COGS 9 - Introduction to Data Science
Winter 24

Week 3 Discussion

Slides can be found here: https://github.com/PrasannaKumaran/COGS-9---WI24

About me..

- 2nd Year CSE Grad Student
- B.E in Computer Science and Engineering
- Current research focuses on Computational Neuroscience, AI/ML

- 2nd year undergraduate
- DSC major

Agenda for Today

- Project Group Formation
- Quick overview of the Reading for this week
- Questions

Project: Groups

- Form groups of 4-5 and come up with a group name
- Discuss about topics that interests you within the group
  - You will be focusing on how to integrate a variety of Data Scientific methods and theories to address a problem
  - No coding
  - Topics can include churn prediction, how does Black Friday sales affect the economy, is social media spreading more positive or negative information and so on.
  - The project is open ended

Let’s take 5 - 10 minutes and get back

Link to form

Fill this form once you have finalized your team!!!

Project: Directions

Once you have decided on your topic -

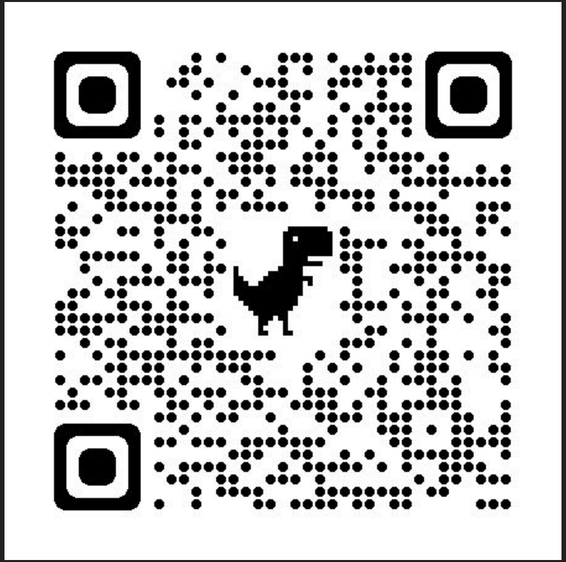
- Look for appropriate datasets. Kaggle, Google Dataset Search, Data.gov, UCI ML repository are few sites you can check out
- Analyse what’s given in the data and what inferences can be made
    - What kind of problem are you trying to solve?
    - Can you derive useful information from raw data provided?
    - What impacts does solving the problem have?

You can change the question or dataset later!

Attendance for the session

Fill out the form below to mark your attendance

Link:



Project: Quick tips

- Share your email IDs with your team members
- Establish communication channels with your team members. Example: Slack, Discord, WhatsApp, Messenger etc.
- Maintain a Drive folder to store your project documents and files
- Go over your schedule and set up weekly meetings
- Coordinate with your team regularly
- Divide your work equally

Reading: 50 Years of Data Science

- Talks about the advancements in the field over the last 50 years
- How is data science different from statistics
- Difference between generative and predictive modeling
- Common Task Framework
    - Consider a publicly available training dataset
    - Competitors competing to infer a class prediction rule from the training data
    - Scoring referee reports the score achieved by the submitted rule of unseen test data

Reading: 50 Years of Data Science

- Big data perspective
  - Not a good indicator to distinguish between Data Science and Statistics
  - Statistics have historically been used to compile census data
  - Mathematical statistics researchers have studied big datasets for decades
  - Data science = “big data” is not a good conclusion to make
- Skills perspective
  - Hadoop to use with datasets distributed across a cluster of computers
  - Earlier such computing tasks were easier since datasets could fit on a single processor
  - These skills are not for better solving but to deal with organizational artifacts of large-scale cluster computing
- Jobs perspective
  - Data science initiatives (DSI) require computing and database skills along with quantitative knowledge
  - Apart from rigorous statistical analysis, knowledge to deploy production systems, coding
  - Takes time!!!

Reading: 50 Years of Data Science (contd.)

6 major divisions of Greater Data Science (GDS)

1) **Data Gathering, Preparation and Exploration**
    - Gathering relevant information
    - Preparing data for analyses
    - Exploratory Data Analysis
2) **Data Representation and Transformation**
    - Modern Databases: SQL, noSQL, Live data streams
    - Mathematical representation: Fourier Transforms, network data

Reading: 50 Years of Data Science (contd.)

6 major divisions of Greater Data Science (GDS)

3) **Computing with Data**

- Cluster and Cloud Computing
- Python, R

4) **Data Visualization and Presentation**

5) **Data Modeling**

- Generative modeling seeks to develop stochastic models which fits data and make inferences about data-generating mechanism
- Predictive modeling prioritizes prediction, discussing only accuracy of approaches

6) **Science about Data Science**

- Analyse effectiveness of workflow using various metrics

Reading: 50 Years of Data Science (contd.)

- Cross-Study Analysis
  - Different teams produce different predictions for the same problem. Example: medical domain
  - Parmigiani. - From 23 studies (1251 patients) of ovarian cancer with publicly available data (10)
  - From 101 candidate papers identified 14 prognostic models for prediction
  - 14 x 10 matrix to study individual model’s performance across datasets
- Cross-workflow analysis
  - Different workflows can lead to different conclusions
  - Carp et al. studied 241 fMRI studies
  - Found nearly same workflows as studies

Reading: 50 Years of Data Science (contd.)

- Prediction
  - Concerned about performance (metrics)
  - More CS focused
- Inference
  - Understanding input-output relationships
  - Central to traditional statistics

Questions?

Make sure you filled out the group information and attendance forms!

Groups

Attendance