Senior Design Fall Presentation

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Team

- Project Name: Automated Correlation Analysis
- Individual Project by Ted Cordonnier
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Goals

- Find Correlation between target column and all other columns in a .csv file
- Automates statistical tests of correlation as well as allows any analyst to find strength of association between all types of variables
- All without extensive statistical experience from the user

Intellectual Merits

- Myself and my advisor Seokki Lee were not able to think of or find tools that are able to automatically find correlation between variables given a .csv file input.
- Tools do exist (IBM SPSS, minitab) that allow users to run different statistical tests on a given set of data. However, it requires that the user has a solid foundation on statistics.
- Available tools do not have the ability to do do all these tests automatically
- Available tools do not have the ability to determine which test should be used based on the datatype of each column.
- Given the datatype that my program identifies, the correct correlation method is used
- Some correlation tests only identify if there is correlation and can't say anything about its strength. My program uses further tests to determine the strength of this correlation, something that I have not seen other programs do

Broader Impacts

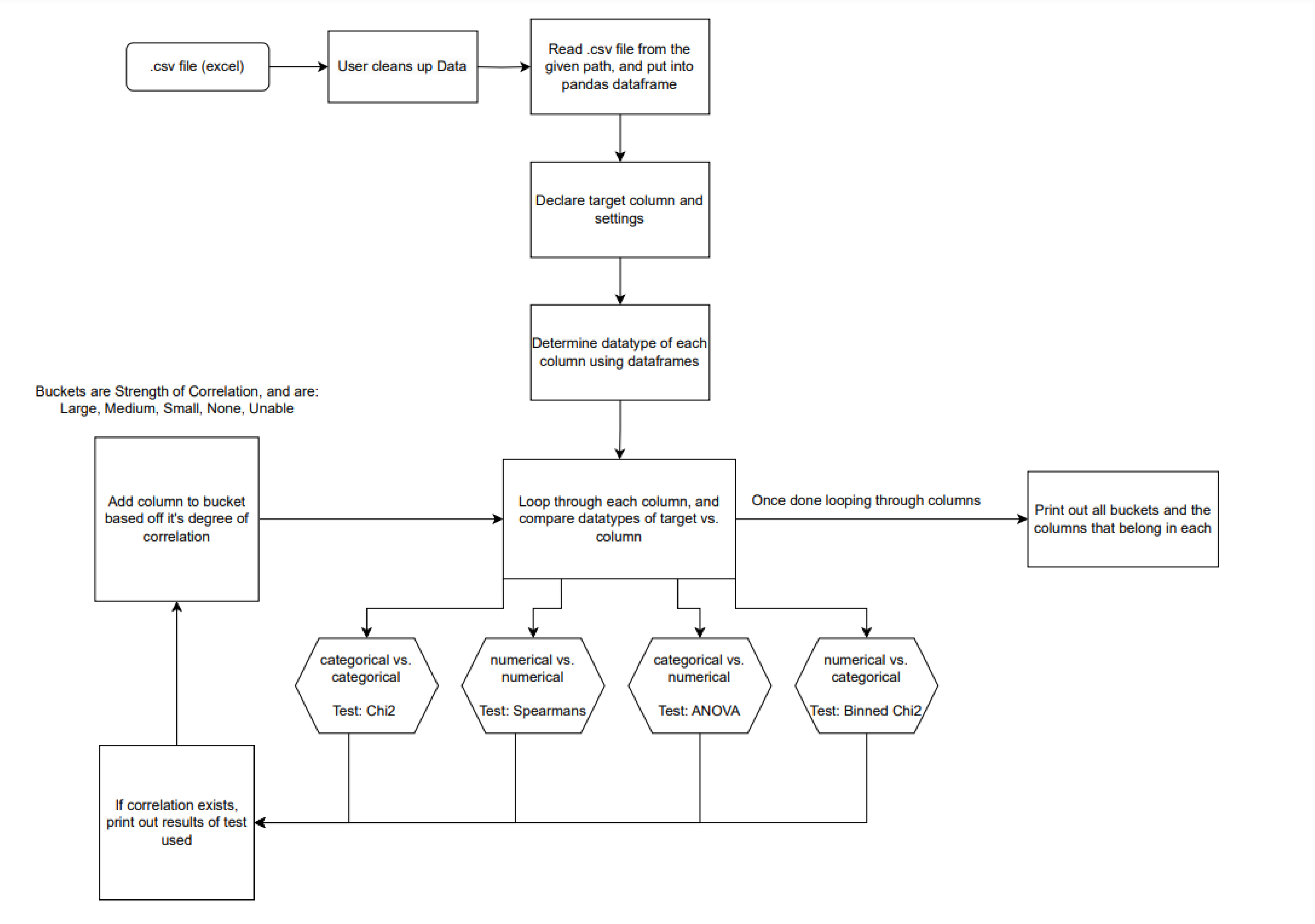
- Correlation is useful because it quantifies the degree to which two variables are related. Understanding correlation helps in predicting one variable from another, identifying trends, and making inferences.
- Correlation is a fundamental statistical tool that enables data analysts to draw insights from data as well as guide decision-making.
  - Examples: Find out which variables impact sales the most, which variables determine to apple quality, which lifestyle factors impact cardiovascular disease, etc.
- My program allows a user without extensive statistical experience to be able to calculate correlation from the target they want to analyze to their entire .csv file.

Design Specifications

- Program was created inside of a Jupyter Notebook
- Input: .csv file
- Output: Strength of correlation between target and all other columns

- Takes the .csv file and puts it into a Pandas dataframe. Dataframe automatically determines the datatype of each column.
- Loop through each column and run one of 4 correlation tests depending on the datatypes of the target vs. column.

Design Specifications



.csv file (excel)

User cleans up Data

Read .csv file from the given path, and put into pandas dataframe

Declare target column and settings

Determine datatype of each column using dataframes

Buttons are Strength of Correlation, and are:

Buckets are Strength of Correlation, and are:
Large, Medium, Small, None, Unable

Add column to bucket based off it's degree of correlation

Loop through each column, and compare datatypes of target vs. column

Once done looping through columns

Print out all buckets and the columns that belong in each

categorical vs. categorical

Test: Chi2

numerical vs. numerical

Test: Spearmans

categorical vs. numerical

Test: ANOVA

numerical vs. categorical

Test: Binned Chi2

If correlation exists, print out results of test used

Technologies

- Jupyter Notebook
  - Python Data Science Workspace
- Git
  - Version Control
- Data Handling and Analysis Libraries
  - NumPy, Pandas Dataframes
  - Handling data from the .csv
- Statistical Analysis Libraries
  - SciPy, Statsmodels
  - Running the tests for correlation and strength of correlation

Milestones

- 1/15: Project plan, environment setup, data collection
- 1/22: Initial data analysis report outlining which types of .csv should be used
- 1/30: Research which tests should be used for each correlation datatypes
- 2/15: Prototype for functions for ANOVA, chi-square, and correlation tests integrated into the project.
- 2/25: Initial analysis of correlation results, keep working on tests
- 2/30: Ensure correlation results are correct with IBM SPSS
- 3/25: Complete final presentation, poster, deliverables, etc.
- 4/14: Final project presentation at Expo, collection of feedback, documentation of lessons learned, and discussion of potential future work

Results

- Achieved all milestones
- Currently have a working Correlation Analysis Program
- Demo will consist of showing the execution of the program live with 3 datasets I have picked
- There are things that could be added in the future, but with time constraints, this is the place that I have decided to stop at
- I am happy with how things turned out and believe that my program demonstrates the research and implementation of Computer Science/Statistics

Challenges

- Project direction changed somewhat sharply right before the end of the Fall Semester
  - My advisor and I believed that this was the correct choice and would lead to a more meaningful project
- Lots of research had to be done on statistics, correlation, etc., since I did not have an extensive background
  - I was able to learn a considerable amount from resources around the internet.
  - There was a shockingly low number of resources on programs to calculate correlation. I learned there are many formulas for calculating correlation
  - I found out that the method and formula used depends on the datatypes of the variables being analyzed