Complete Guide to Installing PySpark on MacOS

May 31, 2019

Author :: Kevin Vecmanis

Getting PySpark set up locally can be a bit of an involved process that took me a few tries to get right. In this post I cover the entire process of succesfully installing PySpark on MacOS. Enjoy!

In this article you will learn:

- The packages you need to download to install PySpark
- How to properly setup the installation directory
- How to setup the shell environment by editing the ~/.bash_profile file
- How to confirm that the installation works
- How to run PySpark in Python Shell
- How to run PySpark in Jupyter Notebooks
- Using findspark to run PySpark from any directory

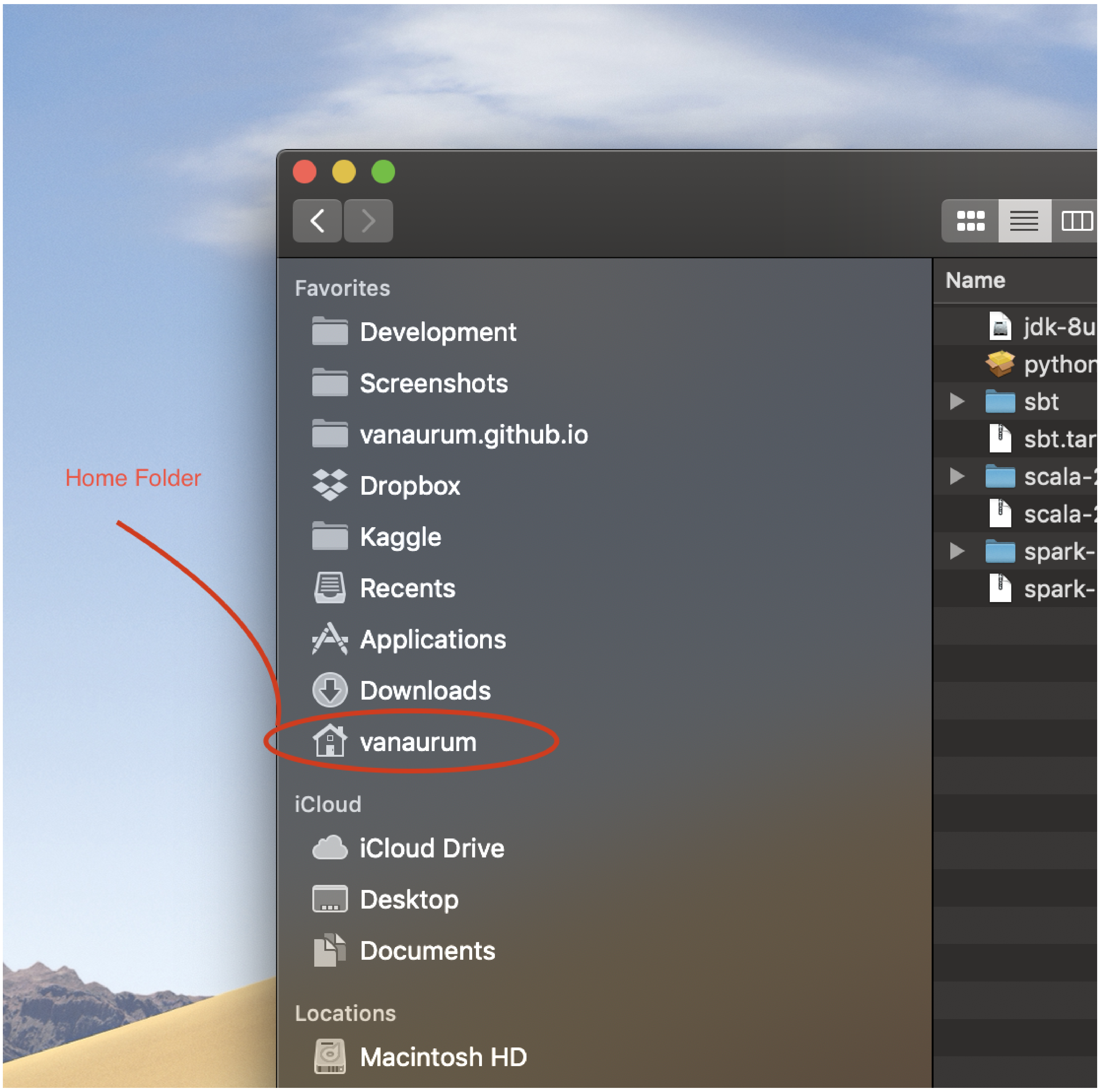
Table of Contents

Introduction

If you're here because you have been trying to install `PySpark` and you have run into problems - don't worry, you're not alone! I struggled with this install my first time around. Make you follow all of the steps in this tutorial - even if you think you don't need to!

Step 1: Set up your $HOME folder destination

What is `$HOME`? If you're on a Mac, open up the **Terminal** app and type `cd` in the prompt and hit enter. This will take you to your Mac's home directory. For me, it's called `vanaurum`. If you open up **Finder** on your Mac you will usually see it on the left menu bar under **Favorites**. This what it looks like on my Mac:



This folder equates to `Users/vanaurum` for me. Throughout this tutorial you'll have to be aware of this and make sure you change all the appropriate lines to match your situation – `Users/<your username>`.

The next thing we're going to do is create a folder called `/server` to store all of our installs. The path to this file will be, for me `Users/vanaurum/server`. Or, equivalently, `$HOME/server`.

In the terminal app, enter the following:

```
cd
mkdir server
```

Note: `cd` changes the directory from wherever you are to the `$HOME` directory. If you're in a directory, the `cd ..` command brings you up one folder, and `cd <folder_name>` brings you down one level into the specified `folder_name` directory.

Step 2: Download the Appropriate Packages.

Spark's documentation states that in order to run Apache Spark 2.4.3 you need the following:

- Java 8+
- Python 2.7+ or 3.4+
- Scala 2.11

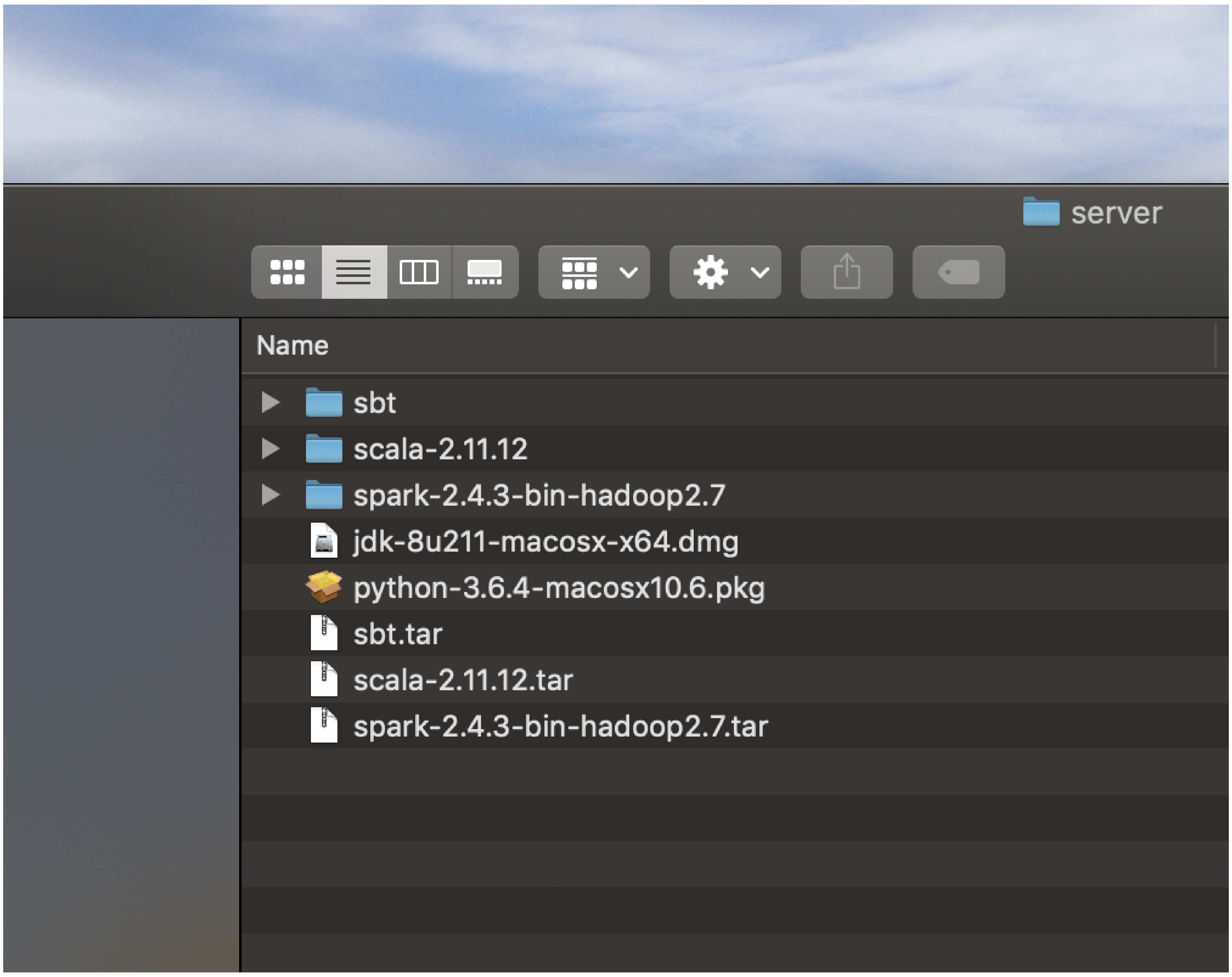
Click on each of the following links and download the **zip** or **tar** files to your `$HOME/server` directory that we just created:

- spark-2.4.3-bin-hadoop2.7.tgz
- jdk-8u162-macosx-x64.dmg
- scala-2.11.12.tgz
- sbt-0.13.17.tgz
- python-3.6.4-macosx10.6.pkg (Optional)

All of these files should be copied over to your `$HOME/server` folder.

Step 3: Extract the downloaded files

Double click on each installable that you downloaded and install/extract them in place (Including Java and Python packages!). When you're done you should see three new folders like this:



server

Name

- sbt
- scala-2.11.12
- spark-2.4.3-bin-hadoop2.7
- jdk-8u211-macosx-x64.dmg
- python-3.6.4-macosx10.6.pkg
- sbt.tar
- scala-2.11.12.tar
- spark-2.4.3-bin-hadoop2.7.tar

Step 4: Setup shell environment by editing the ~/.bash_profile file

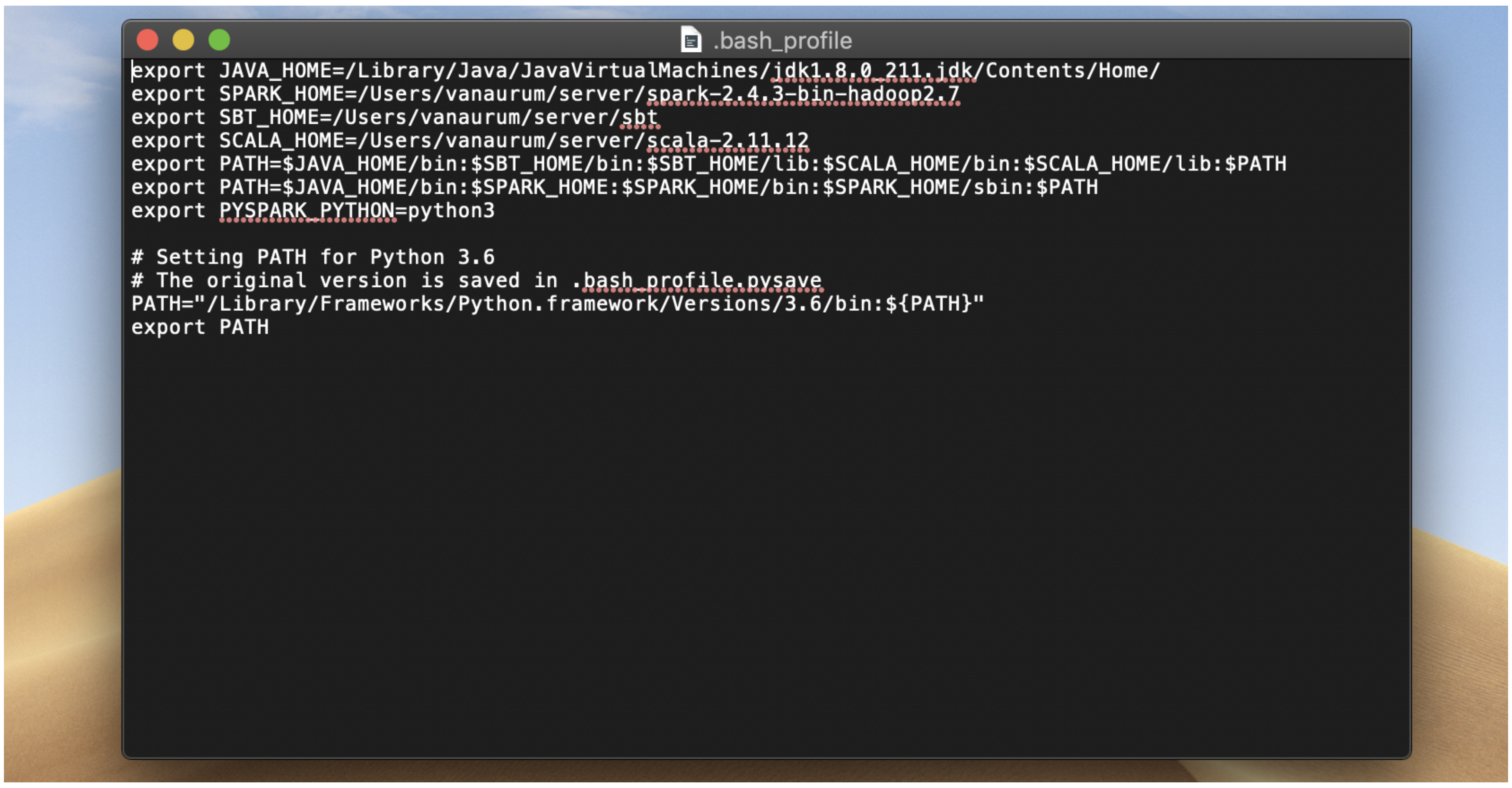
The `.bash_profile` is simply a personal configuration file for configuring your own user environment. This file can be configured however you want - but in order for Spark to run, your environment needs to know where to find the associated files. This is what we're going to configure in the `.bash_profile` file.

We creates the `.bash_profile` with the following command line commands.

```
cd
touch .bash_profile
open -e .bash_profile
```

`touch` is the command for **creating** a file. `open -e` is a quick command for opening the specified file in a text editor.

This is what my `.bash_profile` looks like. This is what yours needs to look like after this step!



```
export JAVA_HOME=/Library/Java/JavaVirtualMachines/jdk1.8.0_211.jdk/Contents/Home/
export SPARK_HOME=/Users/vanaurum/server/spark-2.4.3-bin-hadoop2.7
export SBT_HOME=/Users/vanaurum/server/sbt
export SCALA_HOME=/Users/vanaurum/server/scala-2.11.12
export PATH=$JAVA_HOME/bin:$SBT_HOME/bin:$SBT_HOME/lib:$SCALA_HOME/bin:$SCALA_HOME/lib:$PATH
export PATH=$JAVA_HOME/bin:$SPARK_HOME:$SPARK_HOME/bin:$SPARK_HOME/sbin:$PATH
export PYSPARK_PYTHON=python3

# Setting PATH for Python 3.6
# The original version is saved in .bash_profile.pysave
PATH="/Library/Frameworks/Python.framework/Versions/3.6/bin:${PATH}"
export PATH
```

Copy the following into your `.bash_profile` and save it. Note that in **Step 2** I said that installing Python was optional. If you skipped that step, you want have the last 4 lines of this file. If you do have them, make sure you don't duplicate the lines by copying these over as well!

Important: There are two key things here:

- Make sure you swap all instances of `vanaurum` for your own username.
- The files you downloaded might be slightly differed versions than the ones listed here. If that's the case, make sure all your version digits line up with what you have installed. For example, I have `/jdk1.8.0_211.jdk`, but you might have a new version that needs to be modified in your `.bash_profile`.

```
export JAVA_HOME=/Library/Java/JavaVirtualMachines/jdk1.8.0_211.jdk/Contents/Home/
export SPARK_HOME=/Users/vanaurum/server/spark-2.4.3-bin-hadoop2.7
export SBT_HOME=/Users/vanaurum/server/sbt
export SCALA_HOME=/Users/vanaurum/server/scala-2.11.12
export PATH=$JAVA_HOME/bin:$SBT_HOME/bin:$SBT_HOME/lib:$SCALA_HOME/bin:$SCALA_HOME/lib:$PATH
export PATH=$JAVA_HOME/bin:$SPARK_HOME:$SPARK_HOME/bin:$SPARK_HOME/sbin:$PATH
export PYSPARK_PYTHON=python3
#
# Setting PATH for Python 3.6
# The original version is saved in .bash_profile.pysave
PATH="/Library/Frameworks/Python.framework/Versions/3.6/bin:${PATH}"
export PATH
```

Save and **close** this file.

Step 5: Reload the bash file

Now that our `.bash_profile` has changed, it needs to be reloaded. Every time you make a change to the `.bash_profile` you should either close the **Terminal** and reload it, or run the following command:

```
source ~/.bash_profile
```

Step 6: Run the installation

Let's confirm that we've done everything properly:

Check the Java version by typing `jave -version` in the terminal. You should see something like this:

```
$ java -version
java version "1.8.0_211"
Java(TM) SE Runtime Environment (build 1.8.0_211-b12)
Java HotSpot(TM) 64-Bit Server VM (build 25.211-b12, mixed mode)
```

Next we'll test `PySpark` by running it in the interactive shell. If you type `pyspark` in the terminal you should see something like this:

```
$ pyspark
Python 3.6.4 (v3.6.4:d48ecebad5, Dec 18 2017, 21:07:28)
[GCC 4.2.1 (Apple Inc. build 5666) (dot 3)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
19/06/01 16:52:44 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform...
using builtin-java classes where applicable
Using Spark's default log4j profile: org/apache/spark/log4j-defaults.properties
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
Welcome to
      ____              __
     / __/__  ___ _____/ /__
    _\ \/ _ \/ _ `/ __/  '_/
   /__ / .__/\_,_/_/ /_/\_\   version 2.4.3
      /_/

Using Python version 3.6.4 (v3.6.4:d48ecebad5, Dec 18 2017 21:07:28)
SparkSession available as 'spark'.
>>>
```

Hit **CTRL-D** or type `exit()` to get out of the pyspark shell.

If you made it this far without any problems you have succesfully installed PySpark. Next, we're going to look at some slight modifications required to run PySpark from multiple locations.

Step 7: Run PySpark in Python Shell and Jupyter Notebook

So far we have succesfully installed `PySpark` and we can run the PySpark shell successfully from our home directory in the terminal. Now I'm going to walk through some changes that are required in the `.bash_profile`, and an additional library that needs to be installed to run PySpark from a **Python3** terminal and **Jupyter Notebooks**.

Right now, if you run the following in terminal:

```
cd
Python3
import pyspark
```

You will likely get the following error message:

```
ModuleNotFoundError: No module named 'pyspark'
```

This is happening because we haven't linked our Python installation path with the PySpark installation path. We can do this in the `.bash_profile`. Let's open up our `.bash_prifle` again by running the following in the terminal:

```
cd
open -e '.bash_profile'
```

We're going to add the following 3 lines to our profile:

```
export PYTHONPATH=$SPARK_HOME/python/:$PYTHONPATH
export PYSPARK_DRIVER_PYTHON="jupyter"
export PYSPARK_DRIVER_PYTHON_OPTS="notebook"
```

This is going to accomplish two things - it will link our Python installation with our Spark installation, and also enable the drivers for running PySpark on Jupyter Notebook.

Our `.bash_profile` should look like this now:

```
export JAVA_HOME=/Library/Java/JavaVirtualMachines/jdk1.8.0_211.jdk/Contents/Home/
export SPARK_HOME=/Users/vanaurum/server/spark-2.4.3-bin-hadoop2.7
export SBT_HOME=/Users/vanaurum/server/sbt
export SCALA_HOME=/Users/vanaurum/server/scala-2.11.12
export PATH=$JAVA_HOME/bin:$SBT_HOME/bin:$SBT_HOME/lib:$SCALA_HOME/bin:$SCALA_HOME/lib:$PATH
export PATH=$JAVA_HOME/bin:$SPARK_HOME:$SPARK_HOME/bin:$SPARK_HOME/sbin:$PATH
export PYSPARK_PYTHON=python3
export PYTHONPATH=$SPARK_HOME/python/:$PYTHONPATH
export PYSPARK_DRIVER_PYTHON="jupyter"
export PYSPARK_DRIVER_PYTHON_OPTS="notebook"
#
# Setting PATH for Python 3.6
# The original version is saved in .bash_profile.pysave
PATH="/Library/Frameworks/Python.framework/Versions/3.6/bin:${PATH}"
export PATH
```

Once these changes are made, save and close the profile and then run `source ~/.bash_profile` to update these changes in your environment.

Now, try importing `pyspark` from the Python3 shell again.

```
cd
python3
import pyspark
```

You'll likely get another message that looks like this:

```
ModuleNotFoundError: No module named 'py4j'
```

`py4j` is a small library that links our Python installation with PySpark. Install this by running `pip install py4j`. Now you'll be able to succesfully import `pyspark` in the Python3 shell!

Import PySpark in Jupyter Notebook

To run PySpark in Jupyter Notebook, open Jupyter Notebook from the terminal.

```
cd
jupyter notebook
```

(You may need to install jupyter notebook if you get a `ModuleNotFound` error)

Once The Jupyter Notebook server opens in your internt browser, start a new notebook and in the first cell simply type `import pyspark` and push **Shift + Enter**.

Using findspark to import PySpark from any directory.

`findspark` is a package that lets you declare the home directory of PySpark and lets you run it from other locations if your folder paths aren’t properly synced.

To install `findspark`, run:

```
pip3 install findpark
```

To use it in a python3 shell (or Jupyter Notebook), run the following:

```
>>> import findspark
>>> findspark.init('Users/vanaurum/server/spark-2.4.3-bin-hadoop2.7')
>>> import pyspark
```

`findspark.init('Users/vanaurum/server/spark-2.4.3-bin-hadoop2.7')` initializes the correct path to your Spark installation. Note that you’ll have to change this to whatever path you used earlier (This path is for my computer only)!

That’s it!

I hope you enjoyed this post

Kevin Vecmanis

main :: kevinvecmanis@gmail.com