October 13, 2011

Dr. Robert Frash, Department of Hospitality and Tourism Management
Dr. Jocelyn Evans and Dr. Alan Shao, School of Business
Sabbatical Reviewing Committee, College of Charleston

Dear Dr. Frash, Dr. Evans, Dr. Shao, and School Reviewing Committee,

The intent of this letter is to request a full-year sabbatical leave during the academic year of 2012-2013, for conducting research at Hong Kong Polytechnic University.

During that academic year, I plan to use my time to develop new ways to monitor and forecast destination tourism and hospitality performance with online real-time data. For this purpose, I plan to work with Dr. Rob Law and Dr. Haiyan Song in Hong Kong Polytechnic University. The project will advance my research expertise, assist me to better manage the Office of Tourism Analysis, and help the tourism business industry in the Charleston area by providing better forecasting tools. I have submitted a research proposal to Hong Kong Research Grants Council on this topic working with Dr. Law and Dr. Gang Li (University of Surrey).

Hong Kong Polytechnic is considered one of the top programs in the world in the area of tourism and hospitality, as ranked by research productivity (Journal of Hospitality and Tourism Research, 2009, 33:451). Dr. Haiyan Song is one of the leading researchers in the field of tourism forecasting and Dr. Rob Law is a leading researcher in the field of information technologies in tourism. By working with Dr. Song and Dr. Law, I can improve my knowledge and understanding of the tourism forecasting using real-time online data. The Office of Tourism Analysis has been working with our economists in the School of Business to produce a forecasting report for the Charleston's tourism industry on an annual basis. However, the accuracy of this report needs to be improved. This sabbatical project could help improve the quality of the forecasting by using online data such as real-time search volume for tourist-related keywords, news content and blogs, and mining of Twitter messages.

The project can benefit my research abilities by producing articles in top-ranked business and hospitality/tourism journals. I also plan to teach an MBA course on Forecasting and Business Analytics in the coming years for our newly developed MBA concentration in Hospitality Revenue Management. I can improve my teaching on this topic as I will be able to incorporate the latest technological trends in forecasting and revenue management. In addition, the project can benefit the Office of Tourism Analysis by improving the forecasting methods and accuracy for the local area. Furthermore, both the School of Business and the entire College will see benefits through top research publications, which may attract potential external funding. Also, by working closely with the School of Tourism and Hospitality Management in Hong Kong Polytechnic, I hope to build student and scholar exchange programs with the University. This will aid the mission of the School of Business on the
globalization of the program.

In addition, working with our department chair, we have secured a replacement director for my responsibilities in the Office of Tourism Analysis, with our internal funding from the Office.

Thank you for your time in evaluating my proposal and please let me know if I can answer any of your questions.

Sincerely,

Bing Pan

Bing Pan, Ph.D.
Associate Professor and Head of Research
Office of Tourism Analysis
Department Hospitality and Tourism Management
School of Business, College of Charleston
Sabbatical Proposal, 2012-2013

Forecasting Tourist Destination Performance Using Real-Time Online Data

Bing Pan, Ph.D., Associate Professor and Head of Research
Office of Tourism Analysis, Department of Hospitality and Tourism Management
School of Business, College of Charleston
October 13, 2011

Rationale

Due to the perishability of tourism products, tourism forecasting is crucial in enabling industry participants to allocate limited resources and meet tourist demand, either for a single business or for a destination as a whole (Frechtling 2001; Rajopadhye, Ben Ghalia et al. 2001; Song, Li et al. 2008). Traditional forecasting methods include time series analysis and econometric models (Song, Li et al. 2008). Prior studies have shown that no single method is consistently superior to other models; depending on the evaluation criteria and data sets employed, certain models perform better than others (Song and Li 2008). Specifically, recent studies have demonstrated that combinations of forecasting methods can produce more accurate results in a tourism context (Palm and Zellner 1992; Chu 1998; Wong, Song et al. 2007; Chan, Witt et al. In Press).

Traditional forecasting methods rely on historic data for both dependent and independent variables; the latter include populations of source markets, income levels of tourists, tourism prices in both the focus destination and competing destinations, exchange rates and other qualitative data, and “one-off” events such as the Olympic Games (Song, Li et al. 2008). In recent years, the adoption of the Internet as a travel planning and online transaction tool (TIA 2008) has made a new category of data available that has great potential to enhance predictive power. When tourists conduct searches or make bookings online, their behavior on the Internet can be tracked and monitored using various Internet technologies. Traces of Internet access can be captured on a variety of Web servers and Internet routers. Because tourists usually plan online before actually making the trip, aggregated traces in the form of query volumes on search engines and Web access logs are early indicators of interest. In addition, the explosion of User-Generated Content and social media created a large amount of data in the forms of blogs, Twitter messages, reviews, status updates, etc (Litvin, Goldsmith et al. 2008). This content is visible online and thus extremely influential to travelers when they make decisions on destinations, accommodations, restaurants, or attractions (Xiang and Gretzel 2010). As a result, mining the content of social media could help predict tourism activities. Government bodies and private businesses can use this aggregated online behavioral data to predict the future activities and consumption patterns of tourists.

The online data sources in the forms of search engine query volumes or social media content have been employed in other research fields such as economics, social sciences, and health research. Google Trends is a public tool provided by Google Inc. (Carneiro and Mylonakis 2009; Choi and Varian 2009). It gives volume data for specific search queries on Google. Choi and Varian (2009) found that Google Trends data helps to improve forecasts of economic time
series including retail sales, automotive sales, home sales, and international tourist arrivals (Choi and Varian 2009). Specifically, prior investigations have found that by incorporating Google search volume data, exchange rates, and “one-off” events into a univariate seasonal autoregressive (AR) model, the forecasting performance of the model for international tourist arrivals has been greatly improved (Choi and Varian 2009). Choi and Varian (2009) have also used search data on “jobs” and “welfare/unemployment” in an ARIMA model to predict unemployment claims and found that it produced more accurate forecasting results than the baseline model in which no search data were used. In addition, Asktas and Zimmermann (2009) demonstrated strong correlations between keyword searches and unemployment rates in Germany using monthly data in a simple error-correction model.

In the medical field, Google volume data were also used to forecast influenza outbreaks (Ginsberg, Mohebbi et al. 2009). Traditional methods rely on reports from the Center for Disease Control (CDC) in the United States, in which forecasts are based on physicians’ case reports. Ginsberg and colleagues instead used raw keyword search volumes from Google—instead of normalized and scaled data from Google Trends. They proved that the frequencies of certain queries are highly correlated with the percentage of patients with influenza-like symptoms. An automated method identified the 45 most predictive search queries from among billions of searches. A real-time data source feed was used for the forecasting model to generate very accurate forecasts one week earlier than reports from CDC (Ginsberg, Mohebbi et al. 2009). In addition, Zhang, Jansen, and Spink (2009) estimated a number of ARIMA models using raw search engine keyword volume data from Dogpile.com. Their study demonstrated that time series of daily log data could be used to detect changes in user behavior across different time periods (Zhang, Jansen et al. 2009).

Social media content can be seen as the online form of the wisdom of the crowd (Surowiecki 2004); it is also used for predicting economic activities. Gruhl and his colleagues (2010) used automated data mining on blogs to predict the volume of book sales. Zhang, Fuches, and Gloor (2010) used six months of Twitter feeds and the volumes of tweets containing hope and fear each day to correlate them with stock market. They found that emotional tweets percentages are significantly correlated with Dow Jones, NASDAQ, and S&P 500. Lampos and Cristianini (2010) also used the volume of Twitter messages on certain keywords to track and predict flu epidemics. Asur and Huberman (2010) used the rate of chatter from three million tweets to construct a linear model to predict box-office revenues of movies in advance of their release. The results actually performed better than the Hollywood Stock Exchange.

In summary, the advantages of the new types of data provided by search engines and social media are that they are real-time, high-frequency (daily and weekly instead of quarterly or annual), and sensitive to small changes in user behavior. Researchers in other fields have proven that this data are very valuable in generating accurate forecasts. With the exception of the investigation of Choi and Varian (2009), very few studies of online behavioral data forecasting have been carried out in the field of tourism. Tourists usually check out their destination and plan online before making the trip (TIA, 2008). In contrast with other explanatory variables traditionally used in tourism demand forecasting, search queries and social media content can be seen as behavioral indicators of purchase intentions (Gitelson and Crompton 1983; Barry 1987).
These online behavioral data can therefore be used as an “early warning” signal for aggregated tourist activities. I plan to use my sabbatical year to collaborate with top scholars in this field and learn advanced techniques in econometrics and data mining in order to improve traditional forecasting methods for tourism destinations.

**Narrative on activity:**
There are two main types of activities I plan to take on during my sabbatical year at Hong Kong Polytechnic University:

1. I will collaborate with Dr. Law, Dr. Song, and Dr. Li to develop a conceptual model for monitoring and tracking tourism and hospitality performance using online data combined with traditional data sources. We will also explore possible funding opportunities in mainland China for supporting an extension of the research project.

2. I will statistically select the significant online tourism indicators and build a meaningful model for short-term forecasting. Specifically, I plan to work on two pilot projects with Dr. Song, Dr. Law, and Dr. Li. Dr. Song and I collaborated on a project focused on forecasting hotel occupancy with Google search volume data of five tourism-related queries. We plan on expanding the research scope by incorporating more keywords and also search engine ranking data for the Charleston Area Convention and Visitors Bureau website to increase forecasting accuracy. The second pilot project will be on exploring the predictive power of sentiment mining of Twitter messages. The two pilot projects are the first step in establishing the validity and feasibility of the large project.

**Professional Benefit to Applicant**
This sabbatical will provide me with the opportunity to expand my knowledge of most advanced forecasting and data mining methods. Along with my strong analytical and quantitative background, I will be able to generate top-ranked business and tourism journal articles. The knowledge I gain through working with the top scholars in those fields will help me better teach the course on MBA course on Forecasting and business Analytics by incorporating the most recent trends in this field. I could develop more in-depth exercise and homework for using online data for business intelligence.

**Benefit to the Office of Tourism Analysis**
The Office of Tourism Analysis has been working with our economists in the School of Business to produce forecasting reports for the Charleston's tourism industry on an annual basis. However, the accuracy of this report needs to be improved. This sabbatical project could help improve the quality of the forecasting and help local tourism and hospitality businesses to better manage their properties and allocate resources.

**Benefit to the School and the College**
My sabbatical project will benefit both the School and the entire College through top research publications and also may attract potential external funding. Also, by working closely with the School of Tourism and Hospitality Management at Hong Kong Polytechnic, I hope to build student and scholar exchange programs with the University. This supports the mission of the School of Business on the globalization of our programs.
References


Surowiecki, J. (2004). *The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business, economies, societies, and nations*, Random House, Inc.


CURRICULUM VITA

BING PAN, Ph.D.

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Office Address: 315 Beatty Center, 5 Liberty Street, Charleston SC, 29466
Mailing Address: Department of Hospitality and Tourism Management,
School of Business, College of Charleston, Charleston, SC 29424

EDUCATION

Ph.D. in Tourism Management, University of Illinois at Urbana-Champaign, Champaign, IL, May, 2003.

M.S. in Natural Geography, Department of Urban and Resource Sciences, Nanjing University, June, 1998

B.E. in Tourism Planning and Management, Department of Urban and Resource Sciences, Nanjing University, June, 1995

ACADEMIC EXPERIENCE

2011-Now Associate Professor and Head of Research, Office of Tourism Analysis, Department of Hospitality and Tourism Management, School of Business and Economics, College of Charleston.

2011 Visiting Assistant Professor, January, 2011, Hong Kong Polytechnic University EMBA Program in Hangzhou, China

2006 - 2011 Assistant Professor and Head of Research, Office of Tourism Analysis, Department of Hospitality and Tourism Management, School of Business and Economics, College of Charleston.

2005 -2006 Visiting Assistant Professor and Head of Research, Office of Tourism Analysis, Department of Hospitality and Tourism Management, School of Business and Economics, College of Charleston.


TEACHING EXPERIENCE

Principles of Hospitality and Tourism; Online Marketing for Hospitality and Tourism Hospitality and Tourism Technology; Management Information Systems; Summer Study Abroad in China; Summer Study Abroad in Taiwan
EDITORIAL REVIEW


AD-HOC REVIEWER


HONORS AND AWARDS

Best Researcher Award, School of Business, College of Charleston, 2010
Best Paper Award, 2010 ENTER Conference, February, 2010
Senior Scholars Best IS Publication Award, 2009
Global Scholar, College of Charleston, 2009-Now
Best Paper Award in MIS Quarterly, 2009
Charles Goeldner Best Paper Award in Journal of Travel Research, 2009
Runner-Up for Best Paper Award, 2009 ENTER Conference, January, 2009
Best Poster Paper Award on 2007 ISTTE Annual Conference, June, 2007
Honor Society of Phi Kappa Phi, 2002
Distinguished Illinois Fellowship, University of Illinois, 1998-2001
Excellent Graduate Scholarship, Nanjing University, 1997

PUBLICATIONS

JOURNAL ARTICLES


REFERENCES


Information Technology and Tourism, 2009. Amsterdam, Netherland. Finalist Best Paper Award


Fourth ACM/IEEE Joint Conference on Digital Libraries (JCDL' 04) (pp. 188-189).
New York: ACM.


PANELS AND PRESENTATIONS


BOOK REVIEW


GRANTS AND PROJECTS

1. 2005 – Now Market Analysis and Hospitality Performance Tracking Projects in the Office of Tourism Analysis from the Charleston Area Convention and Visitors Bureau, $50,000 Annually

2. 2009 – Now Annual Accommodation Tax Evaluation of Charleston County, $10,000 Annually

3. 2011 Charleston Area African American Visitor Profile Survey, Grant from the City of North Charleston, $3,500

4. 2010 Usability Study of GuestCentric Booking Engine, Grant from GuestCentric Inc., Principle Investigator, $3,000

5. 2008-2010 Developing a Search Engine Visibility Information System (SEVIS) and Benchmarking Online Performance of Tourism Businesses and Organizations, Grant from Hong Kong Polytechnic University, External Principle Investigator, $39,679

6. 2008 Americans’ Travel Behavior and Destination Preferences, sub-grant from China National Tourism Administration, Co-Investigator, $3,000

7. 2007 Exploring Online Trip Planning using Eye Tracking Methods, Research Grant from Orbitz.com, Principle Investigator, $5,100

8. 2007 Exploring the Process and Determinants of Online Hotel Choice Using Eye Tracking Methodology, Summer Research Grant from School of Business and Economics, College of Charleston, Principle Investigator, $3,240

9. 2006 Angler Survey of Artificial Reef of South Carolina 2006-2007, Grant from Department of Natural Resources of South Carolina, Principle Investigator, $22,000

10. 2005 Pilot Study of Angler Survey of Artificial Reef of South Carolina, Grant from Department of Natural Resources of South Carolina, $1,400

11. 2005 Consultant to the School of Interactive Arts and Technology, Simon Fraser University, Canada on Innovation in the New Economy Research Grant “Managing E-loyalty through Experience Design”.

8


14. 1997 Marketing research project in the National Park of Dr. Sun Yat-sen’s Mausoleum, Nanjing, China

SERVICES

1. Mentor, College of Charleston Global Scholar Program, 2009-Now
2. Faculty Advisor for Club for Hospitality And Tourism student club (CHAT), 2008-Now
3. Master's Thesis Committee Member for Karen Thal, the College of Charleston, 2011
4. Board member for Greater Charleston Chinese Association, 2009-Now
7. Technology Committee of College of Charleston, 2008-2009
8. President, Chinese Association of Greater Charleston, 2008
10. Founder and President of Chinese Tai Chi Club, Cornell University, 2004-2005

PROFESSIONAL DEVELOPMENT

1. Faculty Technology Institute, College of Charleston, July 19 to July 23, 2010
2. TravelCom, Dallas, March 9 to March 11, 2010
3. Faculty Technology Institute, College of Charleston, March 2 to March 5, 2009
4. Southeast Chapter of Travel and Tourism Research Association Annual Conference, Asheville, March 31 to April 1, 2008
5. South Carolina Governor’s Conference on Tourism, Columbia, February 11 to February 12, 2008

INVITED TALKS

7. Pan, B., Xiang, Z., & Fesenmaier, D.R. (2009), Destination marketing competitiveness and search engine marketing, July 17, 2009 at Hong Kong Polytechnic University