UFRN

Open Data Day
Natal, Brazil

01 a 03 de março de 2018

Minicourse

Machine Learning Fundamentals in Python - Platform & First Model

Speaker:
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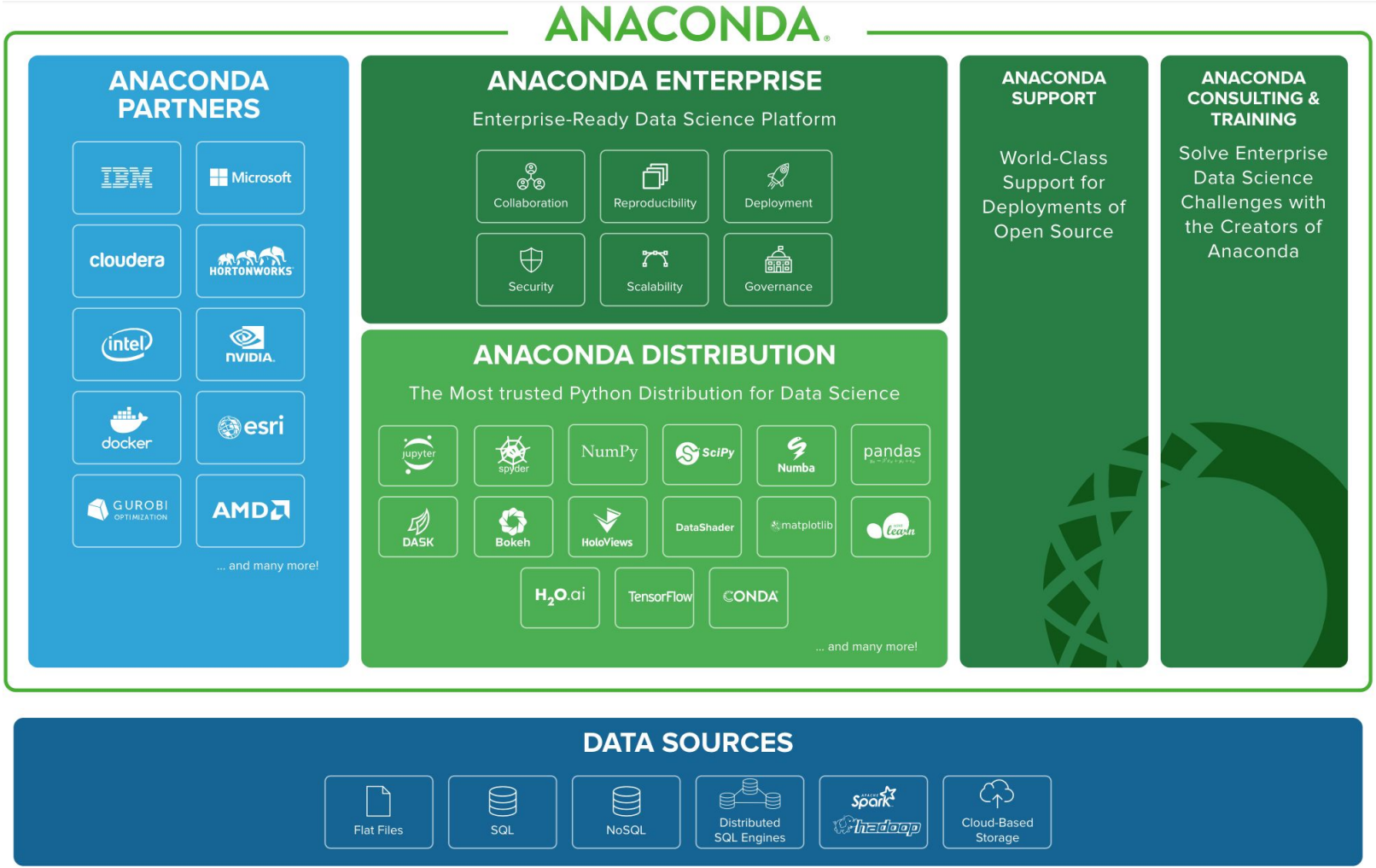
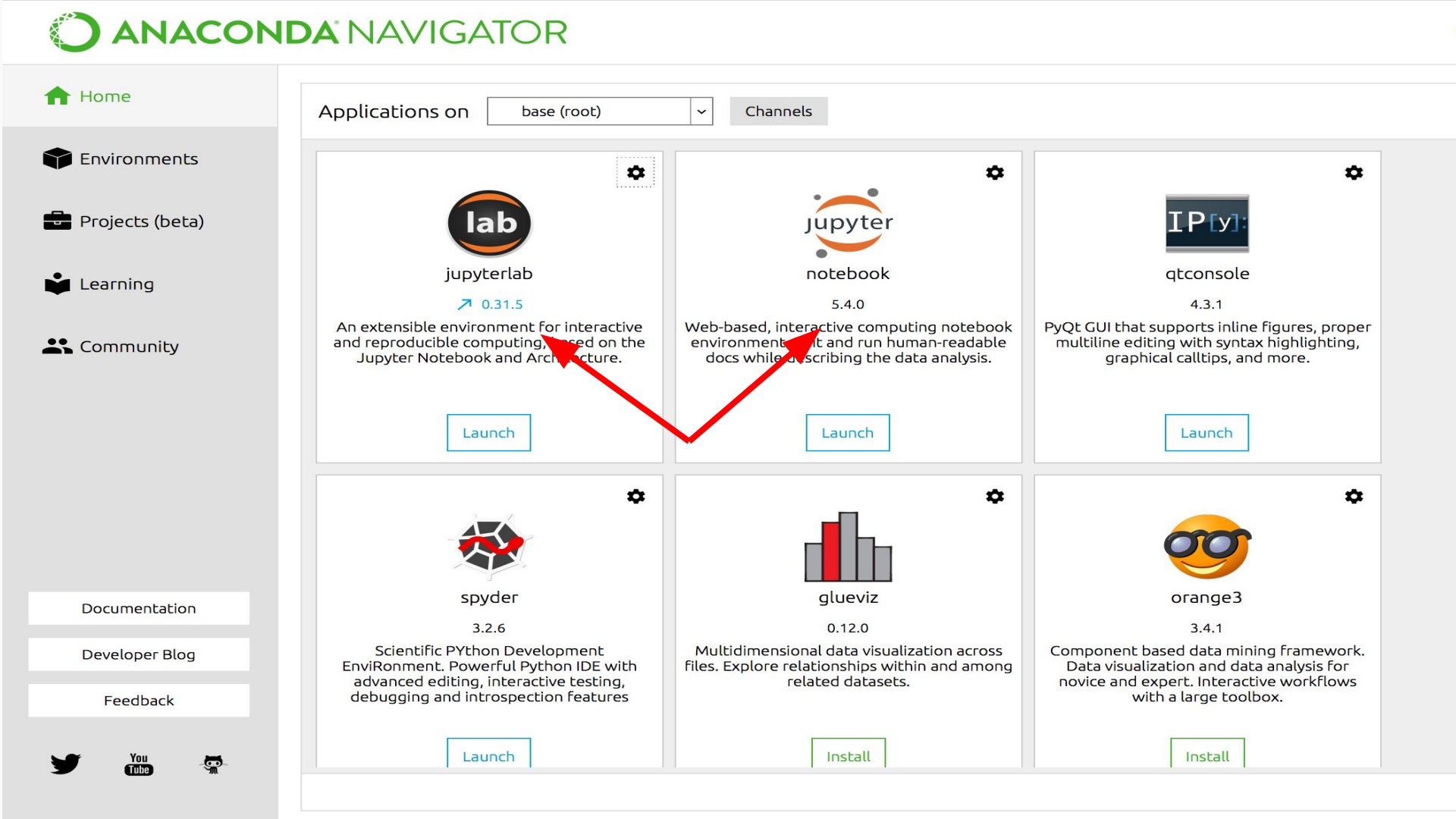
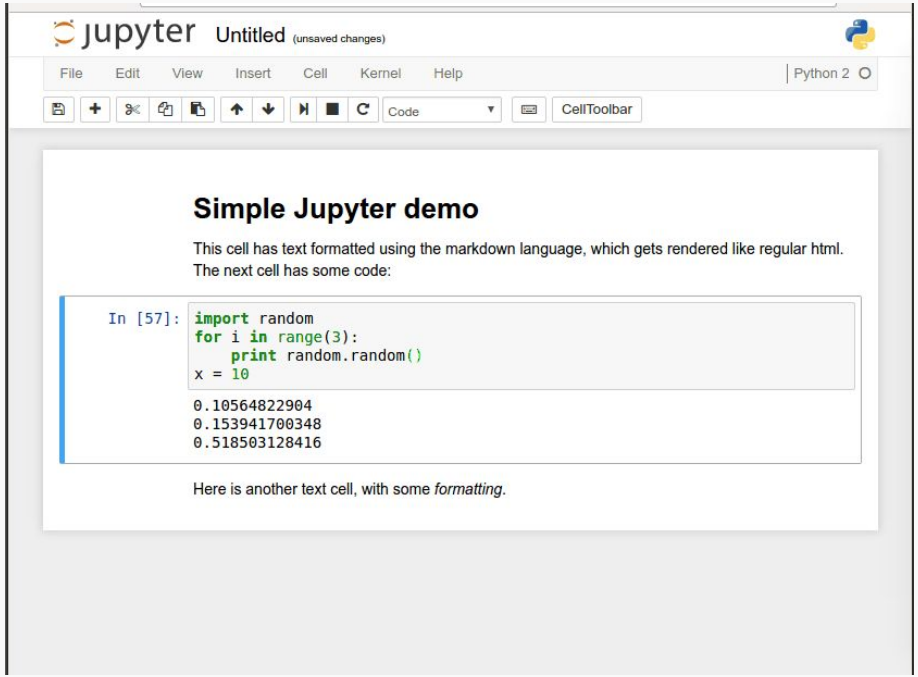
https://www.continuum.io/downloads

Why Anaconda?




ANACONDA NAVIGATOR
Home
Environments
Projects (beta)
Learning
Community
Documentation
Developer Blog
Feedback
Applications on
base (root)
Channels
jupyterlab
0.31.5
An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.
Launch
notebook
5.4.0
Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.
Launch
qtconsole
4.3.1
PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.
Launch
spyder
3.2.6
Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features
Launch
glueviz
0.12.0
Multidimensional data visualization across files. Explore relationships within and among related datasets.
Install
orange3
3.4.1
Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox.
Install

What is a Jupyter Notebook?



Mix of code and rich elements (text, figures, links, equations, etc)

Aside from JUlia, PYThon and R (JUPYTER) notebook technology also supports many other languages. https://github.com/jupyter/jupyter/wiki/Jupyter-kernels

https://goo.gl/LfEx5r

Setup a data science environment on Cloud

https://www.datacamp.com/community/tutorials/google-cloud-data-science

https://www.datacamp.com/community/tutorials/deep-learning-jupyter-aws

NumPy

pandas

$y_i t = \beta' x_{it} + \mu_i + \epsilon_{it}$

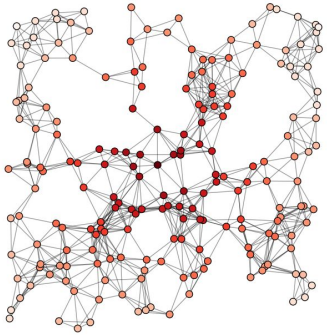
Keras

TensorFlow

scikit learn

NetworkX

PyGSP



matplotlib

Folium

GeoJSON

Seaborn

plotly

Requests

bokeh

Leaflet

Beautiful Soup

Scrapy

EVOLUTION

MAPS

FLOW

Other

THE PYTHON GRAPH GALLERY

https://python-graph-gallery.com/

DISTRIBUTION

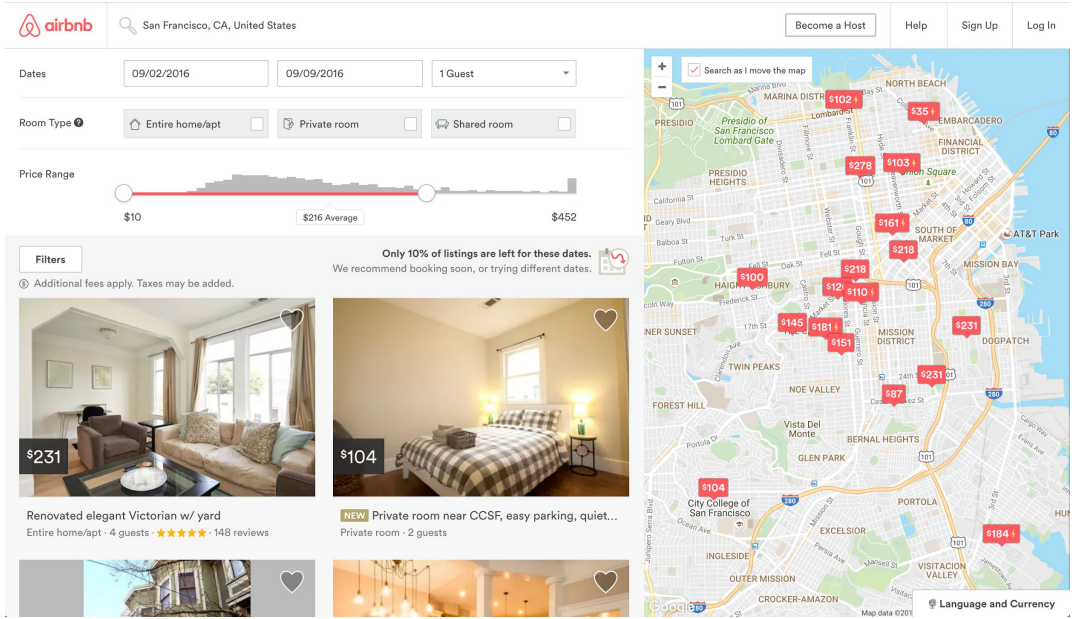
CORRELATION

RANKING

PART OF A WHOLE

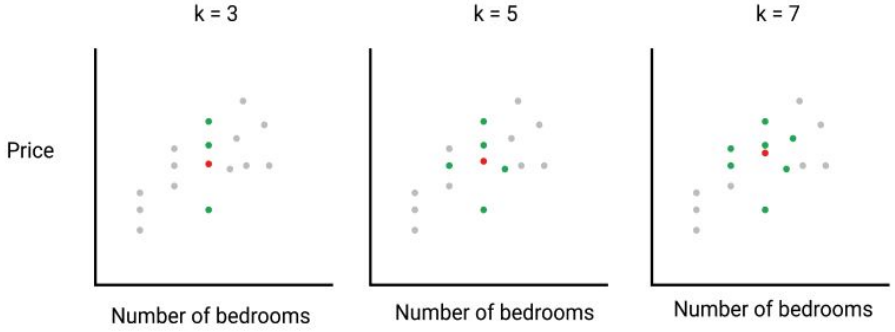
Problem definition

One challenge that hosts looking to rent their living space face is <u>determining the optimal nightly rent price</u>



- host_response_rate: the response rate of the host
- host_acceptance_rate: number of requests to the host that convert to rentals
- host_listings_count: number of other listings the host has
- latitude: latitude dimension of the geographic coordinates
- longitude: longitude part of the coordinates
- city: the city the living space resides
- zipcode: the zip code the living space resides
- state: the state the living space resides
- accommodates: the number of guests the rental can accommodate
- room_type: the type of living space (Private room, Shared room or Entire home/apt
- bedrooms: number of bedrooms included in the rental
- bathrooms: number of bathrooms included in the rental
- beds: number of beds included in the rental
- price: nightly price for the rental
- cleaning_fee: additional fee used for cleaning the living space after the guest leaves
- security_deposit: refundable security deposit, in case of damages
- minimum_nights: minimum number of nights a guest can stay for the rental
- maximum_nightss: maximum number of nights a guest can stay for the rental
- number_of_reviews: number of reviews that previous guests have left

Select the number of similar listings, **k**, you want to compare with.



For each listing, calculate how similar it is to our unpriced listing.

For this example, we'll use 3 for our **k** value.

K-Nearest Neighbors

Rank each listing by the similarity metric and select the first **k** listings.

Calculate the mean list price for the **k** similar listings and use as our list price.

Euclidean distance

$$d = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2 + \ldots + (q_n - p_n)^2}$$

index	host_listings_count	accommodates	bedrooms	bathrooms	beds
0	26	4	1	1	2
1	1	6	3	3	3

$(q_1 - p_1) + (q_2 - p_2) + \ldots + (q_n - p_n)$ differences $(26 - 1) + (4 - 6) + (1 - 3) + (1 - 3) + (2 - 3)$

$(q_1 - p_1)^2 + (q_2 - p_2)^2 + \ldots + (q_n - p_n)^2$ squared differences $(25)^2 + (-2)^2 + (-2)^2 + (-2)^2 + (-1)^2$

$\sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2 + \ldots + (q_n - p_n)^2}$

Euclidean distance

$= \sqrt{625 + 4 + 4 + 4 + 1}$

$= \sqrt{638}$

$= 25.258661$

Euclidean distance - example

Univariate case

$$d = \sqrt{(q_1 - p_1)^2}$$

$$d = |q_1 - p_1|$$

	accommodates
our listing	8

	index	accommodates	distance
dc_listings	0	4	$(4 - 8)^2$
	1	6	$(6 - 8)^2$
	2	1	$(1 - 8)^2$
	3	2	$(2 - 8)^2$

Randomizing and sorting

```
dc_listings[dc_listings["distance"] == 0]["accommodates"]
26       3
34       3
36       3
40       3
44       3
45       3
48       3
65       3
66       3
71       3
75       3
86       3
...
```

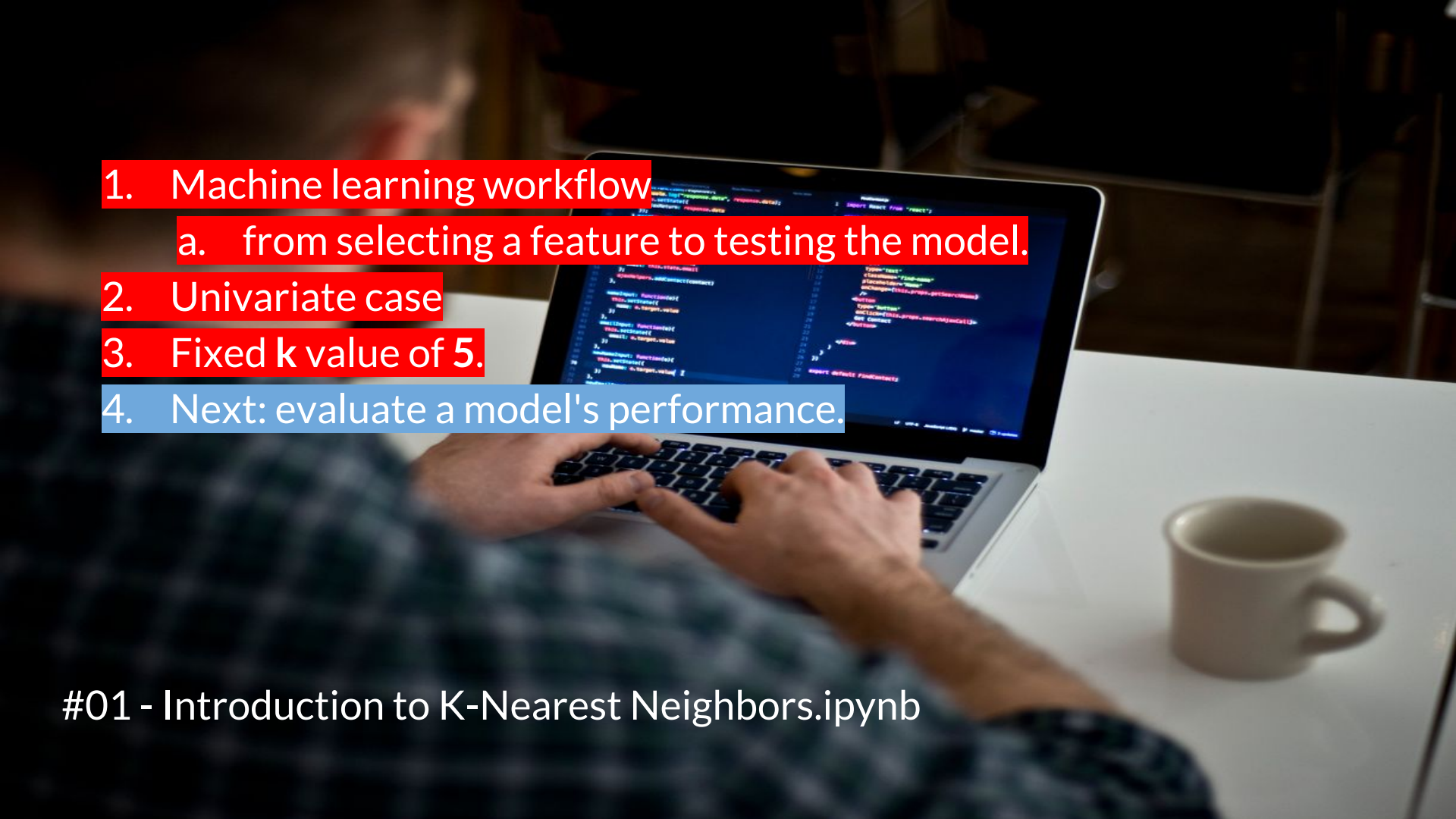
Cleaning & preparing data

```
# Brought along the changes we made to the `dc_listings` Dataframe.
dc_listings = pd.read_csv('dc_airbnb.csv')
stripped_commas = dc_listings['price'].str.replace(',', '')
stripped_dollars = stripped_commas.str.replace('$', '')
dc_listings['price'] = stripped_dollars.astype('float')
dc_listings = dc_listings.loc[np.random.permutation(len(dc_listings))]
```

Made your first prediction!!!!

Function to make predictions

```
def predict_price(new_listing):
    temp_df = dc_listings
    temp_df['distance'] = temp_df['accommodates'].apply(lambda x: np.abs(x - new_listing))
    temp_df = temp_df.sort_values('distance')
    nearest_neighbors = temp_df.iloc[0:5]['price']
    predicted_price = nearest_neighbors.mean()
    return(predicted_price)
```



1. Machine learning workflow
    a. from selecting a feature to testing the model.
2. Univariate case
3. Fixed **k** value of **5**.
4. Next: evaluate a model's performance.

#01 - Introduction to K-Nearest Neighbors.ipynb