

# LINDEN LAB: RECOMMENDATION ENGINE FOR SECOND LIFE

## What is Second Life?

A virtual world with regions that are populated by avatars.

- Linden Lab makes platform for object creation and scripting, and hosts the land and space servers
- Content is all user-made.



Regions vary from well-constructed and populated to mostly abandoned and devoid of aesthetic quality



## Second Life Activities

- Chat with IMS or voice
- Fly and teleport
- Own land on which to build
- Build and script objects
- Buy or sell user-made virtual goods with Linden Dollars (LS)



- Clubbing
- Concerts
- Dating
- Roleplaying



## Problem

After the novelty of flying and having an avatar wears off, it is difficult to find engaging places.

- Currently, Linden Lab offers a showcase of hand-selected places
- Search functionality is improving, but not great.
- Avatars may promote “picks” on their user profiles
- In-world map shows current avatar locations, but it is slow



## Our Goal

Build a recommendation engine to help with user retention

- Using streams of data provided by Linden Lab
- Web interface for use outside of Second Life or within Second Life’s built-in web browser.

## Approach and Methods

3 rounds of making and testing recommendation algorithms

- Algorithms rank regions (256 meter X 256 meter patches of land in Second Life)
- Top ranked regions are returned by algorithms and presented for feedback

### Limitations on Data Available

- Very limited amount of useful metadata about second life regions and objects
- Most algorithms based on behavioral characteristics (population, economic behaviors)
- Data was anonymized, limiting attempt to make algorithms personalized.

### Gathered feedback from users with web-based survey

- Asked for users to rate regions returned by algorithms on 1-5 scale for each of (1) how much they liked the regions and (2) how much they thought others would like it
- Also gathered comments about results

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## Algorithms Tested

Round 1:

Based on long-term data:

- Most L\$ spent
- Most accepted group invitations
- Most chat messages
- Most IM messages (subset of chat)

Round 2:

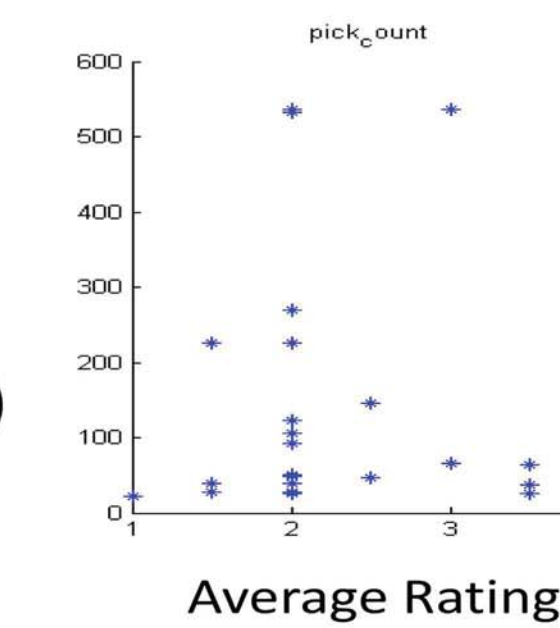
Based on near-realtime data:

- Most chat messages
- Most people-seconds (dwell time)
- “Freebie Dwells” – Most (dwell time X number of zero L\$ transactions)
- “Dwell x Age” – Dwell (person-seconds) with each person weighted by their lifetime use in minutes

Round 3:

Based on near-realtime data:

- “Dwell x Picks” – Dwell x number of times a region is someone’s pick
- Pagerank-inspired algorithm based on travel between regions
- Modified round 2 algorithms



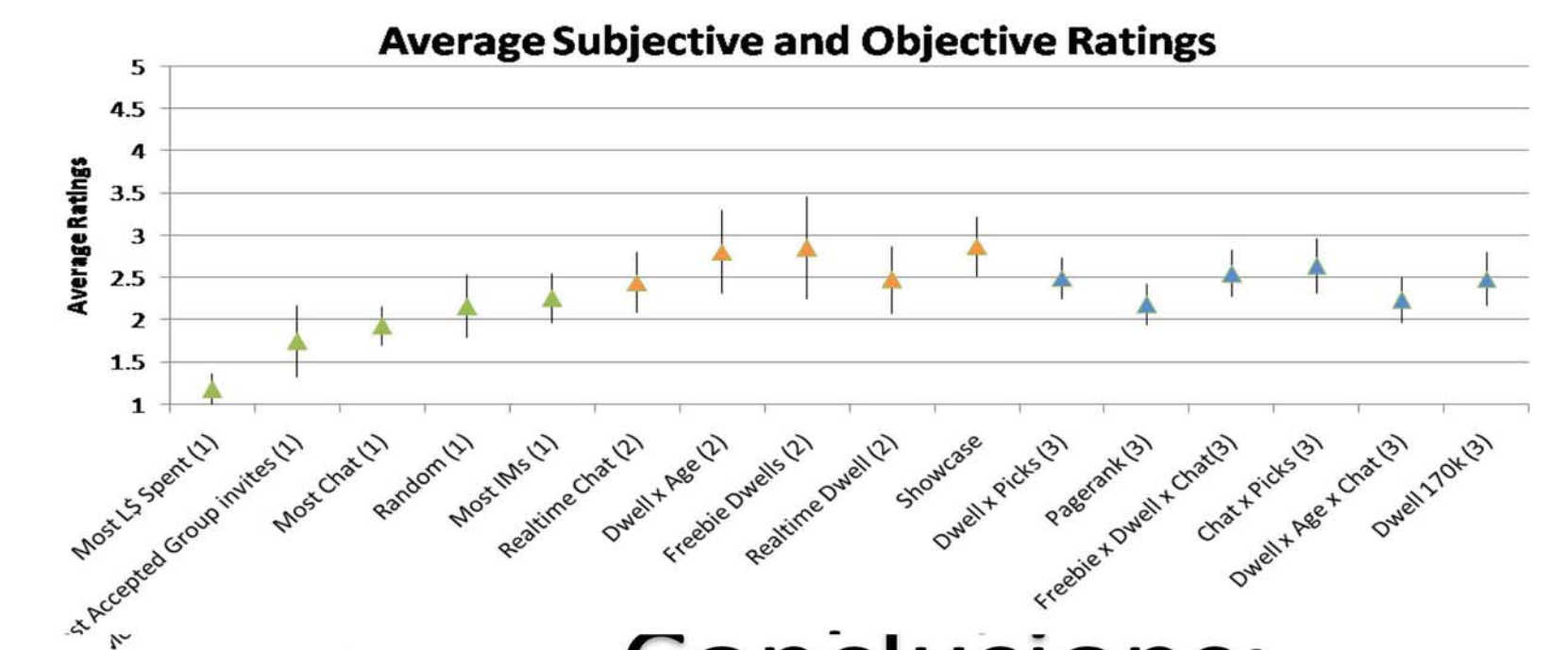
← Example of round 2 algorithm modification – by eliminating results from the “most chat” algorithm that have a pick count of less than 100, the average expected rating is improved.

## Results

Round 1 algorithms performed poorly

Modifications of round 2 algorithms tested in round 3 did not show uniformity in rating improvement (in fact, most got worse)

Many top rated algorithms use dwell.



“really cool. There are horses, places to belly dance...relatively deserted but there were **more people here than other places**”

“build-very well done-really quite impressive”

“interesting concept! ...subway is relatively original and well built.”

“pretty and neat, I want to live here!”

“buildings were cool. **terribly deserted**”

“good build...loaded quickly”

“deserted night club...slightly boring”

“weird and gray and **deserted**”

“nice idea, but the content is amateurishly designed...”

“it took a while to even find some freebies...constantly spammed...no trees or decorations”

“many people there, which was nice to see and a concert going on”

“very clean design, very well organized, good urban planning.”

“the content is quite good!”

“pretty relaxing. **Fairly deserted**”

“Combat sim...content quality seemed to be **good**”

“sex, not interested... noticed I **was the only person there**”

“boring...**very few people**, who seem creepy”

“terrible design”

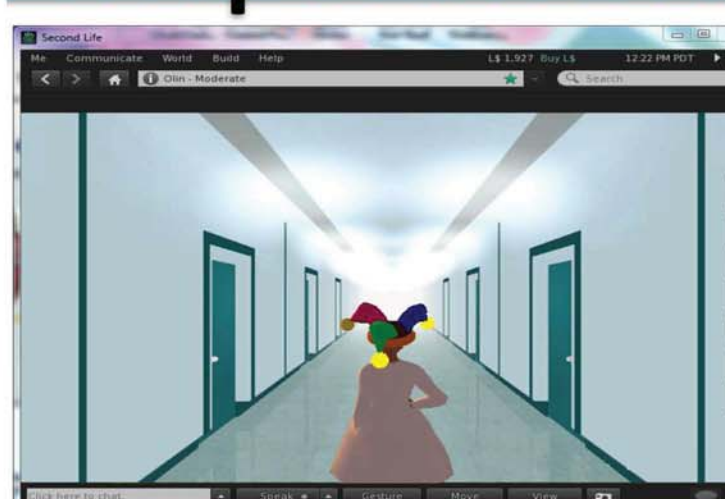
“Rudimentary - cluttered”

Qualitative Feedback from Round 2

## Conclusions:

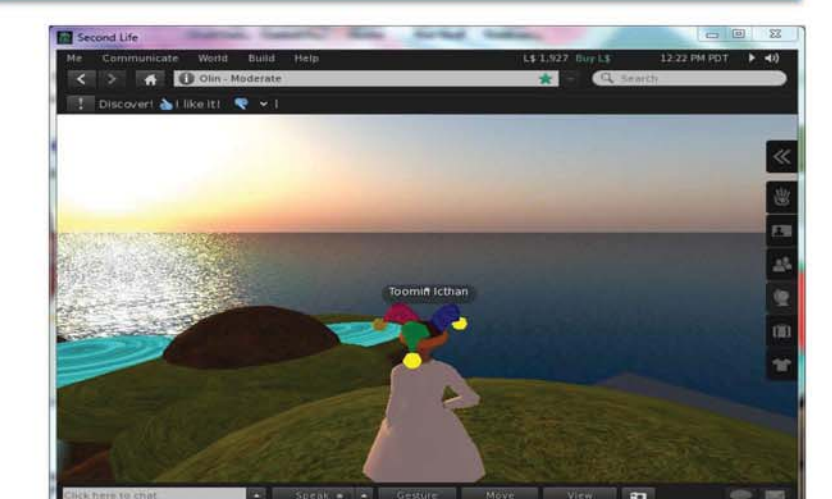
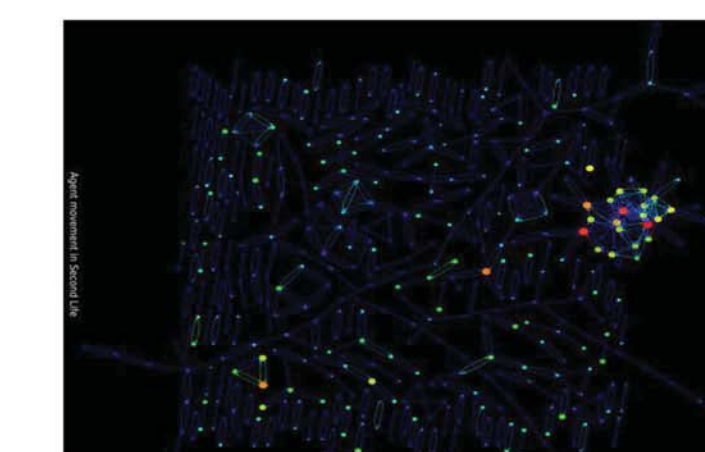
- Realtime or Near-Realtime Recommendations are extremely necessary for good results.
- “Dwell x Age” and “Freebie Dwells” most comparable to the showcase control by the quantitative feedback
- Presence of avatars important for region quality
- Free collectables attractive to new users

## Implementation Possibilities



A hallway of doors inspired by “The Matrix” leading to many distant locations.

A map of regions that highlights any quantitative feature of interest.



A stumbleupon-inspired bar at the top of the viewer could gather feedback and lead to new places.