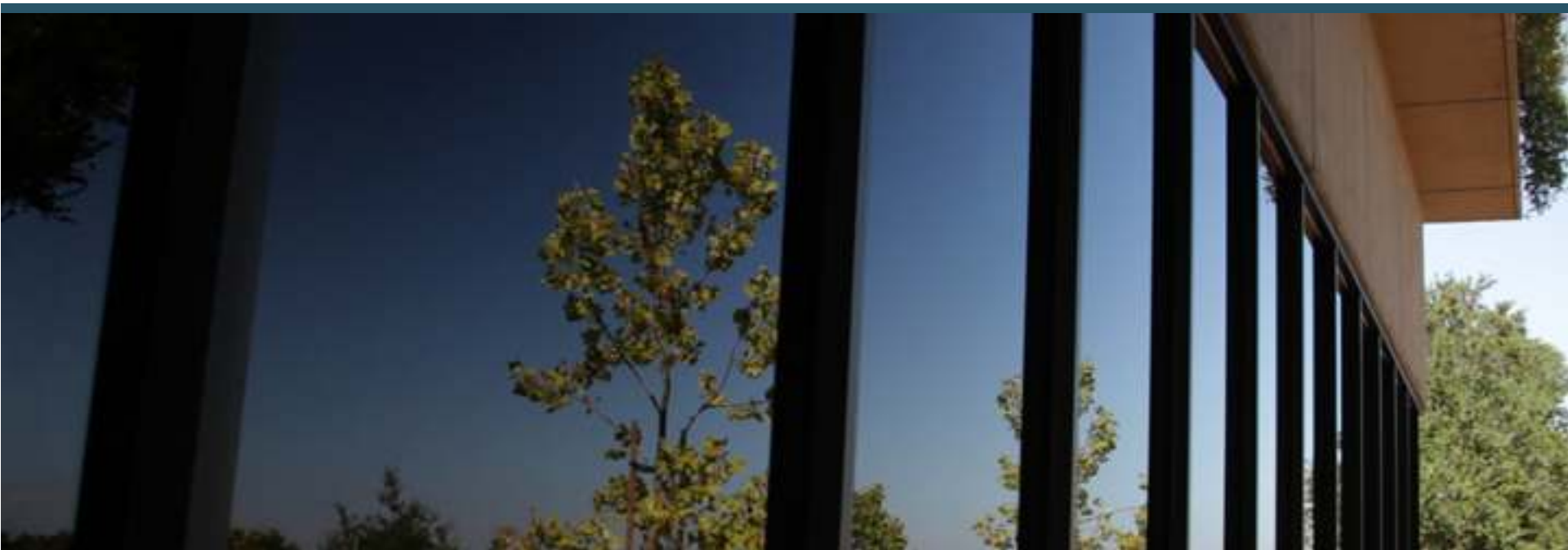


Modeling Destructive Group Dynamics in Online Gaming Communities

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-- ICWSM-12 -- June 5, 2012 --

Motivation

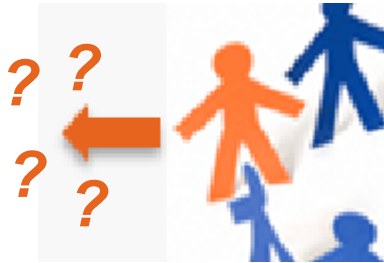


- **Groups** play an increasingly important role in online communities



- Online groups are undermined when **members depart**, often taking resources + other members with them

Motivation



- A member can quit his/her group for a variety of reasons



- Destructive Group Dynamics:
 - A **member quits** the group
 - The “quitting event” leads to **substantial damage** to the group

Problem Definition

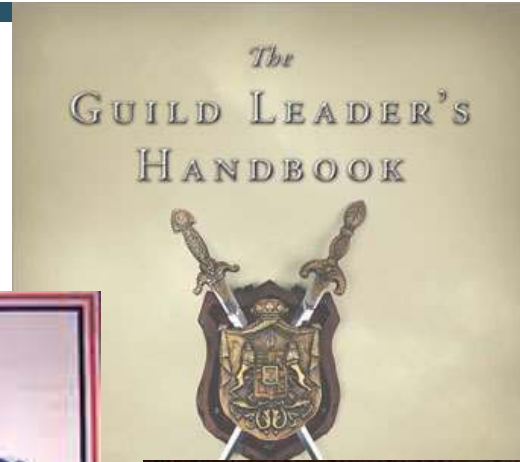
Given interactions within and between groups of individuals,

- Can we predict if an individual's quitting will **cause significant damage** to the group?
- Can we predict **if and when** an individual is going to quit the group?

Problem Domain

- Social Group:
 - Two or more individuals
 - Interactions with one another
 - Share similar characteristics/goals
- Online *gaming* communities have most highly developed group structures
 - Groups/Guild membership is often required to succeed in the game

World of Warcraft (WoW)



World of Warcraft (WoW)



- WoW: Massively Multiplayer Online Role-Playing Game (MMORPG)
- 11 million subscribers → Most popular MMORPG
- Players create characters/avatars in a virtual world
- Players play in a realm/server (instance of the game)



WoW Terminologies

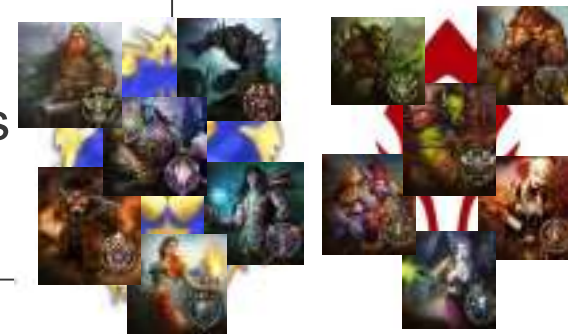
Factions

- A group of allies formed on racial and ideological basis
- Opposite factions are at-war against each other
(*Alliance* vs. *Horde*)



Races

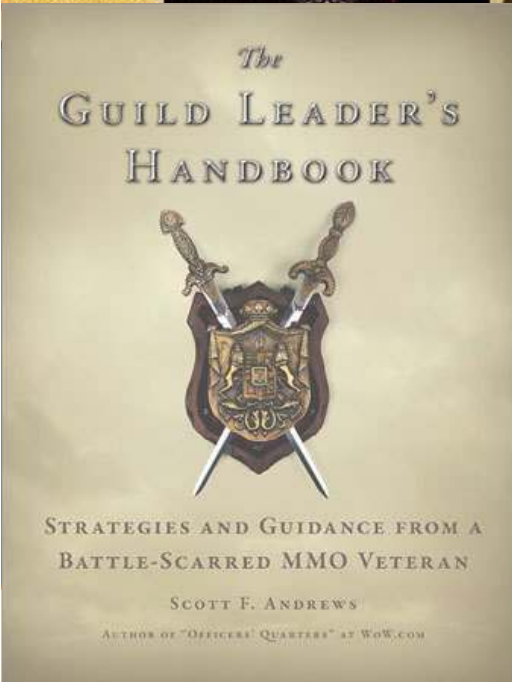
Each character in WoW has a race that determines its faction and abilities



Guilds in WoW



- A guild is a in-game association of characters (of one faction)
- A guild
 - Facilitates interactions among players and organization of large battles
 - Has leader(s)
 - Has its own social hierarchy and structure
- A character may need to send a formal application to join a guild
 - Character name, class, level, guild history, raiding experience



Thanks for visiting the Exiles of Lordaeron w

Character Info (for the character you w

Character Name:

Class:

Race:

Current Server:

Personal Information:

Destructive Group Dynamics (Example)

- **Quitting Event:** Character “Mardis” quits guild “Epic Pugz” and pulls friends out
- **Damage:** Guild “Epic Pugz” loses essential resources and becomes too small to survive



WoW Dataset

- A complete census of 3 servers (realms) from WoW
- Time Range (6 months): Dec 2010 to May 2011

	Eitrigg	Bleeding Hollow	Cenarion Circle
#Characters	176K	160K	140K
#Guilds	5K	5.5K	5.4K
Avg. Playing Time (hrs)	20.54 ± 49.37	25.48 ± 51.95	26.7 ± 58.25
%Characters changing guilds	25.01%	36.92%	26.35%

Social Network Construction

- *Co-Occurrence Heuristic*: A friendship link is placed between two characters if they belong to the *same guild* and were observed playing in the *same zone* at the *same time*
- Hybrid model:

- Two typ

- Two typ

Statistic on server Eitrigg	
Number of Characters	51,224
Number of Guilds	2906
Number of Edges	2,447,577
Avg. Collaboration Time (hrs.)	1.73 ± 1.09
% Characters changing Guild	26.53

Are Quitting Events Independent?

- Quitting events are common in WoW ($\geq 25\%$ of characters change guilds)
 - 70%-90% of quitting events do NOT follow a Poisson process, i.e. are not independent
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Are Quitting Events Independent?

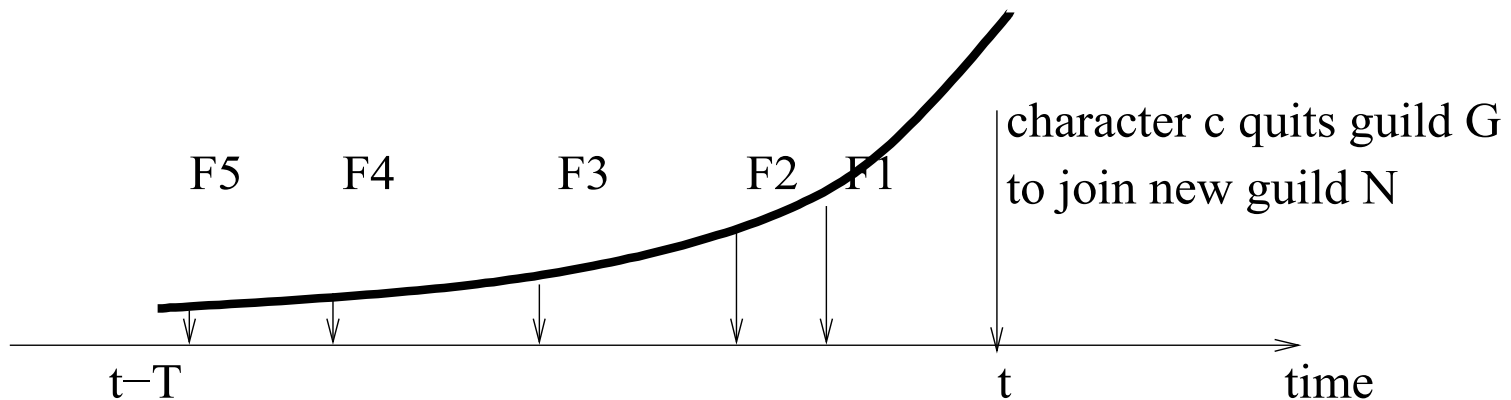
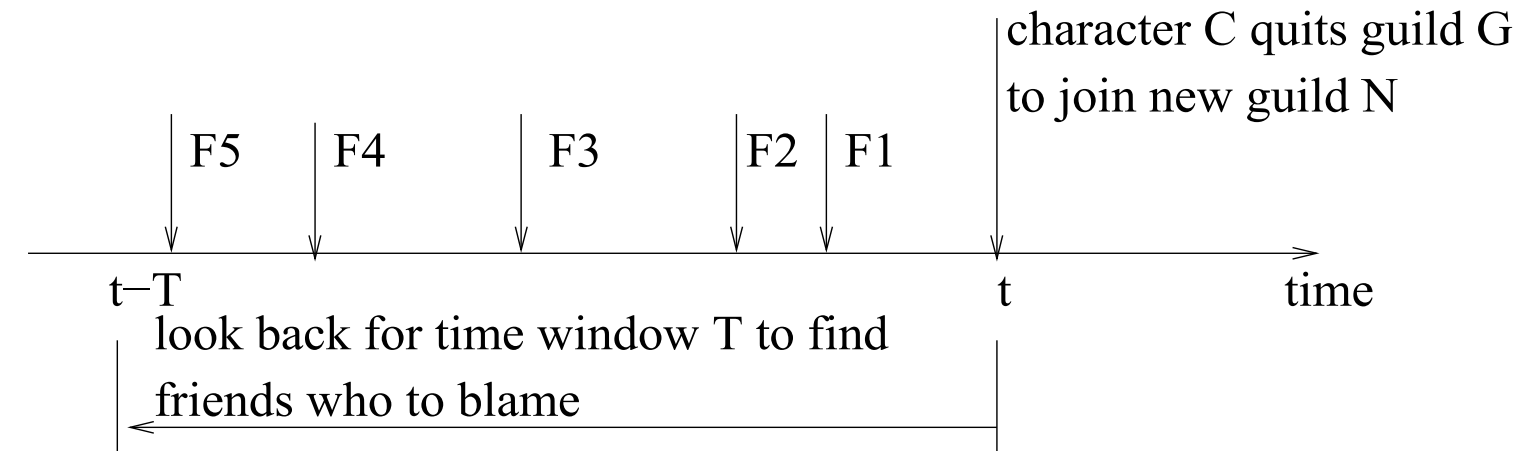
Results for Server Eitrigg	
Number of Guilds	2906
Number of Guilds with ≥ 30 quits	181 (6.23%)
Guilds Following Poisson	23 (12.71%)
Guilds NOT Following Poisson	158 (87.29%)

- Quitting events are influenced by
 - (game engagement, game achievement, social interaction, group topology)

Quantifying Damage of a Quitting Event

- A character's quitting decision is influenced by all preceding quitting events amongst his/her friends
 - **Corollary:** A character who quits a guild shares the blame for every friend that subsequently quits the guild
-

Quantifying Damage of a Quitting Event



Quantifying Damage of a Quitting Event

- **Blame:** Quitting events in the recent past receive high blame while quitting events in the distant past are assumed to have little impact

$$b_{F,C} = \frac{e^{\alpha(|t_F - t|)}}{\sum_{i \in F} e^{\alpha(|t_i - t|)}}$$

- **Damage Score:** Character's aggregate share of blame for subsequent quitting events
-

Predicting Potential Damage

- Supervised Learning:
 - Generate set of features (player, guild, game statistic, social and topological)
 - Mapping from feature set to potential damage score is learned from a training set
 - Binary Class Label: Substantial Damage or Non-Substantial Damage (pre-determined threshold)
-

Prediction Results

- Random Forest with 10-fold cross validation

Server	accuracy	Precision	Recall	F-meas.
Eitrigg	82.50%	0.825	0.825	0.825
Cenarion Circle	81.23%	0.812	0.823	0.813
Bleeding Hollow	79.9%	0.799	0.799	0.799

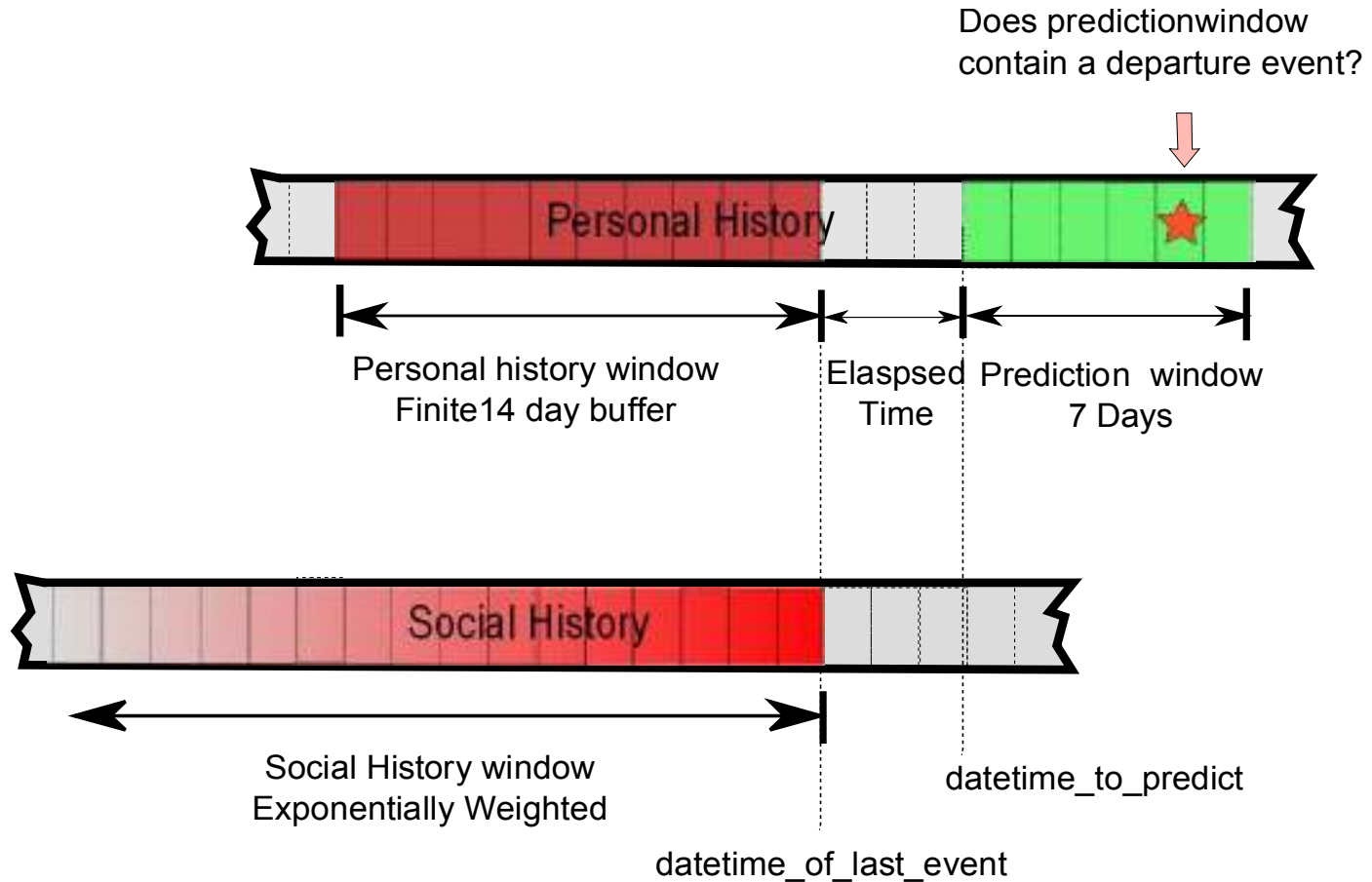
Important Features

- Importance gauged by calculating correlation coefficient with damage score
 - **Playing Time:** The more a player plays, the more important he/she becomes in the guild, and hence the player quitting the guild is likely to cause more damage
 - **Collaboration Time:** High collaboration time indicates higher probability of inducing quits amongst his/her friends
 - **Weighted Degree** show a high correlation with damage scores
 - **Number of Friends** show a high correlation with damage scores
-

Predicting Quitting Events

- Given game trace till time ' t ', can we predict whether a character will quit the guild within a specified future interval (Δ)
 - Generate a set of features for a personal & social history window
 - Predict whether the prediction window contains a departure/quitting event
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Predicting Quitting Events



Prediction Results

- Unbalanced class problem → random sampling
- Disjoint character IDs in test / training set
- Random forest as classifier

Server	Overall Accuracy	Non Quitting Event			Quitting Event		
		Precision	Recall	F Measure	Precision	Recall	F Measure
Eitrigg	82.7432	0.878	0.926	0.901	0.389	0.268	0.317
Cenarion Circle	89.0973	0.917	0.967	0.941	0.342	0.164	0.222
Bleeding Hollow	79.8396	0.855	0.91	0.881	0.396	0.276	0.325

Important Features

- Importance gauged by calculating correlation coefficient with quitting events
 - **Guild Membership:** The more guilds a player has been member of, the more likely the player is to quit the current guild
 - **Clustering Coefficient:** The more balanced the structure of a guild is, the less likely a player is to quit
 - **Playing Time Within Guild:** The longer a player plays within a guild, the less likely the player is to quit the guild
 - **Collaboration Time Within Guild:** The more a player has collaborated with other guild members, the less likely the player is to quit the guild
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Conclusion

- Destructive group dynamics can be modeled from WoW in-game census
 - We have built predictors *with reasonable accuracy* for
 - Potential impact of an imminent quitting event
 - If and when that quitting event will happen in a prediction window
 - Building and combining diverse features is essential
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Future Work

- *Constructive* group dynamics
 - Predict if and when a player joins a guild/group
 - What's the potential gain
- Application of destructive group dynamics on other data sets

Thank you!



Questions?