Utrecht University

Applied Data Science Master's degree programme

Spatial Data Analysis and Simulation Modelling course

Instruction manual for preparing the software environment for labs.

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Table of Contents

Necessary tools and materials

- Python interpreter (64-bit) is necessary for running Python code
- PyCharm is a free Integrated Development Environment for writing and running Python code. It makes use of the Python interpreter. PyCharm can also be used for managing Python packages and libraries.
- QGIS is an open-source Geographic Information System for analyzing and visualizing geo-spatial data.
- All above-mentioned software are available on both Windows and MacOS platforms. However, the guides in this document are based on Windows platform.
- You need to have sufficient rights to install software on your computer.
- Above software and spatial datasets require at least 5GB of free disk space on your computer.
- Finally, you need to have a stable Internet access with enough bandwidth (1 Mb/s) to download large-size software and datasets.

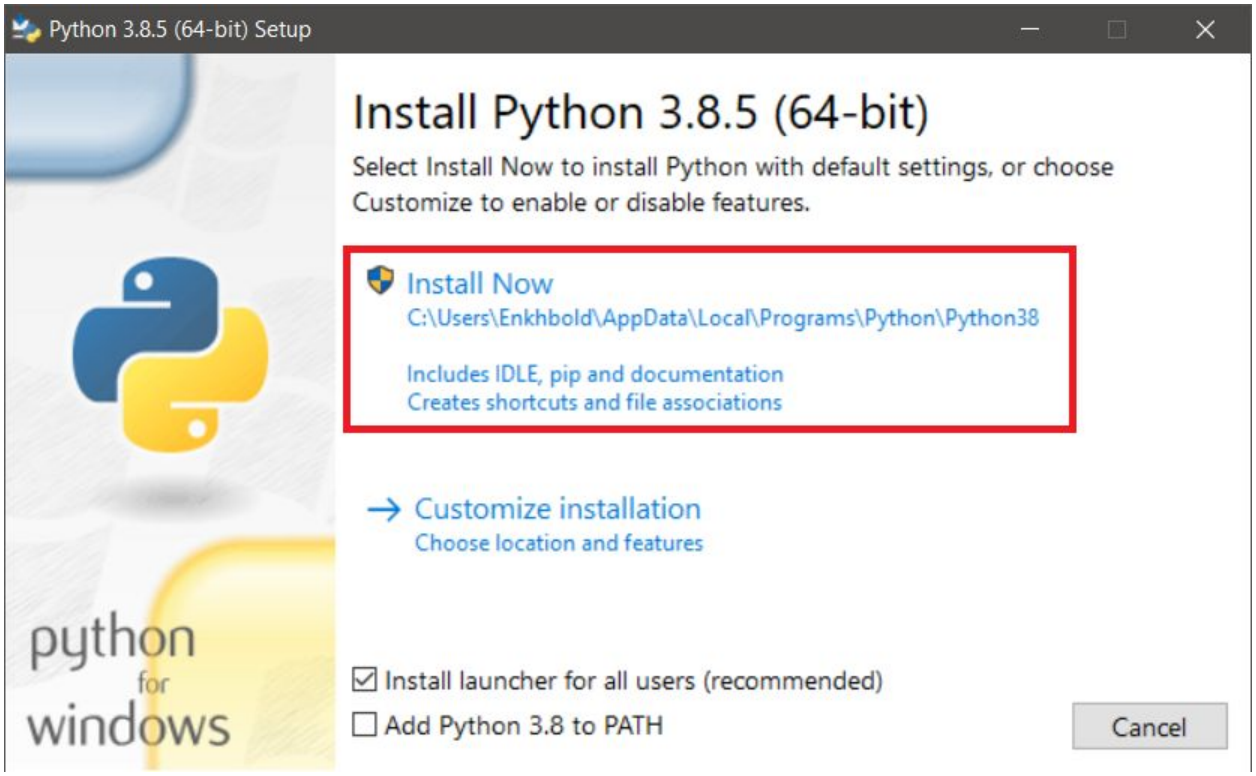
Setting up the software environment (Windows)

1. Installing Python

Before installing anything check if you already have Python installed on your computer. Skip this step if you (1) already have Python and (2) confident that Python libraries mentioned in "*Installing Python Libraries in PyCharm*" are compatible with the version of Python you already have. Note that the latest version of Python is recommended to use all functionalities of QGIS.
Install Python v3.7.7 from https://www.python.org/downloads/release/python-377/ . The download links can be found at the bottom of the webpage. If your computer supports 64-bit architecture then make sure to install the version named "*Windows x86-64 ...*".

NOTE: If you install 32-bit Python, you may not be able to complete some of the laboratory tasks!

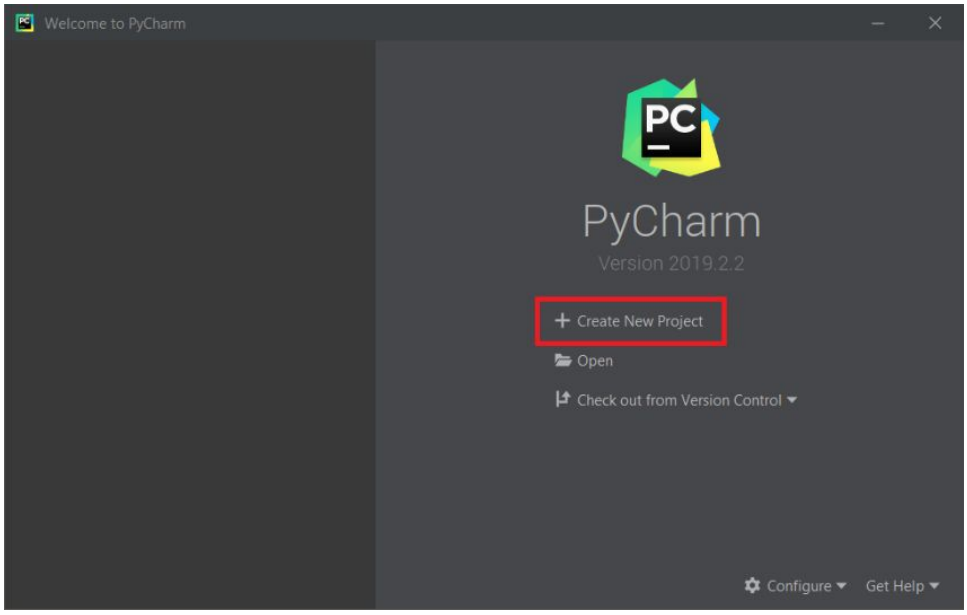
It is also recommended to use the executable installer "*Windows x86-64 executable installer*". Download the executable installer and run it. Select the "*Install Now*" option when prompted.



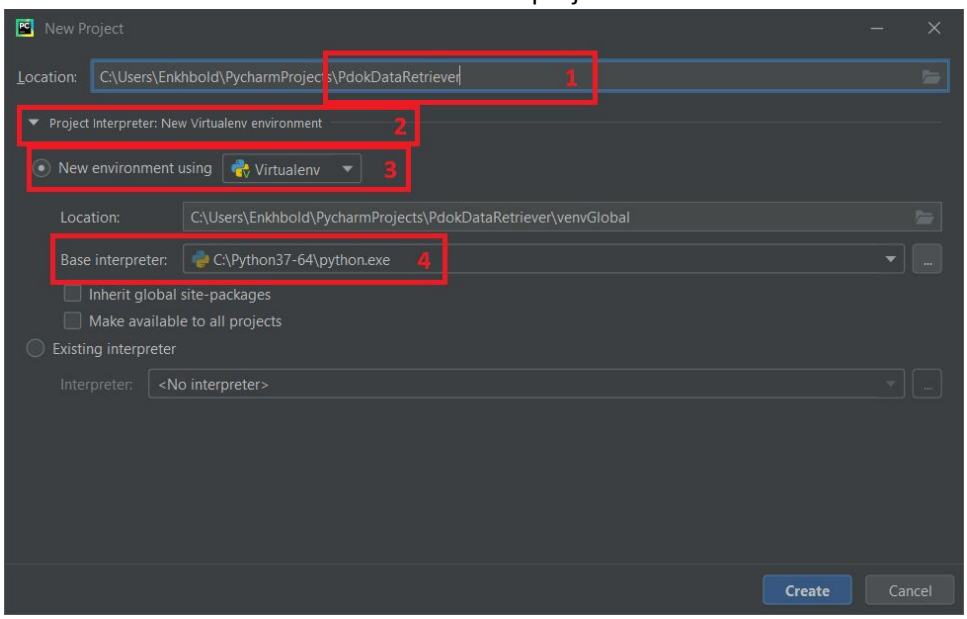
2. Installing PyCharm

PyCharm is a free Integrated Development Environment (IDE) for Python. If you already have PyCharm or another Python IDE, you can skip this step.
Before installing PyCharm, make sure you already have Python installed. PyCharm can be downloaded from https://www.jetbrains.com/pycharm/ . Download the *Community* version of the installer and follow the wizard steps. Upon finishing the installation, open PyCharm. The executable usually can be found in the Start menu under "*JetBrains -> JetBrains PyCharm Community Edition ...*" or in Explorer folder "[installation path]/*JetBrains*/*PyCharm Community Edition .../bin/pycharm64.exe*".

In the "*Welcome to PyCharm*" window, select "*Create New Project*".



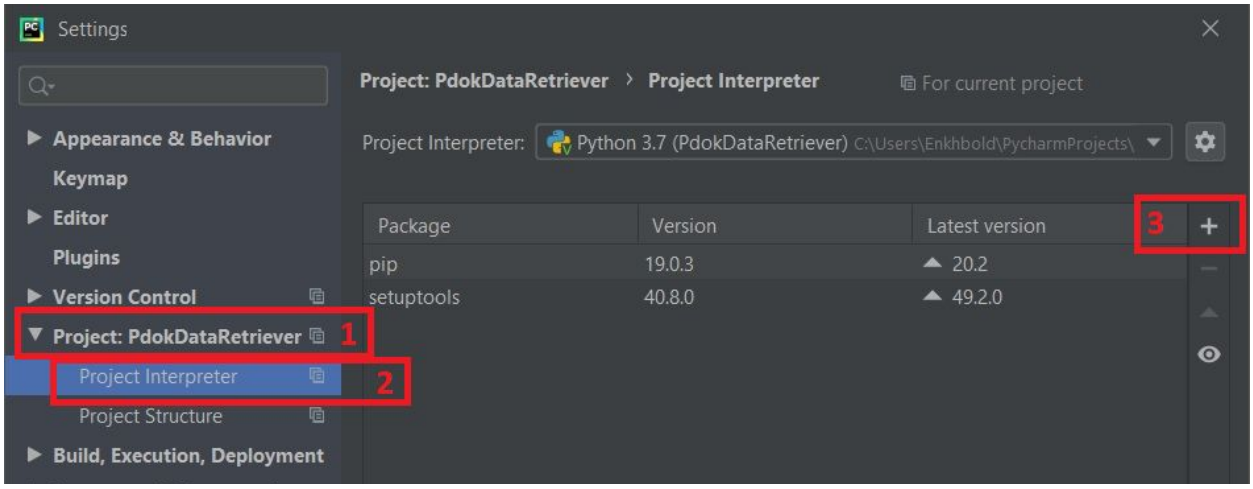
In the "*New Project*" window,
(1) indicate where you want to store the new project and the name of the new project. In example below, the project will be stored in the default location which is "*PycharmProjects*" folder inside user's custom folder. Name the new project as "*PdokDataRetriever*".
(2) Make sure the panel "*Project Interpreter*" is expanded.
(3) In the panel, ensure that "*New environment using*" is set to "*Virtualenv*".
(4) Make sure that "*Base interpreter*" is pointing to the executable "*python.exe*" of the Python version you have installed during the step "*Installing Python*".
Press the "*Create*" button to create the new project.



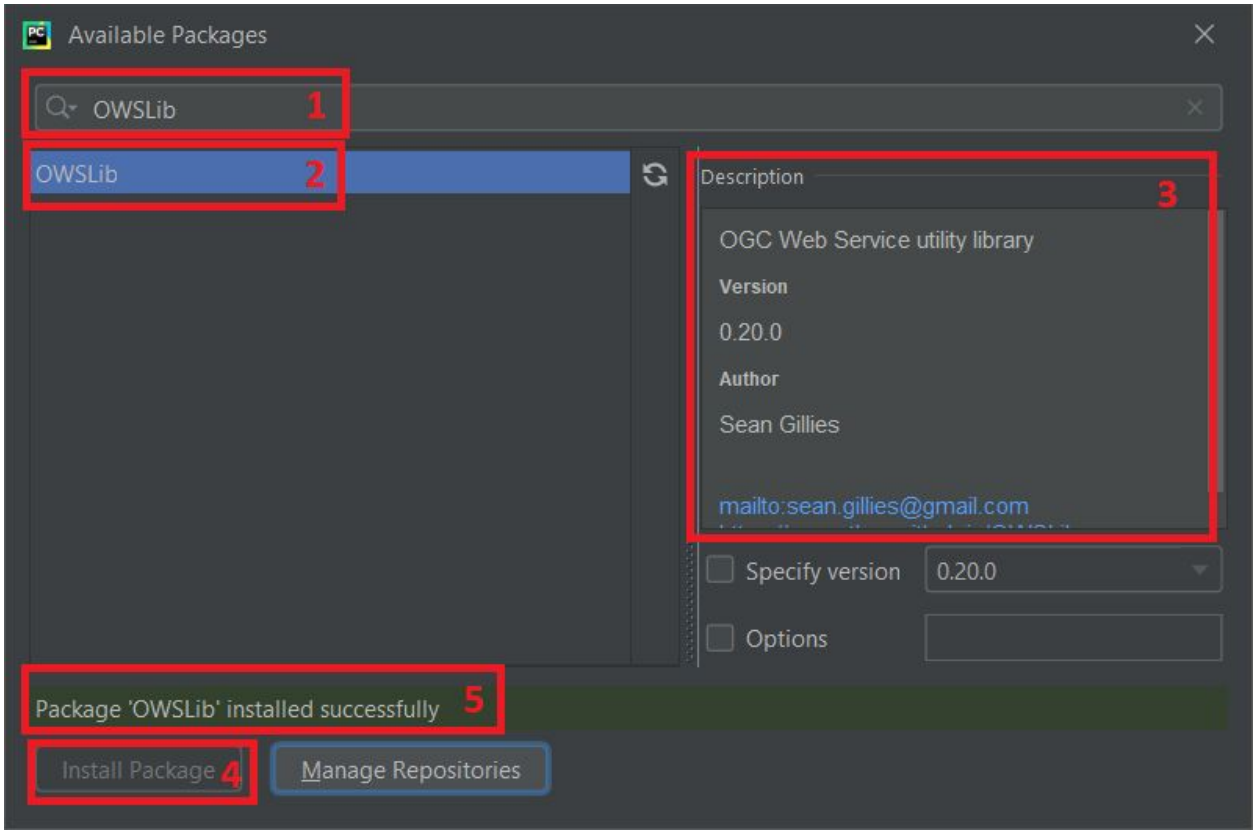
3. Installing a Python package in PyCharm

In this step, we explore how to install a Python package using PyCharm's built-in PIP tool. The package we are interested in is *OWSLib* (https://geopython.github.io/OWSLib). This package includes functions for accessing web services that are compliant with the standards of the *Open Geospatial Consortium* (OGC). *Web Feature Service* (WFS) is an example of such OGC-compliant web service and can be used to download vector data from PDOK.

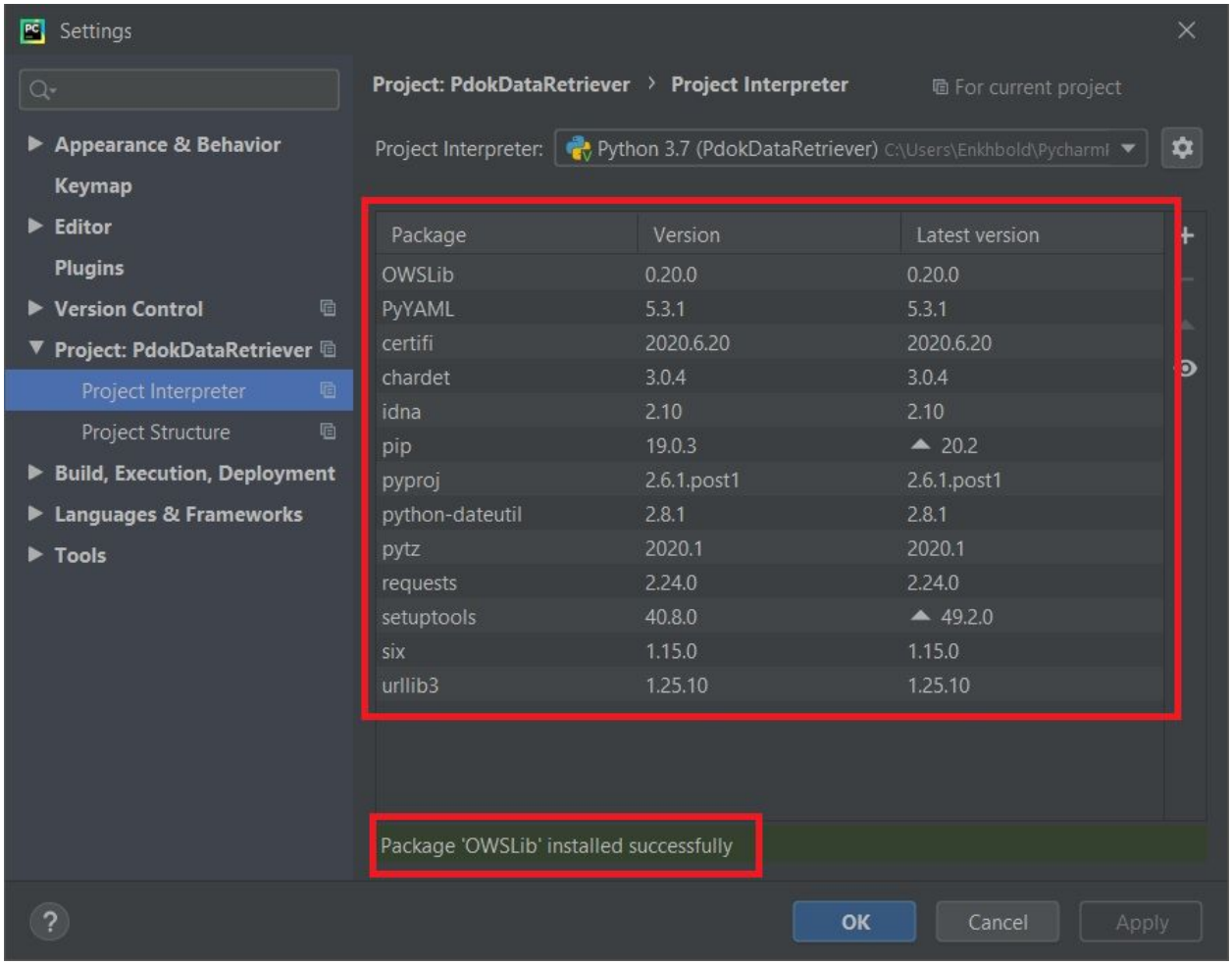
Make sure the *PdokDataRetriever* project is open in PyCharm. In PyCharm, open the *Settings* window by clicking "*File -> Settings*". In the *Settings* window,
(1) expand the *Project: PdokDataRetviever* option, which can be found in the left side menu
(2) select the *Project Interpreter* option in the submenu to see the list of packages currently installed for this project (currently only two packages are installed: *pip* and *setuptools*)
(3) click the "+" button in the far right to open the *Available Packages* window used for searching and downloading Python packages.



In the *Available Packages* window,
(1) search for *OWSLib* in the search field
(2) select the suggested package from the left menu
(3) make sure it is the correct package and matches the description of "*OGC Web Service utility library*" in the right menu
(4) click the *Install Package* button to install the selected package
(5) wait for the message "*Package 'OWSLib' installed successfully*"
(6) close the *Available Packages* window by pressing **X**



In the *Settings* window, you can see the updated list of installed packages. You can notice that the list contains packages other than *OWSLib*. These packages were selected and installed automatically because *OWSLib* depends on these packages. You can close the *Settings* window.



Package	Version	Latest version
OWSLib	0.20.0	0.20.0
PyYAML	5.3.1	5.3.1
certifi	2020.6.20	2020.6.20
chardet	3.0.4	3.0.4
idna	2.10	2.10
pip	19.0.3	▲ 20.2
pyproj	2.6.1.post1	2.6.1.post1
python-dateutil	2.8.1	2.8.1
pytz	2020.1	2020.1
requests	2.24.0	2.24.0
setuptools	40.8.0	▲ 49.2.0
six	1.15.0	1.15.0
urllib3	1.25.10	1.25.10

4. Installing QGIS

QGIS is the most popular open-source Geographical Information System (GIS) for analyzing and visualizing spatial data. Before installing QGIS, make sure you have already installed Python. You can download QGIS from https://qgis.org/en/site/forusers/download.html.

NOTE: It is highly recommended to download the 64-bit version if your computer architecture supports it.

NOTE: The laboratory tasks were tested with the following QGIS versions: 3.10, 3.12, and 3.14.

The installation wizard may ask you whether you want to install example datasets as well. These are not required but recommended for those who want to play around with these datasets to learn more about spatial data and QGIS. Note that the installation will require around 2.2 GB of disk space.