



**Partnership for International Research and Education**  
**A Global Living Laboratory for Cyberinfrastructure Application Enablement**

**Participatory Sensing: Data Filtration in a Reputation Environment**

**Student:** Michael Whitney, PhD Student, University of North Carolina Charlotte

**Research Advisor:** Dr Heather Lipford, University of North Carolina Charlotte

**CI-PIRE Partner Advisor:** Dr. Yong Zhang, Tsinghua University, Beijing, China



**National Science Foundation**

**I. Research Overview and Outcome**

**Problem Statement**

Our healthcare data pool continues to deepen as individuals from around the world share their knowledge and experience. Yet, accessing this information in a pertinent, trustable manner can be problematic.

**Motivation**

Work toward a worldwide collaborative community capable of supporting societal data record needs. A community that can both tap into, draw from, and contribute to a plethora of data in an efficient and reliably predictive manner.

**Objectives**

Expand personal knowledge base  
Develop international collaborative relationships  
Enhance participatory sensing, collaborative filtering & reputation practices

**Background**

In simple terms, Participatory Sensing is any mechanism by which individuals in the general public collect, share and analyze local data [1] while Collaborative Filtering is a supportive preference based (i.e., movies, twitter feeds) mechanism used to create predictions for other individuals with similar preferences so that unwanted information is filtered out [2]. Similarly, a Reputation System computes and publishes aggregate scores based on past behavior data [3][4]. Such systems assist individuals with future trust based decisions as well as encourage positive behavior.

**Research Direction**

For the recommendation component, implement a bag-of-words method [5] so as to generate a collection of words one user uses and a collection of words for one item (such as tweets), and then calculate a rating value according to the match degree of the two collections. Once complete, test for recommendation accuracy as compared with other methods (i.e., most frequently used URLs [6]) using the taste framework. The next step is to examine the influence of reputation on recommendations and further refine recommendations. Test accuracy in relation to other methods.

**Research Tools: Taste**

"Taste is a flexible, fast collaborative filtering engine for Java. The engine takes users' preferences for items ("tastes") and returns estimated preferences for other items. Taste provides a rich set of components from which you can construct a customized recommender system from a selection of algorithms." [7]

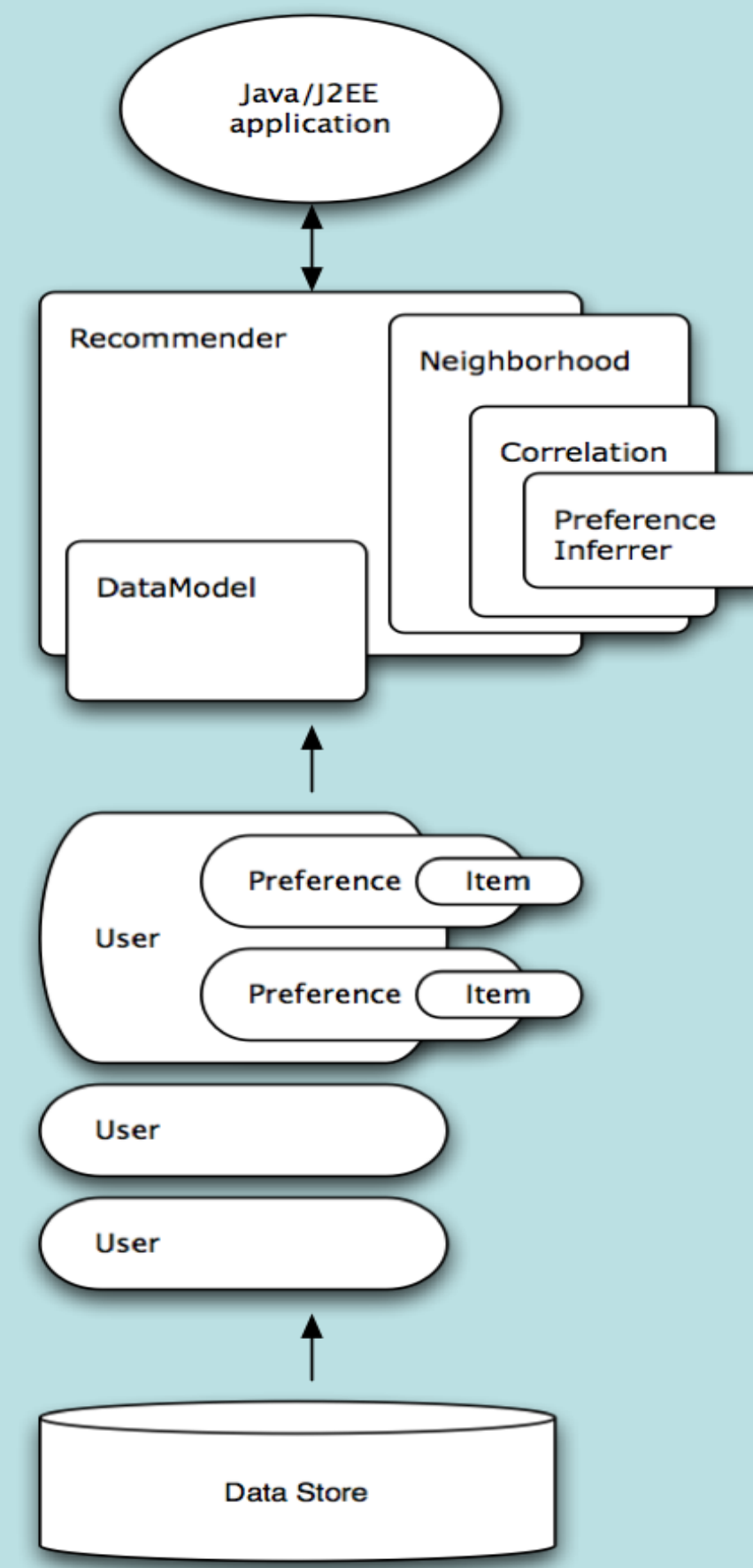


Figure 1  
Taste Framework [7]

**Data Set: Twitter**

To test the effectiveness of the recommendations, Choudhury et.al Twitter data set will be used. "This dataset comprises a large set of about 10.5 million tweets from 200,000 users; along with their time zone, location, status count, favorite count, followers and followings count and the social graph information. The time range of the tweets is between 2006 and 2009. This dataset is useful for temporal analysis of posting activity on Twitter - with respect to information flow and social network topology." [8]

**Status**

In a collaborative fashion, this endeavor is being developed from two directions. At Tsinghua University, algorithms have been developed and built upon in order to standardize the twitter data set. Recommendation algorithms are being finalized with data soon to follow.

At the University of North Carolina Charlotte (UNCC) a collaborative reputation based handheld system has been developed and is soon to be deployed. The intent is to create a sense of community through an information-sharing medium that ultimately can be used for the contribution of healthcare data. The current focus is to deploy, and research the application at UNCC that highlights a community based information sharing topic such the state of parking on campus.

**Future Work**

Continuing this collaboration in a longitudinal manner, Tsinghua recommendation data will be user tested for accuracy improvement whilst UNCC builds upon a deployed reputation system. These two directions will then further merge so as to examine what influence reputation has on the developed recommendation algorithms.

**II. International Experience**

**Fire Cupping**

"A type of acupressure therapy; that is pressure applied to acupuncture points on the body. Practitioners of Traditional Chinese medicine believe that a person's chi, or vital energy, gets thrown out of balance when they are ill or have been injured. In Eastern society, it is thought that fire cupping pulls out blockages in the patient's chi which allows energy to flow more freely and promote healing." [9]



**Great Wall**

"The Great Wall of China is one of the greatest sights in the world. The longest wall in the world, it is an awe-inspiring feat of ancient defensive architecture. Its winding path over rugged country and steep mountains takes some great scenery." [10]



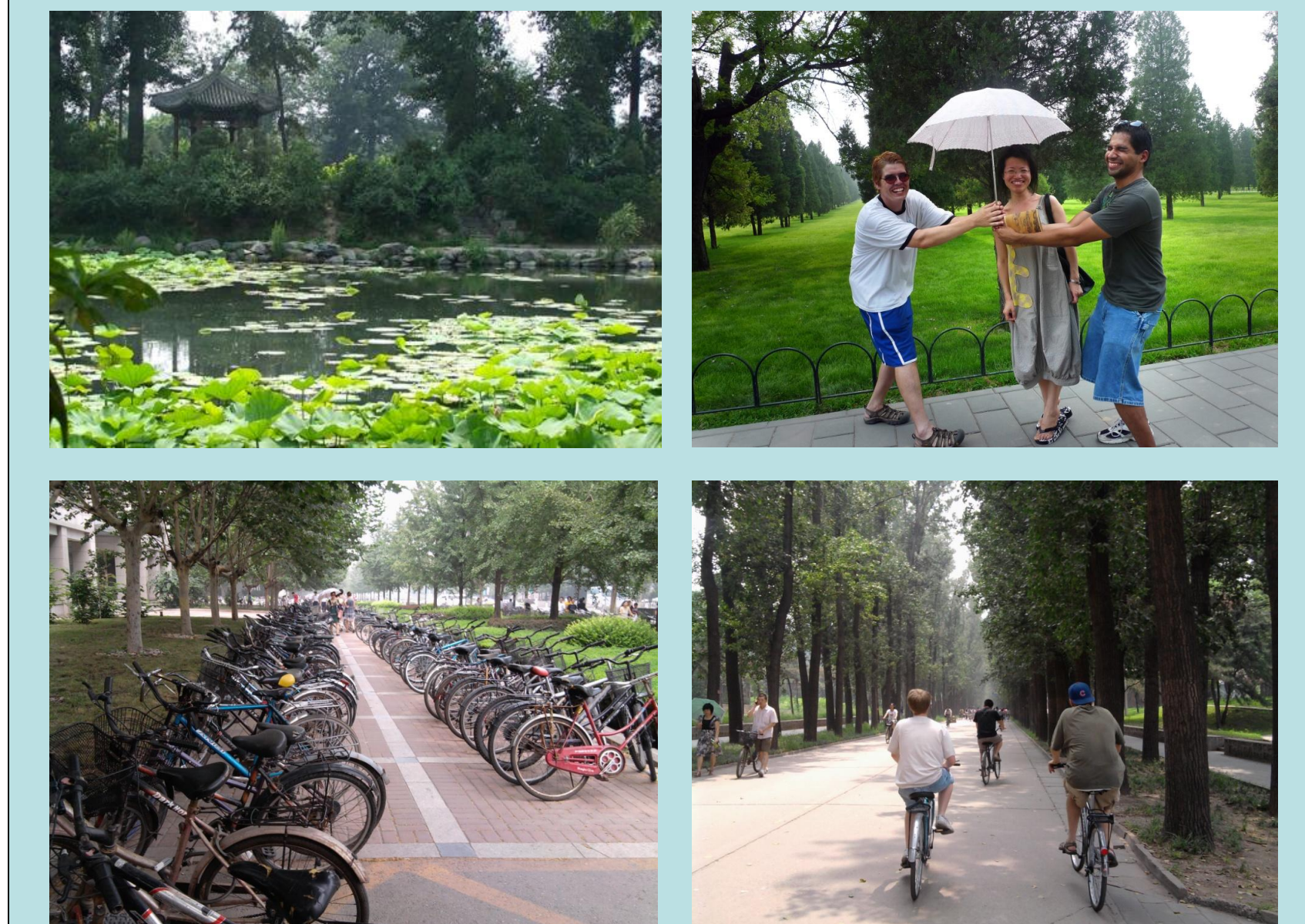
**Temple of Heaven**

"The Temple was the place where the emperors of the Ming and Qing dynasties worshipped heaven and prayed for good harvests. They came here twice a year, on the 15th day of the 1st lunar month and on winter solstice. The Temple of Heaven is regarded as one of the greatest architectural structures in the world. Some environmental artists and gardeners describe the temple as a place where people can talk to the heaven." [11]



**Tsinghua**

"Founded in 1925, Tsinghua sits on the former site of the Qing Dynasty's royal gardens. The campus is peppered with artificial ponds where stone benches and floating lotus blossoms inspire reflection. The land landscaping and many of the buildings are traditional Chinese, but the campus also boasts many Western-style edifices, such as the quad and auditorium" [12]. While here I developed some lifetime collaborative connections as well opened international career opportunities.



**References**

- [1] Burke, J., Hansen, M., Parker, A., Ramanathan, N., Reddy, S., Sivastava, M. B. "Participatory Sensing." WSW'06 at SenSys. Boulder: ACM, 2006.
- [2] Sarwar, B., Karypis, G., Konstan, J., and Reid, J. 2001. Item-based collaborative filtering recommendation algorithms. In Proceedings of the 10th International Conference on World Wide Web (Hong Kong, Hong Kong, May 01 - 05, 2001). WWW '01. ACM, New York, NY, 285-295.
- [3] Resnick, P., Kuwabara, K., Zeckhauser, R., and Friedman, E. 2000. Reputation systems. Commun. ACM 43, 12 (Dec. 2000), 45-48.
- [4] Jesang, A., Ismail, R., and Boyd, C. 2007. A survey of trust and reputation systems for online service provision. Decis. Support Syst. 43, 2 (Mar. 2007), 616-644.
- [5] Pazzani, M.J., Muramatsu, J. and Billsus, D. 1996. Syskill & webster: Identifying interesting web sites. AAAI/IAAI, Vol. 1, 54-61.
- [6] Hill, W. and Terveen, L. 1996. Using frequency-of-mention in public conversations for social filtering. In Proc of CSCW '96.
- [7] Taste: Collaborative filtering for Java. <http://code.sourceforge.net/taste/>
- [8] Munmun De Choudhury. Twitter dataset. <http://www.public.asu.edu/~mdechoudh/datasets.html>
- [9] Fire Cupping: An Alternative Medicinal Treatment. <http://healthmail.com/alternative/fire-cupping-an-alternative-medical-treatment/>
- [10] The Great Wall of China. <http://www.chinahighlights.com/greatwall/>
- [11] Temple of Heaven. <http://www.beijing-tours.cn/temple-of-heaven>
- [12] The World's Most Beautiful College Campuses [http://www.torres.com/2010/06/31/beautiful-colleges-lifestyle-education-colleges-10-university-architecture\\_slide\\_8.htm](http://www.torres.com/2010/06/31/beautiful-colleges-lifestyle-education-colleges-10-university-architecture_slide_8.htm)

**III. Acknowledgement**

The material presented in this poster is based upon the work supported by the National Science Foundation under Grant No. OISE-0730065. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.