PS5841

Data Science in Finance & Insurance

Front Matter

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Spring 2022

Columbia University

Data Science

- Data Science Techniques
  - Extract info form data
  - Produce inputs for decision making
- Trendy labels
  - Machine learning
  - Deep learning
  - Artificial intelligence

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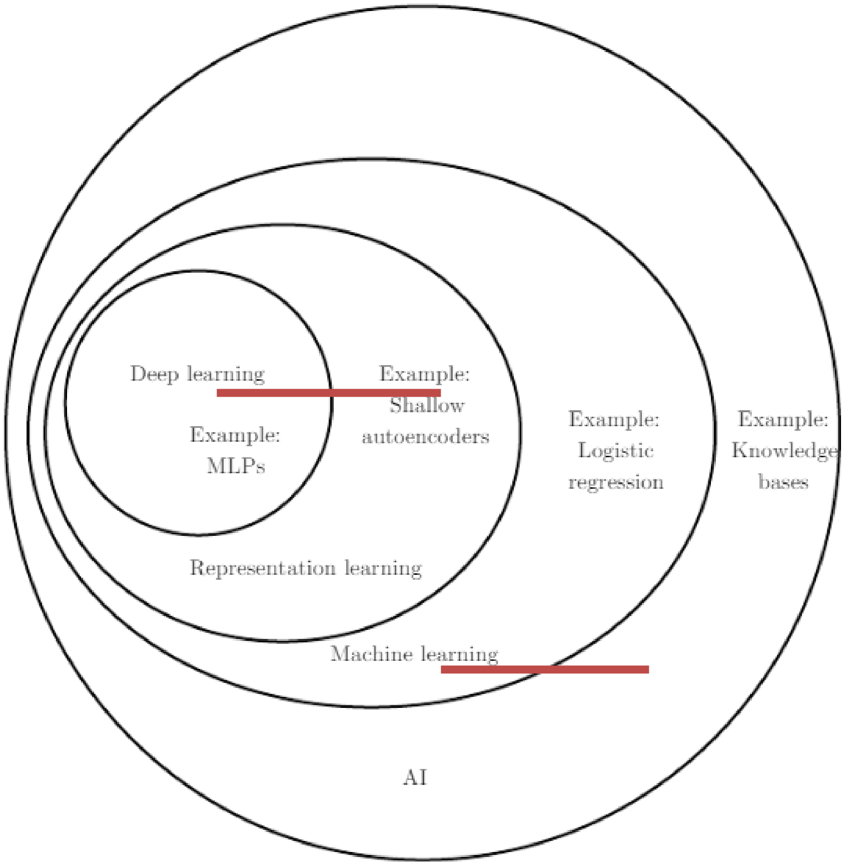
ML & SL



- 1800s linear regression
- 1930s LDA
- 1940s logistic regression
- 1970s GLM
- 1980s trees, GAM, NN
- 1990s SVM
- …

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This Course

- Course Goals
  - Coding & Algo
  - ML/SL Models
  - Portable Skills
  - Review & Highlights (overlap)
- Helpful preparations
  - Probability & Statistics, Calculus, Linear Algebra

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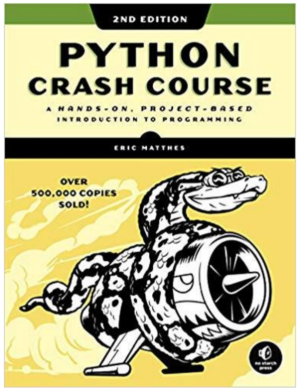
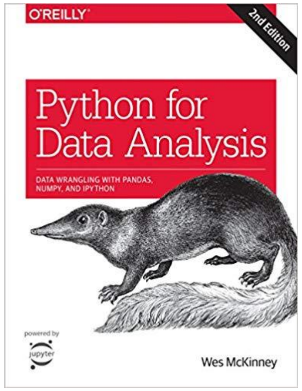
Reference Materials - Coding

- “Official” Python Tutorial
- Matthes, *Python Crash Course, 2nd ed*, No Starch Press.


2ND EDITION
PYTHON
CRASH COURSE
A HANDS-ON, PROJECT-BASED INTRODUCTION TO PROGRAMMING
ERIC MATTHES
OVER 500,000 COPIES SOLD!
no starch press

- McKinney, *Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython, 2nd ed.,* O’Reilly Media.



Computing Environment

- Tools
  - Python, and virtual environments
  - R
  - Spreadsheets
- Modes
  - Terminal
  - Editor and/or IDLE(e.g. spyder)
  - Jupyter-notebook

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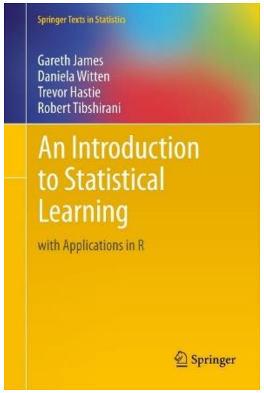
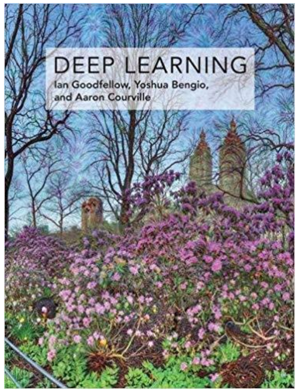
Open Source Python Packages

- Numpy
- Pandas
- Matplotlib
- Scipy
- Sklearn
- Statsmodels
- Tensorflow/keras

Reference Materials – SL

- James, Witten, Hastie & Tibshirani, *An Introduction to Statistical Learning, with Applications in R,* Springer.
  - 2nd ed available
  - SOA: SRM, PA, CAS: MAS-I, MAS-II
- Goodfellow, Bengio and Courville, *Deep Learning,* MIT Press.





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Reference Materials – more SL

- Select readings for other ACTU core courses
  - Frees [SOA: SRM]
  - Cowpertwait & Metcalfe [CAS, MAS-I]
  - Dobson & Barnett [CAS, MAS-I]
  - James et al [SOA: SRM, PA, CAS: MAS-I, MAS-II]

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Learning From Data

- Supervised learning
  - Outcome measurements
  - Prediction and inference
  - Regression and classification
- Unsupervised learning
  - No outcome measurements
  - Data organization
- ML/SL methods
  - Regularization
  - Cross validation
  - Ensemble learning

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Important Pieces

- Training Set
- Model Class
- (Fitted) Model
- Validation Set
- Test Set

Keep in mind

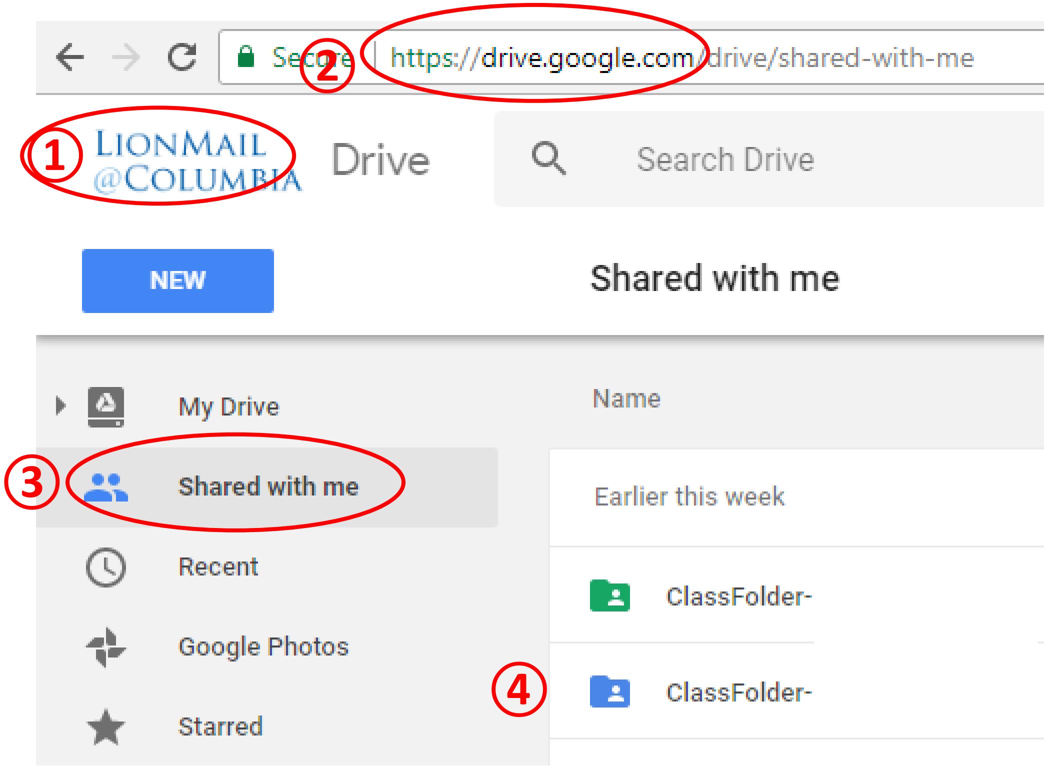
- No universally best approach
- Curse of dimensionality
  - Parametric vs non-parametric approaches
- Bias & variance tradeoff when predicting
  - Bias: how close is the model estimate on average
  - Variance: how variable is the model estimate when fitted with different training sets

School Stuff

- Calendar
  - First class 1/18 (Thu)
  - Midterm 3/10 (Thu)
  - No classes 3/16 (Tue) 3/17 (Thu)
  - Project 4/26 (Tue), 4/28 (Thu)
  - Last class 4/28 (Thu)
  - Final 5/12 (Thu) – 9am-noon

Class Folder

- Class Folder
  - ①Log into CU email with your UNI
  - ②Go to drive.google.com
  - ③Go to “shared with me”
  - ④Go to ClassFolder-DataSci-Spr2022



- Class Folder
  ①Log into CU email with your UNI
  ②Then go to https://tinyurl.com/ds2022spring

Group Project (1)

- Who – minimum 3 and maximum 4 people per team
  - Get to know your peers
  - Build on each other's strengths
- What – issues in finance or insurance
- Why – justify its merit for you and your audience
- How –
  - Find/Construct the relevant data set
  - Apply the tools and approaches discussed in the course to appropriately analyze the data to shed light on your questions
  - Educate the class with your informative and lively presentation!
  - Writeup
- When – see the next page

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Group Project (2)

- Keep the dates
  - Project proposal due week 8 (3/10)
  - Draft writeup due week 12 (4/14)
  - Project presentation week 14 (4/26, 4/28)
  - Final writeup due at Final

That was