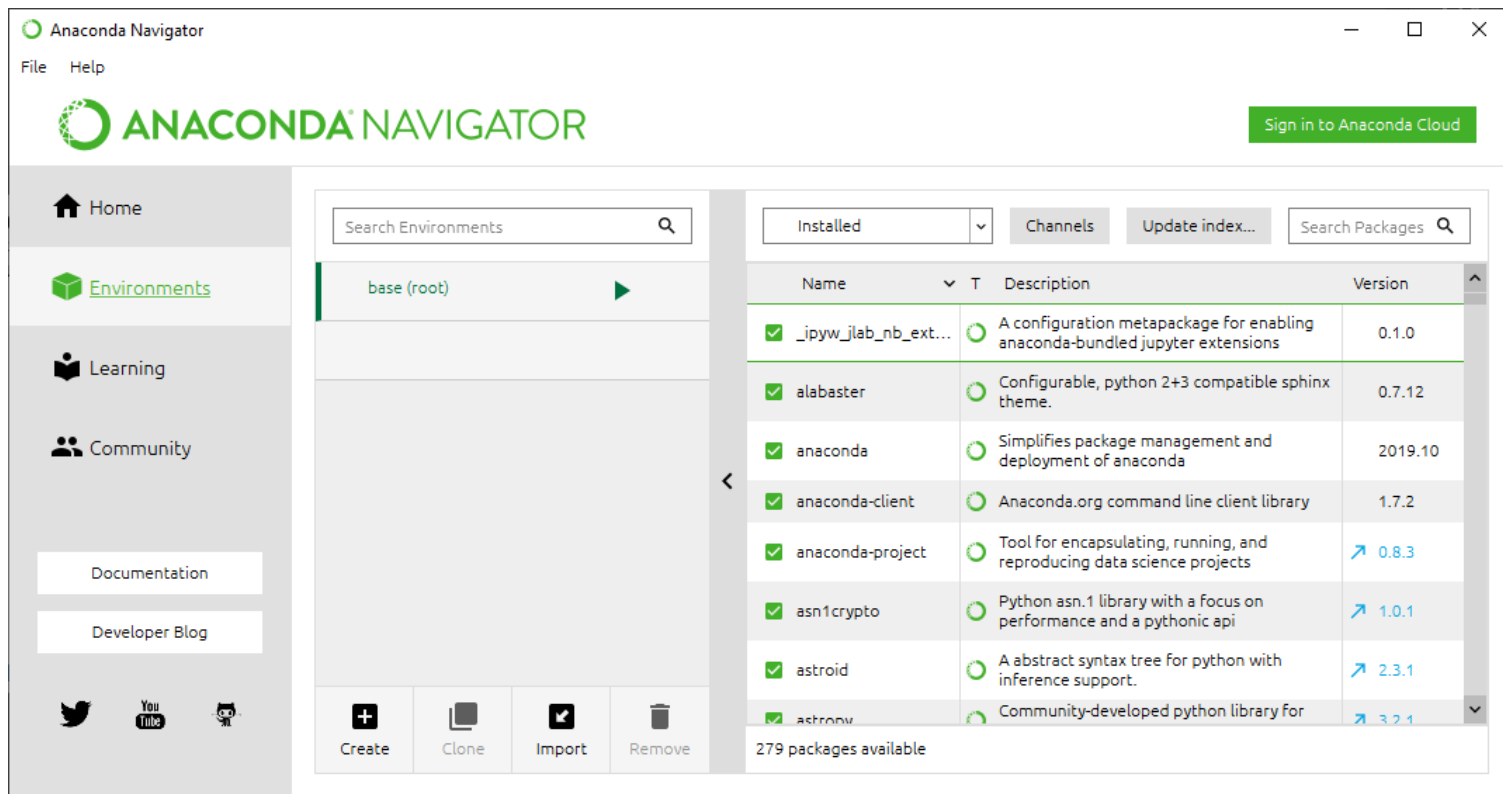
The open-source [Anaconda Distribution](#) is the easiest way to perform Python/R data science and machine learning on Linux, Windows, and Mac OS X. With over 19 million users worldwide, it is the industry standard for developing, testing, and training on a single machine, enabling *individual data scientists* to:

- Quickly download 7,500+ Python/R data science packages
- Manage libraries, dependencies, and environments with [Conda](#)
- Develop and train machine learning and deep learning models with [scikit-learn](#), [TensorFlow](#), and [Theano](#)
- Analyze data with scalability and performance with [Dask](#),



# Anaconda Navigator

## Checkout Environments in Anaconda Navigator: base (root)



The screenshot displays the Anaconda Navigator application window. The left sidebar contains navigation links: Home, Environments (highlighted), Learning, and Community. Below these are buttons for Documentation and Developer Blog, and social media icons for Twitter, YouTube, and GitHub. The main panel is divided into two sections. The top section shows a search bar for environments and a list of environments, with 'base (root)' selected. The bottom section shows a list of installed packages with columns for Name, Description, and Version. A 'Sign in to Anaconda Cloud' button is located in the top right corner.

Search Environments

base (root)

Installed Channels Update index... Search Packages



| Name                   | Description  | Version |
|------------------------|--|---------|
| ✓ _ipyw_jlab_nb_ext... | A configuration metapackage for enabling anaconda-bundled jupyter extensions | 0.1.0   |
| ✓ alabaster            | Configurable, python 2+3 compatible sphinx theme.                            | 0.7.12  |
| ✓ anaconda             | Simplifies package management and deployment of anaconda                     | 2019.10 |
| ✓ anaconda-client      | Anaconda.org command line client library                                     | 1.7.2   |
| ✓ anaconda-project     | Tool for encapsulating, running, and reproducing data science projects       | 0.8.3   |
| ✓ asn1crypto           | Python asn.1 library with a focus on performance and a pythonic api          | 1.0.1   |
| ✓ astroid              | A abstract syntax tree for python with inference support.                    | 2.3.1   |
| ✓ astronv              | Community-developed python library for                                       | 3.2.1   |

279 packages available


Create Clone Import Remove



**JET  
BRAINS**

Tools Languages Solutions Support Company Store  

**PyCharm** Coming in 2020.1 What's New Features Learning Center Buy [Download](#)



Version: 2019.3.3  
Build: 193.6494.30  
7 February 2020

[System requirements](#)  
[Installation Instructions](#)

## Download PyCharm

[Windows](#) [Mac](#) [Linux](#)

### Professional

For both Scientific and Web Python development. With HTML, JS, and SQL support.

[Download](#)

Free trial

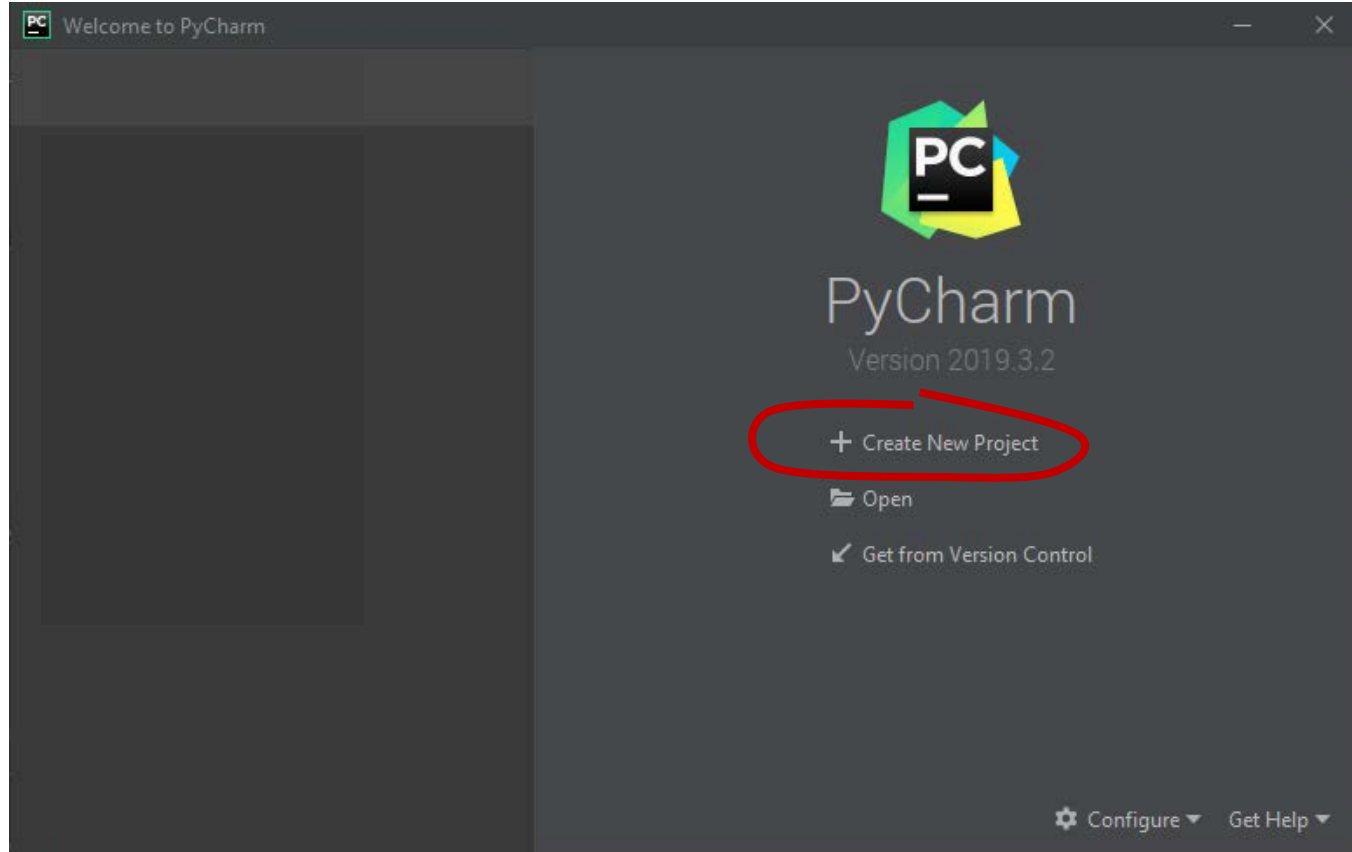
### Community

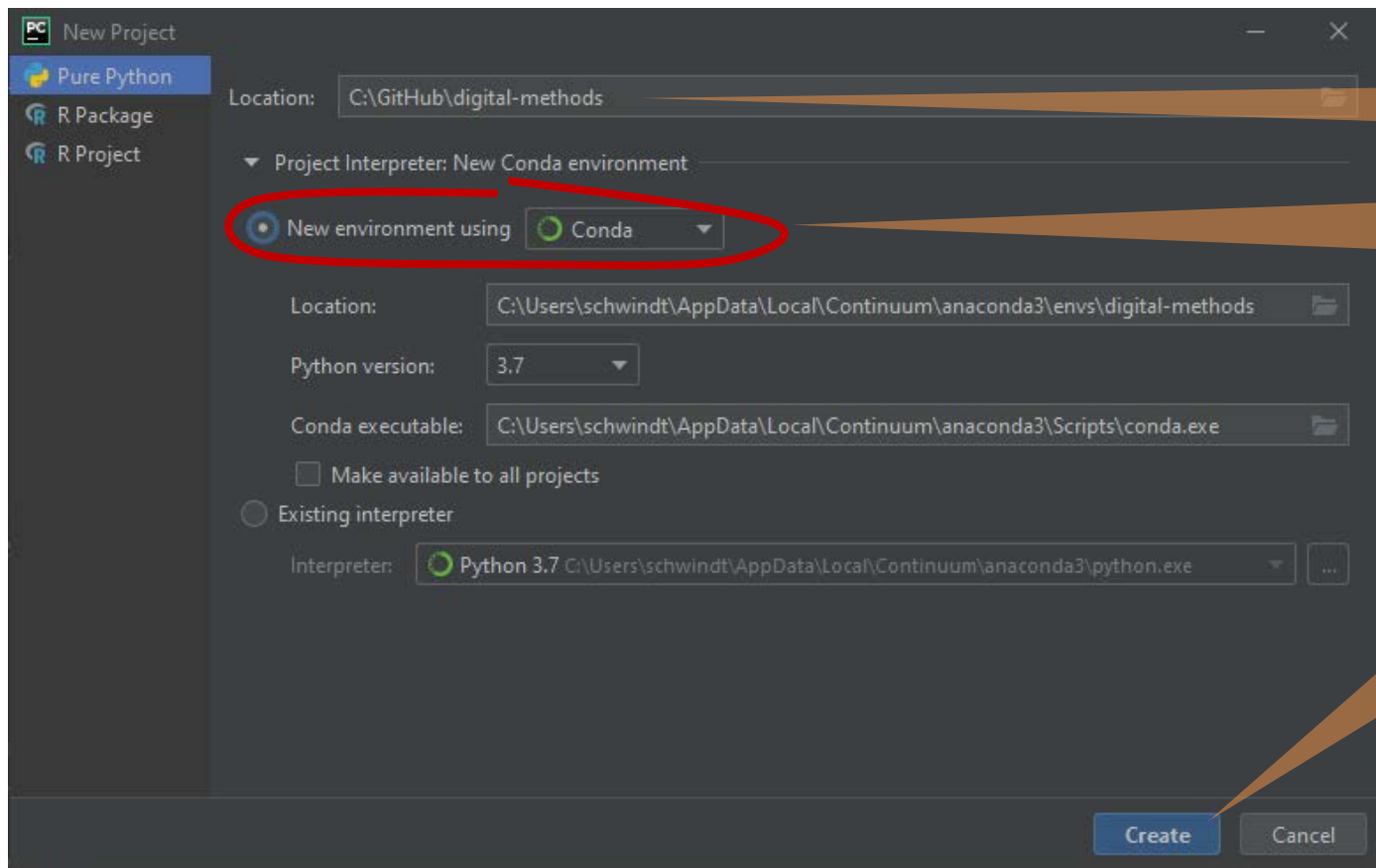
For pure Python development

[Download](#)

Free, open-source







Define location (e.g.,  
C:\...\digital-methods)

Select "New  
environment using  
**Conda**"

Create

All set & ready for the  
class 😊



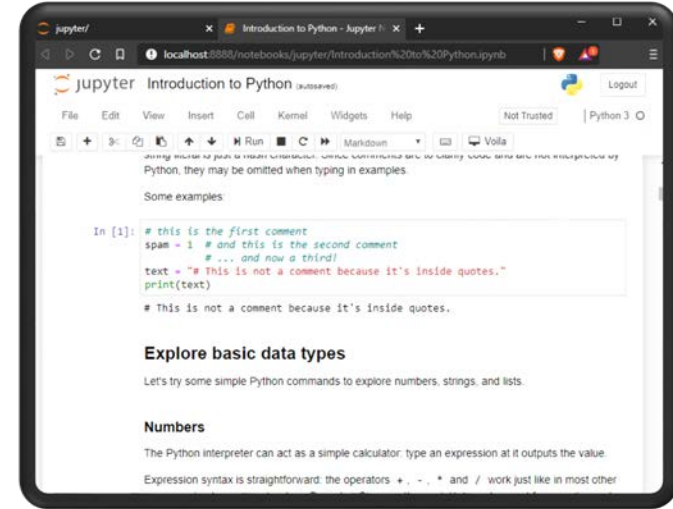


Wrap up



# General Information

- ▶ Interactive lectures with presentations and **jupyter** notebook short-exercises
- ▶ Register in ILIAS UND C@MPUS
- ▶ Clone Material from GitHub
- ▶ Evaluation in groups of 2 (max.3) students
  - 4 Assignments
  - Project
- ▶ Contact Dr. sc Sebastian Schwindt  
sebastian.schwindt@iws.uni-stuttgart.de  
office 0.920



# General Information





Questions, Remarks or Request?

