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2XB3 Design GROUP 29

Alchemist

Functional Overview & Specifications

April 4th, 2016

SFWR ENG 2XB3 - McMaster University Department of Computing & Software

NSERC Grant Database Search & Forecasting Tools

What is the size of a particular field of research in the next n years?

NSERC Grant Dataset

- Most of the research that occurs in Canada is funded in NSERC
  - Grants awarded by the NSERC are almost always co-funded by a partner in industry
- Large dataset spanning 1996 to 2014

Prof. Name	Award Amount	Year Awarded	Institution	Subject	Field	Province, Territory, or State

Purpose

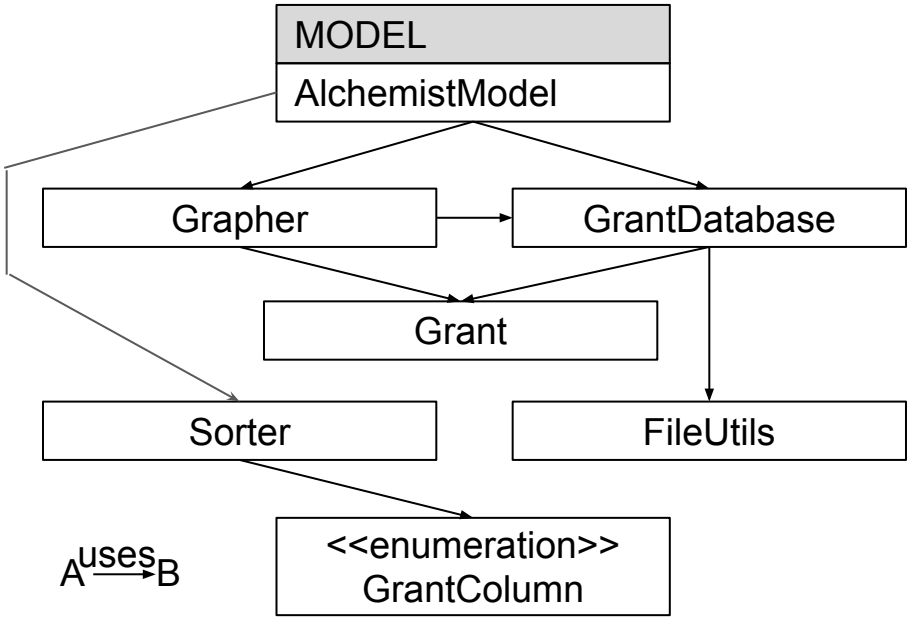
- Objectives
  - Forecast future grant amounts
  - Increase accessibility to NSERC grant award database
  -
- Motivation
  - Identify financial trends in research
  - Provide research institution metrics for students, faculty, and business

Requirements and Specification

- Search by field
  - Researcher Name, Institution, Province/State,Grant Amount, Year, Subject, Field
- Sort results to display top N results
- Use a graph type data structure to organize grants
  - Optimize sort and search algorithms
- Display results relevant to the query on a map or other suitable medium
  - I.e. a bar graph if the query is amount rather than the geographical location
- Prediction model based on external library
  - Offer a prediction within a certain margin of error
  - Cannot account for significant shifts in economic stability or inflation
  - Results should be interpreted as **current** value of currency

Software Architecture

SERVER API Provider



CLIENT API Consumer

VIEW
Ionic Framework

Sending HTTP Requests to Server:

GET /api/search/:column/:search

GET /api/get/series/:column/:search

GET /api/list

GET /api/ping

Algorithms

Sorting: **Timsort**

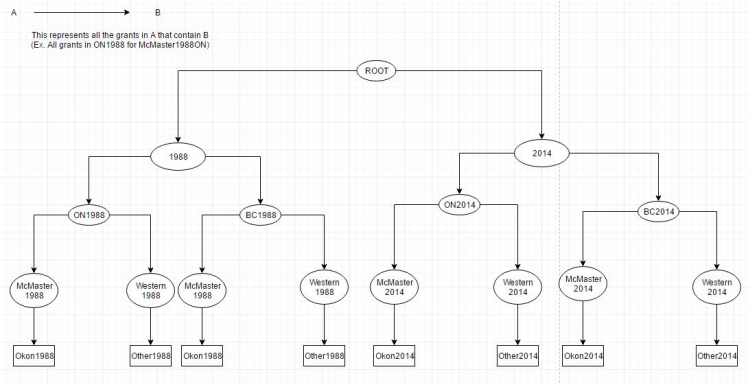
- nlog(n) Complexity
  - N complexity for best case
- Space was not an issue

Searching: **BinarySearch**

- Log(n) Complexity
- Arrays sorted before searches

Graphing: **Tree**

- Hierarchy of nodes
- Undirected Weighted Graph
- BFS to find specific weights



Validation (Testing)

Blackbox:

-Logic, Functionality

-Requirement Testing

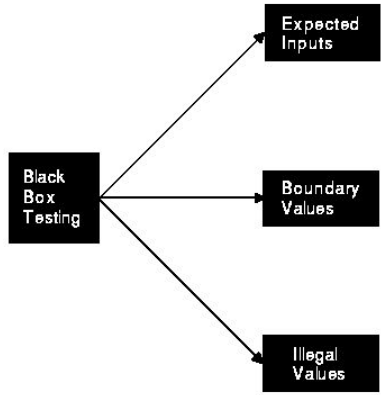
-Edge Cases/Partitioning Inputs

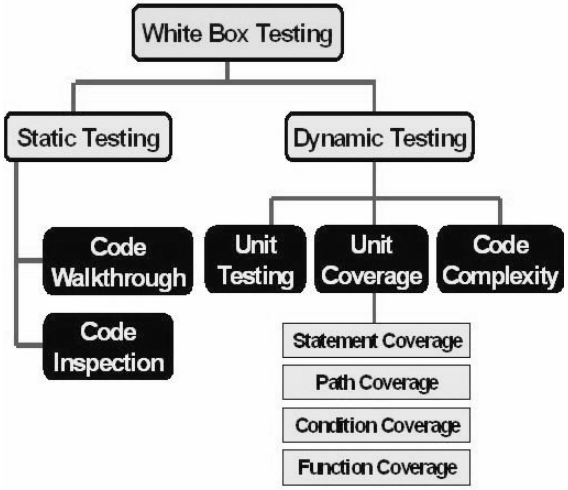
Whitebox:

-Selective JUnit Testing

-Modular level /Structural Testing

-Pre/Post Conditions





Validating Projections

- Margin of acceptable error
  - Up to 5% in grant amount awarded
- “Supervised Validation”
  1. Take a subset of data (years 1991-2008)
  2. Project for 2009
  3. Compare with actual 2009 data
  4. Check if it is within margin of acceptable error

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Demo

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