

## Chapter 15

# Modeling the Diversity of User Behavior in Online Communities

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### ABSTRACT

*This chapter describes models of the diversity of behavior seen in online communities, in particular how users contribute and attend to content, and how they form social links with their peers. We illustrate the models and parameter estimation procedure with a political discussion community. The models identify key characteristics of users and the web site design leading to the diverse behaviors, and suggest future experiments to identify causal mechanisms producing these characteristics.*

### INTRODUCTION

Online communities are becoming ubiquitous and allow exploiting “wisdom of crowds” (Surowiecki, 2004) to create and rate content. Examples include identifying interesting current news stories (Digg), creating encyclopedia articles (Wikipedia), sharing photos and videos (Flickr and YouTube) and fixing bugs in open source software (Bugzilla). Online communities often allow users to form explicit links with other users whose contributions they find interesting and many times they highlight the activity of a user’s designated friends

(Lerman and Galstyan, 2008) to help users find relevant content.

The key aspects of the communities are the users, their links to other users, and the content they create and act on. User behaviors in these communities are often extremely diverse, with long-tailed distributions among participants. These behaviors include a concentration of activity among a few top users, a focus of community attention on a small fraction of the submitted content, and a few active users forming most of the links in the community networks. Thus diversity plays a dominant role in community behavior. Identifying the nature of this diversity can aid in designing online communities, particularly in identifying aspects of the web site design that

DOI: 10.4018/978-1-60960-040-2.ch015

promote effective participation by various types of users (Ren et al., 2007).

This chapter describes models of this diversity based on choices users make with information readily available to them on the community web site. The models suggest how diversity in behavior arises from underlying preferences of the users and the design of the site. Identifying these characteristics can help improve the web site by attracting or retaining contributing users, and by suggesting what information the web site should highlight about contributed content or other users. Models can also describe the aggregate average or typical behaviors in the community (Lerman, 2007).

We describe and illustrate these models in the context of a political group formation community site, Essembly. The models not only explain the observed diversity but also allow estimating users' activity rates from their behavior on the site shortly after they join, and estimating the community's interest in new content from the initial reactions of a few users. That is, model parameter estimation shows that user activity rate and community interest in new content becomes evident shortly after users join or content is posted (Szabo and Huberman, 2010).

In the remainder of this chapter, we first describe the Essembly online community that we focus on for our models. We then discuss models for user activity, content relevance and link structure. We conclude with questions for future study and discuss how these models apply to other online communities.

## **ESSEMBLY**

Essembly is an online community for political discussion. These discussions center around user-created *resolves* reflecting controversial political issues such as "overall, free trade is good for workers". Similar to other online communities,

Essembly allows users to contribute, rate, and discuss content, in this case political policy questions.

Essembly encourages users to find others with similar interests and form links with them. To facilitate this discovery, Essembly provides each user a ranked list of the other users with similar ideological profiles based on their votes on the resolves. Unlike most online communities, Essembly allows users to explicitly distinguish links to others with similar preferences (e.g., discovered via their community activities) from links to people they know socially. Specifically, Essembly provides three distinct networks for users: a social network, an ideological preference network, and an anti-preference network, called *friends* (those who know each other in person), *allies* (those who share similar ideologies), and *nemeses* (those who have opposing ideologies), respectively. Users specify the link type when they create links. Network links are formed by invitation only and each link must be approved by the invitee. The resulting networks have a structure similar to that seen in other social networking web sites, and the links generally conform to their nominal semantics (Brzozowski et al., 2008; Hogg et al., 2008). In summary, user activities consist of *creating resolves*, *voting* (expressing their opinions on resolves on a 4-point scale ranging from *strong disagreement* to *strong agreement*), *commenting* on resolves (e.g., to explain their vote or how they interpret the resolve), and *forming links* to other users. The Essembly user interface presents several options for users to discover new resolves, e.g., based on votes by network neighbors, recency, overall popularity, and degree of controversy.

Essembly is a modest-sized community for which it is feasible to evaluate the behavior of all users and contributed content over an extended period of time. This comprehensive view is useful for studying diversity of user behavior. In contrast, larger online communities, such as Digg or YouTube, generally require focusing on a sample of users or content. Nevertheless, online communities generally show similar broad distributions

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