ANACONDA & JUPYTER NOTEBOOK

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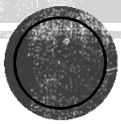


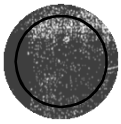
ANACONDA - INTRODUCTION

- Distribution of packages built for data science
- Conda - package and environment manager
- Conda to create environments for isolating projects that use different versions of Python and/or different packages
- Download and install Anaconda

<https://www.anaconda.com/download/>

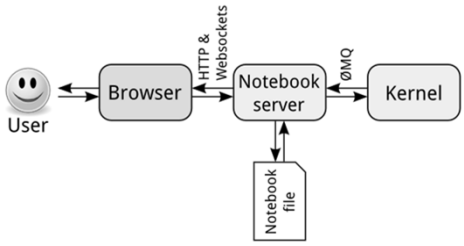
MANAGING PACKAGES

- Install numpy with conda : `conda install numpy=1.14.0`
- Conda also automatically installs dependencies for you. For example scipy depends on numpy
- To uninstall : `conda remove package_name`
- update all packages in an environment: `conda update –-all`
- `conda search numpy`



JUPYTER NOTEBOOK

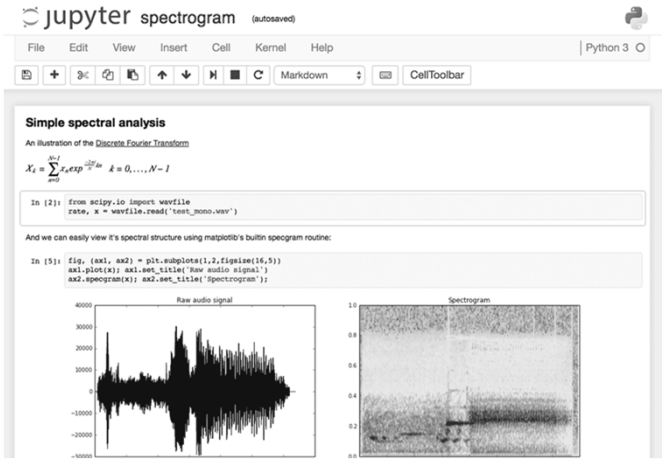
INTRODUCTION



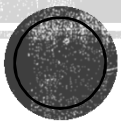
- Web application that allows to combine explanatory text, math equations, code, and visualizations all in one easily sharable document
- Notebooks have quickly become an essential tool when working with data
- Being used for data cleaning and exploration, visualization, machine learning, and big data analysis
- Literate programming proposed by Donald Knuth in 1984 - documentation is written as a narrative alongside the code
- Jupyter notebooks grew out of the IPython project started by Fernando Perez

INSTALLING AND LAUNCHING NOTEBOOK

- http://localhost:8888
- conda install nb_conda
- cell - Code or Markdown
- Command palette
- Headers



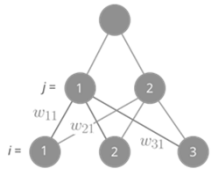
MATRIX MATH & NUMPY



CONTENTS

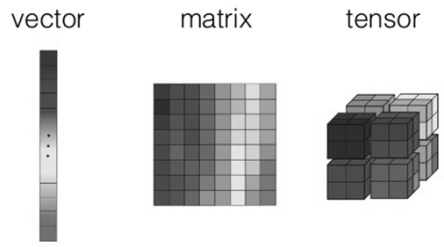
INTRODUCTION

- ML involves a lot of matrix math
- Understand the basics before diving into the subject
- Refresher on Matrix Math
- NumPy library to work efficiently with matrices in Python



$$\begin{bmatrix} x_1 & x_2 & x_3 \end{bmatrix} \times \begin{bmatrix} w_{11} & w_{12} \\ w_{21} & w_{22} \\ w_{31} & w_{32} \end{bmatrix}$$

DATA DIMENSION



- Scalars – Eg. Height of a person – 0 dimension
- Vectors – Row or Column vectors – Eg. Height, weight, age form a vector
- Matrices – Eg. Image pixel values
- Tensors – n dimensional collection of values - Eg. Matrix is a 2dim vector
- Visualize a tensor
- Indexing

DATA IN NUMPY

<Practice in Jupyter Notebook>

```
import numpy as np
s = np.array(5)
V = np.array([1,2,3])
M = np.array([[1,2,3], [4,5,6], [7,8,9]])
T = np.array([[[1,2,3], [4,5,6], [7,8,9]],[[1,2,3], [4,5,6], [7,8,9]]])
T.shape
```

ELEMENT-WISE MATRIX OPERATIONS

- Addition and Scalar Multiplication
  - To add or subtract two matrices, their dimensions must be the same

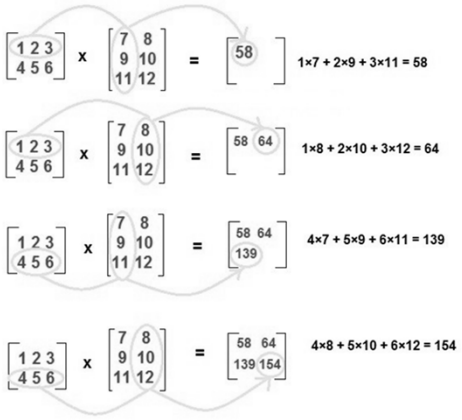
$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} + \begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} a+w & b+x \\ c+y & d+z \end{bmatrix}$$

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} * x = \begin{bmatrix} a*x & b*x \\ c*x & d*x \end{bmatrix}$$

MATRIX MULTIPLICATION

$$\begin{bmatrix} a & b \\ c & d \\ e & f \end{bmatrix} * \begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} a*w+b*y & a*x+b*z \\ c*w+d*y & c*x+d*z \\ e*w+f*y & e*x+f*z \end{bmatrix}$$

- Properties
  - Not commutative. A∗B≠B∗A
  - Associative. (A∗B)∗C=A∗(B∗C)



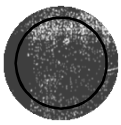
MATRIX TRANSPOSE

$$A\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \quad A^T\begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$$

$$A\begin{bmatrix} 1 & 4 & 3 \\ 8 & 2 & 6 \\ 7 & 8 & 3 \\ 4 & 9 & 6 \\ 7 & 8 & 1 \end{bmatrix} \quad A^T\begin{bmatrix} 1 & 8 & 7 & 4 & 7 \\ 4 & 2 & 8 & 9 & 8 \\ 3 & 6 & 3 & 6 & 1 \end{bmatrix}$$

A

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$



THANK YOU