# “Project Alien Worker”

DATASCI W210 Capstone

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# The Business Problem

- How long does it take to get a work visa for a given job title?
- Context and Audience
  - Companies want to know if it's worth the effort (time, money) to fill post with a foreign worker
  - Individuals want to know what job areas have a quicker path to visa approval
- Impact
  - Improved insight on visa petitions on time taken to process applications for a given job type
- Importance
  - Companies can do more predictable planning about their hiring practices
  - Individuals can focus their applications to jobs that have better visa turnaround times

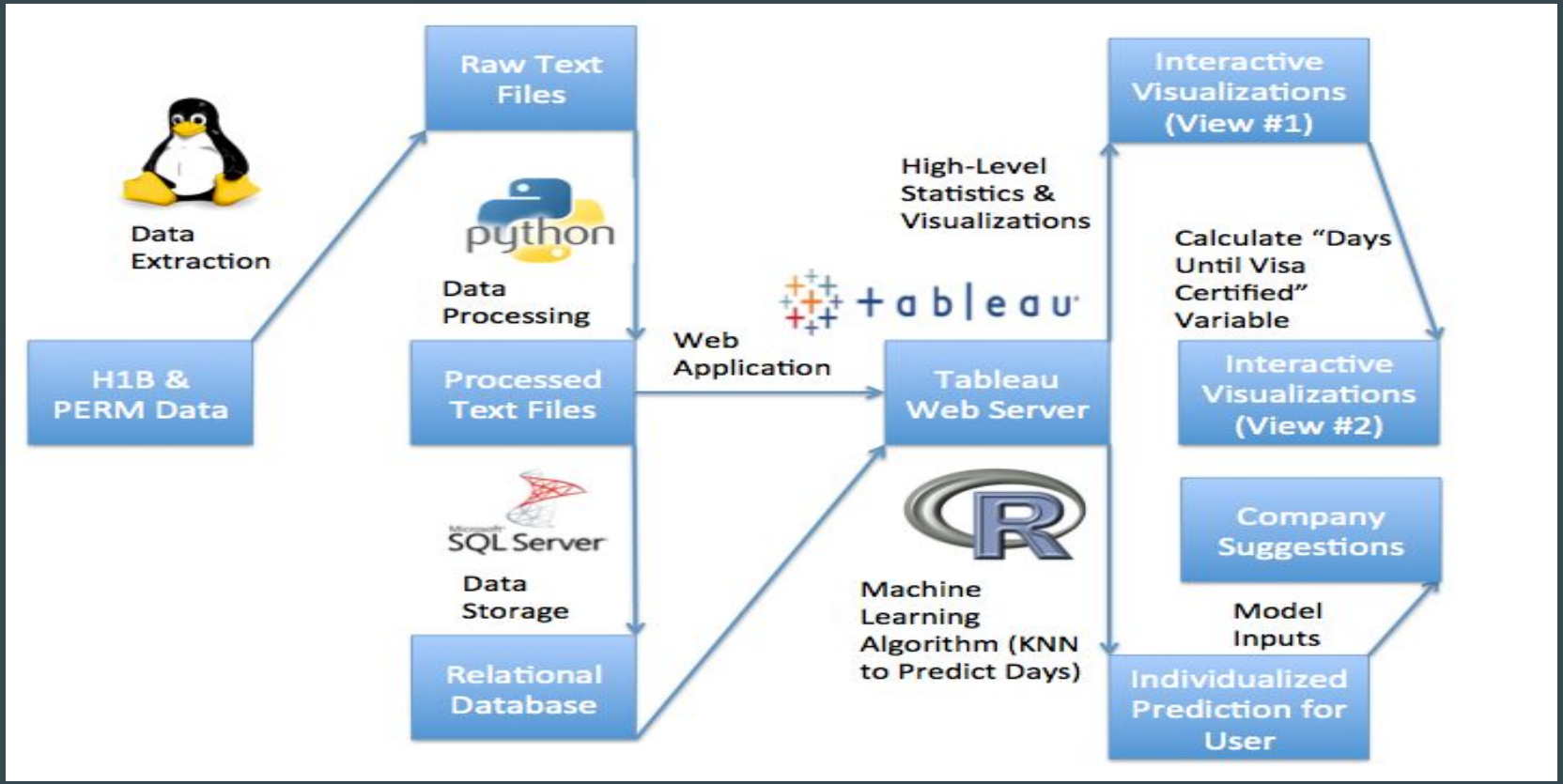
# The Data

- Collection and Extraction
  - H-1B data collected 2001-2015 from Department of Labor
  - Merged into a single SQL database table with a combined schema
- Cleanup
  - Standardized labels (e.g. wage rates, state names), addresses, etc;  trimmed whitespace
  - Created job dimension tables for modeling and higher-level analyses
  - Other pre-aggregated datasets to improve Tableau performance
- Sample fields
  - Application submission date
  - Job title
  - Last significant event (Certified, Denied, Withdrawn)
  - Last significant date (e.g. date certified)

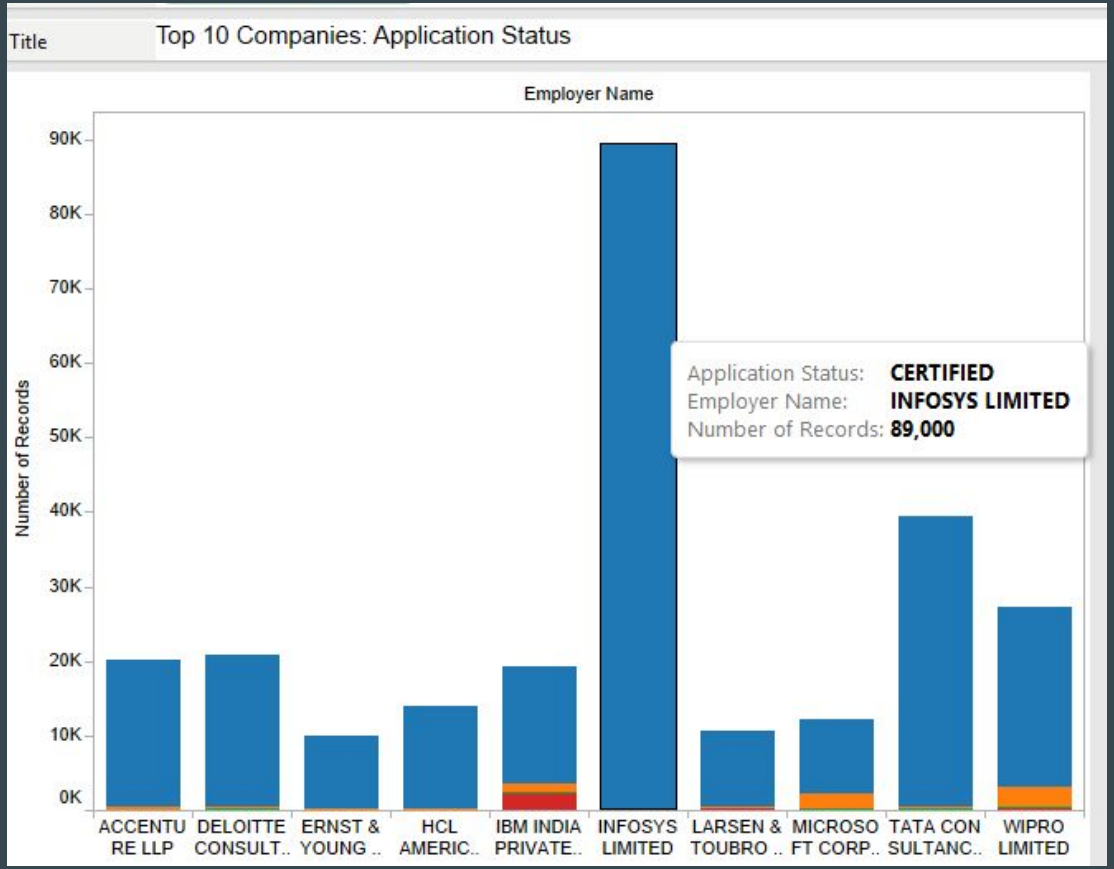
# The Solution

- Process
  - For each application, calculate “Days Until Visa Certified” variable
  - Use a sample set to train a KNN machine learning algorithm with job title as predictor
  - Then use the algorithm to predict “Days Until Visa Certified” for other inputs
- Explanation
  - Exploratory analysis shows job title can be a predictor for how long an application might take
- Our differentiator
  - Currently, official USCIS site only lets users/companies view current application stage
  - There are no sites or apps that try to predict the application time
  - Our project’s prediction adds an important piece that’s currently missing

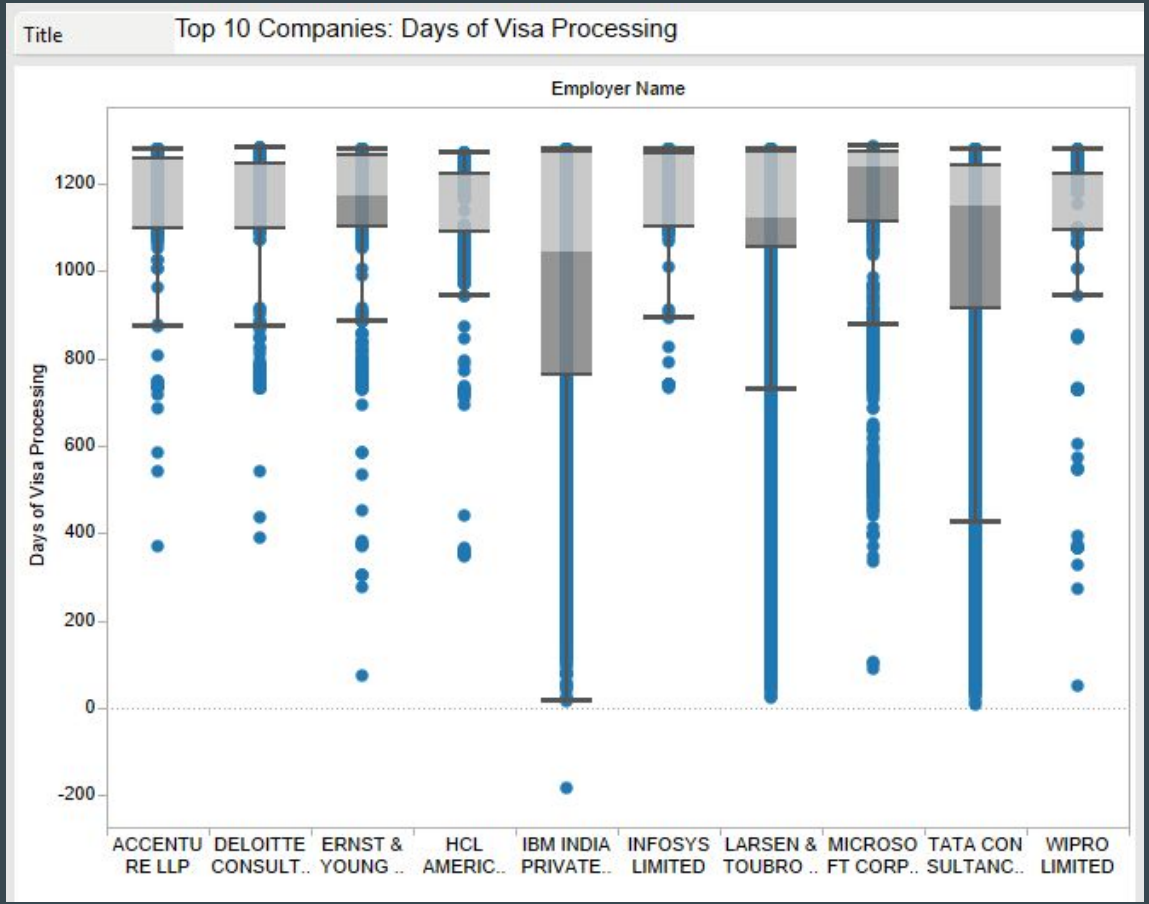
# The Data Pipeline



# Exploration: Application Status by Company



# Exploration: Days to Process by Company



# Exploration: Quickest Job Titles and Companies

## Quickest Certification Rate: Jobs

| Job Title | |
|---|---|
| COMPUTER PROGRAMMER | 1,073.87 |
| PROGRAMMER ANALYST | 1,117.77 |
| SYSTEMS ANALYST | 1,126.94 |
| COMPUTER SYSTEMS ANA.. | 1,132.24 |
| SENIOR SOFTWARE ENGIN.. | 1,136.51 |
| BUSINESS ANALYST | 1,140.52 |
| TECHNOLOGY LEAD - US | 1,145.56 |
| SOFTWARE DEVELOPER | 1,152.83 |
| SOFTWARE ENGINEER | 1,156.11 |
| TECHNOLOGY ANALYST - U.. | 1,163.99 |

## Quickest Certification Rate: Companies

| Employer Name | |
|---|---|
| IBM INDIA PRIVATE LIMITED | 971.8 |
| TATA CONSULTANCY SERVICES LI.. | 1,019.6 |
| LARSEN & TOUBRO INFOTECH LIMI.. | 1,054.5 |
| HCL AMERICA, INC. | 1,131.9 |
| WIPRO LIMITED | 1,145.0 |
| DELOITTE CONSULTING LLP | 1,149.8 |
| INFOSYS LIMITED | 1,163.2 |
| ACCENTURE LLP | 1,165.2 |
| ERNST & YOUNG U.S. LLP | 1,179.2 |
| MICROSOFT CORPORATION | 1,192.2 |

# The Predictive Modeling

- Dependent Variable
  - Days Until Visa Application Certified
- Independent Variables
  - Desired company location
  - Desired job title
- K-Nearest Neighbors algorithm
  - Predicts days until application is certified
  - Outputs 3 company suggestions with minimal wait times
  - User can input company location or job title for prediction
- Accuracy
  - Predictions on average are roughly within 50 days of true value
  - ~95% of predictions are within 200 days of true value

# Highlights, Challenges, Takeaways

- Project management from day 1
  - Agile methodology allowed us to iterate over ideas and assigned tasks
- Clear problem-solving approach, avoiding data overload
  - Datasets had millions of rows and hundreds of variables
  - Great to explore all of the data, but should be quick to define problem statement
- Dirty data causes problems
  - Wrong or missing data and unstandardized fields
  - As a data originator, good to define a data structure/schema that holds with time

# The Future

- Improving our training model by incorporating more predictors
  - Year of application
  - Applicant's level of education
  - Applicant's current visa class
- Incorporate additional datasets
  - E.g. if unemployment rates in a region affect visa turnround time

# The Project Website

http://people.ischool.berkeley.edu/~samkabue/capstone/

# The Toolkit


python


Microsoft
.NET


Microsoft
SQL Server


cassandra


+ableau


R


SOFTLAYER
an IBM Company


GitHub