Python

A Problem Solving Kit

10 May 2021(Monday)

11-1pm

Alvin Alexander

Geotechnician @ JX Nippon

https://github.com/elvinado/Problem-Solving-Kit

- Go to menti.com
- Use this code 8409 3511

Before we start

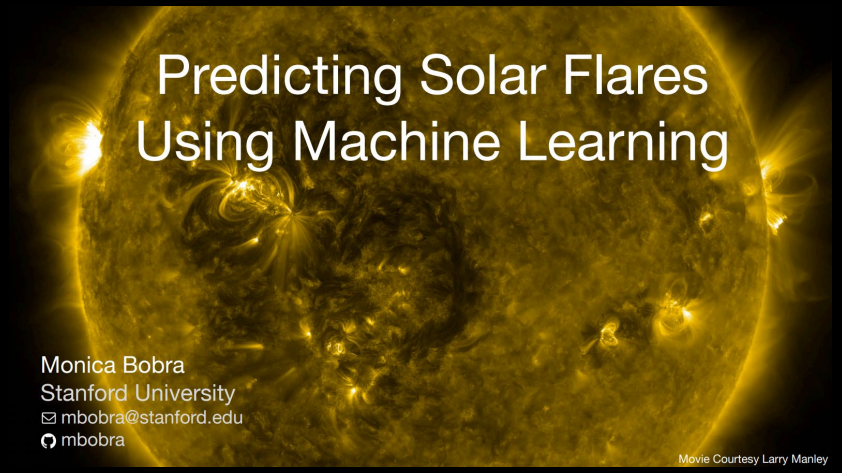
- Go to http://bit.ly/3qq7iNU (.ipynb file)
- Click 

- Login to your google account

Alternatively you can download the .ipynb file and open in your own computer

Let’s see how people use Python out there

A to Z of Python Usage

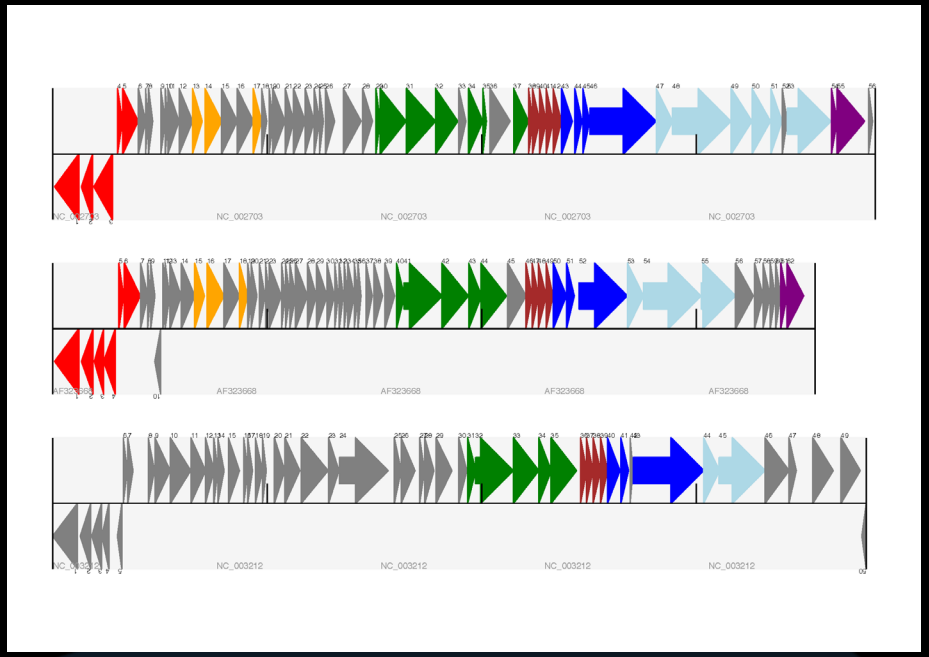


Predicting Solar Flares Using Machine Learning Methods by Monica Bobra

Astrophysics

Notable Package – Astropy

https://youtu.be/drvQKtIuN5U

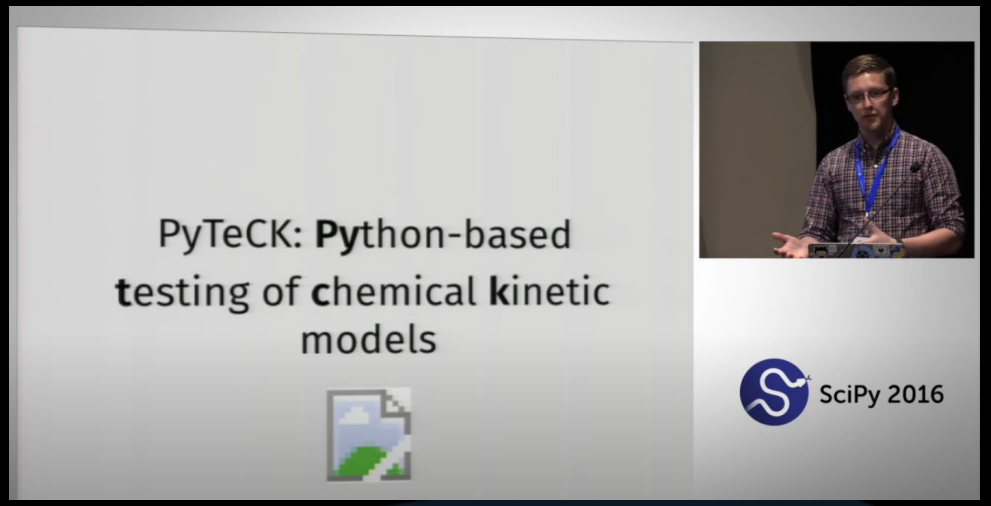


Three phage genomes diagram side by side (BioPython Tutorial)

Biology/Genomic

Notable Package – BioPython

http://biopython.org/DIST/docs/tutorial/Tutorial.html#sec347

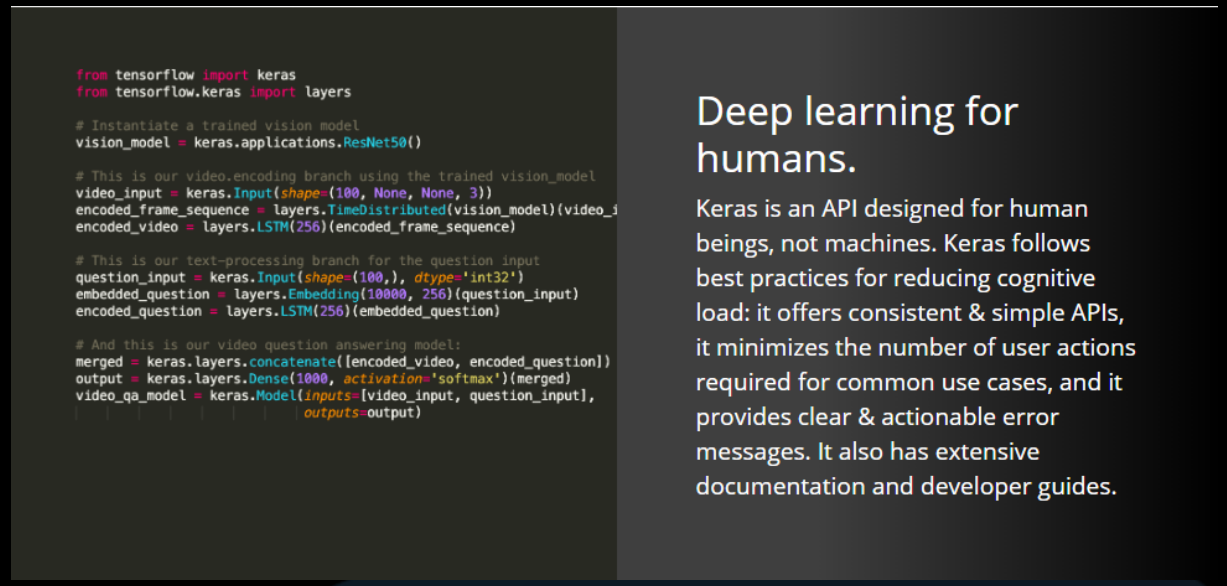


PyTeCK: A Python-based automatic testing package for chemical kinetic models by Kyle Nie

Chemistry

Notable Packages – ChemPy, Chemlib, etc. check Awesome Python Chemistry

https://youtu.be/Ke3Ip25C4pY

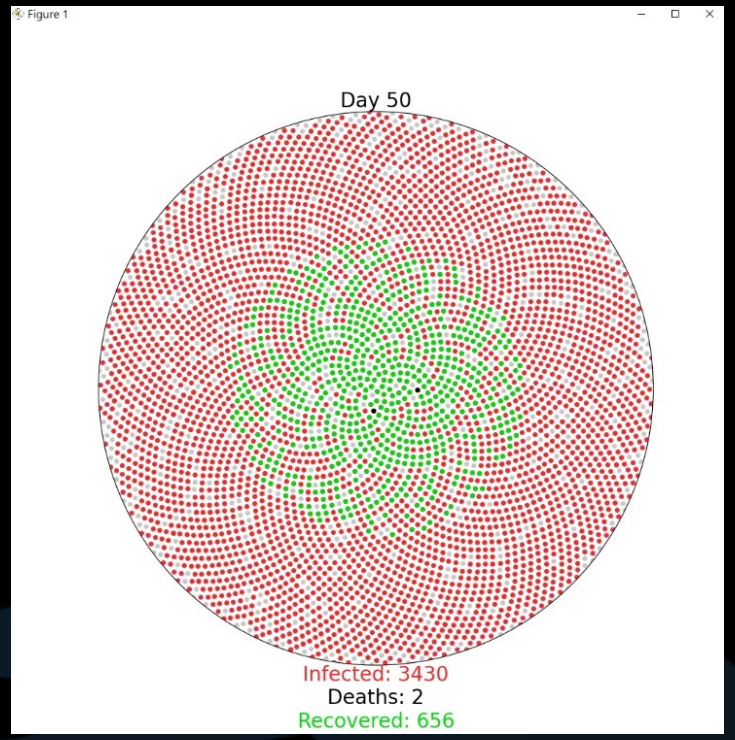


Keras is a deep learning API written in Python, running on top of the machine learning platform TensorFlow.

Deep Neural Network

Notable Packages – Keras, TensorFlow, PyTorch

https://keras.io/

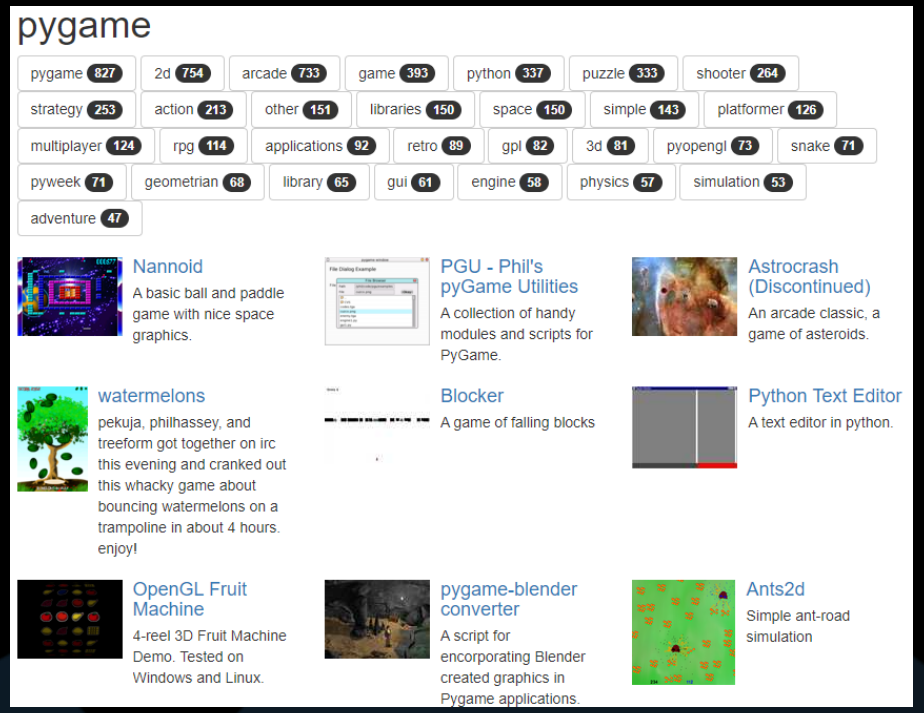


Simulating Epidemic using Python, NumPy & Matplotlib Tutorial by KITE youtube

Epidemiology

Notable Packages – NumPy, Matplotlib

https://youtu.be/KAmZe5D3v5I



Pygame is a set of Python modules designed for writing video games.

Fun

Notable Package – PyGame

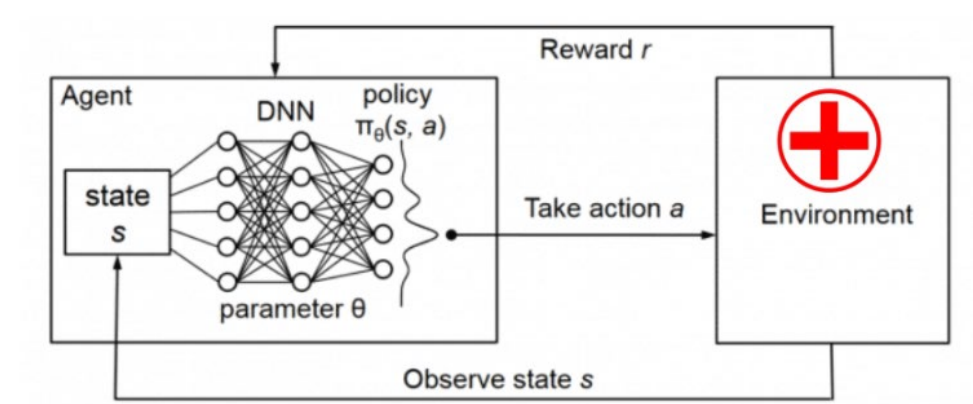
https://www.pygame.org/news

Introduction to Spatial Analysis in Python with Geopandas – Tutorial By Hatari Lab

Geographic Information System

Notable Packages – GeoPandas

https://youtu.be/h5sy0z2BUTo



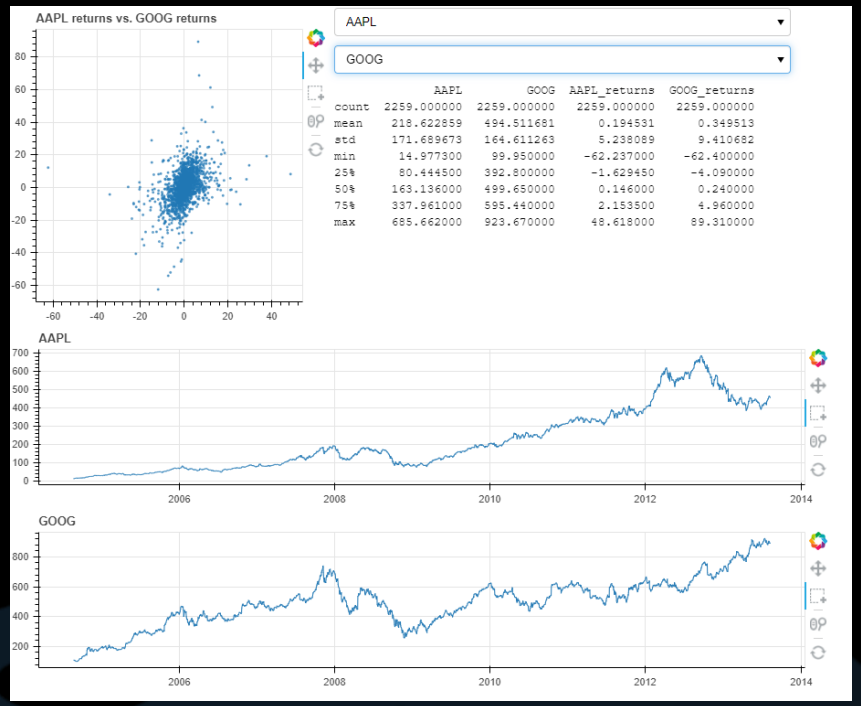
Experiments in combining Deep Reinforcement Learning (using PyTorch) and Hospital Simulation (using SimPy)

The Learning Hospital: learn how to manage the bed stock

Healthcare

Notable Packages – Simpy (for simulation)

https://pythonhealthcare.org/the-learning-hospital/

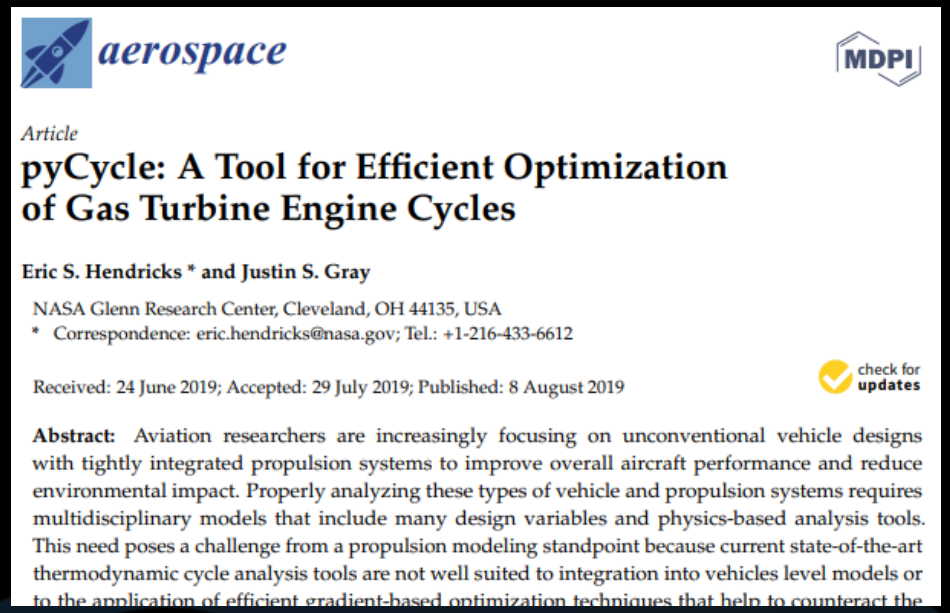


Linked plots, summary statistics, and correlations for market data

Interactivity & Visualization

Notable Packages – Bokey, Plotly

https://demo.bokeh.org/stocks



aerospace

MDPI

Article

pyCycle: A Tool for Efficient Optimization of Gas Turbine Engine Cycles

Eric S. Hendricks * and Justin S. Gray

NASA Glenn Research Center, Cleveland, OH 44135, USA
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Received: 24 June 2019; Accepted: 29 July 2019; Published: 8 August 2019

check for updates

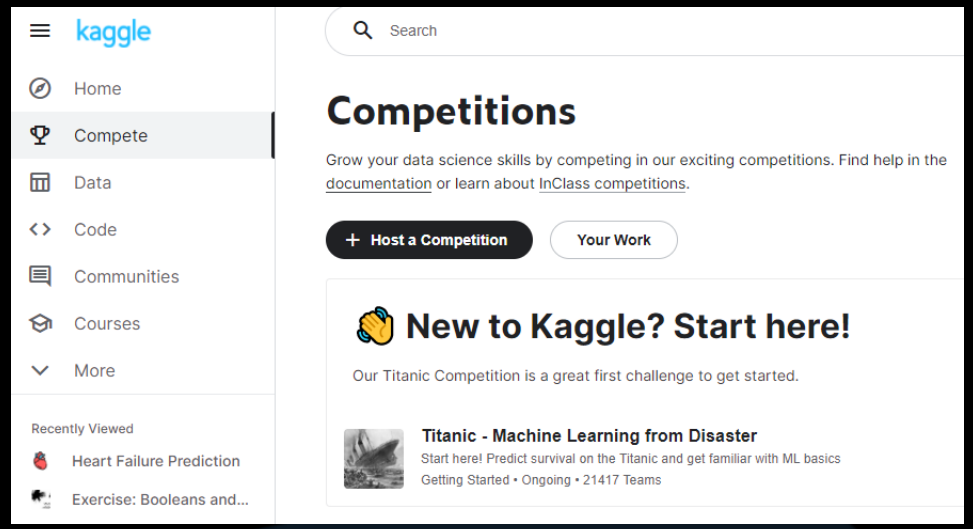
Abstract: Aviation researchers are increasingly focusing on unconventional vehicle designs with tightly integrated propulsion systems to improve overall aircraft performance and reduce environmental impact. Properly analyzing these types of vehicle and propulsion systems requires multidisciplinary models that include many design variables and physics-based analysis tools. This need poses a challenge from a propulsion modeling standpoint because current state-of-the-art thermodynamic cycle analysis tools are not well suited to integration into vehicles level models or to the application of efficient gradient-based optimization techniques that help to counteract the

Thermodynamic cycle modeling library, designed primarily to model jet engine performance

Jet

Notable Packages – pyCycle

https://github.com/OpenMDAO/pyCycle

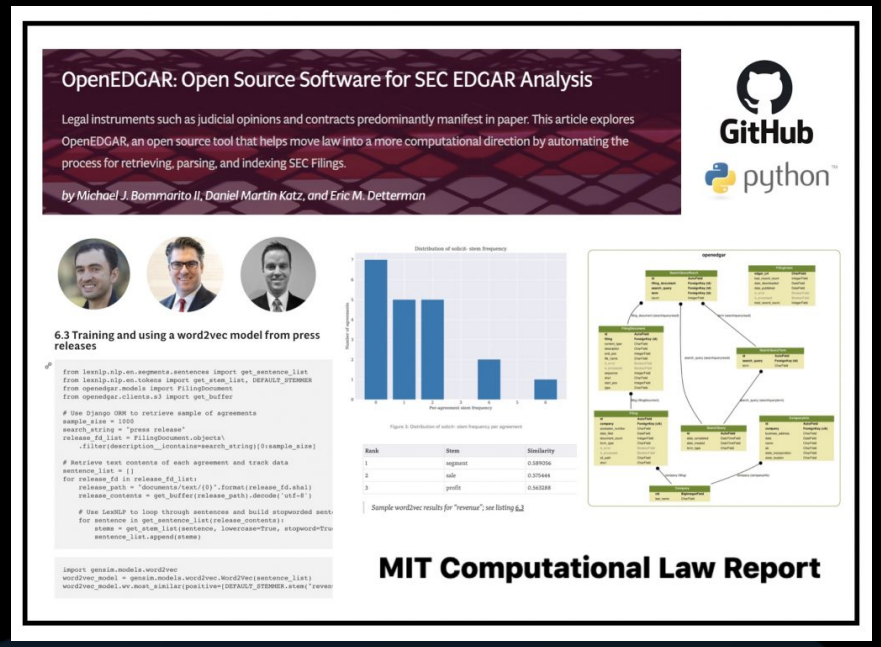


Kaggle is online data science competition website

Kaggle

Notable Packages – Any

https://www.kaggle.com/

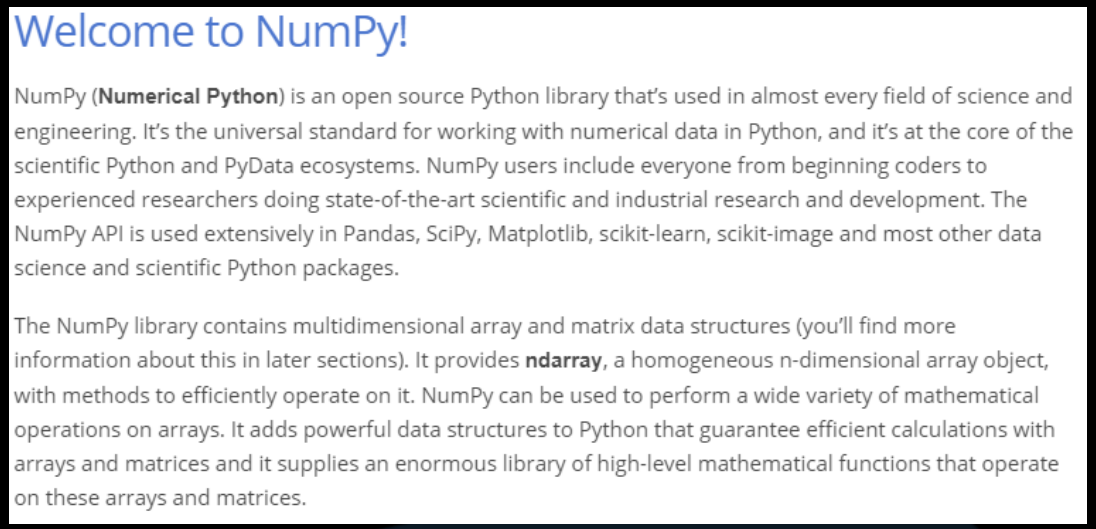


Automating the process for retrieving, parsing ,and indexing SEC Filings

Legal

Notable Project – OpenEDGAR

https://github.com/LexPredict/openedgar



Numpy: The fundamental package for scientific computing with Python

Mathematics

Notable Package – Numpy

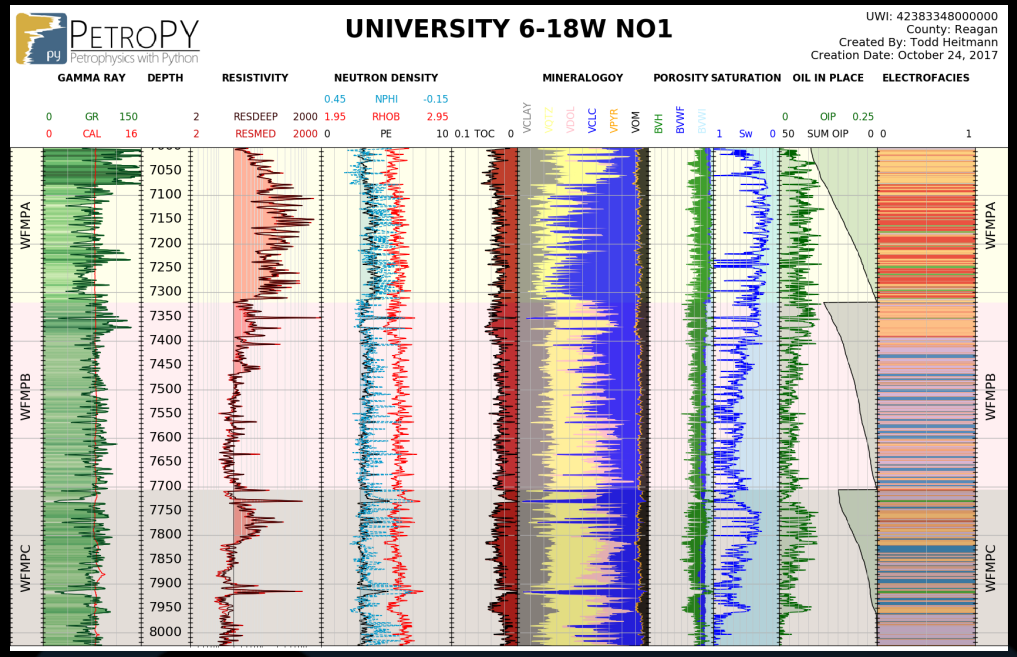
https://numpy.org/

Keeping Notes using Jupyter Notebook

Notebooks

Notable Package – Jupyter

https://hackaday.com/2019/02/22/drops-of-jupyter-notebooks-how-to-keep-notes-in-the-information-age/

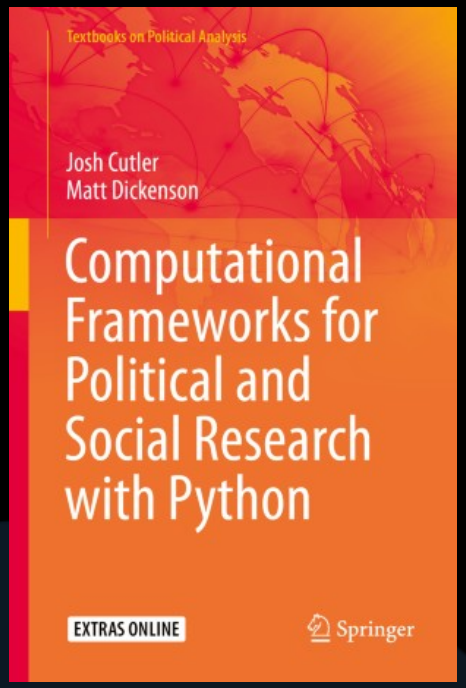


Scientific python computing of subsurface formation evaluation

Oil & Gas

Notable Package – PetroPy, Lasio, Segyio

https://github.com/toddheitmann/PetroPy

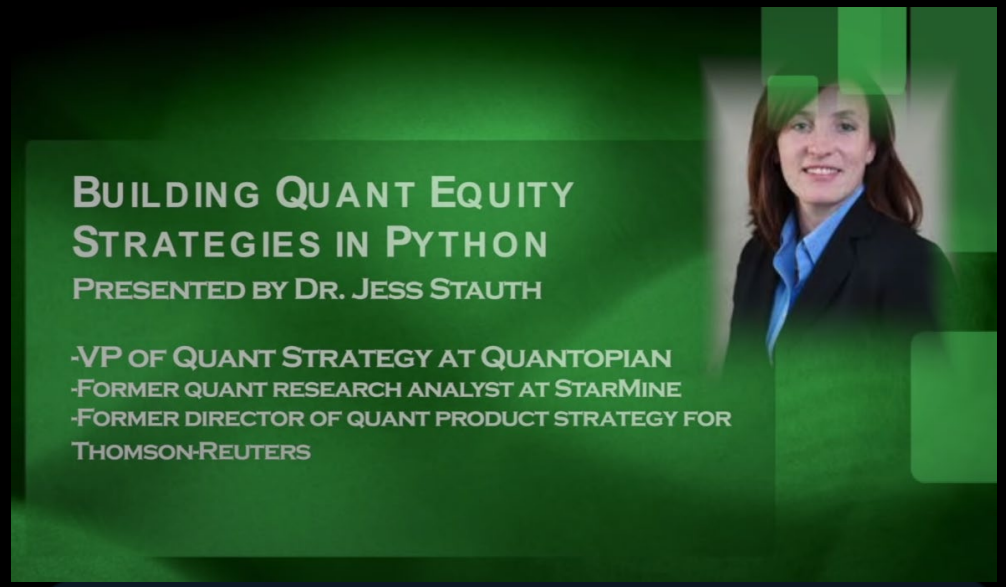


Computational Frameworks for Political and Social Research with Python

Politics

Notable Package – Python

https://www.springer.com/gp/book/9783030368258

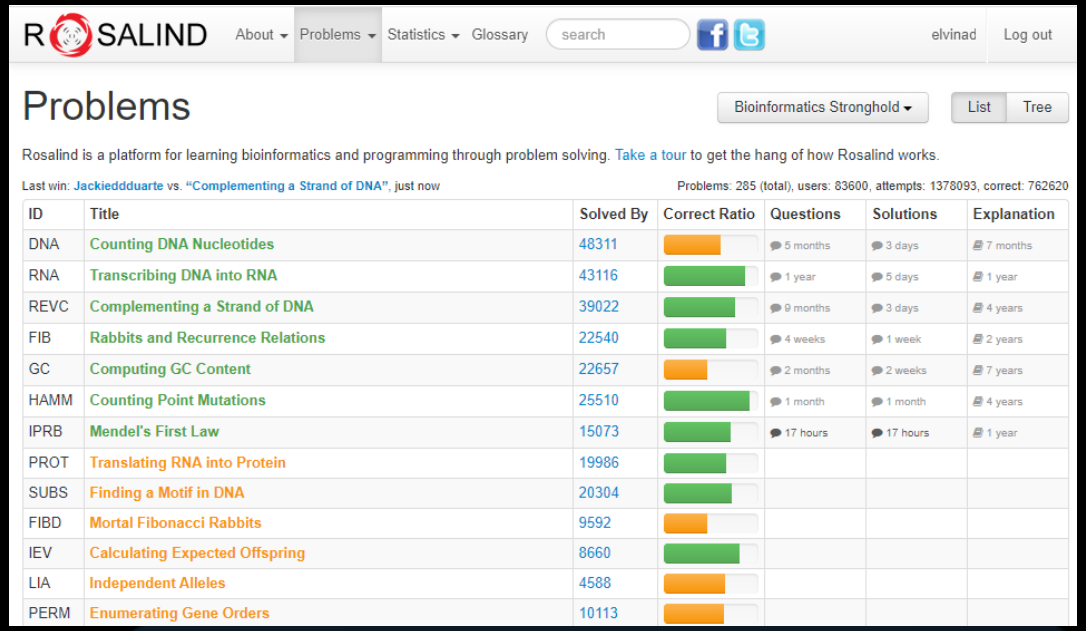


Building Quant Equity Strategies in Python by Dr.Jess Stauth

Quantitative Finance

Notable Package – check [awesome-quant]

https://www.youtube.com/watch?v=nCKzRY_JV4c

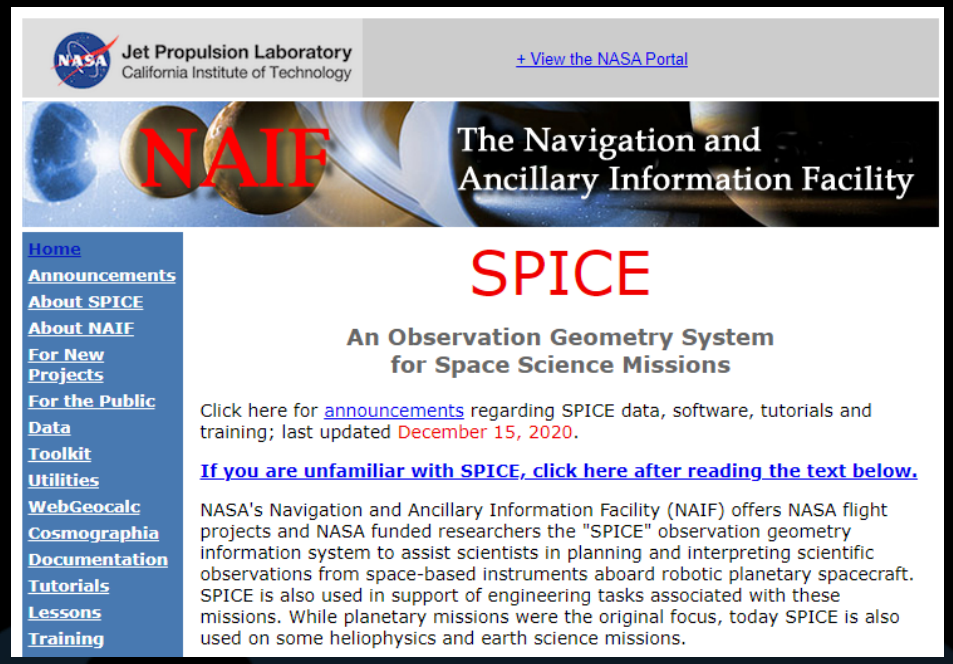


Rosalind is a platform for learning bioinformatics through problem solving.

Rosalind.info

Useful Package – biopython

http://rosalind.info/

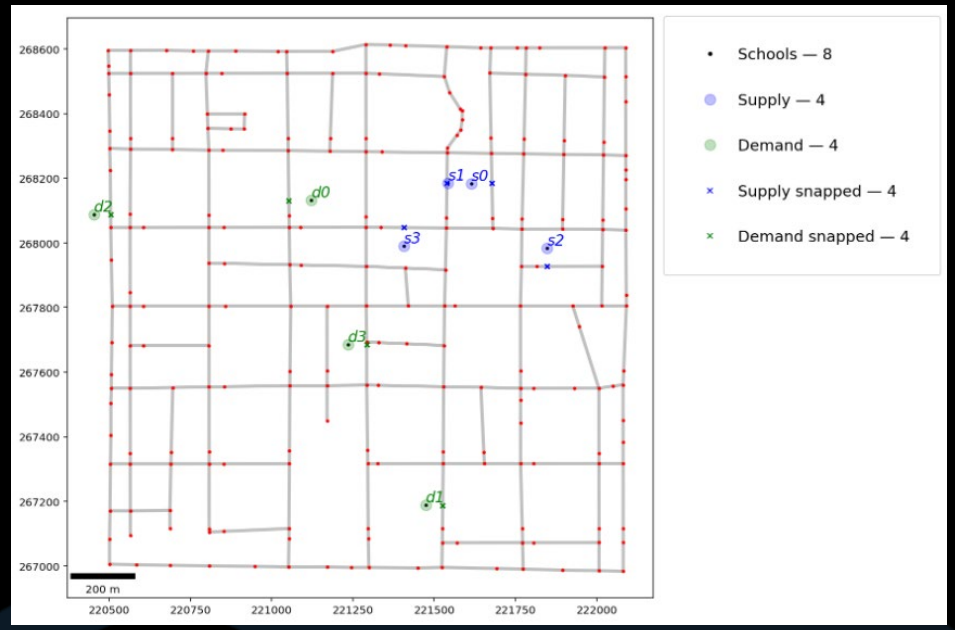


Planetary and spacecraft ephemeris (navigation) and ancillary engineering information

Space

Notable Package – SpiceyPy

https://spiceypy.readthedocs.io/en/main/

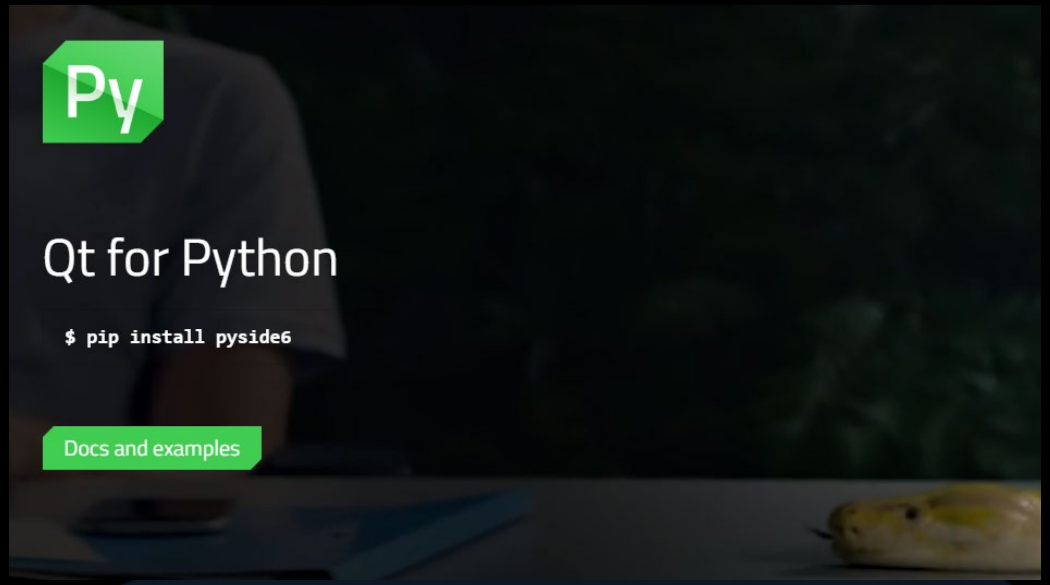


Allocate supply to demand while minimizing transportation costs

Transportation

Notable Package – PySal

https://pysal.org/spaghetti/notebooks/transportation-problem.html

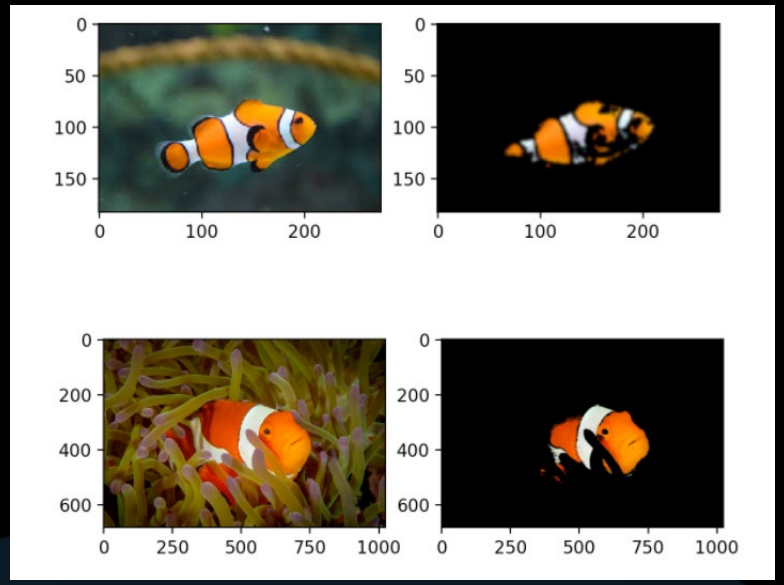


Qt for Python is the project that provides the official set of Python bindings

User Interface (UI)

Notable Packages – Qt, Tkinter, wxPython, PySimple GUI

https://www.qt.io/qt-for-python

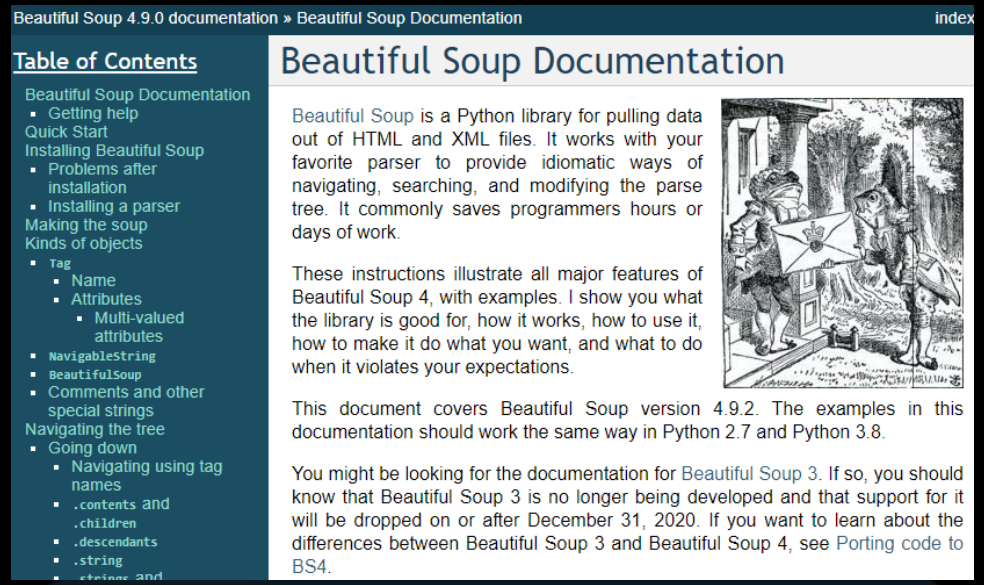


Solving computer vision problem such as image segmentation

Vision

Notable Package – OpenCV, PyTorch

https://realpython.com/python-opencv-color-spaces/

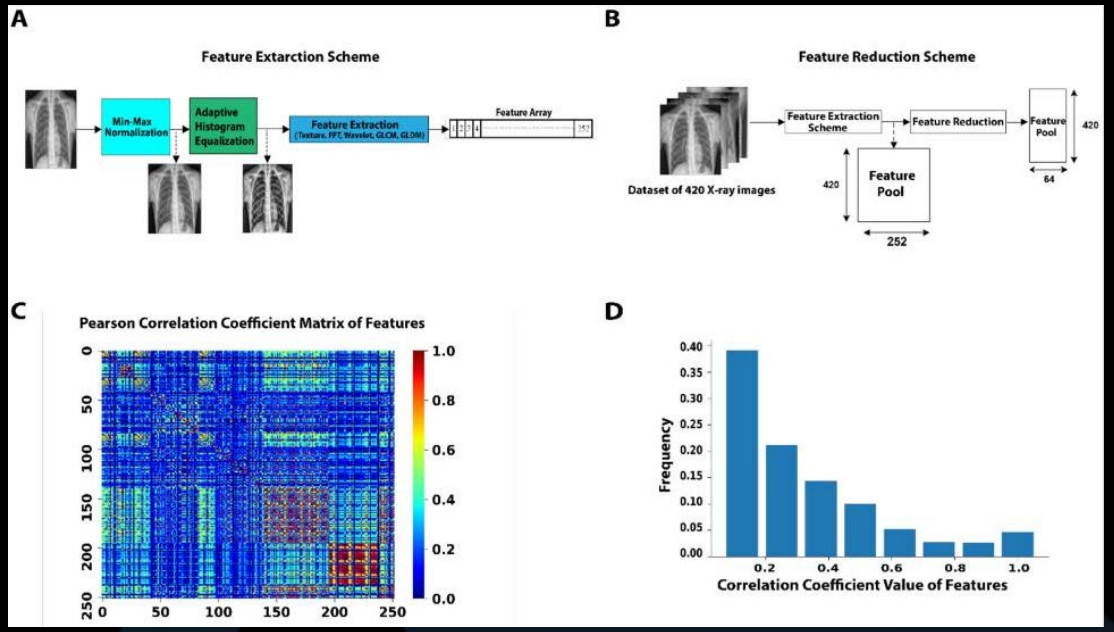


Beautiful Soup is a Python library for pulling data out of HTML and XML files.

Web Scraping

Notable Packages – BeautifulSoup, Selenium, Scrapy

https://www.crummy.com/software/BeautifulSoup/bs4/doc/



COVID-Classifier: An automated machine learning model to assist in the diagnosis of COVID-19 infection in chest x-ray images

X-ray

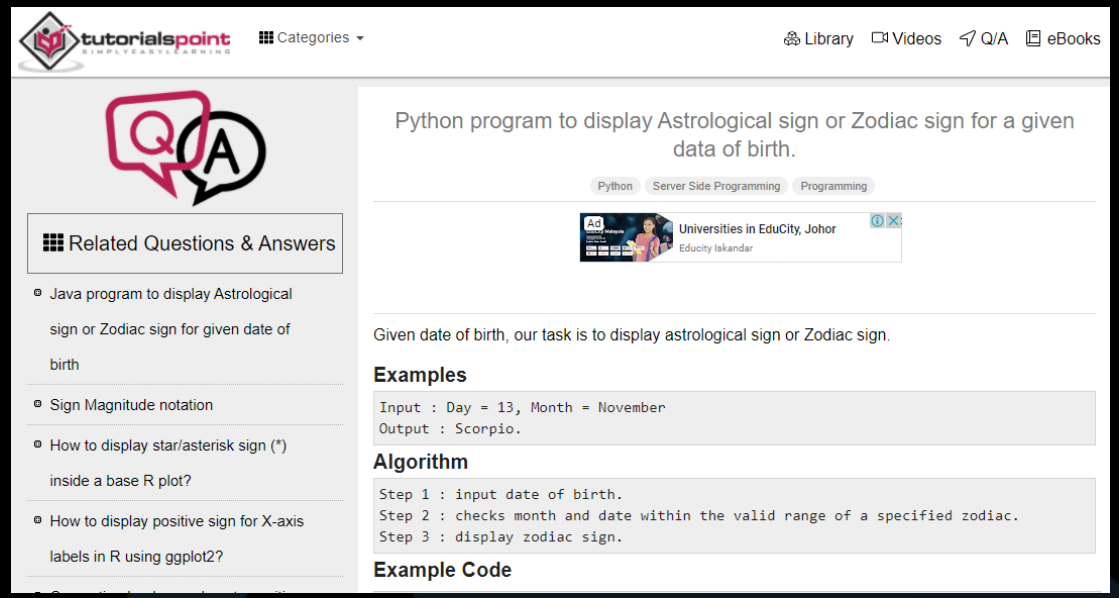
Notable Packages – Numpy, Scipy, Sklearn, Keras

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7273278/

You?

Y

I just could not find anything starting with Y



Python program to display Astrological sign or Zodiac sign for a given data of birth.

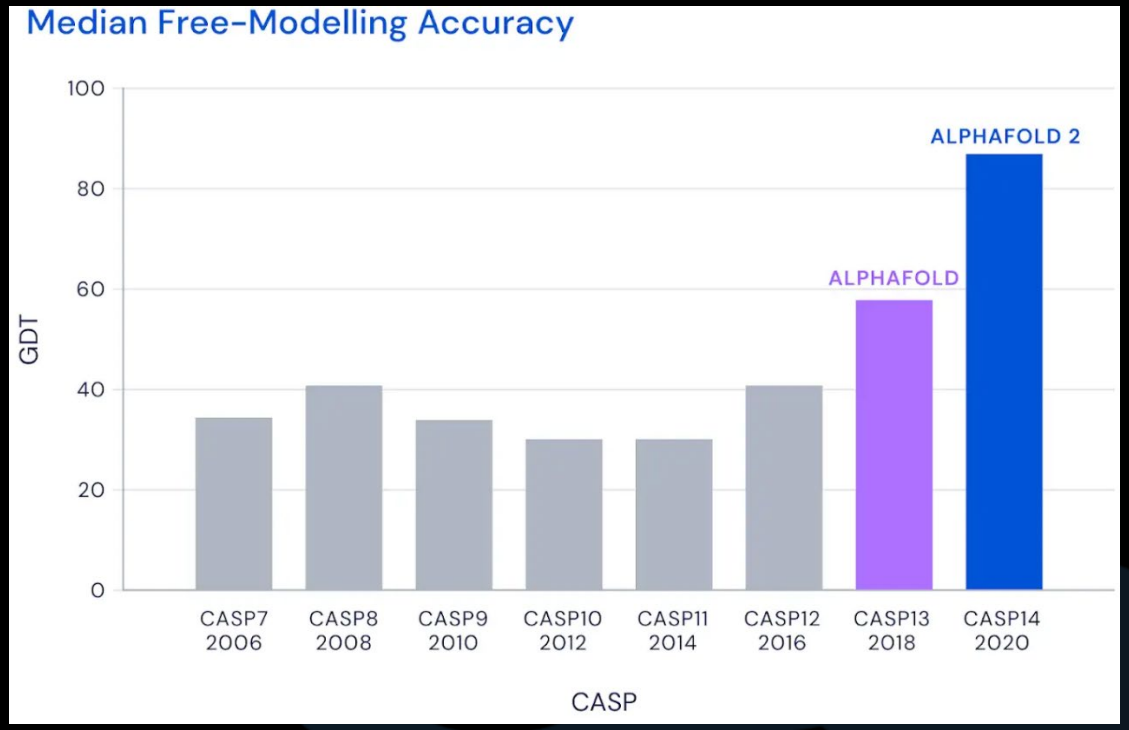
Zodiac sign

This is getting a little bit contrived.

Luckily we managed to get to Z.

On this note…. Now do you see how important coding literacy is?

https://www.tutorialspoint.com/python-program-to-display-astrological-sign-or-zodiac-sign-for-a-given-data-of-birth



CASP - biennial Critical Assessment of protein Structure Prediction

Alphafold 2

A notable example that may be pertinent to you.

https://deepmind.com/blog/article/alphafold-a-solution-to-a-50-year-old-grand-challenge-in-biology

Now sure you asks yourself…
What can I use this for?

WHY?

Try this exercise… ask why…

Train your curiosity

Why Python for me?

I need to do the following repetitively:

- Drag & Drop
- Download
- Digitize

I know there should be a better way.

Python@work

- Digitize graph
- Image cleaning
- Download data from websites
- Data format/structure transformation (ETL)
- Generate maps
- Extract coordinates from geospatial data
- Renaming files
- Generate folders from list
- Generate plots and graphs
- Zipping files
- Digitize seismic image into seismic data
- Digitize “log” image into log data
- Finding matching information from multiple files
- Summarizing data

My offer to you today

"Not so much about filling you up with knowledge as it is about '*teaching you how to think.*'"

– Author David F. Wallace

"Everything should be made as simple as possible, but no simpler."

– Albert Einstein

"Be less curious about people and more curious about ideas"

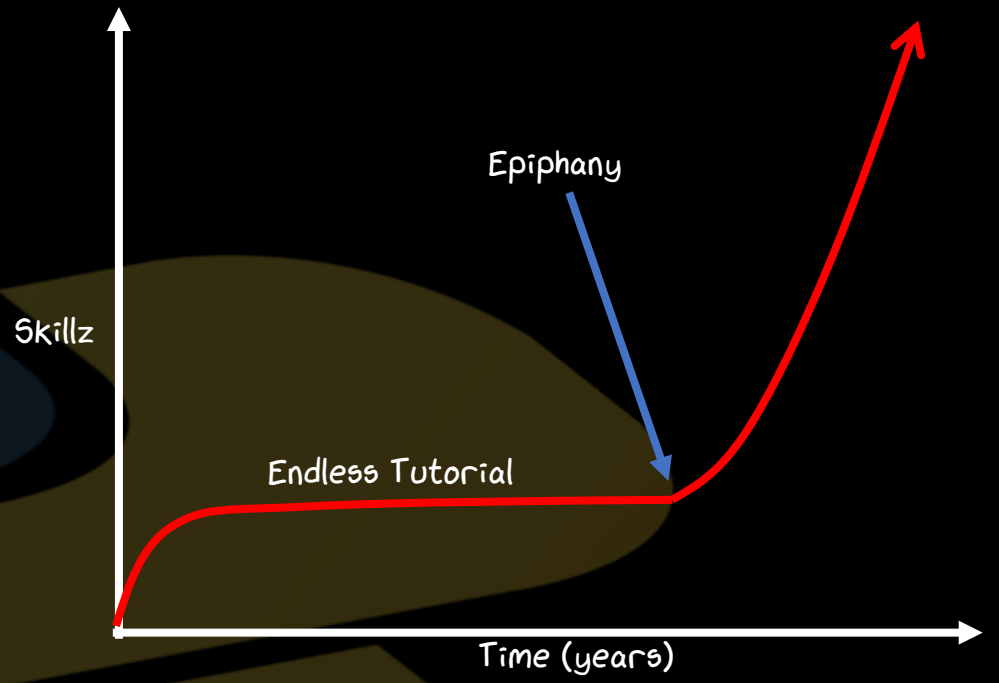
– Marie Curie

What to expect?

It is easy…but not going to be too easy

Expect doing tutorial for years but unable to go beyond it

Then, one day… you magically knows how to do everything



Logistics before we start

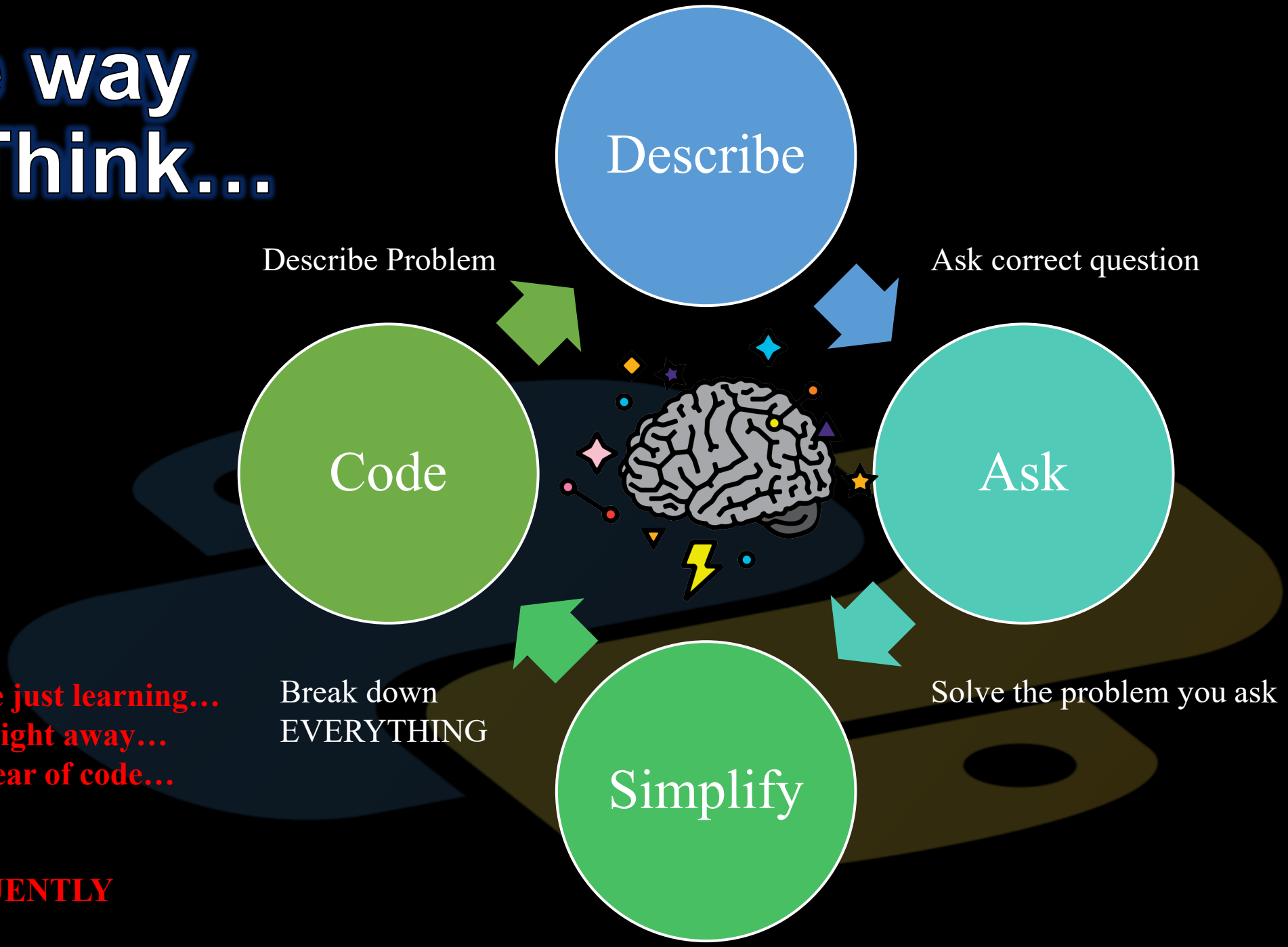
- Go to http://bit.ly/3qq7iNU (.ipynb file)
- Click 

- Login to your google account

Alternatively you can download the .ipynb file and open in your own computer

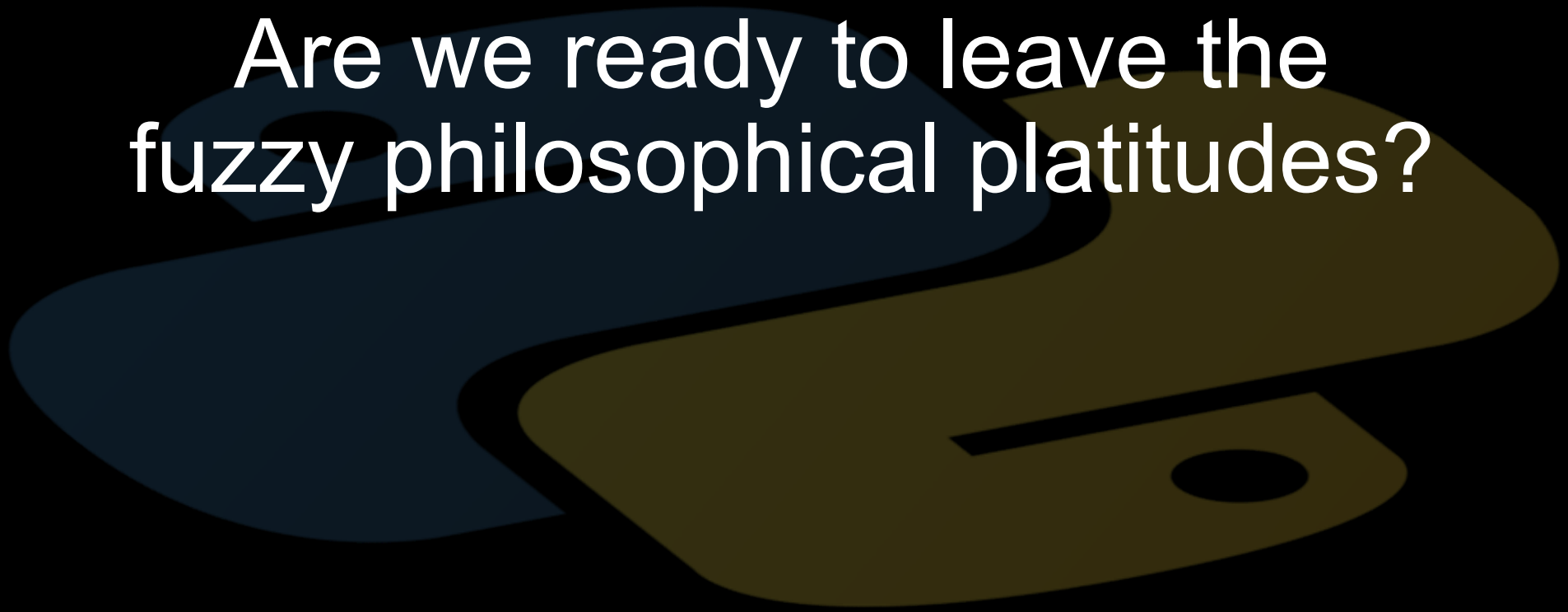
import this

One way To Think...



When you are just learning…
Just code straight away…
Remove the fear of code…

FAIL FAST
FAIL FREQUENTLY



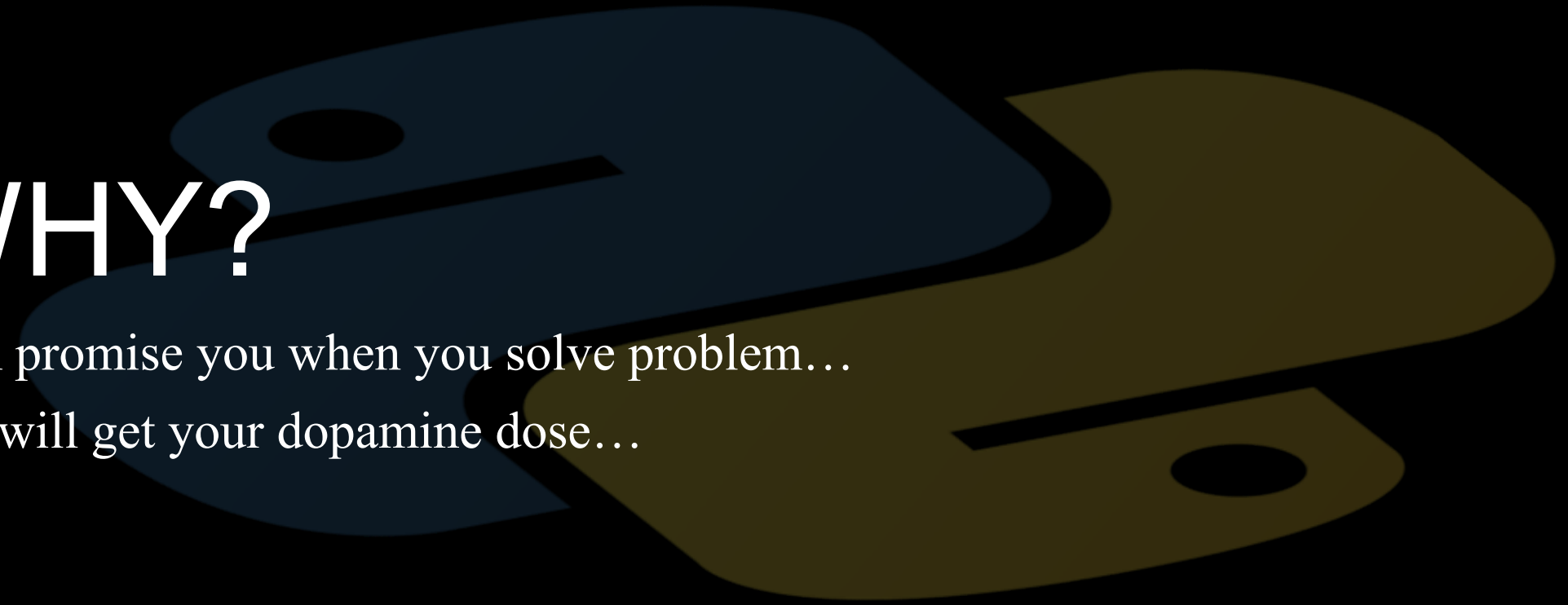
Are we ready to leave the fuzzy philosophical platitudes?

CODING SESSION

WHY?

I can promise you when you solve problem…

You will get your dopamine dose…



- Stringing things together is the trick.

Thank you very much

https://github.com/elvinado/Problem-Solving-Kit