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# A bi-directional recommendation system for a massive online game

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[strataconf.com](http://strataconf.com)

[#StrataHadoop](https://twitter.com/StrataHadoop)

# Who Are We ?



Lead Data Scientist @ Jagex



Big Data Consultant & Co-Founder @ RESEREC  
Former Lead Data Engineer @ Jagex

Machine Learning

Anomaly Detection

Graph Analysis

Predictive Analytics

Hadoop Based Data discovery

Emotion Detection

**Recommendations**

# What is the problem ?



**Name:** Mike

**Gender:** Male

**Age:** 29

**Interests:** Sightseeing,  
Night photography



**Place:** Magic Fountain of Montjuïc

**Features:** Light show, music

**Best time:** 20-23pm

**Price:** free



# What is the problem ?



## About Me

Interested in travelling,  
night photography and  
having fun with friends.



## Description

This fountain is a must see in  
Barcelona, featuring regular music  
and light show. Best enjoyed in the  
night.

# Generalisation

- You have information about a user
- You have information about an item (product, job, news article, ...)
- You may or may not have common feature space between user/item
- You have information about users affinity with items
  - Explicit: star ratings, written reviews, purchase...
  - Implicit: search queries, clicks, time spent, #views, ...

# Existing Solutions

- Neighborhood approaches (e.g. collaborative filtering)
- Content Based Recommendations
- Latent Factor Based / Singular Value Decomposition

# Challenges

- Accuracy
- Diversity
- Serendipity
- Transparency
- Privacy
- Robustness



# The Automated Salesman



Love fast cars, earns  
\$100K/year, based in  
Cambridge, UK.



Lamborghini Sesto Elemento  
Luxury Super Car  
0-60mph in 2.5s  
Price: \$2.2M



# The Automated Salesman

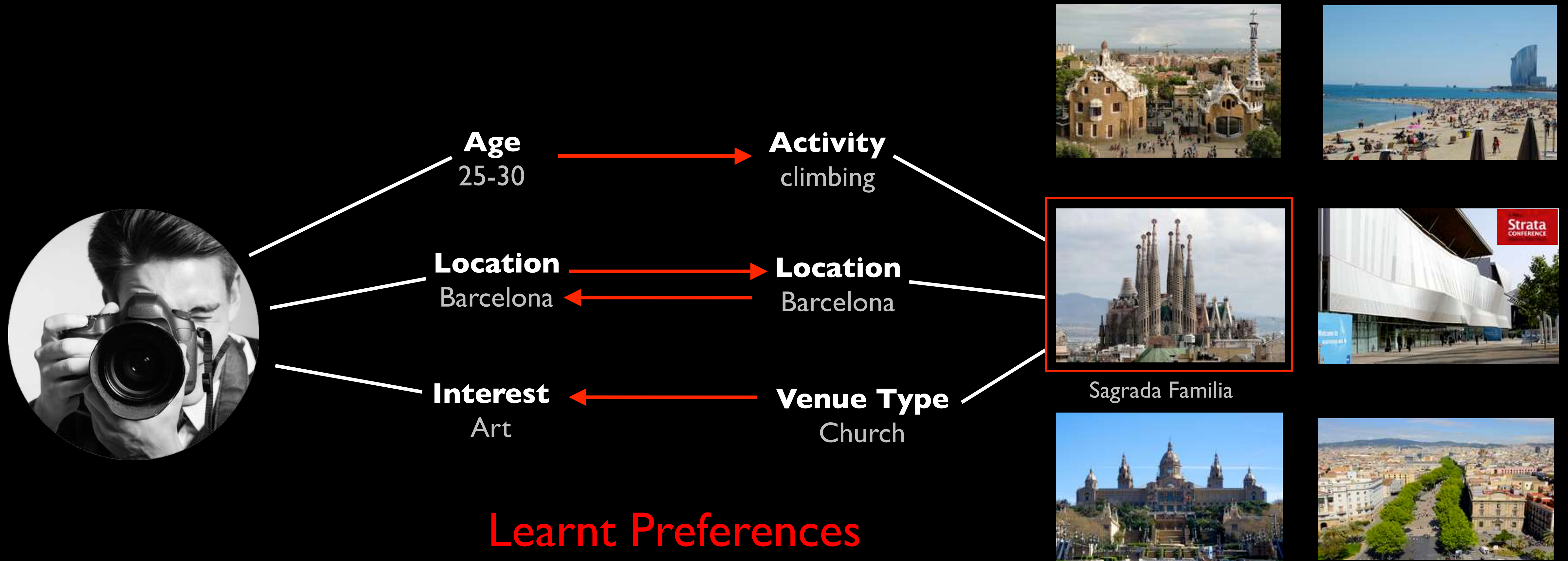


# Dating





# Bi-directional Model



Tourist

Barcelona





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# Runescape

[strataconf.com](http://strataconf.com)

[#StrataHadoop](https://twitter.com/StrataHadoop)



- An MMO fantasy RPG
- More than 220 million player accounts created since launch in 2001.



# The Challenge





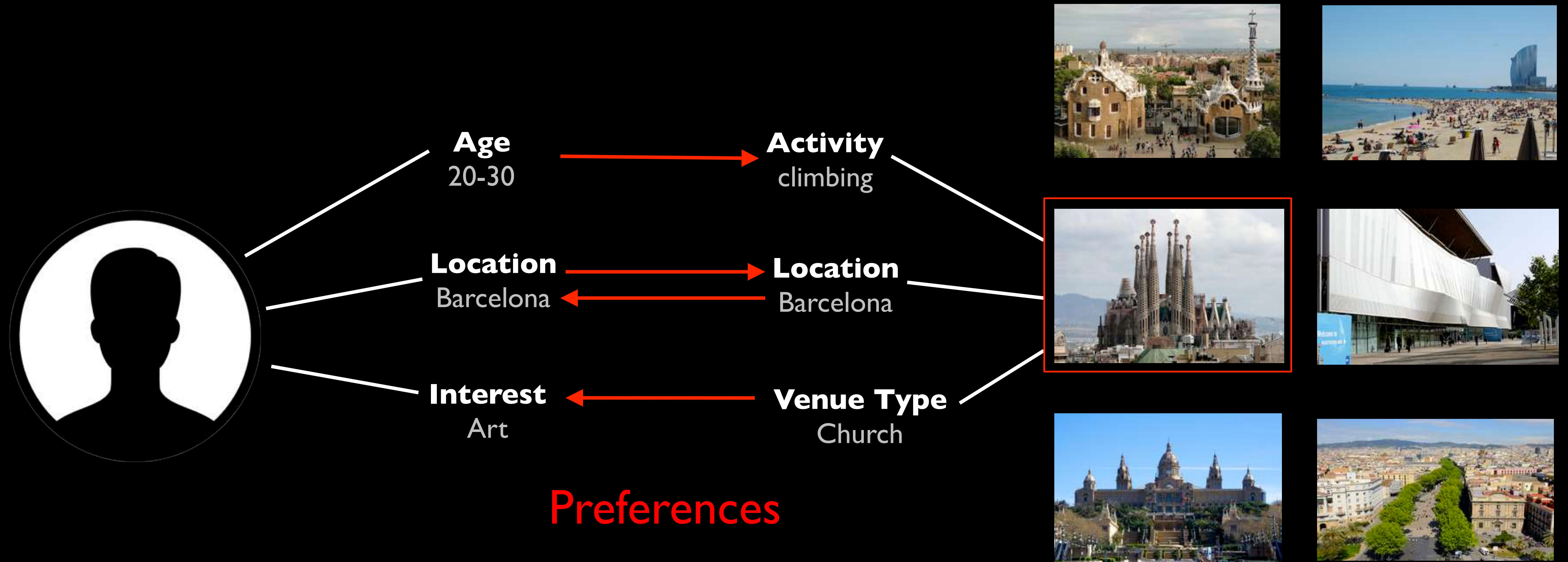
# Problems faced



# Solution

- Sequence mining
- Bi-Directional recommendations
- In-game triggering

# Bi-directional Model

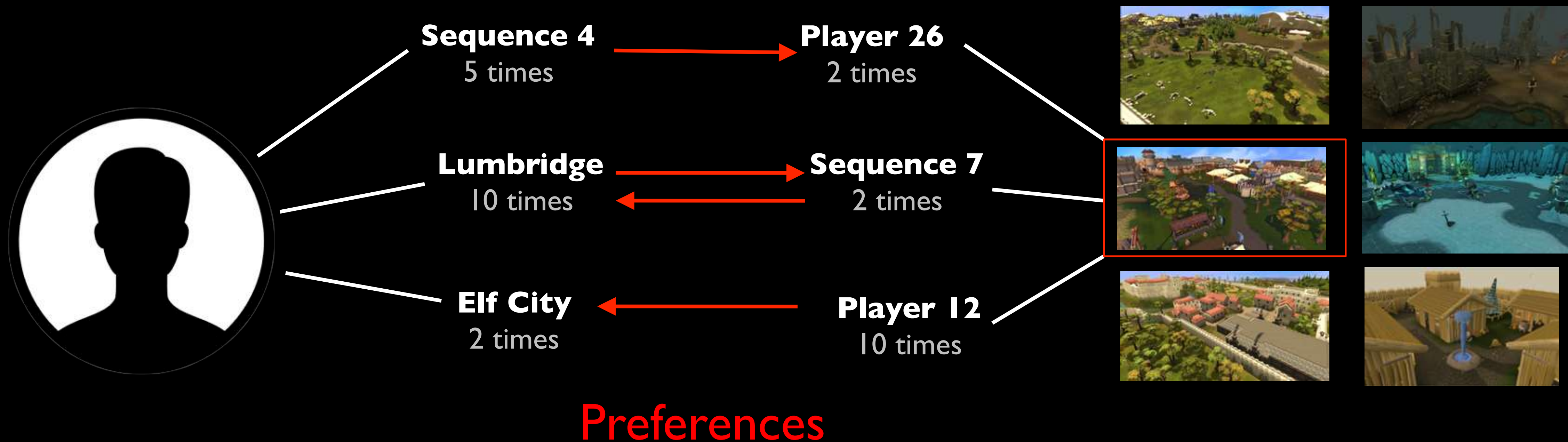


Tourist

Barcelona



# Bi-directional Model



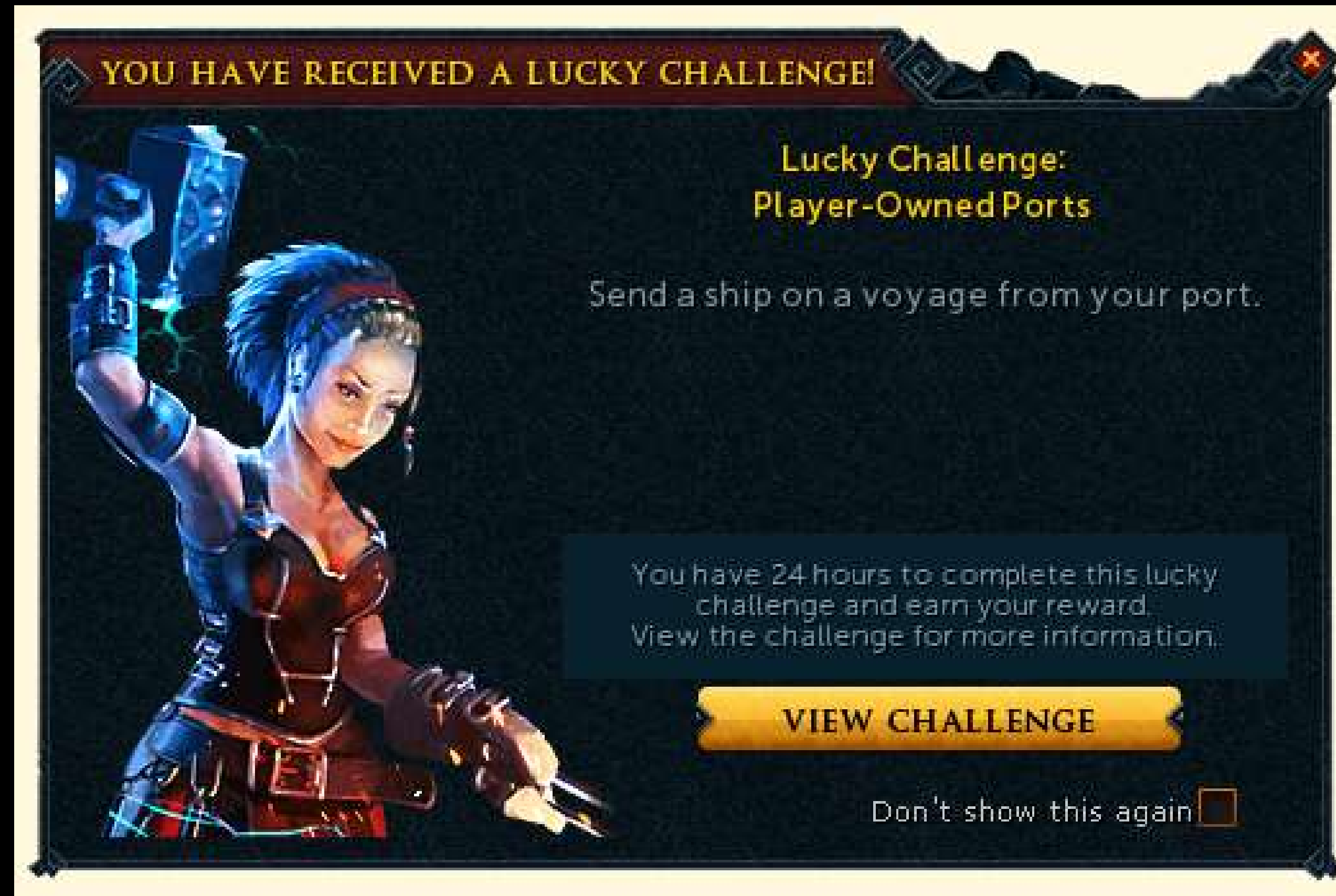
Player

Runescape

# Working with Game Developers

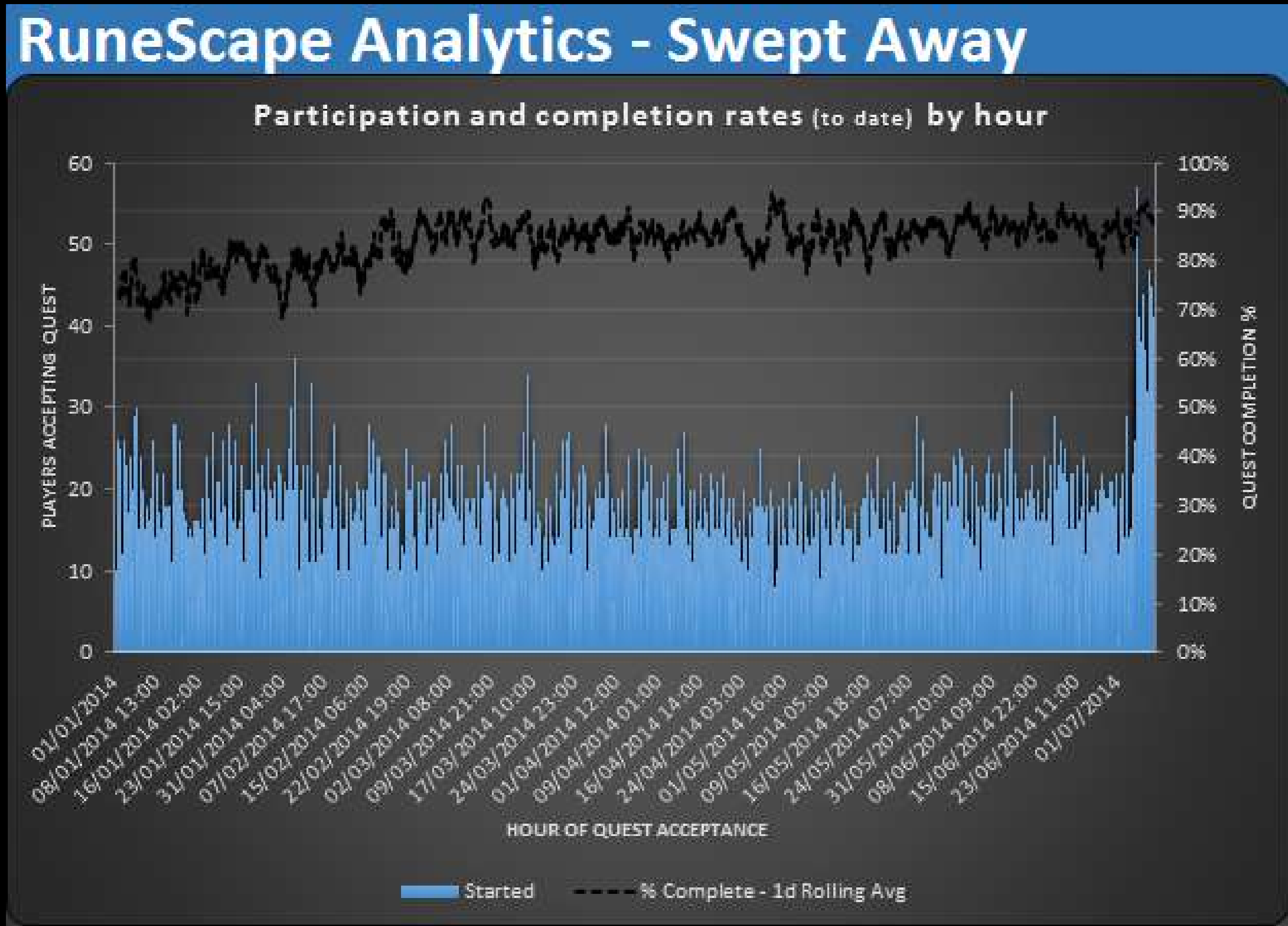
“Brave Warrior go to Location 46, 48 and trigger sequence ID 4278”

# Recommendation Presentation



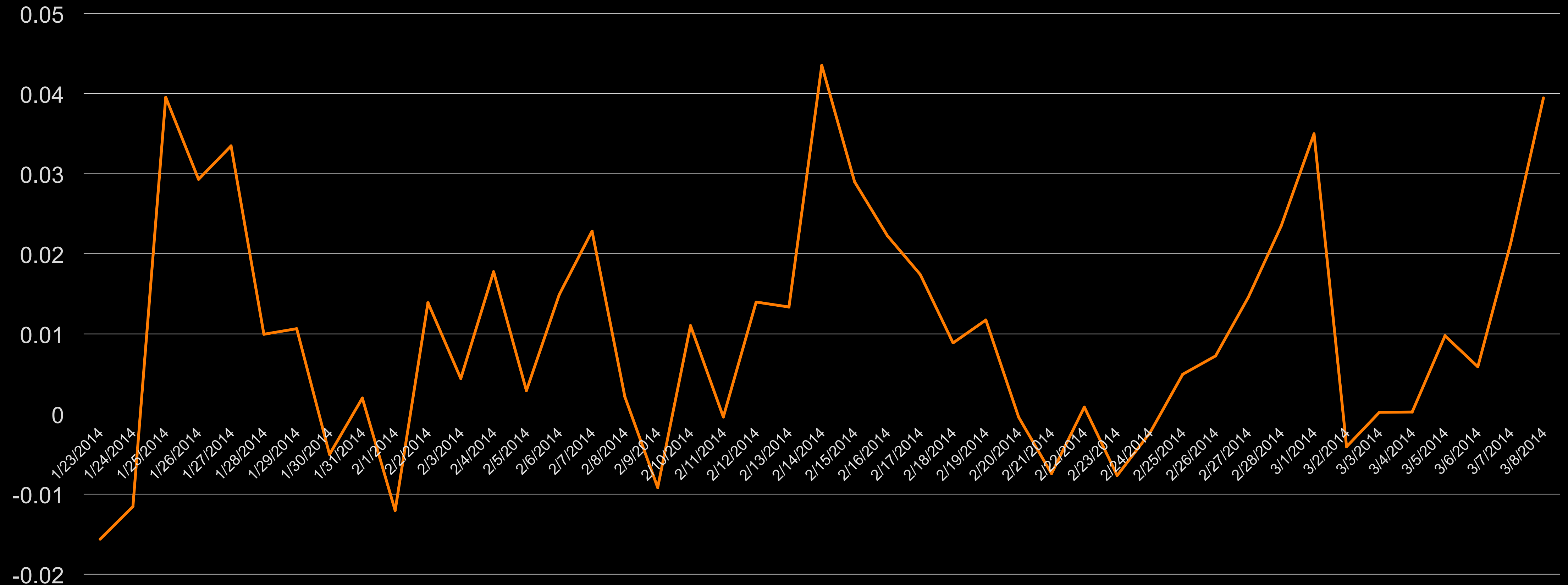


# Gains Realised



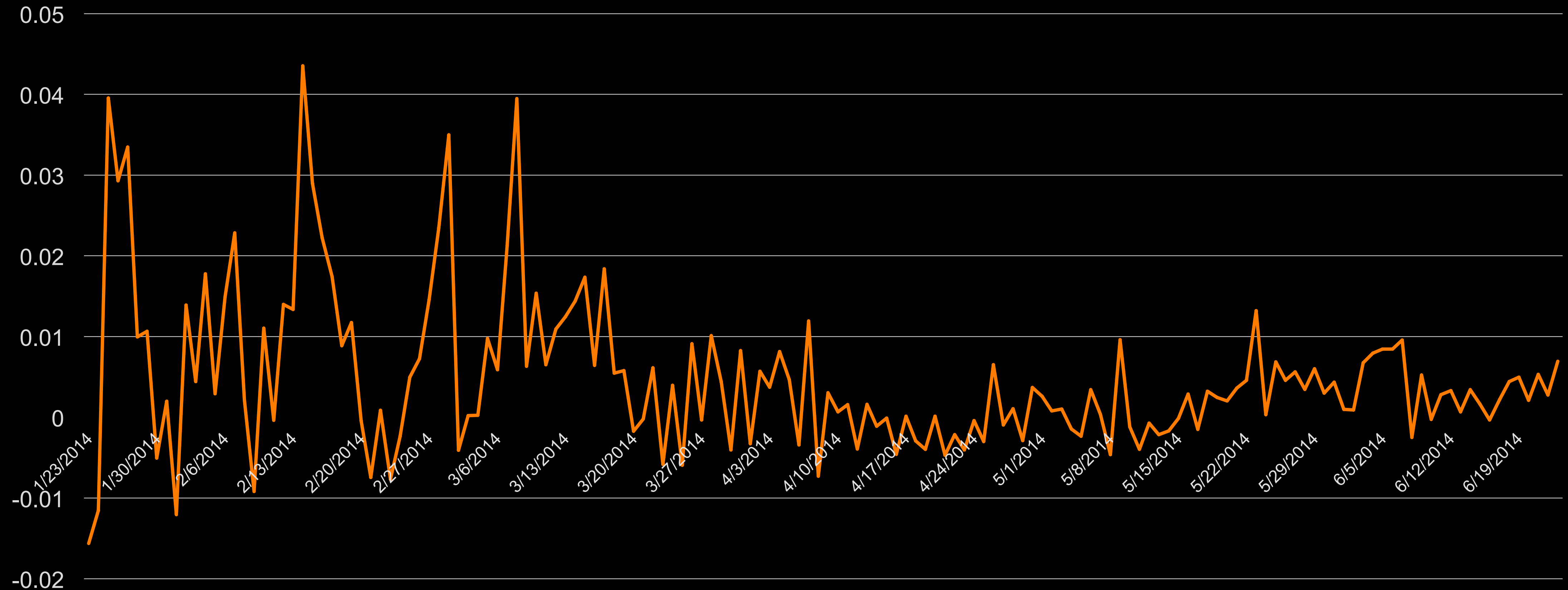
# Gains Realised

Change Against Control



# Challenges

Change Against Control





# Where are we now?

- An iterative “Lucky Challenge” deployment & refinement system is now in place.

Lucky Challenges  <a href="#">Edit</a>		
Name	Skill	Task
<a href="#">Bacon</a>	<a href="#">Cooking</a>	Cook bacon: 31
<a href="#">Gold ore</a>	<a href="#">Mining</a>	Mine gold ore: 45
<a href="#">Coal</a>	<a href="#">Mining</a>	Mine Coal: 50
<a href="#">Kalphites</a>	<a href="#">Attack</a>	Kill kalphites: 30*
<a href="#">Magic logs</a>	<a href="#">Firemaking</a>	Light magic logs or add them to a bonfire: 320
<a href="#">Magic logs</a>	<a href="#">Woodcutting</a>	Chop magic logs: 30
<a href="#">Moss Giants</a>	<a href="#">Combat</a>	Kill moss giants: 30
<a href="#">Player-Owned Ports</a>	N/A	Send a ship on a voyage from your port.
<a href="#">Quest</a>	N/A	Complete the specified quest.
<a href="#">Ice warriors</a>	<a href="#">Combat</a>	Kill Ice warriors: 30
<a href="#">Offer or Bury Bones</a>	<a href="#">Prayer</a>	Bury or offer at a player-owned-house altar any type of bone: 20
<a href="#">Sparkling memories</a>	<a href="#">Divination</a>	Gather sparkling memories: 100
<a href="#">Salmon</a>	<a href="#">Fishing</a>	Catch Salmon: 61

# When do I use this model ?

- The domain is rich/complex
- No need to hack to get your domain to fit into model
- Need to express complex queries to get recommendations
- Want a model with high accuracy
- Can be used as a Search Engine queried with the user preferences



# A New Kind of Discovery Service



# #StrataHadoop

Strata+Hadoop  
WORLD



# Let's Build a Success Story Together



## Talk to me !

