Automatic Measurement of Corporate Reputation for Retail Companies from Online Public Data on the Web

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Final Program and Book of Abstracts

6 - 8 July, 2021

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DATA 2021
Final Program and Book of Abstracts

10th International Conference on Data Science, Technology and Applications

Online Streaming
July 6 - 8, 2021

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Foreword

This book contains the abstracts and final program of the 10th International Conference on Data Science, Technologies and Applications (DATA 2021) which is sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC), and held in cooperation with the ACM Special Interest Group on Management Information Systems (ACM SIGMIS). This year DATA was held as a web-based event due to the COVID-19 pandemic, from 6 - 8 July.

This conference brings together researchers, engineers and practitioners interested on databases, big data, data mining, data management, data security and other aspects of information systems and technology involving advanced applications of data.

The high quality of the DATA 2021 program is enhanced by the four keynote lectures, delivered by distinguished speakers who are renowned experts in their fields: Jan Recker (University of Cologne, Germany), Sandro Bimonte (INRAE, France), Hala Skaf-Molli (Nantes University, France), and Volker Markl (German Research Center for Artificial Intelligence (DFKI) and Technische Universität Berlin (TU Berlin), Germany).

DATA 2021 received 64 paper submissions from 27 countries of which 19% were accepted as full papers. In order to evaluate each submission, a double-blind paper review was performed by the Program Committee. All presented papers will be available at the SCITEPRESS Digital Library and will be submitted for indexation by Scopus, Google Scholar, DBLP, Semantic Scholar, Microsoft Academic, EI (Elsevier Index), and Web of Science (Clarivate). As in previous editions of the Conference, based on the reviewer's evaluations and the presentations, selected authors from the conference will be invited to submit extended versions of their papers for a book that will be published by Springer with the best papers of DATA 2021. This year, a short list of best papers will be invited for a post-conference special issue in the Springer Nature Computer Science Journal.

The program for this conference required the dedicated effort of many people. Firstly, we must thank the authors, whose research efforts are herewith recorded. Next, we thank the members of the Program Committee and the auxiliary reviewers for their diligent and professional reviewing. We would also like to deeply thank the invited speakers for their invaluable contribution and for taking the time to prepare their talks. Finally, we gratefully acknowledge the professional support of the conference secretariat and INSTICC team for all organizational processes, especially given the need to introduce online streaming, forum management, direct messaging facilitation and other web-based activities in order to make it possible for DATA 2021 authors to present their work and share ideas with colleagues in spite of the logistic difficulties caused by the current pandemic situation.

We wish you all an exciting conference and we look forward to having additional research results presented at the next edition of DATA.

Christoph Quix, Hochschule Niederrhein, University of Applied Sciences and Fraunhofer FIT, Germany
Slimane Hammoudi, ESEO, ERIS, France
Wil van der Aalst, RWTH Aachen University, Germany

Important Information

Event App
Download the Event App from the Play Store and App Store now, to have mobile access to the technical program and also to get notifications and reminders concerning your favorite sessions.

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Keynotes Videos
The keynote lectures will also be available on video on the website after the event, as long as the appropriate authorization from the keynote is received, so you will be able to see them again or watch them should you have missed one.

Survey
Every year we conduct a survey to access the participants’ satisfaction with the conference and gather the suggestions. You will receive an e-mail after the event with the detailed information. Your contribution will be carefully analysed and a serious effort to react appropriately will be made.

* Please login to PRIMORIS (www.insticc.org/Primoris), select the role “Delegate” and the correct event.

If you have any doubt, we will be happy to help you at the Welcome Desk.

General Information

Welcome Desk
Tuesday, July 6 – Open from 14:15 to 18:00
Wednesday, July 7 – Open from 08:45 to 18:00
Thursday, July 8 – Open from 09:30 to 13:30

Opening Session
Tuesday, July 6, at 14:30 in the Plenary 1 room.

Closing Session
Thursday, July 8, at 13:15 in the Plenary 1 room.

Secretariat Contacts
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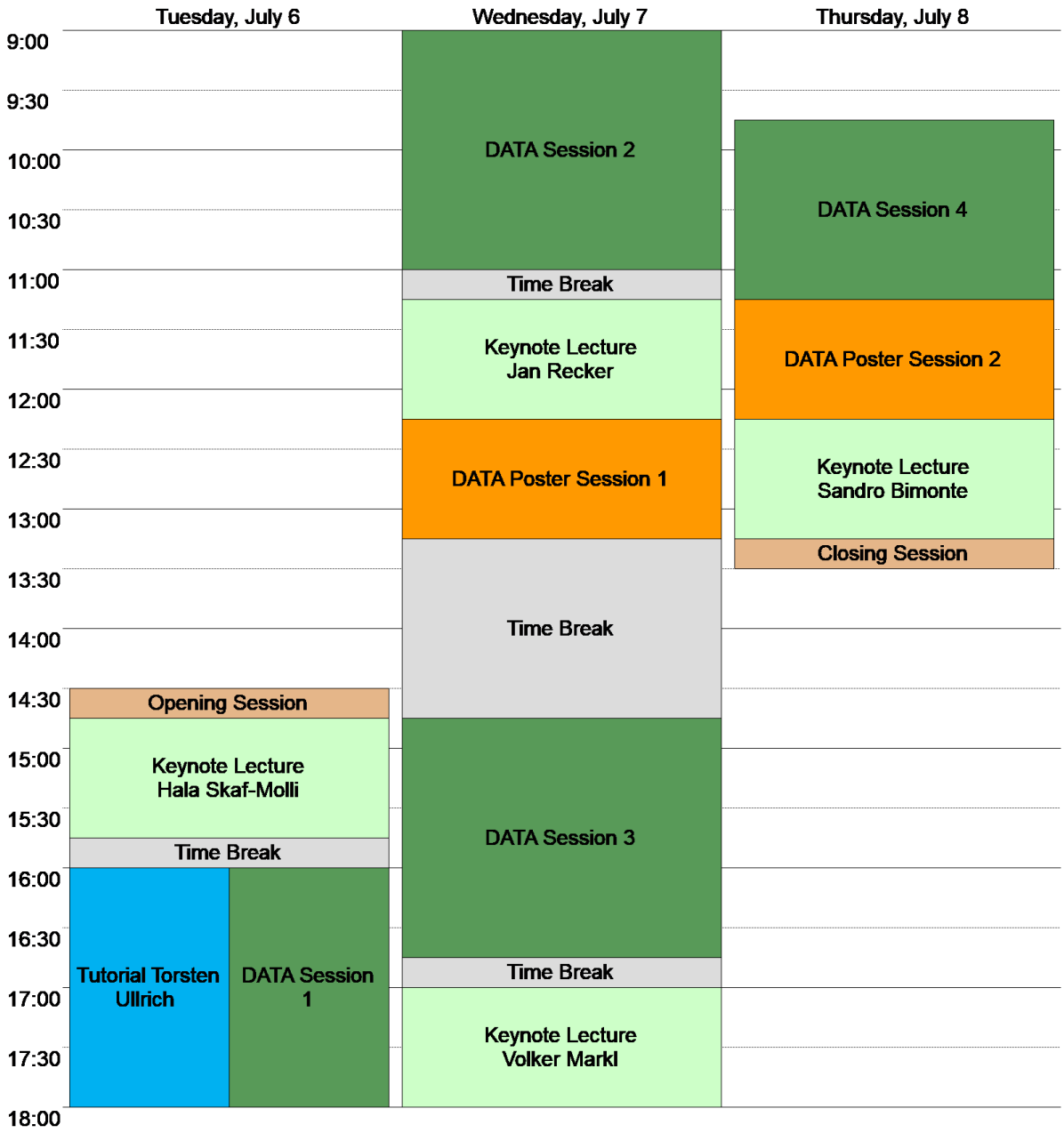
Program Layout



Final Program and Book of Abstracts

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Tuesday Sessions: July 6

Wednesday Sessions: July 7

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Thursday Sessions: July 8

Session 4B **DATA**
09:45 - 11:15 **Room 8**
Business Analytics

Complete Paper #49

A Study on the Effects of Response Time on Travel Package Attributes

Usha Ananthakumar and Sagun Pai
Indian Institute of Technology Bombay, Mumbai, India

Keywords: Consumer Behavior, Conjoint Analysis, Demographic Profiling, Tourism Preferences, Willingness to Pay.

Abstract: The rapid growth of online surveys in the past decade has raised questions about the effects of response time on the results. The focus of our current study is to discuss the impact of response time on various travel package attributes, thereby understanding consumer cognitive process. This study makes use of a recently conducted conjoint analysis experiment on travel package preferences in order to gain insights into the impact of response time on attribute importance and willingness to pay (WTP). Accordingly, the respondents are grouped as fast and slow depending on their response time and their differences in conjoint attribute importance estimates are investigated. The study also examines the changes in consumer willingness to pay for the two groups. Additionally, the distinctions in socioeconomic characteristics between the fast and slow respondents are also analyzed. The results and conclusions obtained from this research will help tour operators to scrutinize the time taken by consumers and thereby deploy appropriate marketing strategy based on the respective importance values and WTP trends.

Complete Paper #54

A Longitudinal Model for Song Popularity Prediction

Ahmet Çimen and Enis Kayış
Department of Industrial Engineering, Ozyegin University, Istanbul, Turkey

Keywords: Music Analytics, Time-varying Coefficients, Mathematical Programming.

Abstract: Usage of new generation music streaming platforms such as Spotify and Apple Music has increased rapidly in the last years. Automatic prediction of a song's popularity is valuable for these firms which in turn translates into higher customer satisfaction. In this study, we develop and compare several statistical models to predict song popularity by using acoustic and artist-related features. We compare results from two countries to understand whether there are any cultural differences for popular songs. To compare the results, we use weekly charts and songs' acoustic features as data sources. In addition to acoustic features, we add acoustic similarity, genre, local popularity, song recentness features into the dataset. We applied Flexible Least Squares (FLS) method to estimate song streams and observe time-varying regression coefficients using a quadratic program. FLS method predicts the number of weekly streams of a song using the acoustic features and the additional features in the dataset while keeping weekly model differences as small as possible. Results show that the significant changes in the regression coefficients may reflect the changes in the music tastes of the countries.

Complete Paper #63

A Company's Corporate Reputation through the Eyes of Employees Measured with Sentiment Analysis of Online Reviews

R. Loke and R. Lam-Lion
Centre for Market Insights, Amsterdam University of Applied Sciences, Amsterdam, The Netherlands

Keywords: Sentiment Analysis, Corporate Reputation, Natural Language Processing, Semantic Search, Scraping.

Abstract: Corporate reputation can be defined as the overall assessment of a company's performance over time (Kircova & Esen, 2018). Organizations with a positive corporate reputation create a competitive advantage and are more likely to influence customer's behaviors and attitudes (Kircova, 2018). Measuring corporate reputation from online data is an increasingly important area in business studies because the amount of opinions and comments is increasingly growing on the internet and has become very accessible to strangers (Shayaa, 2018). Traditionally, corporate reputation is measured with well-known approaches such as surveys, qualitative interviews, and sample groups (Smith, 2010). Researchers like Fombrun, Fonzy and Newburry (2015) developed instruments to measure corporate reputation and predictivily modeled its impact on stakeholder outcomes. So far, however, there has been little attention in the literature on sophisticated measurement techniques for corporate reputation that can be applied to online reviews from the public web. This paper applies sentiment analysis in combination with semantic search as a suitable technique to explore how employees perceive organizations. By using our toolbox, organizations can adapt to market changes and cater to stakeholders' needs. Also, it can be used to raise awareness for organizations that are unaware of negative reviews online.

Poster Session 2 **DATA**
11:15 - 12:15 **Room Posters DATA**

Abstract #19

Automatic Measurement of Corporate Reputation for Retail Companies from Online Public Data on the Web

Marselo Sitorus and Rob Loke
Centre for Market Insights, Amsterdam University of Applied Sciences, Amsterdam, The Netherlands

Keywords: Aspect Based Sentiment Analysis (ABSA), Unsupervised Learning, Retail Industry, Corporate Reputation, Web Scraping, Online Reviews.

Abstract: Retail industry consists of the establishment of selling consumer goods (i.e. technology, pharmaceuticals, food and beverages, apparels and accessories, home improvement etc.) and services (i.e. specialty and movies) to customers through multiple channels of distribution including both the traditional brick-and-mortar and online retailing. Managing corporate reputation of retail companies is crucial as it has many advantages, for instance, it has been proven to impact generated revenues (Wang et al., 2016). But, in order to be able to manage corporate reputation, one has to be able to measure it, or, nowadays even better, listen to relevant social signals that are out there on the public web. One of the most extensive and widely used frameworks for measuring corporate reputation is through conducting elaborated surveys with respective stakeholders (Fombrun et al., 2015). This approach

is valuable but deemed to be laborious and resource-heavy and will not allow to generate automatic alerts and quick and live insights that are extremely needed in this era of internet. For these purposes a social listening approach is needed that can be tailored to online data such as consumer reviews as the main data source. Online review datasets are a form of electronic Word-of-Mouth (WOM) that, when a data source is picked that is relevant to retail, commonly contain relevant information about customers' perceptions regarding products (Pookulangara, 2011) and that are massively available.

The algorithm that we have built in our application provides retailers with reputation scores for all variables that are deemed to be relevant to retail in the model of Fombrun et al. (2015). Examples of such variables for products and services are high quality, good value, stands behind, and meets customer needs. We propose a new set of subvariables with which these variables can be operationalized for retail in particular. Scores are being calculated using proportions of positive opinion pairs such as <fast, delivery> or <rude, staff> that have been designed per variable. With these important insights extracted, companies can act accordingly and proceed to improve their corporate reputation. It is important to emphasize that, once the design is complete and implemented, all processing can be performed completely automatic and unsupervised.

The application makes use of a state of the art aspect-based sentiment analysis (ABSA) framework because of ABSA's ability to generate sentiment scores for all relevant variables and aspects. Since most online data is in open form and we deliberately want to avoid labelling any data by human experts, the unsupervised aspectator algorithm has been picked. It employs a lexicon to calculate sentiment scores and uses syntactic dependency paths to discover candidate aspects (Bancken et al., 2014).

We have applied our approach to a large number of online review datasets that we sampled from a list of 50 top global retailers according to National Retail Federation (2020), including both offline and online operation, and that we scraped from trustpilot, a public website that is well-known to retailers.

The algorithm has carefully been evaluated by manually annotating a randomly sampled subset of the datasets for validation purposes by two independent annotators. The Kappa's score on this subset was 80%.

Complete Paper #28

Predicting Shopping Intent of e-Commerce Users using LSTM Recurrent Neural Networks

Konstantinos Diamantaras, Michail Salampasis, Alkiviadis Katsalis and Konstantinos Christantonis

Intelligent Systems Laboratory, Department of Information and Electronic Engineering, International Hellenic University, Sindos, Thessaloniki, Greece

Keywords: Purchase Intent, e-Commerce, LSTM-RNN, Web Usage Mining.

Abstract: An e-commerce web site is effective if it turns visitors into buyers achieving a high conversion rate. To this realm, it is useful to predict each user's purchase intent and understand their navigation behavior. Such predictions may be utilized to improve web design and to personalize shopper's experience, hopefully leading to increased conversion rates. Additionally, if such predictions can be done in real-time, during the ongoing navigation of an e-commerce user, the e-commerce application can take proactive stimuli actions to offer incentives with a view to increase the probability that a user will finally make a purchase. This paper presents a method for predicting in real-time the shopping intent of e-commerce users using LSTM recurrent neural networks. We test several variants of our method in a dataset created from the processing of Web server logs of an industry e-commerce web application, dividing user sessions in three different classes: browsing, cart abandonment, purchase. The best classifier achieves a predictive accuracy of almost 98%. This result is competitive with other state-of-the-art methods, which affirms that accurate and scalable purchasing intention prediction for e-commerce, using only session-based data, is feasible without any intense feature engineering.

Complete Paper #41

Applied Feature-oriented Project Life Cycle Classification

Oliver Böhme and Tobias Meisen

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Keywords: Machine Learning, Classification, Prediction, Deep Neural Networks, MLP, LSTM, Multivariate, Automotive, R&D, Projects Progressions, Project Life Cycle, Comparative Analysis.

Abstract: The increasing complexity in automotive product development is forcing traditional manufacturers to fundamentally rethink. As a result, many companies are already investing in the development of methods to increase the controllability of their development processes. The use of data-driven approaches is a promising way to provide an early prediction of potential problems in the course of a project by learning from the past. In vehicle development, projects can be divided into two basic categories: new vehicle launches and model enhancement projects. The course of projects according to the above-mentioned categories can be based on different influencing factors. To verify this hypothesis and to determine the extent of the differences in the data, we carry out a data-driven classification of the project category. In contrast to the recognition of other time-dependent data (e.g., univariate sensor data courses), we use multivariate project information from the automotive industry. With this paper, which is of an application nature, we prove that a multivariate classification of automotive projects can be realized based on the underlying project's progression.

Complete Paper #45

Impact of Duplicating Small Training Data on GANs

Yuki Eizuka[1], Kazuo Hara[1] and Ikumi Suzuki[2]

[1] *Yamagata University, 1-4-12 Kojirakawa-machi, Yamagata City, 990-8560, Japan*

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Keywords: Generative Adversarial Networks, Small Training Data, Emoticons.

Abstract: Emoticons such as (^_^) are face-shaped symbol sequences that are used to express emotions in text. However, the number of emoticons is miniscule. To increase the number of emoticons, we created emoticons using SeqGANs, which are generative adversarial networks for generating sequences. However, the small number of emoticons means that few emoticons can be used as training data for SeqGANs. This is concerning because as SeqGANs underfit small training data, generating emoticons using SeqGANs is difficult. To address this problem, we duplicate the training data. We observed that emoticons can be generated when the duplication magnification is of an appropriate value. However, as a trade-off, it was also observed that SeqGANs overfit the training data, i.e., they produce emoticons that are exactly the same as the training data.