Elements Of Data Science - F2024

Introduction

9/9/2024

Who am I?

Andi Cupallari

- PhD in Economics with a focus on AI and Deep Learning. Research Interests: AI, NLP (LLMs), causal inference, forecasting, advanced analytics

Director, Forecasting Capabilities @ Merck

MERCK

Past Experiences

Associate Director, Advanced Analytics @ Kite Pharmaceuticals

Kite
A GILEAD Company

Data Scientist, AI and NLP Expert

NOVARTIS

Who is this course for?

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People new to (at least) one of:

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Who is this course for?

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- Visualization
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- 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

Columbia University email: ac5562@columbia.edu

Personal email: acupallari@gmail.com

TAs: See the course website

Office Hours:

- Andi: Mondays, 6pm, location TBA
- TAs: TBA, location TBA

Course Materials

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- Course Website via Courseworks: https://courseworks2.columbia.edu/courses/185631

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Slides

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- written using Jupyter Notebook
    - in `notebooks` folder
    - open .ipynb files in jupyter

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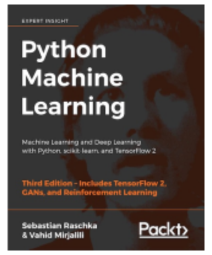
- also saved as pdf
  - in `slides_pdf` folder
  - open .pdf in a pdf viewer (chrome, acrobat, evince, etc.)

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



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

Quizzes, Homeworks and Exams

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- **Weekly Quiz**, submit online (TBA)
    - 10% of grade, equally weighted
    - **no late submissions accepted**
    - **if you know there will be an issue, let me know in advance**

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    - 2 free late days total over the semester to be used when you choose
    - 25% off for each late day

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- **Final Exam** 25% of grade

In person Course

- In-class
- 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?

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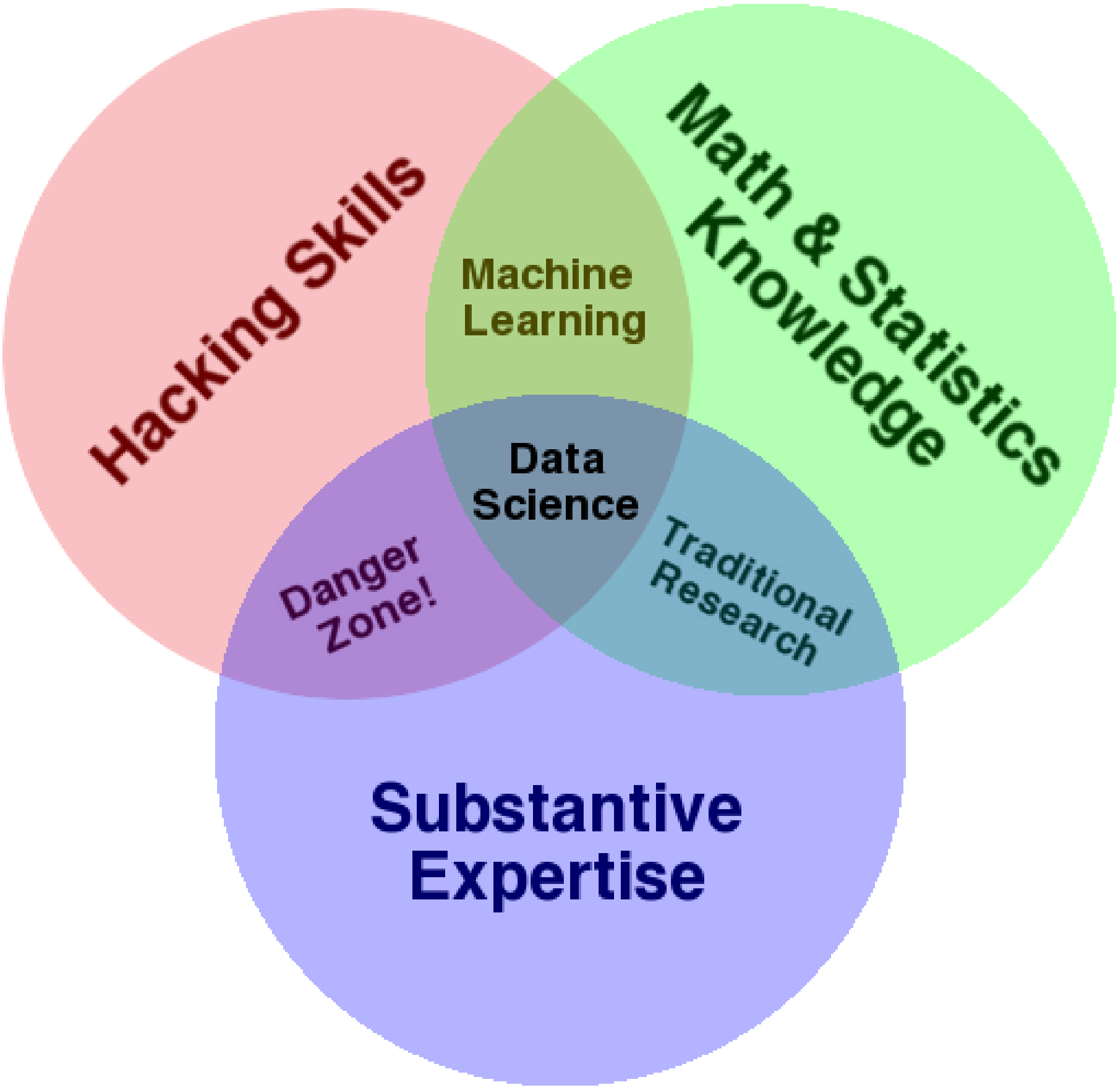
What is Data Science?

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

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

Data Science $\neq$ Magic

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

Data Science ≠ Magic

- "Can we find something in this data?" **Yes**
- "Will it solve our business problem?" **Maybe**
- "Will it be easy?" **Probably not**

Data Science Workflow

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- Business Need →

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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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3. How are we going to measure it?

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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?