Elements Of Data Science - F2022

Introduction

9/7/2022

Who am I?

Bryan R Gibson, PhD
Principal Data Scientist

Russell
Reynolds
ASSOCIATES

WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

UNIVERSITY OF MICHIGAN

Who is this course for?

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People new to (at least) one of:

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- Python

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Who is this course for?

People new to (at least) one of:

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- Visualization
- Hypothesis Testing
- Machine Learning

What will we be covering?

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- Python DS tools
- Exploratory Data Analysis and Visualization
- Data Manipulation including cleaning and transformation
- Hypothesis Testing
- Predictive modeling using ML

What will we be covering? (cont)

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- Clustering
- Dimensionality Reduction
- Natural Language Processing and Topic Modeling
- Dealing with Time Series data
- Recommendation Engines
- Interacting with Databases

Logistics

Email: brg2130@columbia.edu

TAs: See the course website

Office Hours: See the course website

Course Materials

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- Course Website via Courseworks: https://courseworks2.columbia.edu/courses/154945

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  https://github.com/bryanrgibson/eods-f22

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  https://github.com/bryanrgibson/eods-f22

- Homeworks via git:
  More instructions to come

Slides

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- written using Jupyter Notebook + RISE + reveal.js
  - in `notebooks` folder
  - open .ipynb files in jupyter

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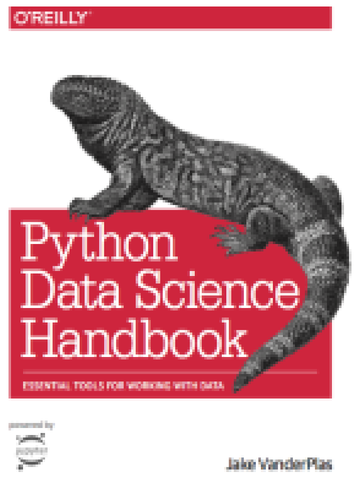
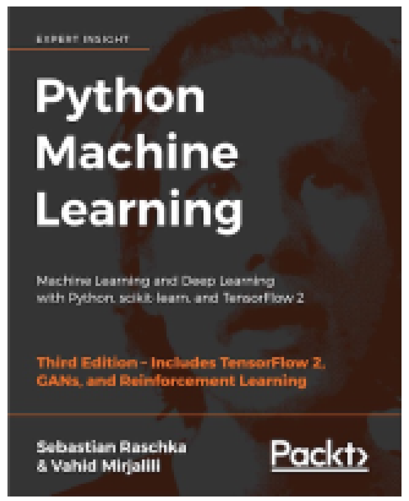
- also saved as pdf
    - in `slides_pdf` folder
    - open .pdf in a pdf viewer (chrome, acrobat, evince, etc.)

Textbooks

- (PDSH) **Python Data Science Handbook** by Jake VanderPlas
  - Free online
  - Columbia Library
  - 2nd Edition coming soon
- (PML) **Python Machine Learning (3rd Edition)** by Raschka and Mirjalili
  - Columbia Library
  - Associated Github repo
  - New Edition: Machine Learning with PyTorch and Scikit-Learn




EXPERT INSIGHT
Python
Machine
Learning
Machine Learning and Deep Learning
with Python, scikit-learn, and TensorFlow 2
Third Edition - Includes TensorFlow 2,
GANs, and Reinforcement Learning
Sebastian Raschka
& Vahid Mirjalili
Packt

Other Useful Texts

- **Data Science from Scratch, 2nd Ed.** by Joel Grus
- **Python for Data Analytics** by Wes McKinney (2nd Edition coming soon)
- **Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python** by Bruce, et al.
- **Effective Pandas** by Matt Harrison
- **SQL for Data Scientists** by Renée M. P. Teate

Additional Resources

- See the course website...

Quizzes, Homeworks and Exams

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- **Weekly Quiz**, submit online
    - 10% of grade, equally weighted
    - **no late submissions accepted**
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- **Final Exam** (online, ~week of 12/7) 25% of grade

Online Course

- In-class and online (see course page for recordings)
- Use Ed Discussion for questions
- Zoom office hours (TBD)

Expectations

- Attend/view the weekly lecture
- Ask/answer questions via Ed
- Attend Office Hours for additional help
- Complete all quizzes and homeworks on time
- Hopefully learn enough to get through a junior DS job interview

Plagarism and Code copying

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- Homeworks may be checked for plagiarism
- Copied code will result in 0 points for all involved
- Copying from my slides or online sources: not recommended

Questions re Logistics?

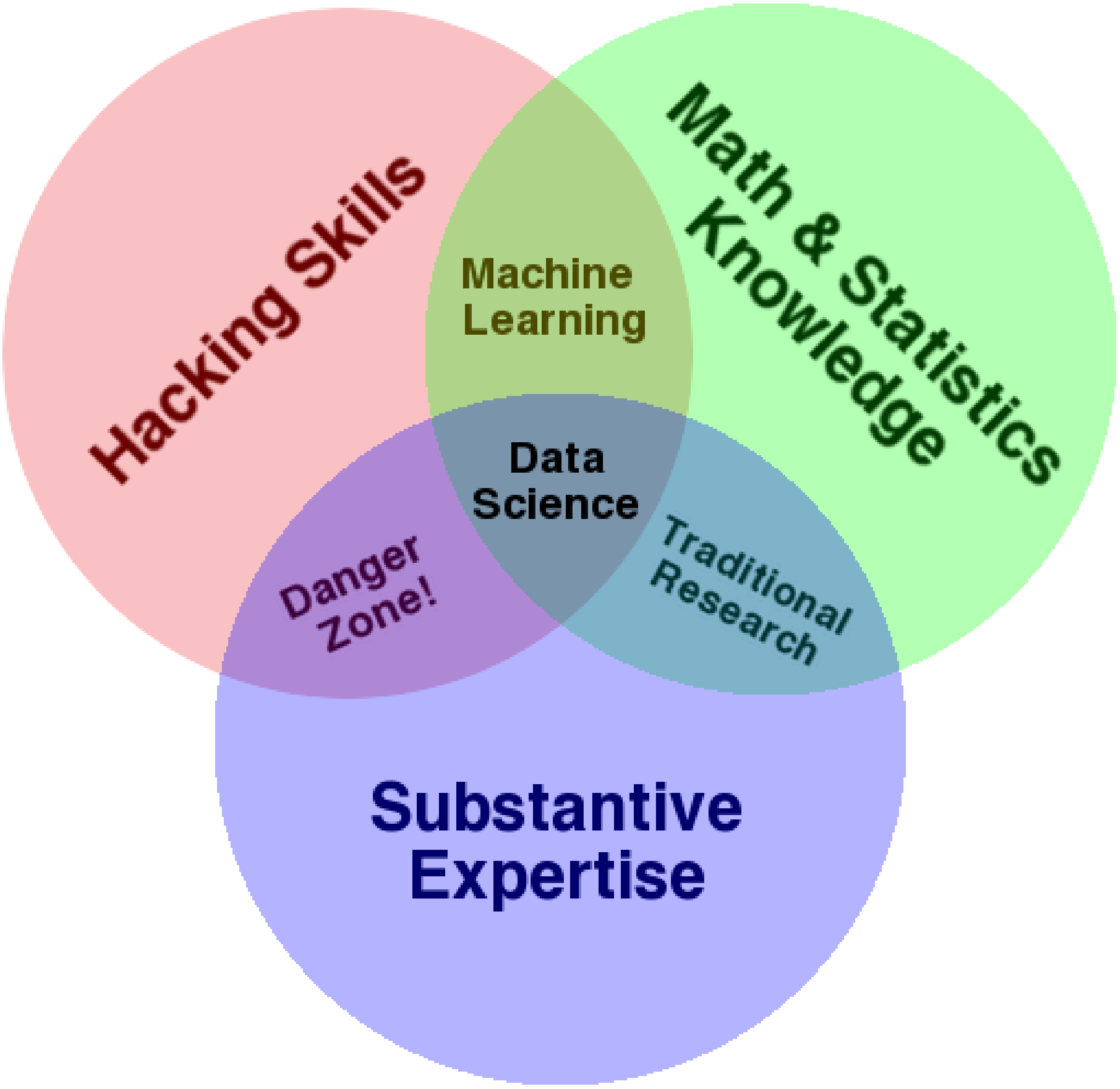
What is Data Science?

What is Data Science?

Data science, also known as data-driven science, is **an interdisciplinary field** about scientific methods, processes, and systems **to extract knowledge or insights from data in various forms**, either structured or unstructured, similar to data mining.

https://en.wikipedia.org/wiki/Data_science

What is Data Science?



http://drewconway.com/zia/2013/3/26/the-data-science-venn-diagram

Data Science $\neq$ Magic

Data Science ≠ Magic

- "Can we find something in this data?" **Yes**

Data Science ≠ Magic

- "Can we find something in this data?" **Yes**
- "Will it solve our business problem?" **Maybe**

Data Science $\neq$ Magic

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- "Will it solve our business problem?" **Maybe**
- "Will it be easy?" **Probably not**

Data Science Workflow

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- DS Question →

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- **E**xtract-**T**ransform-**L**oad (ETL)→

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- Reporting

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2. What does success look like?

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Can't always get answers to these, but good to ask.

Example DS Projects

- Machine Bias in Criminal Sentencing, Propublica
- Analysis of OkCupid Data
- David Bowie Job Mentions
- NYC Crash Mapper
- NeurIPS 2019 Acceptance Stats
- NeurIPS 2021 Stats
- Demo: Example Flowershop

Questions?