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# Basic Python for Geoscientists



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April 2020

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# About me...

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## Academic

- 2007: PhD, The Australian National University
- 2001: MSc, Applied Geophysics, ITB
- 1998: BSc, Geophysical Engineering, ITB

## Career

1. Present
  - Geodwipa Cloud Computing (Founder)
  - Lecturer at Pertamina University
  - Geophysical Consultant
2. Past
  - Kuwait Oil Company
  - ExxonMobil Exploration Company, Houston Texas USA
  - ExxonMobil Oil Indonesia Company

## Interests

- Seismic Imaging
- Cloud Computing
- Seismic Tomography



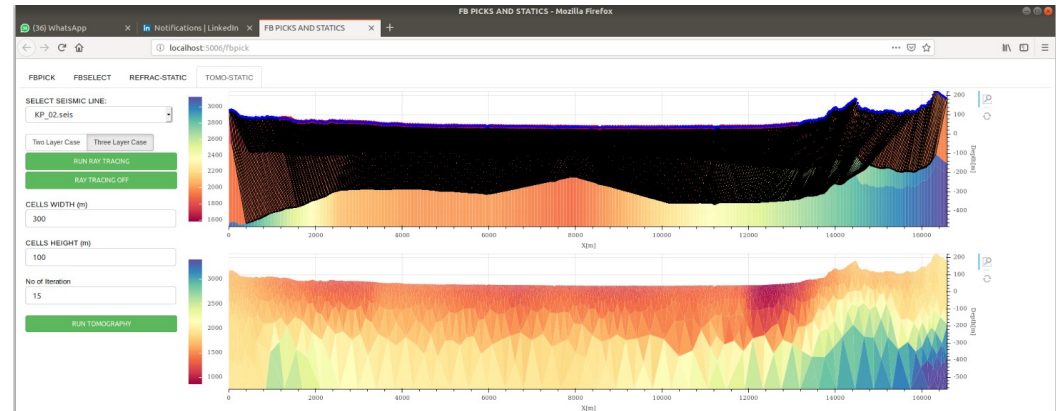
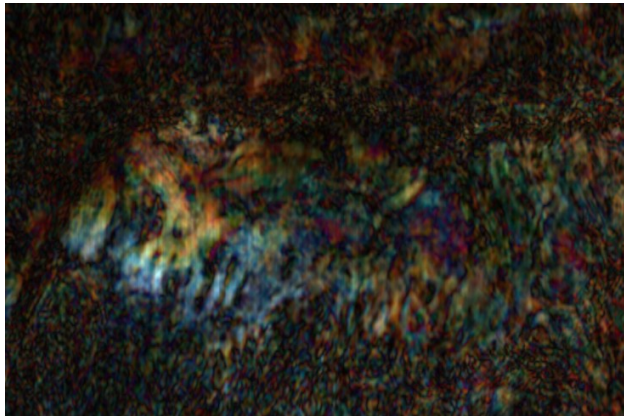
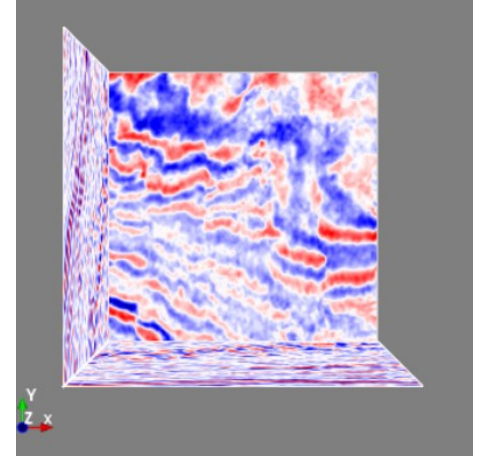
# Requirements

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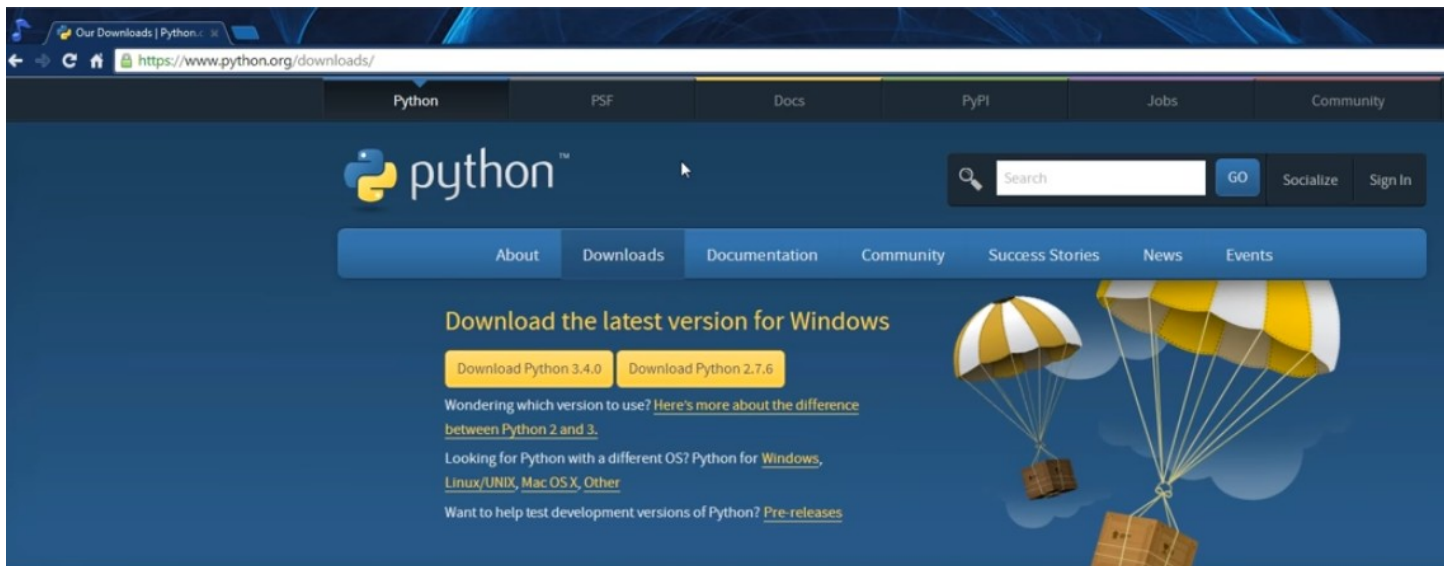
- Python 3.7.0
  - numpy
  - matplotlib
  - sklearn
  - scipy
  - pandas
  - etc
- PyCharm IDE or Jupyter Notebook

# Why Python?

- Open source
- Big Community across disciplines
- Cross Platform
- Flexible
- Multi processing, GPU, Multi GPU...



# Download and install Python



The screenshot shows the Python.org website's download page. The browser's address bar displays 'https://www.python.org/downloads/'. The website has a dark blue header with the Python logo and a navigation menu. Below the header, there's a search bar and social media links. A main section titled 'Download the latest version for Windows' features two buttons: 'Download Python 3.4.0' and 'Download Python 2.7.6'. Below these buttons, there are links for more information about Python versions and for downloading Python on other operating systems like Linux, UNIX, Mac OS X, and Other. An illustration of two parachutes with cargo boxes is also present.

Our Downloads | Python.org

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Download the latest version for Windows

Download Python 3.4.0 Download Python 2.7.6

Wondering which version to use? [Here's more about the difference between Python 2 and 3.](#)

Looking for Python with a different OS? Python for [Windows](#), [Linux/UNIX](#), [Mac OS X](#), [Other](#)

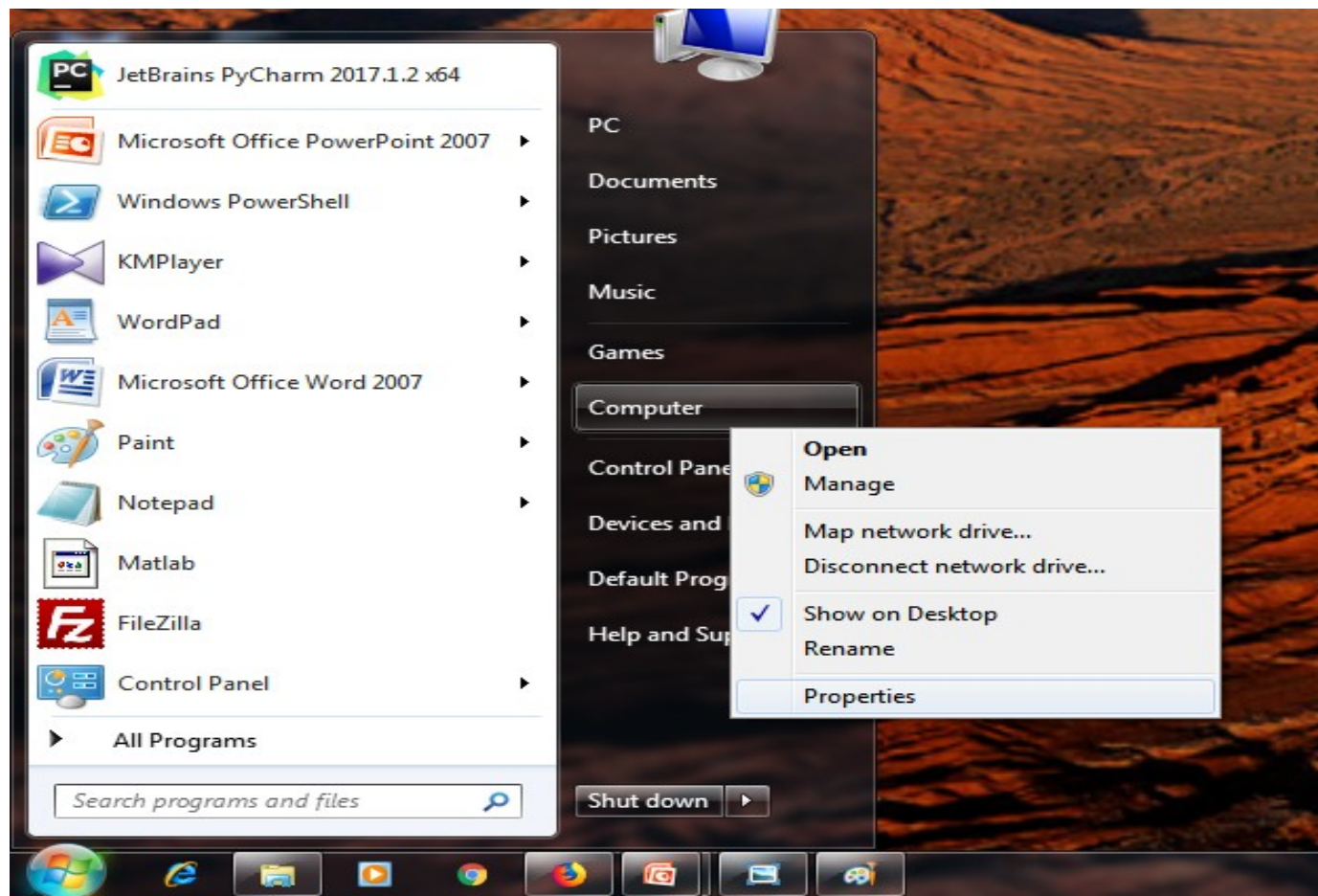
Want to help test development versions of Python? [Pre-releases](#)

Looking for a specific release?

Python releases by version number:

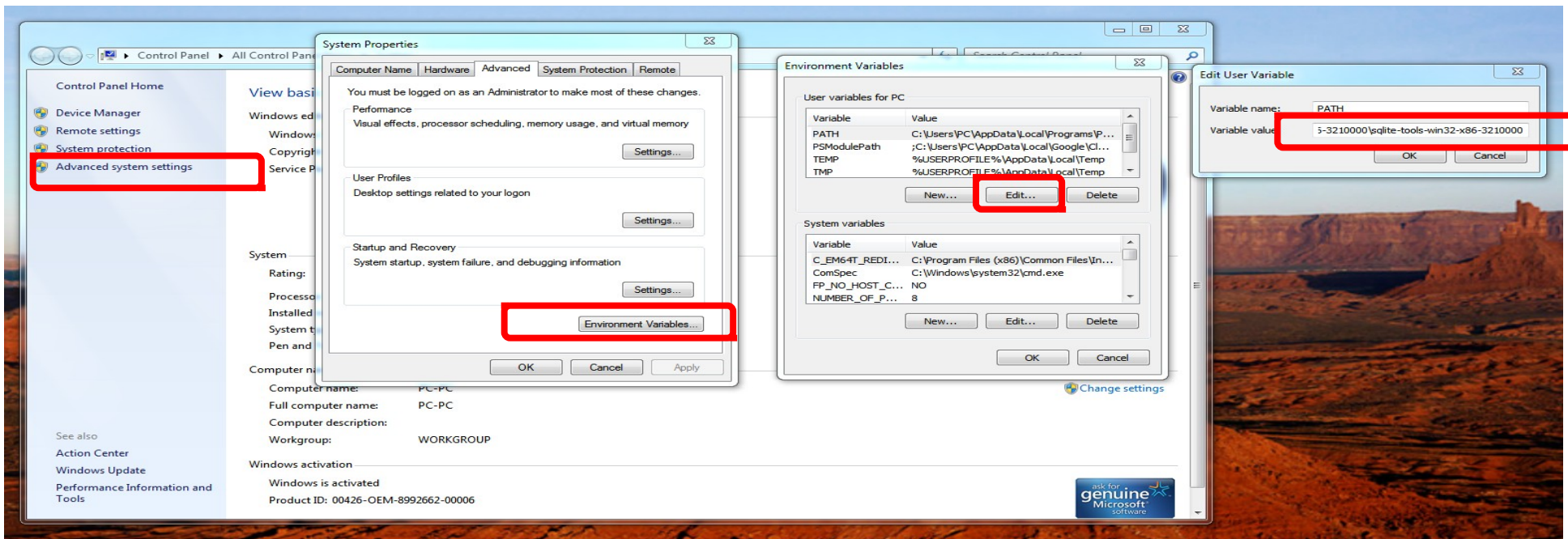
Release version	Release date	Click for more	
<a href="#">Python 3.4.0</a>	March 17, 2014	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 3.3.5</a>	March 9, 2014	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 3.3.4</a>	Feb. 9, 2014	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 3.3.3</a>	Nov. 17, 2013	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 2.7.6</a>	Nov. 10, 2013	<a href="#">Download</a>	<a href="#">Release Notes</a>
<a href="#">Python 2.7.5</a>	Oct. 10, 2013	<a href="#">Download</a>	<a href="#">Release Notes</a>

# Environment Settings



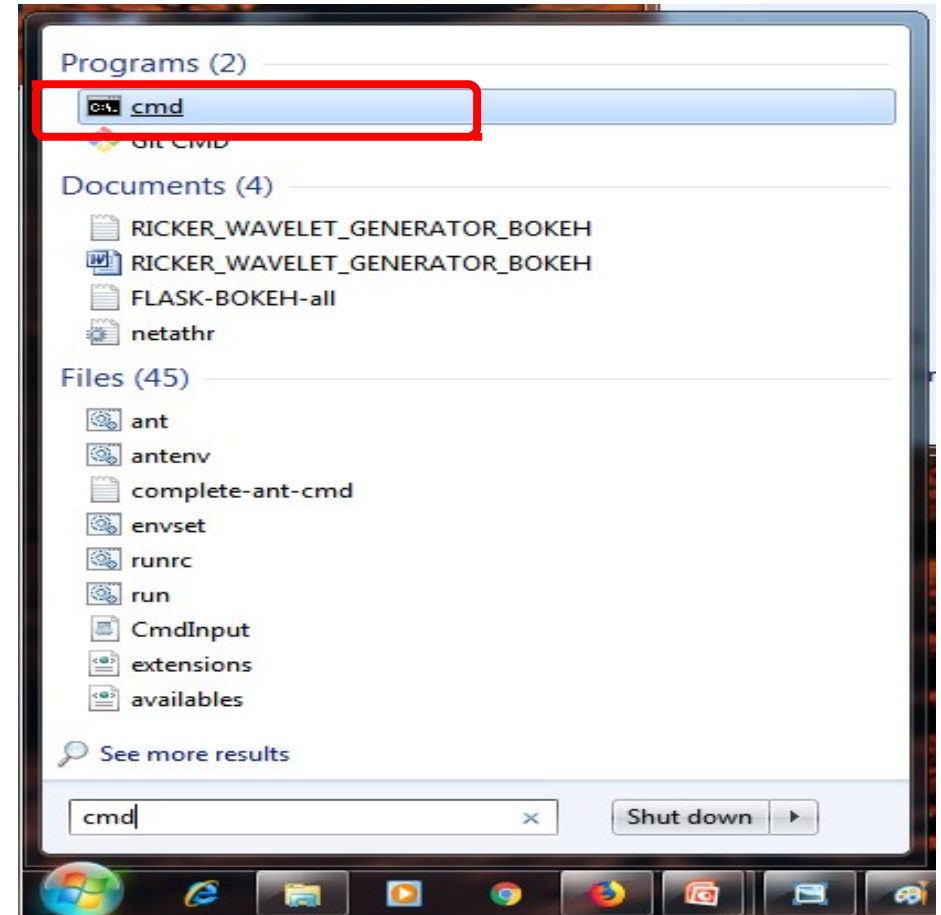
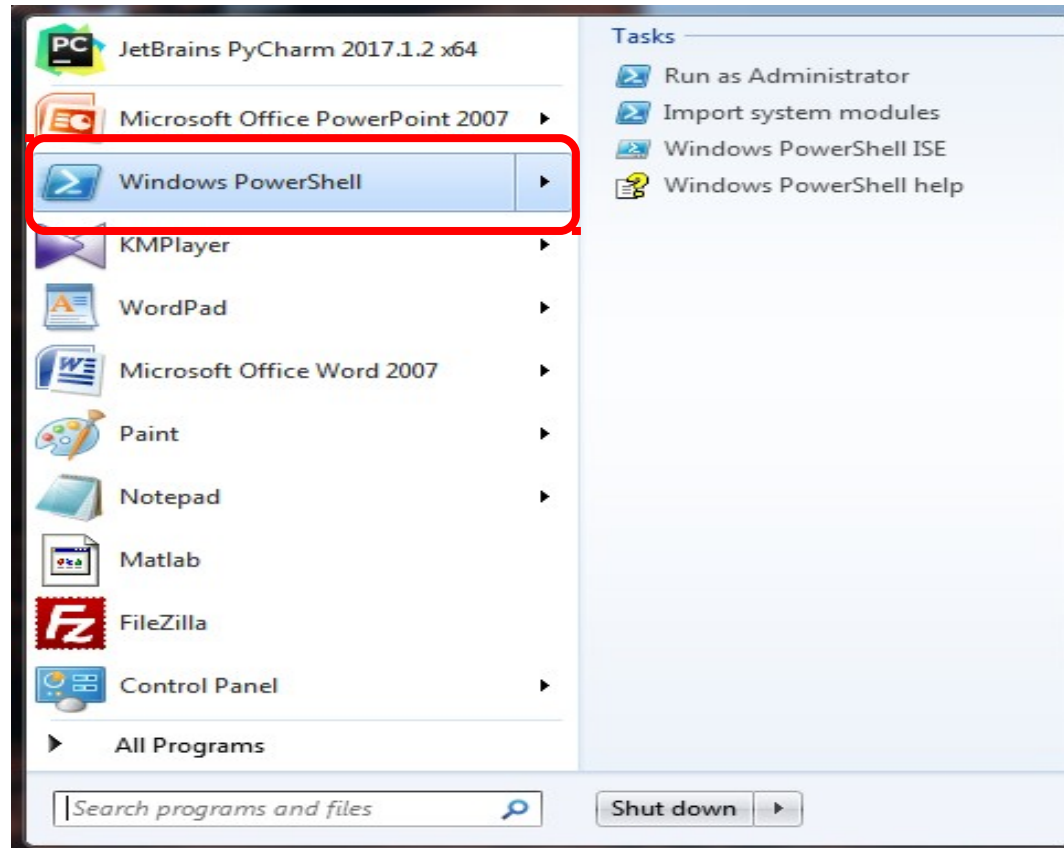


# Environment Settings



C:\Users\PC\AppData\Local\Programs\Python\Python36\Scripts;  
C:\Users\PC\AppData\Local\Programs\Python\Python36\;

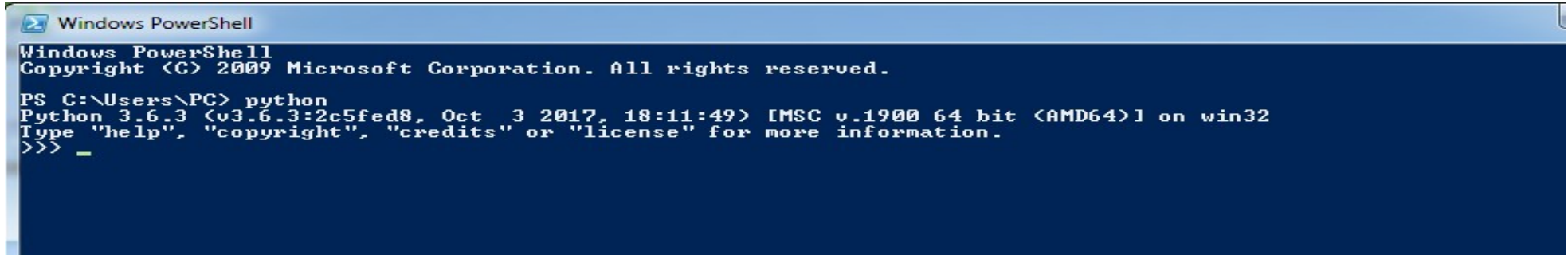
# Environment Settings





# Access python via cmd

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```
Windows PowerShell
Copyright (C) 2009 Microsoft Corporation. All rights reserved.

PS C:\Users\PC> python
Python 3.6.3 (v3.6.3:2c5fed8, Oct 3 2017, 18:11:49) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> _
```

`python -m pip install numpy`

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Version: 2017.3.2  
Build: 173.4127.16  
Released: December 28, 2017

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

## Download PyCharm

Windows

macOS

Linux

### Professional

Full-featured IDE  
for Python & Web  
development

[DOWNLOAD](#)

Free trial

### Community

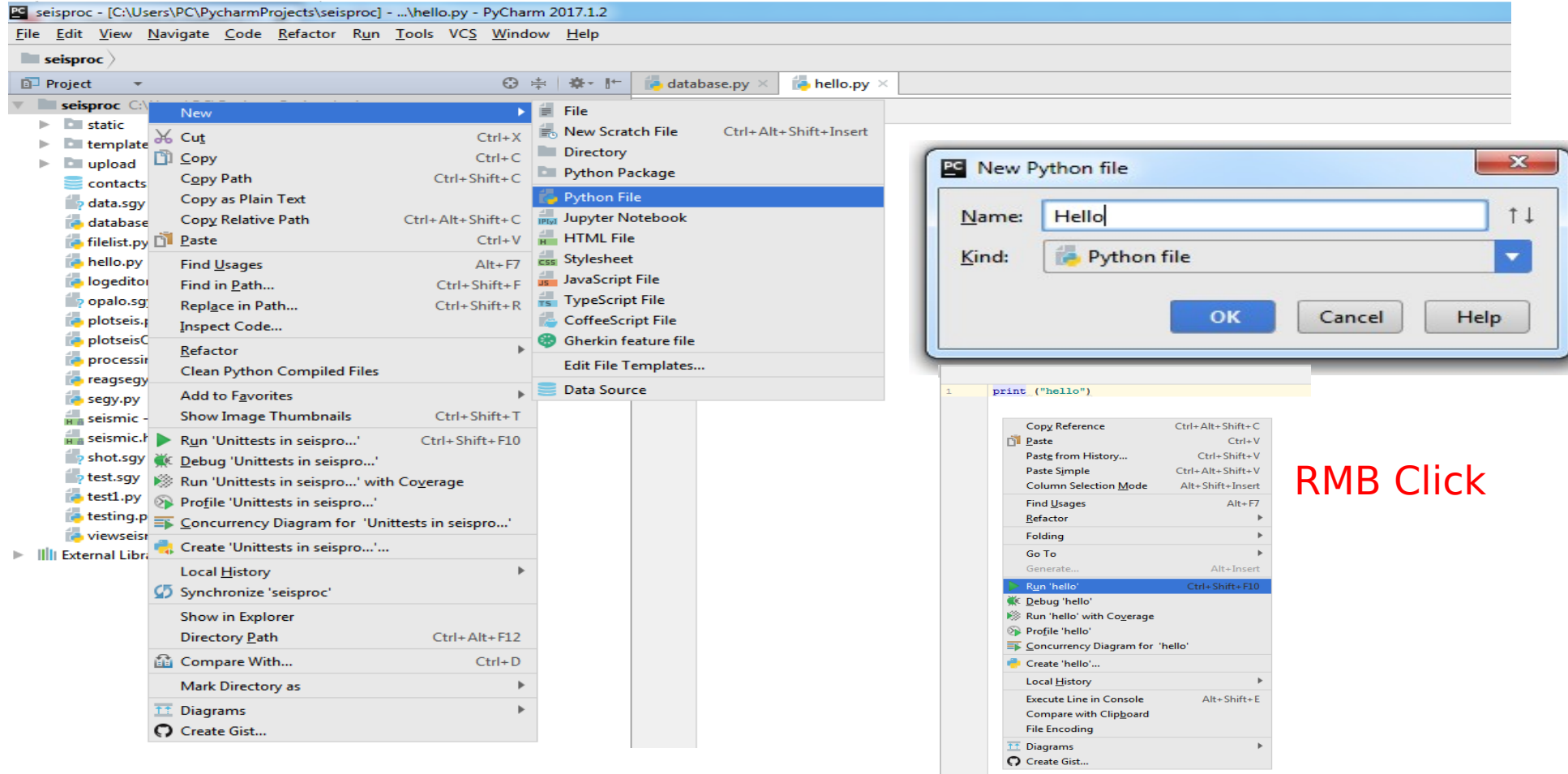
Lightweight IDE  
for Python & Scientific  
development

[DOWNLOAD](#)

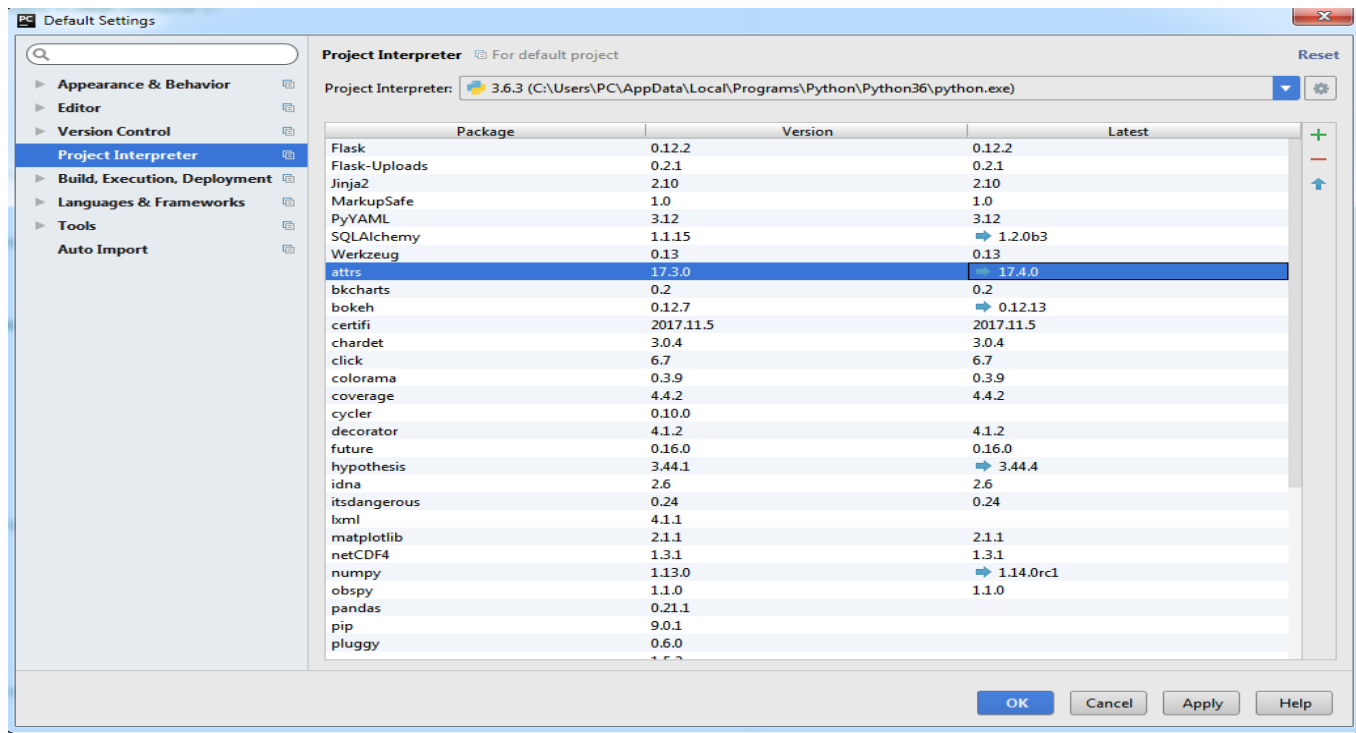
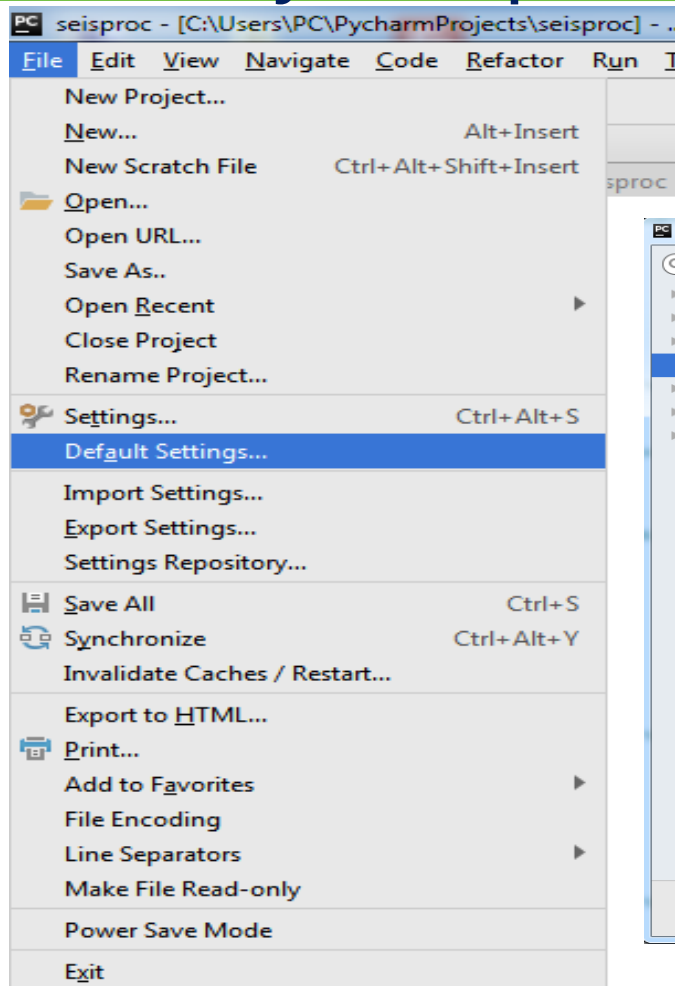
Free, open-source

Free!

# First Project



# Install Python package via Pycharm

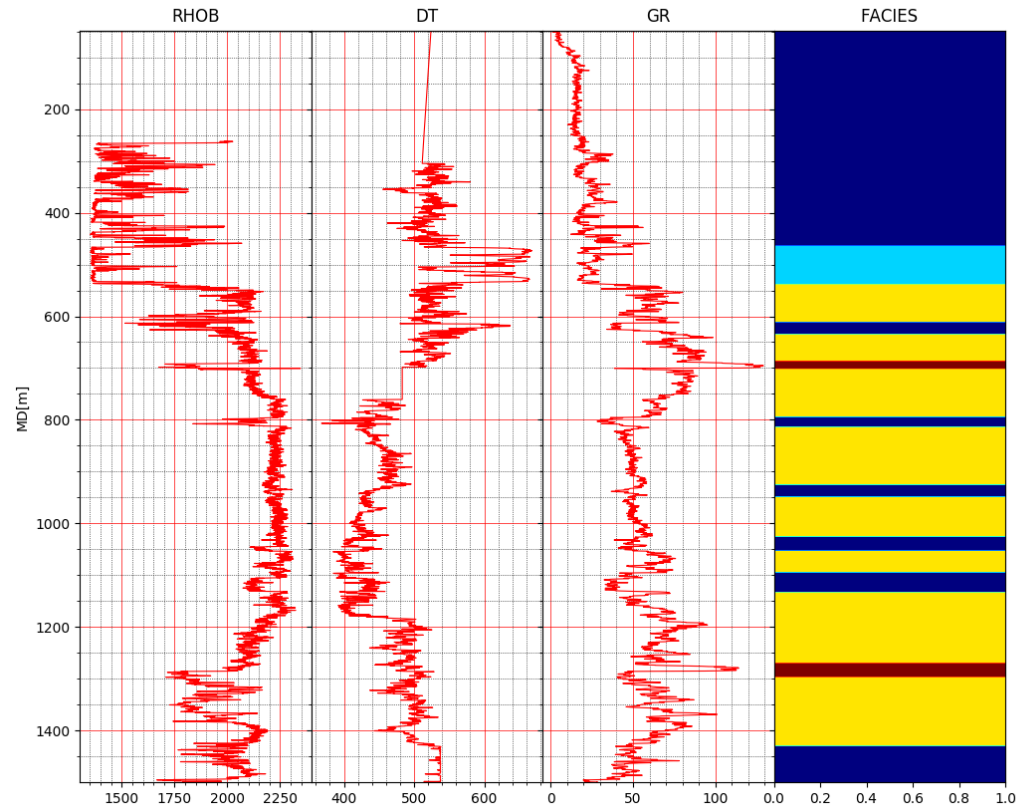


# Topics

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- Well logs file handling (I/O)
  - Well logs visualization and computation
  - Facies Prediction ML-KNN
  - Geophysical Signal: Ricker wavelet
  - Seismic modeling and visualization
-

# Well logs visualization





# Well logs computation using pandas

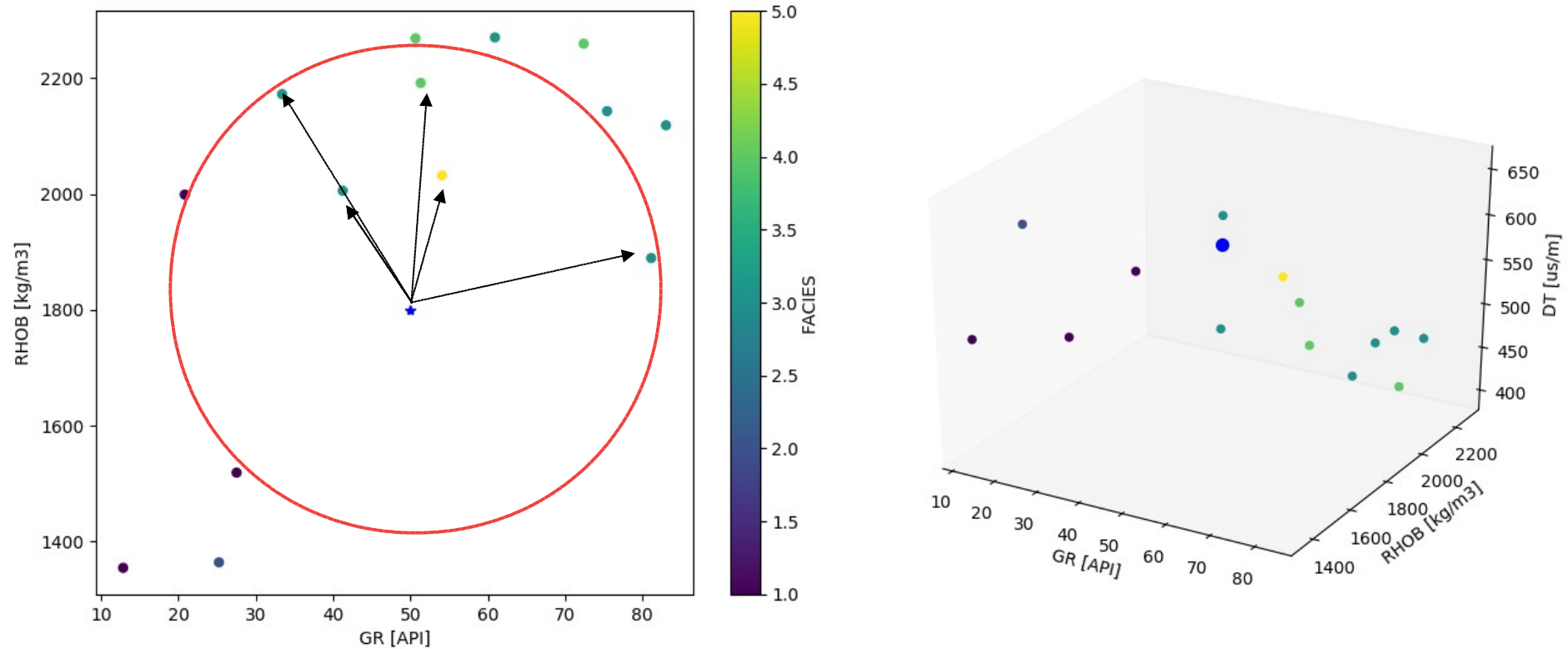
The screenshot displays the PyCharm IDE interface. The top pane shows a project file explorer on the left and a code editor on the right. The code editor is open to the file `099_Well_Logs_Pandas.py`, which contains the following Python code:

```
4 pd.set_option('display.max_columns', None)
5 # pd.set_option('display.max_rows', None)
6
7
8 filename='./WELLS/F02-1_logs.las'
9 data = np.loadtxt(filename, skiprows=35)
10 data[data==-999.2500]=np.nan
11 data = pd.DataFrame(data, columns=['DEPTH', 'RHOB', 'DT', 'GR', 'AI', 'AI'])
12 data = data[(data['DEPTH'] > 600) & (data['DEPTH'] < 1200)]
13 data = data.dropna(how='any')
14
15 print(data)
16 # data ['Vshale'] = (data.GR - min(data.GR)) / (max(data.GR) - min(d
```

The bottom pane shows the output of the script, titled `Run: 099_Well_Logs_Pandas`. It displays a table of well log data with the following columns: DEPTH, RHOB, DT, GR, AI, AIR, and PHIE. The data is shown for depths ranging from 3681 to 3687.

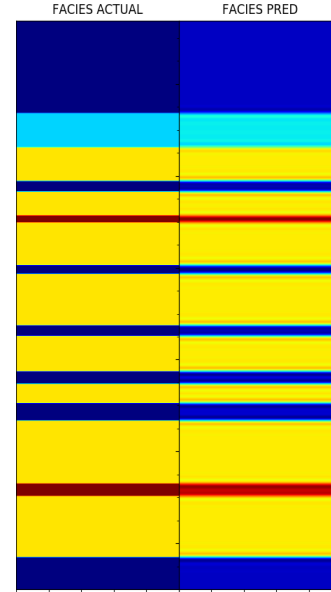
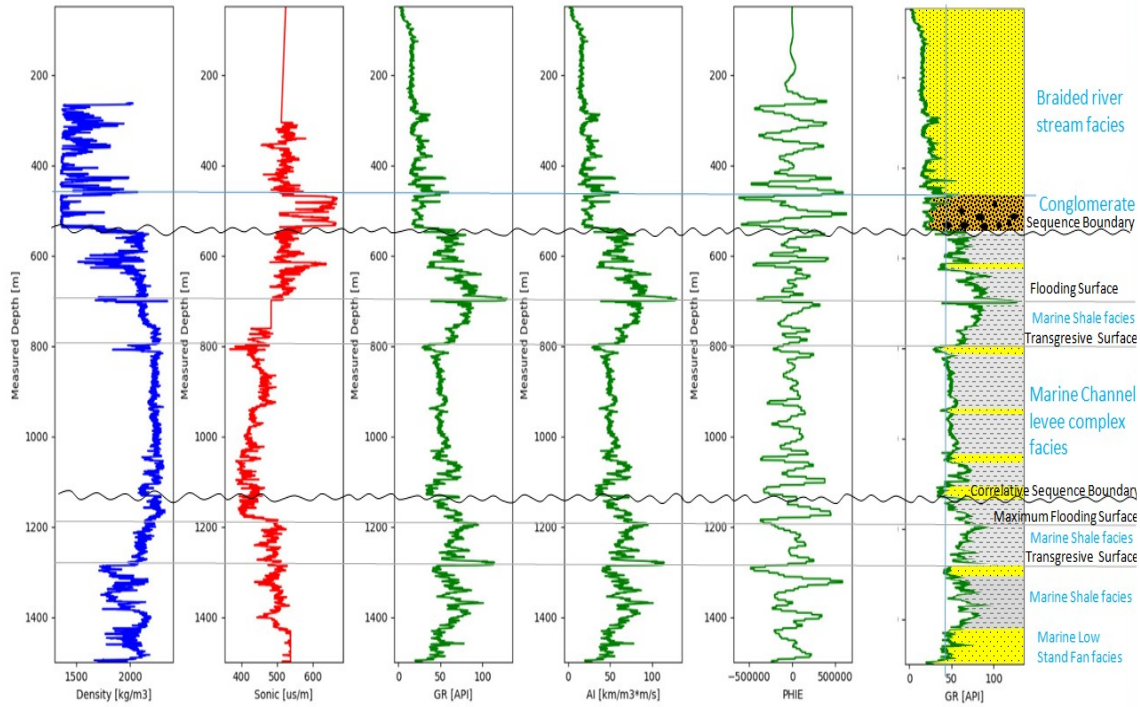
	DEPTH	RHOB	DT	GR	AI	AIR	PHIE
3681	600.1500	1937.2632	539.8325	59.7030	3588638.25	-249545.4531	0.4454
3682	600.3000	1936.0493	538.7640	59.6998	3593507.75	-59458.0117	0.4462
3683	600.4500	1925.3000	543.6034	59.4736	3541736.50	62003.9023	0.4529
3684	600.6000	1895.7000	550.6479	57.8395	3442671.50	62003.9023	0.4714
3685	600.7500	1901.9180	549.5013	57.2965	3461171.25	62003.9023	0.4676
3686	600.9000	1905.0931	545.2362	57.8211	3494078.25	62003.9023	0.4656
3687	601.0500	1915.5045	534.1101	58.3078	3586607.50	62003.9023	0.4500

# Facies prediction ML-KNN

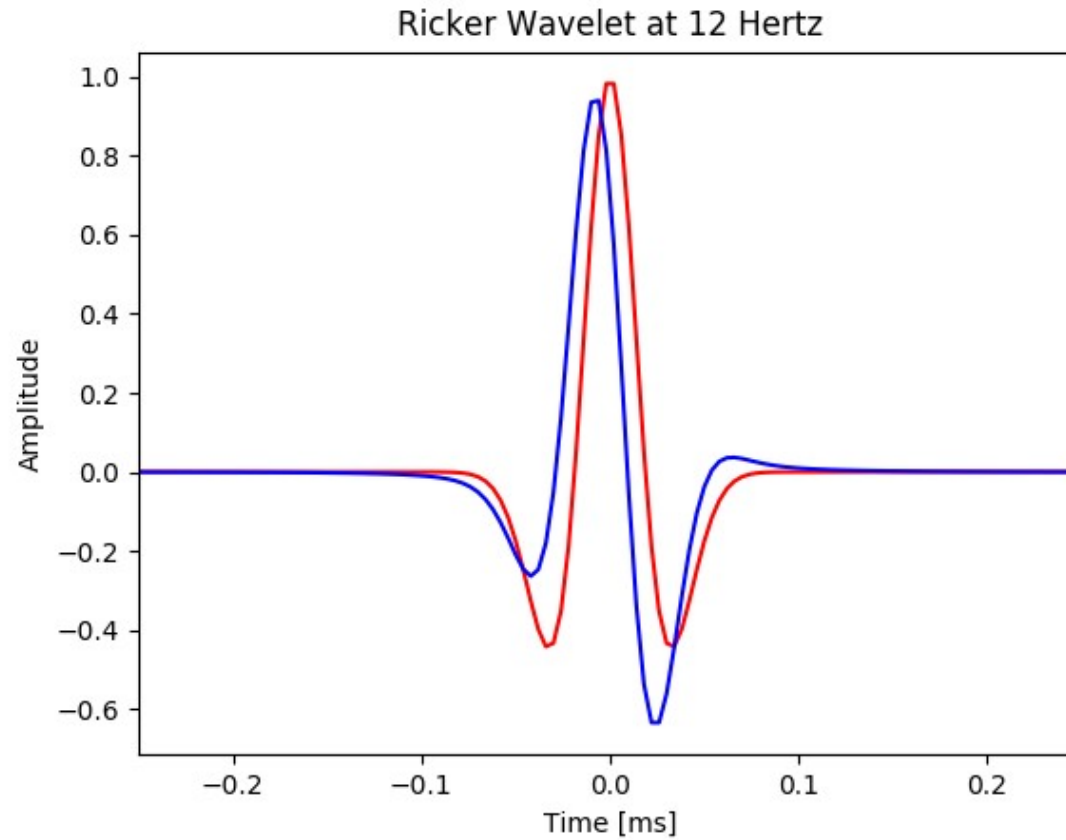


In some cases parameters normalization is required prior to KNN

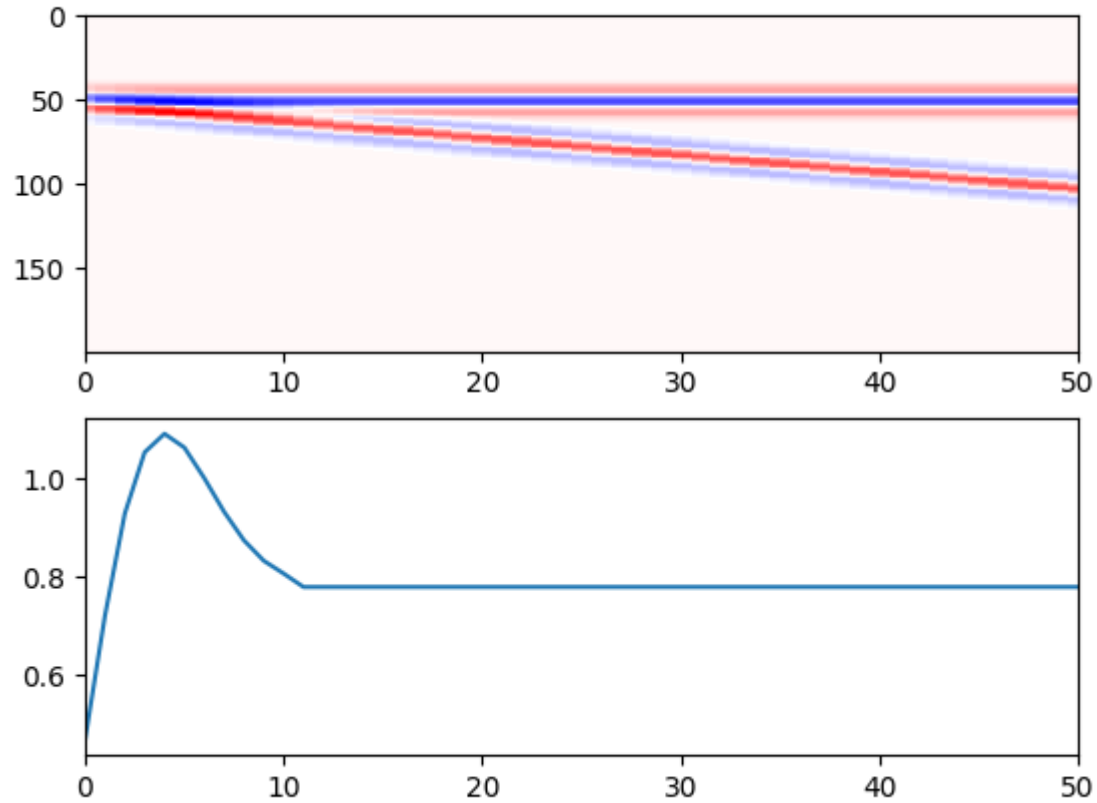
# Facies prediction ML-KNN



# Ricker wavelet and phase rotation



# Seismic Modeling



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Thank You

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