Business Performance Estimate

How To Start New Businesses Based On Customers' Reviews

CS9233 - Programming for Big Data

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Outline

- Introduction
- Data Source
- Workflow
- Result
- Conclusion & Future Work

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Why *location* is so important?

- Directly affect the source of actual audience
- Hard to estimate w/o actual practice and testing
- Time and money consuming
- Risky for new openings
- Also, difficult to figure out key attributes strongly affecting the rating

What can *big data* do?

- Suggest a potential opening in designated area
- Estimate performance and rating based on the given location
- Find out the most important factors combined with *machine learning*

Target Audience?

- Startup or individuals, the ones whom have little or no experience, that willing to take less risks
- Corporate businesses companies, which want to expand their businesses

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Data Source

- Yelp / FourSquare
  - 200k businesses
  - 5.2m ratings
- Financial statements from related corporate businesses
- data.gov: statistics of U.S. businesses

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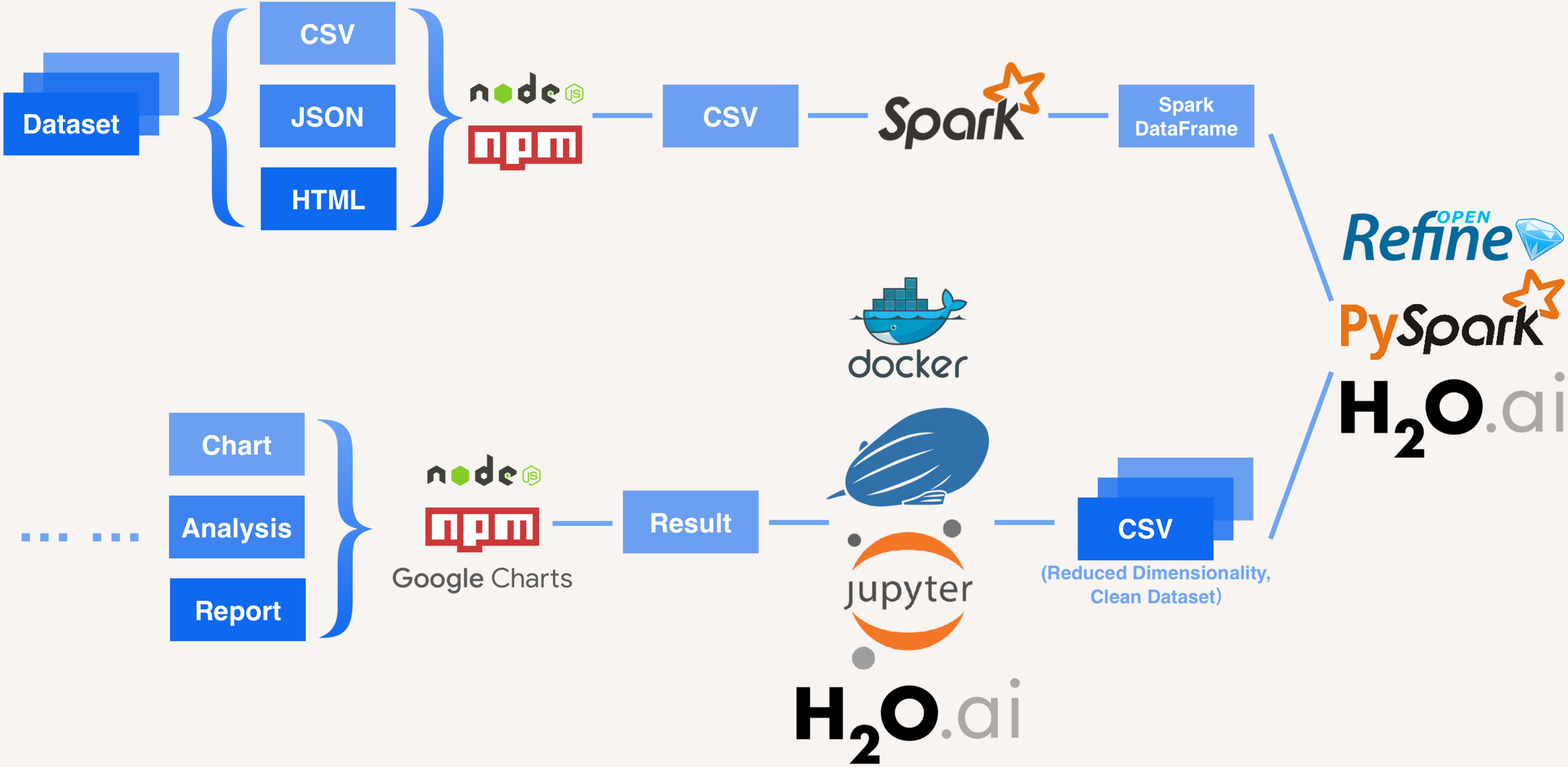
Workflow



Dataset

CSV

JSON

HTML

CSV

Spark DataFrame

Chart

Analysis

Report

Result

CSV

(Reduced Dimensionality, Clean Dataset)

Workflow (Cont.)

- Formatter: convert `.csv`, `.json` and `.html` file into `.csv`
  - nodeJS & `npm`: `json2csv` package
  - Manually collect some useful info from the document
- Import `.csv` files into `Spark`:
  - Flatten attributes
  - Generate Spark DataFrames

Workflow (Cont.)

- Data Preprocessing:
    - Reduce dimensionality:
        - Feature selection & extraction
        - Principal Component Analysis (PCA)
        - Avoid overfitting
    - Clean data

Workflow (Cont.)

- Data Preprocessing:
    - Export into multiple .csv files:
        - Different categories
        - Different cities
        - etc.

Workflow (Cont.)

- Big Data Analysis:
    - Spark SQL module
    - H_2O Machine Learning
- Final Result:
    - Chart
    - Analysis

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Top 10 Categories For Each State

Chart

Category	Rating
Shaved Ice	4.408471787
Gelato	4.378077256
Coffee Roasteries	4.374378378
Cupcakes	4.345326146
Street Vendors	4.328106969
Poke	4.2968294
Local Services	4.22552278
Lebanese	4.224629437
Internet Cafes	4.19702228
Polish	4.19209245

Top 10 Cities For Chinese Restaurant

Chart

City	Rating
Aurora	3.782264274
Pickering	3.73193294
Newmarket	3.729253363
Stuttgart	3.592544663
Gilbert	3.560078808
Gastonia	3.559007997
Edinburgh	3.558972629
Huntersville	3.54797137
Fort Mill	3.47231295
Montreal	3.465306657

Compare Machine Learning Methods

- Chart (Group By Method)
- Chart (Group By Norm)

Method	MSE	RMSE	r^2	mean-residual-deviance	mae	rmsle
Random Forest	0.099864	0.316013	**0.780328**	0.099864	0.230048	0.083253
Deep Learning	0.428654	0.654717	**0.057082**	0.428654	0.503647	0.163133
Gradient Boosting	0.17661	0.42025	**0.611507**	0.17661	0.282799	0.108599
XGBoost	0.408734	0.639323	**0.100901**	0.408734	0.494821	0.159414

Find the Best Location For Opening

TO BE ADDED

Attributes

- `Latitude` comes first:
  - Location is really important

Attribute	Priority (%)
Latitude	0.0469
Accepts Credit Cards	0.0433
Price Range	0.0349
Good For Kids	0.0132
Good For Groups	0.012
Reservations	0.0108
Take Out	0.0108
Outdoor Seating	0.0096
Wi-Fi	0.0096
Noise Level	0.0084
Alcohol	0.0084

Estimate Rating Using Machine Learning Model

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Conclusion - Estimated Objectives

- For Individuals:
  - New businesses opening suggestions
  - Given category / area
- For Corporate Businesses:
  - Where to expand
  - How to improve ratings

Conclusion - Estimated Objectives

- For Both:
    - Key attributes affecting on ratings

Future Work

- If given more data:
  - Time lapse: trends
  - More city data
- Rating vs. Profit
  - Long-term eyesight

Q&A

Thank you!