Final Project Progress Presentation

@CSE305

CSE512 Students  University of Washington
Where is your bus?
Let's find out. We provide easy access to real-time transit information for the Puget Sound region and beyond.

Our Goal
What is OneBusAway? Find out.

We want to make it easier to use public transit by providing easy access to schedule and real-time arrival information for the buses and trains you ride every day.

We provide:

- Real-time arrival information for a number of transit agencies.
- Arrival info for every bus stop.
- Easy access to information across a variety of devices.

Why? We're riders just like you and we don't like waiting for the bus any more than we have to.

Our Tools
Our tools are available across a number of interfaces.

- Web
- Phone
- SMS

- iPhone
- Android
- WP7
- Mobile

Our Research
OneBusAway was started by students at the University of Washington, and it supports research on improving the usability of public transportation, such as the Explore Tool shown above. Check out our research page for more information.

Our work is all open-source software, so that others may reuse and build upon our efforts.
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[Icons for Web, Phone, SMS, iPhone, Android, WP7, Mobile]

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Where is your bus?
Let's find out. We provide easy access to real-time transit information for the Puget Sound region and beyond.
Play animation (and/or select a time) to see how patterns change throughout the day.

Show animated ‘trails’ of buses that fade over time.

Color trail based on delay to show congestion.

Select certain routes to see details like connections.

Routes:
- 16
- 5
- 72
- Etc.
We’d like feedback on:

• Advice for geography tools that ‘play nice’ with D3 and Google
• Ideas on how to deal with “bus bunching”
• Suggestions for how to implement this so that the trails stick to routes instead of jumping across streets?

Camille Cobb, Caitlin Bonnar, Yi Pan, Katie Kuksenok
StepItUp: Context-Aware Visualizations to Motivate Increased Physical Activity

Daniel Epstein        Felicia Cordeiro
CSE 512
Problem Statement
Problem Statement
Related Work

Related Work

Our Approach
Our Approach

Real-time
Our Approach

Real-time

Meaningful
Our Approach

Real-time

Meaningful

Motivational
Our Approach

Real-time

Meaningful

Motivational

Context-Aware
Our Approach

Real-time

Meaningful

Motivational

Context-Aware

Visualizations!!
Current Progress

- You’re about to leave work to go home.
- We know you always take the bus one of 2 ways.
- One way gets more steps than the other.
- We know you are short on steps for the day.
- We could present:
Current Progress

• We notice that you always run on Thursdays.
• It is Thursday evening, and you haven’t run yet.
• We could present:
Feedback We Want

• What other scenarios can you imagine that utilize the ability to predict if someone is going to reach their step goal?

• Thoughts on what visualizations would be most effective in different situations. For example, how complex should the vis be for most impact on a mobile phone?

Daniel Epstein, Felicia Cordeiro
Real-Time Interactive Visualization of Disaggregated Energy Usage

Eric Mullen, Md Tanvir Islam Aumi, & Will Scott
Energy usage is vastly misunderstood.
Not just ‘visible’
Energy usage
Consumers incorrectly believed they could save 2\times more energy by reducing lighting rather than hot water usage.
# Your Energy Efficiency Report

This report tells you specifically how your electricity was used last month, and suggests ways to save.

CHAD SINGER  
2216 S. BENTLEY AVE #9  
LOS ANGELES, CA 90064

<table>
<thead>
<tr>
<th>Your billing period</th>
<th>Total Cost</th>
<th>Compared to last bill</th>
<th>Compared to Similar neighbors*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 1 - Sep 26, 2011</td>
<td>$161.58</td>
<td>$56.58 less (26%)</td>
<td>Similar</td>
</tr>
</tbody>
</table>

You reduced the amount of power used for air conditioning by 76% last month!
- That’s 33% lower than that of similar neighbors!*
- If you maintain this level of usage, you’ll save an estimated $271 this year.

Your dishwasher used 53% more energy this month than your neighbors*.
- You could save up to $180 a year by upgrading to an efficient dishwasher.
- If you find you often want to run the dishwasher before it is full, try the rinse-only feature common on newer models.

<table>
<thead>
<tr>
<th>Your top energy consumers</th>
<th>Estimated Cost**</th>
<th>Compared to last bill</th>
<th>Compared to similar neighbors*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Water Heater</td>
<td>$31.50</td>
<td>$8.12 (26%)</td>
<td>similar</td>
</tr>
<tr>
<td>Air Conditioner</td>
<td>$29.82</td>
<td>$48.23 (76%)</td>
<td>33% lower</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>$22.66</td>
<td></td>
<td>11% higher</td>
</tr>
<tr>
<td>Lighting</td>
<td>$13.80</td>
<td>$14.06 (53%)</td>
<td>21% lower</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>$11.55</td>
<td></td>
<td>53% higher</td>
</tr>
<tr>
<td>Stove</td>
<td>$10.01</td>
<td>$0.91 (5%)</td>
<td>6% lower</td>
</tr>
<tr>
<td>Dryer</td>
<td>$7.56</td>
<td>$0.05 (11%)</td>
<td>similar</td>
</tr>
<tr>
<td>Clothes Washer</td>
<td>$3.96</td>
<td>$0.09 (4%)</td>
<td>similar</td>
</tr>
</tbody>
</table>

**THINGS YOU CAN DO RIGHT NOW TO IMPROVE YOUR EFFICIENCY**

**Target 68°**  
Save more on heating costs this winter. Setting your thermostat a few degrees lower will really add to your savings.

**Insulate your water heater**  
Adding an insulating blanket to your water heater can reduce standby heat losses and save water heating costs.
Annual % Savings

- Enhanced Billing: 3.8%
- Web Based: 6.8%
- Daily Feedback: 8.4%
- Real-time Feedback: 9.2%
- Appliance Level: 12%
- Real-time Appliance level + Personalized Feedback: 20%

>20% reduction: Gardner et al. (2008) and Laitner et al. (2009)
How much does each appliance consume in GALLONS OF GAS per YEAR?

Clothes dryer: 80 GALLONS OF GAS

Appliance total: 1,889 GALLONS OF GAS
Energy Dashboard

12:00 AM

now

Total Usage Today: 121 kWh
Energy Dashboard

Total Usage Today: 121 kWh

Dishwasher: 27% of total usage
Replacement pays for self in: 2.5 years
Cost: $345 per year
Discussion

Eric Mullen
Md Tanvir Islam Aumi
Will Scott
Visualizing Data from a MOOC

Katelin Bailey, Jialin Li, Naveen Kr. Sharma
Data

- Data from 2 offerings of PL Coursera courses
  - Demographic information
    - Location, age, gender, nationality, background
  - Assignment results
  - Quizzes
  - Midterms, Finals
    - Scores for each problem
  - Final grades
Exploratory Questions

● Compare stats across 2 offerings
● Explore data instructors haven’t explored
  ○ Video watching
  ○ Forum participation
  ○ Quiz responses
● Correlations
  ○ Participation vs. scores?
  ○ Background vs. grades?
  ○ etc
Progress
Questions for audience

- If you were the instructor, what do you like to learn from the data?
- What exploratory features you would like from the tool?
  - zooming in on specific questions?
  - stacking filters for more specific exploration?
  - map for geographical information?
  - correlation of time-submitted with grade?

Katelin Bailey, Jialin Li, Naveen Kr. Sharma
Visualizing Query Execution in a Distributed Database

Umar Javed, Thierry Moreau, Dominik Moritz, Adriana Szekeres
How can we make a query run faster?

- Why is execution/data skewed?
- Which worker/node/operations is the bottleneck?
- How does data flow?
SELECT *
FROM S, R,
WHERE S.x = R.y
Data Flow Between Workers

Diagram showing the flow of data between workers 0, 1, and 2. The process includes Scan(S), Scan(R), HashJoin, and DBInsert. Each worker stage is connected with arrows indicating the direction of data flow. The diagram also includes a visualization of the total number of tuples processed.
Data Flow Between a Pair of Workers

0 Scan(S) → 2 HashJoin → 3 DBInsert

1 Scan(R)

# of tuples vs. time
Computation at query segment

Diagram showing the process with nodes labeled: Scan(S), HashJoin, and DBInsert.
Computation at query segment

Diagram showing the computation flow with nodes labeled as Scan(S), HashJoin, and DBInsert, and tasks labeled as Scan(R) and Shuffle Producer. The timeline shows the number of workers over time.
Feedback

- Did we address the questions?
- Are the chosen chart types effective?

- Why is execution/data skewed?
- Which worker/node/operations is the bottleneck?
- How does data flow?
CSE 512
How A Bill Becomes A Law (HABBAL)
Rob Thompson
Lucy Williams
Sam Wilson
Project and Motivation

• How is federal bill text reused and adapted?
• Access to a large number of bill text comparison data
• Want to display comparisons between one bill (ObamaCare) and all others
• Communicate composition and history of one bill’s text
  o A ‘Democratic’ bill may take text from many ‘Republican’ ones
Graph shows matching string loc. in sector

Square per section of bill

List sorted by # of matching bills
Prior work


• XKCD’s “Money” http://xkcd.com/980/
Questions

Is a long list sorted by importance acceptable?

How can text alignment data be shown/explained effectively?

Is seeing section text interesting?

Rob Thompson, Lucia Williams, Sam Wilson
Visualizing Progression Plans for Education and Game Design

Eric Butler and Rahul Banerjee
\[
\frac{1}{2} + \frac{1}{2} \rightarrow \frac{1}{4} + \frac{1}{5} \rightarrow \frac{1}{8} + \frac{1}{13} \rightarrow \frac{1}{4} \times \frac{1}{3} \rightarrow \frac{2}{5} \times \frac{2}{3} \rightarrow \frac{11}{5} + \frac{14}{5}
\]
Designer Activities

- In what order are concepts introduced?
- Which concepts are used in combination?
- How does complexity change during the progression?
- How do two (possibly automatically generated) progressions differ?
Questions for Audience

• Techniques for visualizing plans?
  • Plans represented as sequence of feature vectors
  • Particularly interested in comparison.

• Related domains from which to draw inspiration?

• Potential interaction techniques?

• Potential aggregate summaries (e.g., combination matrix)?
Voice Interfaces for Visually Impaired and Low-Literate Communities in the Developing World

Aditya Vashistha  Sam Sudar
Motivation

• Graphical and textual interfaces leave billions of people behind

• 258M visually impaired
  • 90% in developing countries

• High illiteracy
  • 26% of India
  • 20% of US is “functionally illiterate”
Interactive Voice Response Systems

- Health
- Education
- Citizen Journalism
- Social Media
What is the most effective way to organize information on IVR?
Prior Work

• Desktop and mobile phones
  • Graphical UI
  • Hierarchies vs. List
• Impact of Education
Research Questions

• Hierarchy vs list
• Acceptable list length
• Hierarchy depth
• Effects of user abstraction capability

Currently Designing the Experiment and Evaluation Feedback Needed!

Aditya Vashistha, Sam Sudar
Visualization for Machine Learning

Alex Bykov, Stanley Wang
Motivating problem

• Lack of useful visualizations for understanding how your machine learning algorithms are performing
• Want to go beyond just error rate and simple plotting of decision boundaries
Prior work

- Visualizing the final classifier
The idea
Questions for you

• Do you see this as being useful?
• Any ideas on visualizing the multiple dimensions of the data?
• What would be good info to plot against time? (e.g. accuracy, biggest change in errors)
• Additional encodings for graph?

Alexandre Bykov, Stanley Wang
Transparent Boosting Tree Learning using Interactive Visualization

Tianyi Zhou, Tianqi Chen, Luheng He
Machine Learning meet Visualization

• Machine Learning:
  – A black box using **machine Intelligence**
  – ML is good, but hard to know why (**not transparent**)

• Visualization:
  – Explore data by using **human intelligence**
  – Effective on clean, small, low-dim data
Our solution: **Build a Loop via Interaction**
Comparing to existing tool like BigML, we allow instantaneous update of model caused by user feedback in learning process, and boosting tree is more powerful than decision tree.
Planning Visualizations

Christopher Lin
Jonathan Bragg
Markov Decision Processes
Questions About Plans

“Why did my policy choose this action instead of another one?”

“What are the probabilities (and values) of transitioning to other states?”
Our Idea

User clicks state circle

a_1

a_2

a_3
Our Idea

User clicks state circle

Diagram showing a sequence of actions labeled as $a_1$, $a_2$, and $a_3$.
Our Idea

User clicks action arrow
Our Idea

User clicks action arrow

$a_1$, $a_2$, $a_3$
Questions

1. In the domain-specific visualization of gridworld, it is extremely easy to tell how states are related to each other. In our general method, it is harder to see these relationships. How can we bring the power of a domain-specific visualization to a general encoding?
2. How do we deal with MDPs with an extremely large state space or an extremely large action space?
3. If we extend our method to deal with Partially Observable MDPs, where the states are unobservable, how do we encode distributions over states? How do we encode observations?
4. What is the best way to communicate that two states are the same? Displaying a graph? Using the same color for circles that represent the same two states?