SPAfPM installation instructions

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1 Install Python and required packages

These instructions were tested on [(🪟) June 24, 2022 on a Widows 10 workstation | (🍎) July 20, 2022 on a M1 Mac running MacOS 12.5][1].

- Download and install Anaconda Distribution. Version 2.2.0 of Anaconda Navigator and version 4.13.0 of `conda` were used to test these instructions (obtained with Anaconda Distribution, release 2022.05), but any version should be fine, in principle.
- (🪟)
  - Open Anaconda Navigator and create a new environment using the "*Environment*" tab; insert the environment name, check the "*Python*" box and select for version 3.9.12 in the "*Version*" drop-down menu; note that the name of the example environment that will be used throughout this document is `SPAfPM_env`.
  - In the menuHome tab, select `SPAfPM_env` in the "*Applications on:*" drop-down menu and install **CMD.exe Prompt**, version 0.1.1.
  - Launch **CMD.exe Prompt**.
- (🍎)
  - Launch the MacOS application "*Terminal*".
  - Create a new environment named `SPAfPM_env` based on **Python**, version 3.9.12 using the command:

    ```
    conda create --name SPAfPM_env python=3.9.12
    ```

    note that the name of the example environment that will be used throughout this document is `SPAfPM_env`.
  - Activate the `SPAfPM_env` environment using the command:

    ```
    conda activate SPAfPM_env
    ```
- Install the following packages:
  - install **Spyder**, version 5.1.5 using the command:

    ```
    conda install -c auto spyder=5.1.5
    ```

[1] System-dependent instructions are formatted as [(🪟) instructions for Windows | (🍎) instructions for Mac] when inline. More structured instructions are formatted as sublists opened by the relevant symbols. Even more structured instructions are marked by section headings.

the installation of the **Spyder** IDE is optional, but it is encouraged for the use of SPA;

- optionally, install **Jupiter notebook**, version 6.4.11 using the command:

  ```
  conda install -c auto notebook=6.4.11
  ```

- install **Scikit-Learn**, version 1.0.2[2] using the command:

  ```
  conda install -c auto scikit-learn=1.0.2
  ```

  note that this installs also the required packages **NumPy**, version 1.22.3 and **SciPy**, version 1.7.3;

- install **Matplotlib**, version 3.5.1 using the command:

  ```
  conda install -c auto matplotlib=3.5.1
  ```

- install **pandas**, version 1.4.2 using the command:

  ```
  conda install -c auto pandas=1.4.2
  ```

- install **statsmodels**, version 0.13.2 using the command:

  ```
  conda install -c auto statsmodels=0.13.2
  ```

- install **seaborn**, version 0.11.2 using the command:

  ```
  conda install -c auto seaborn=0.11.2
  ```

- (🪟)
  - install **rpy2**, version 3.5.1 using the command:

    ```
    conda install -c conda-forge rpy2=3.5.1
    ```

- (🍎)
  - install **pip**, version 22.1.2 using the command:

    ```
    conda install -c auto pip=22.1.2
    ```

  - install **rpy2**, version 3.5.1 using the command:

    ```
    pip install rpy2==3.5.1
    ```

- install **openpyxl**, version 3.0.9 using the command:

  ```
  conda install -c auto openpyxl=3.0.9
  ```

- install **cvxopt**, version 1.2.7 using the command:

  ```
  conda install -c conda-forge cvxopt=1.2.7
  ```

2 Install R and required packages

(🪟) Windows instructions

- Browse the main R website and select "*Download R*".

[2]Note that this will also cause the installation of **NumPy**, version 1.22.3 and **NumPy**, version 1.7.3

- Select the appropriate mirror; note that the mirror that will be used throughout this document (as a matter of example) is http://lib.stat.cmu.edu/R/CRAN/.
- Select "*Download R for Windows*".
- Select "*base*".
- Select "*Previous releases*".
- Select "*R 4.2.0*".
- Download and install "*R-4.2.0-win.exe*".
- Optionally, download and install the **RStudio**, version 2022.02.1-461 IDE:
  - browse the main **RStudio** website and select "*Product*" > "*RStudio*";
  - Select "*DOWNLOAD RSTUDIO DESKTOP*".
  - Select "*older version of RStudio*".
  - Under "*2022.02.1*", select "*Installers*".
  - Download and install "*RStudio-2022.02.1-461.exe*".
- Lunch the Windows application "*R 4.2.0*" and install the following packages:
  - install the latest available version of the **remotes** package (version 2.4.2 on the date of writing) using the command:

    ```
    install.packages('remotes', repos='http://lib.stat.cmu
       .edu/R/CRAN/')
    ```

  - load the **remotes** package using the command:

    ```
    library('remotes')
    ```

  - install **acepack**, version 1.4.1 using the command:

    ```
    install_version('acepack', version='1.4.1', repos='http://
       lib.stat.cmu.edu/R/CRAN/')
    ```

    if asked to install and updated version some packages, enter an empty line to reject;
  - install **MVN**, version 5.9 using the command:

    ```
    install_version('MVN', version='5.9', repos='http://lib.
       stat.cmu.edu/R/CRAN/')
    ```

    if asked to install and updated version some packages, enter an empty line to reject; if asked to install and updated version some packages, enter an empty line to reject.
- Set the `R_HOME` environment variable in Windows (this allows Python to know where the required R packages are located in order to properly use them):
  - open the Windows application "*Control Panel*";
  - search for "*Edit the system environment variables*" and launch the related utility (insert Admin credentials if asked);

- select "*Environment variables...*";
- in the field "*System variables*", select "*New...*";
- type `R_HOME` in the "*Name*" field, and:

  `C:\Users\`⟨*username*⟩`\AppData\Local\Programs\R\R-4.2.0`

  in the "*Value*" field; note that this is an example with the default installation path of R and the value should be adjusted according to the actual installation directory chosen by the user; also note that ⟨*username*⟩ should be replaced with the username of the user;
- save the `R_HOME` environment variable by clicking "*OK*" on all windows;
- reboot the system.

(🍎) MacOS instructions

- Browse the main R website and select "*Download R*".
- Select the appropriate mirror; note that the mirror that will be used throughout this document (as a matter of example) is `http://lib.stat.cmu.edu/R/CRAN/`.
- Select "*Download R for macOS*".
- Select "*base*".
- Download and install "*R-4.2.0.pkg*".
- Optionally, download and install the **RStudio**, version 2022.02.1-461 IDE:
  - browse the main **RStudio** website and select "*Product*" > "*RStudio*";
  - Select "*DOWNLOAD RSTUDIO DESKTOP*".
  - Select "*older version of RStudio*".
  - Under "*2022.02.1*", select "*Installers*".
  - Download and install "*RStudio-2022.02.1-461.dmg*".
- Launch the MacOS application "*Terminal*" and install the following packages:
  - install the latest available version of the **acepack** package (version 1.4.1 on the date of writing) using the command:

    ```
    install.packages('acepack', repos='http://lib.stat.cmu.edu
       /R/CRAN/')
    ```

  - install the latest available version of the **MVN** package (version 5.9 on the date of writing) using the command:

    ```
    install.packages('MVN', repos='http://lib.stat.cmu.edu/R/
       CRAN/')
    ```

3 Download SPAfPM and additional packages

- Download the code of SPAfPM from the GitHub repository and unzip the archive.
- Download the **SVDD**, version 1.1 Python package from the GitHub repository and decompress the archive.
- Copy the file `SVDD.py` into the folder of the SPAfPM code.