Introduction to Python and Data Science

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Python Introduction

Why Python ?

- General-purpose programming language (Batteries included)

Figure 1: Lots of libraries

Python Introduction

Why Python ?

- General-purpose programming language (Batteries included)
- Emphasizes Readability and on Productivity

```
print "Hello World!"
```

Python Introduction

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```
def f(x):
    return x**3

print f(2)
```

Python Introduction

Why Python ?

- General-purpose programming language (Batteries included)
- Emphasizes Readability and on Productivity
- It's free!

Python Introduction

Figure 2: Python 2.7 is the recommended version

Outline

- Hands-on experience
  - Python Fundamentals
  - Data Manipulation and classification
- Future
  - Machine Learning
  - Computer Vision

First steps

Is python (Anaconda) installed ?

- Type python in command prompt or terminal

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```
wunderkind:~$ python
Python 2.7.11 |Anaconda 4.0.0 (64-bit)| (default, Dec  6 2015, 18:08:32)
[GCC 4.4.7 20120313 (Red Hat 4.4.7-1)] on linux2
Type "help", "copyright", "credits" or "license" for more information.
Anaconda is brought to you by Continuum Analytics.
Please check out: http://continuum.io/thanks and https://anaconda.org
```

First steps

Launch Jupyter

- Type the following in command prompt or terminal

```
> jupyter notebook
```

Main types

1. Integers

```
a = 3
b = 5

print a + b
```

2. Float

```
a = 3.56
b = 5.23

print a + b
```

Main types

3. String

```
name = "Hello World"

print name
```

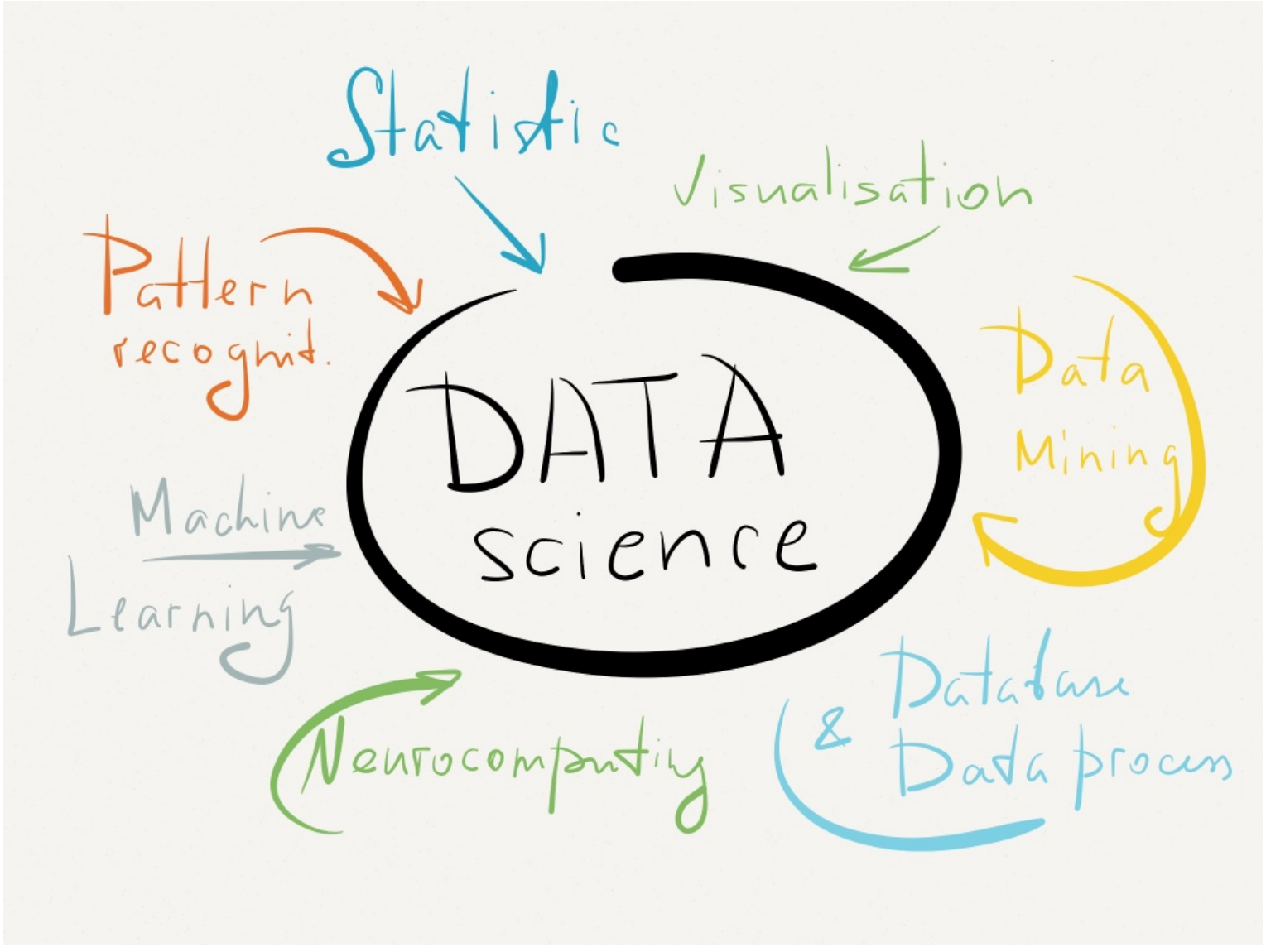
Importing libraries

```
import numpy as np

np.log(3)
np.exp(5)
np.array([3,2,1])
```

```
import pylab as plt

plt.scatter([1,2,3,4], [1,2,3,4])
```

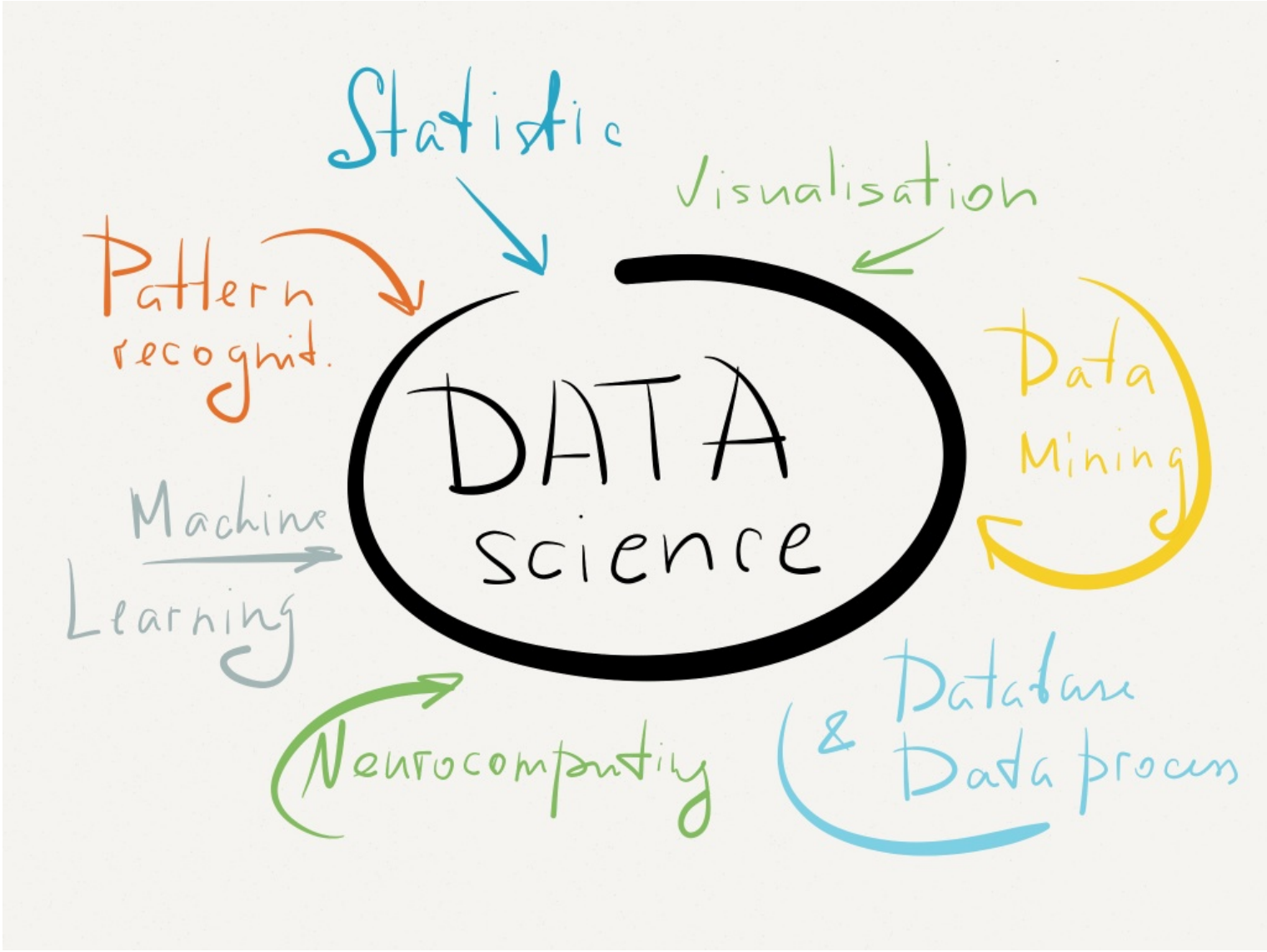
Data Science

- The term "data science" has exploded in business environments



Data Science

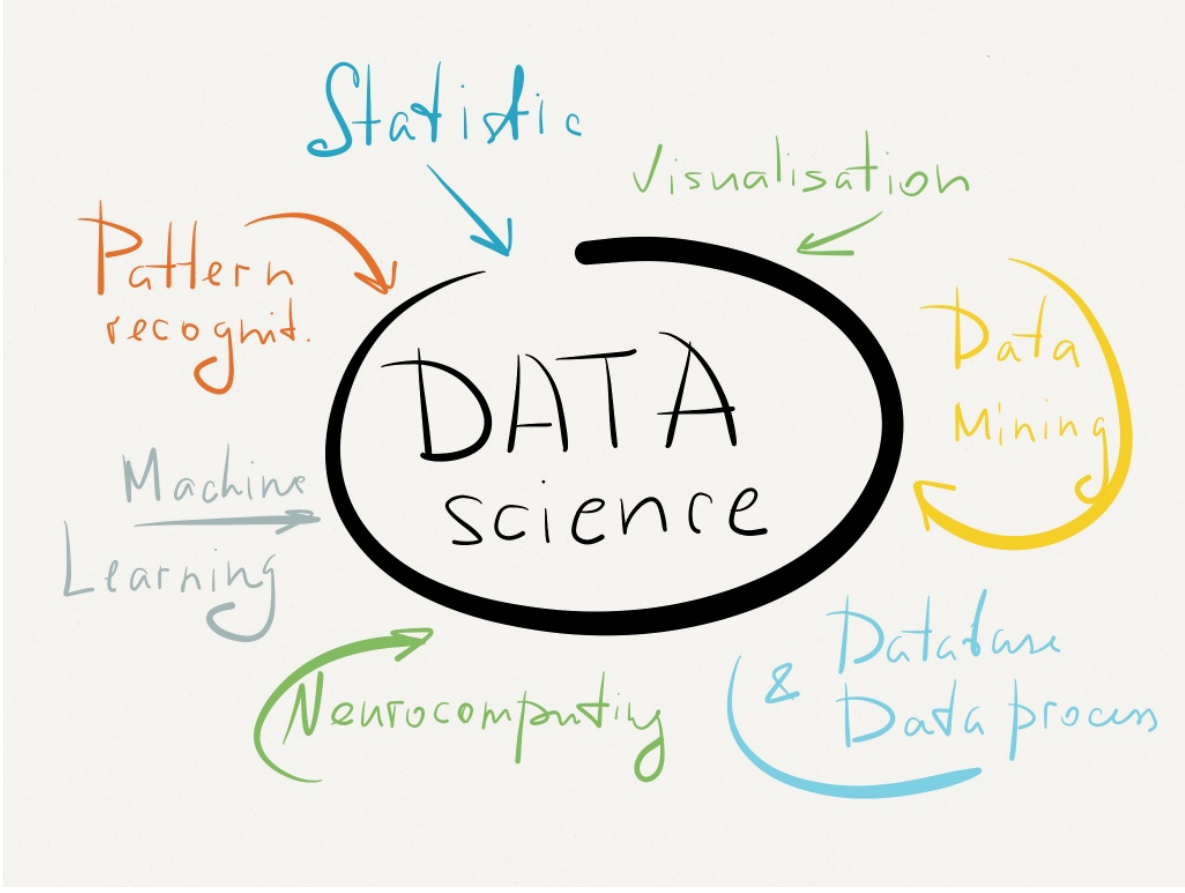
- Many academics and journalists see no distinction between data science and statistics



Data Science

Nate Silver

- Sexed-up term for statistics. Statistics is a branch of science. Data scientist is slightly redundant in some way and people shouldn't berate the term statistician



Data Science

- Find and interpret rich data sources
- Create visualizations to aid in understanding data
- Data Scientists are people who turn data into applications

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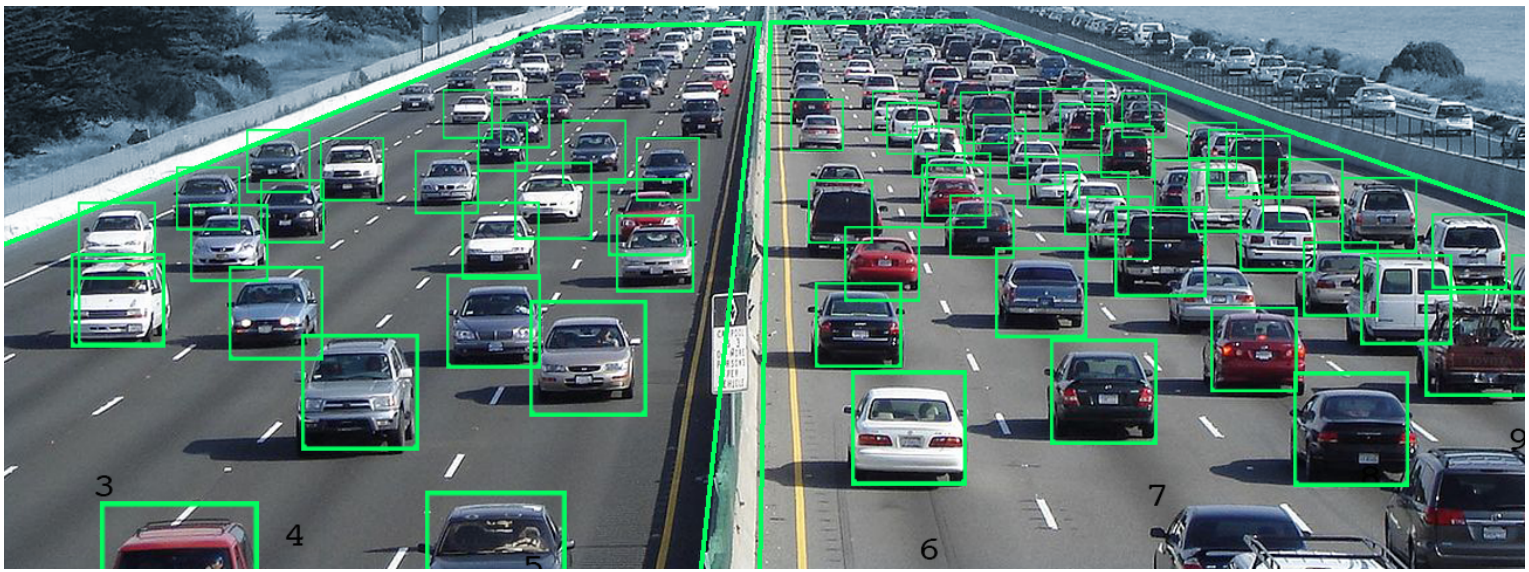

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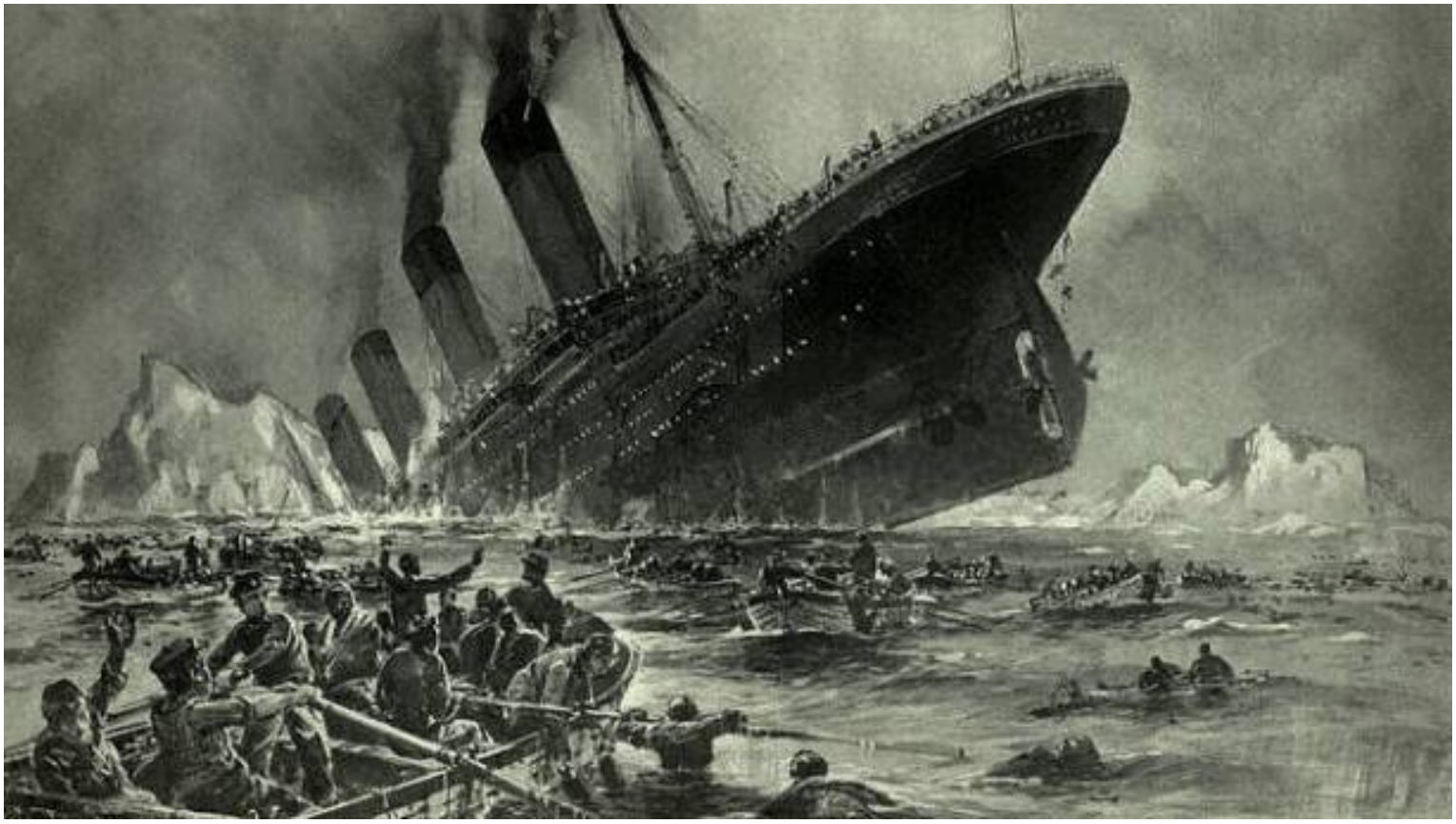
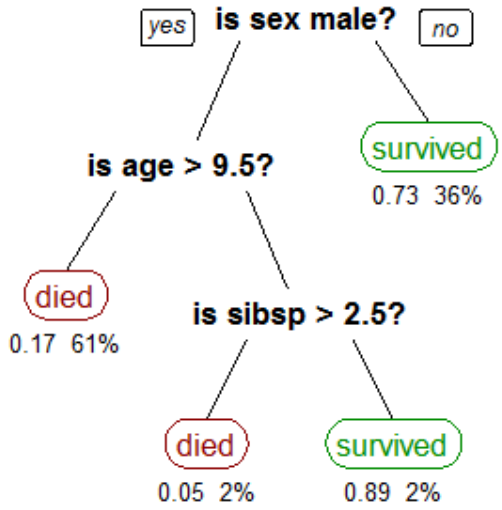
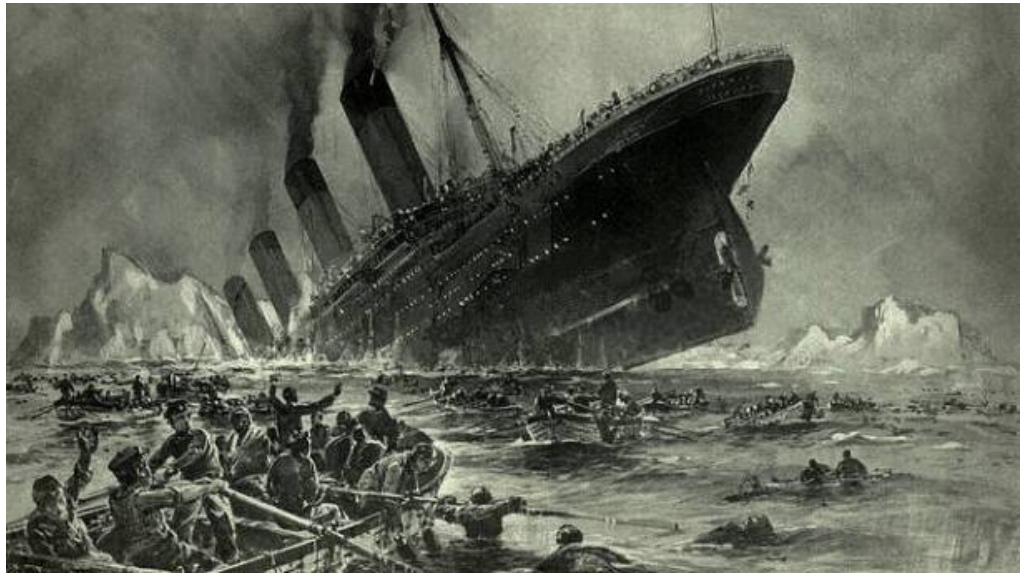


Data Science



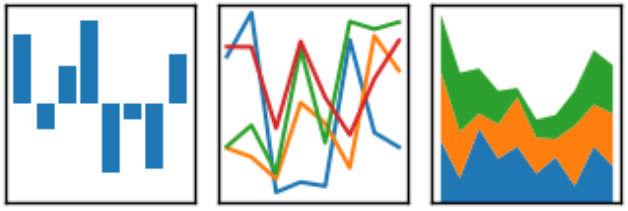


Python libraries for data science

- Pandas (for data manipulation and visualization)

pandas

$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$



- Scikit-learn (for machine learning)

scikits learn

machine learning in Python

Titanic Dataset

On April 15, 1912

- the Titanic sank after colliding with an iceberg
  - killing 1502 out of 2224 passengers and crew.
  - There were not enough lifeboats for the passengers and crew.
- Some groups of people were more likely to survive than others, such as women, children, and the upper-class.

Task

- What sorts of people were likely to survive ?
- Use Data Science or Machine Learning to predict which passengers survived the tragedy.

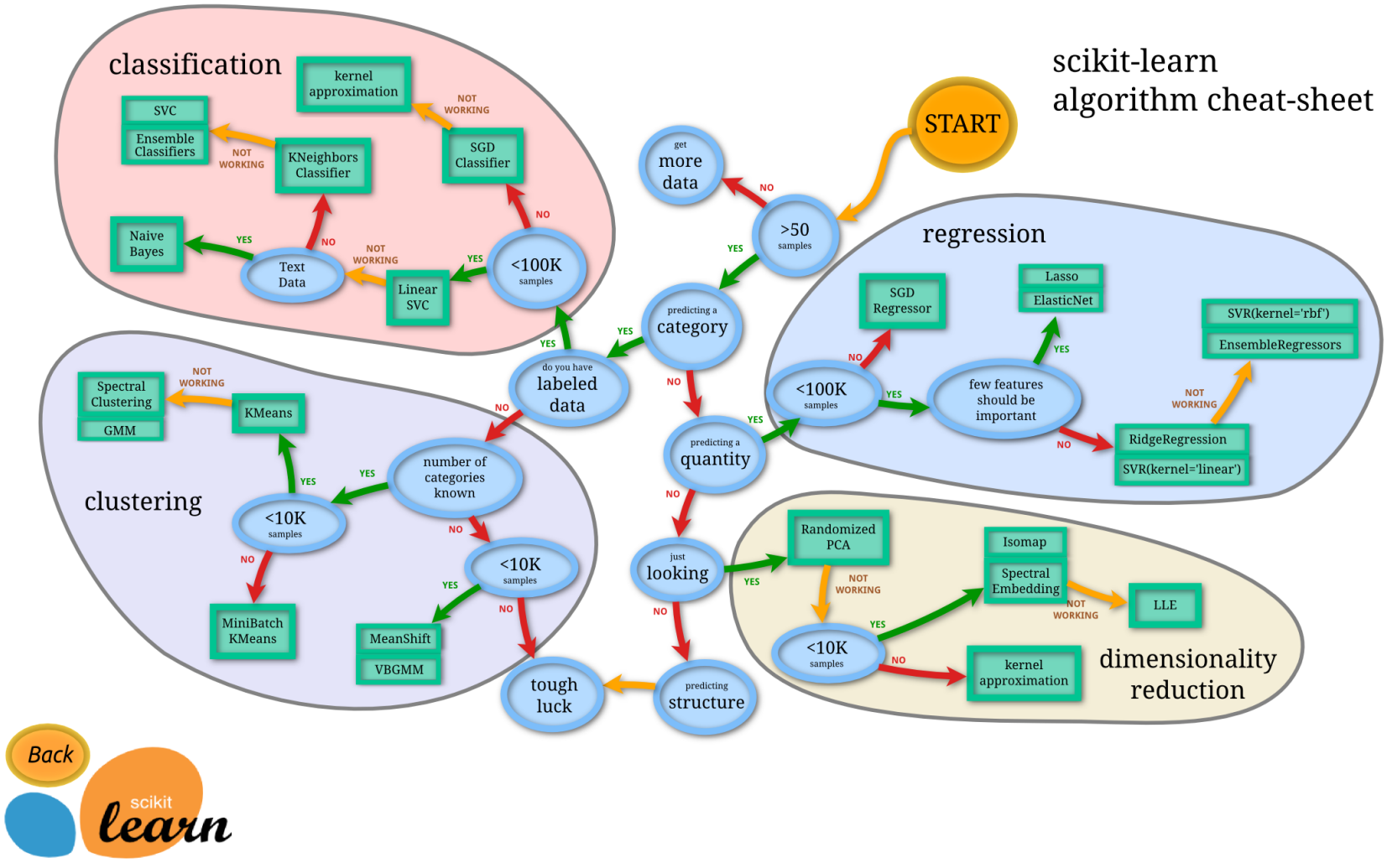
Titanic Dataset

Data Dictionary

Variable	Definition	Key
survival	Survival	0 = No, 1 = Yes
pclass	Ticket class	1 = 1st, 2 = 2nd, 3 = 3rd
sex	Sex	
Age	Age in years	
sibsp	# of siblings / spouses aboard the Titanic	
parch	# of parents / children aboard the Titanic	
ticket	Ticket number	
fare	Passenger fare	
cabin	Cabin number	
embarked	Port of Embarkation	C = Cherbourg, Q = Queenstown, S = Southamp

- Download link: goo.gl/oF5GBc

Sklearn


scikit-learn
algorithm cheat-sheet
START
>50 samples
get more data
predicting a category
do you have labeled data
predicting a quantity
just looking
predicting structure
tough luck
classification
kernel approximation
SVC
Ensemble Classifiers
KNeighbors Classifier
SGD Classifier
Naive Bayes
Text Data
Linear SVC
<100K samples
regression
SGD Regressor
Lasso
ElasticNet
SVR(kernel='rbf')
EnsembleRegressors
<100K samples
few features should be important
RidgeRegression
SVR(kernel='linear')
clustering
Spectral Clustering
GMM
KMeans
number of categories known
<10K samples
MiniBatch KMeans
<10K samples
MeanShift
VBGMM
dimensionality reduction
Randomized PCA
Isomap
Spectral Embedding
LLE
<10K samples
kernel approximation
YES
NO
NOT WORKING
Back
scikit learn