Mining social network users opinions' to aid buyers' shopping decisions

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ABSTRACT

More and more online buyers turn to online reviews, while shopping, to get support in their choices. For instance, D'Avanzo and Kuflik (2013) show that more than 80% of buyers, while shopping online, expect *user's* or *professional reviews* services, implemented on the seller's website, that can be consulted before their purchase could take place. However, the diffusion of information, that buyers deal with during their shopping experience, makes room to the information and cognitive overload an out-and-out curse. All that is causing sellers adding Web decision support services to help buyers with their decision-making processes and there is a growing number of studies focusing on the enhancing of buyers online shopping decisions with the aim to improve their subjective attitudes towards shopping decisions. More and more sellers add on their side web decision support services that implement decision strategies employed by individuals to arrive at decisions and purchases. This paper introduces a cognitively based procedure (Gopnik et al., 2004) that mines users opinions from specific kinds of market, visually summarizing them in order to alleviate buyers overload and speeding up her/his shopping activity. The proposed approach emulates Vygotsky's theory of *zone of proximal development* that is well-known in the collaborative learning community (Chiu, 2000).

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1. Introduction

The increase of user generated content in the form of reviews is straight proportional to the rapid expansion of online shopping that, according to a report by Forrester research,[1] accounts for 13% of total retail sales in 2010 (Gudigantala, Song, & Jones, 2008). The easing both for sellers to transmit large amount of information at a low cost and for buyers to reduce the effort of getting at the information they are interested in, should have made the buyers shopping activity easier. Furthermore, this information diffusion about products imagined buyers satisfied during purchase decisions and, in general, shopping experiences, because in a brick-and-mortar of the traditional marketplace, more information was turned into better buyers decisions (Russo, 1974). However, the diffusion of information, that buyers deal with during their shopping experience, makes room to the curse of information overload (Cheng, Sun, & Zeng, 2010), a problem difficult to deal with (Karr-Wisniewski & Lu, 2010; Sicilia & Ruiz, 2010), especially if we consider the chief role played by buyers cognitive states because of their limited information processing capabilities (Iyengar, Wells, & Schwartz, 2006; Simon, 1956; Tversky & Kahneman, 1990).

Globalization and internationalization has pushed companies to improve customer satisfaction and get better results (Gonzlez-Gonzlez, Serradell-Lpez, & Castillo-Merino, 2012). In last years, community put a lot of effort for developing Web/shopping decision support systems that may help buyers finding the most relevant information (Resnick & Varian, 1997; Turban, Aronson, Liang, & Sharda, 2007; Xiao & Benbasat, 2007), spawning a lot of interdisciplinary interest (Alba et al., 1997; Hłubl & Murray, 2003; Hłubl & Trifts, 2000; Kowatsch & Maass, 2010; Lee & Lee, 2009; Murray & Hłubl, 2009; Qiu & Benbasat, 2010; Wang & Doong, 2010) and Knowledge Society is playing a crucial role nowadays (Lytras & de Pablos, 2011). For instance, cognitive scientists (Newell & Simon, 1976; Oulasvirta, Hukkinen, & Schwartz, 2009) debate on the role that individual factors, together with external information, play in the decision making process and there is a growing number of studies focusing on the enhancing of buyers online shopping decision with the aim to improve their subjective attitudes towards shopping decisions (Gupta & Harris, 2010; Kukar-Kinney & Close, 2010; Lee & Lee, 2004, 2009; Toncovich, Turn, Escobar, & Moreno-Jimnez, 2011). All that is causing sellers adding Web decision support services to help buyers with their decision-making processes (Lin, Hong, Chen, & Dong, 2010; Mohanty, Ravi, & Patra, 2010; Papatla & Liu, 2009). These services can be implemented by using decision strategies, i.e., rules, either referred to as heuristics (Marewski, Schooler, & Gigerenzer, 2010;

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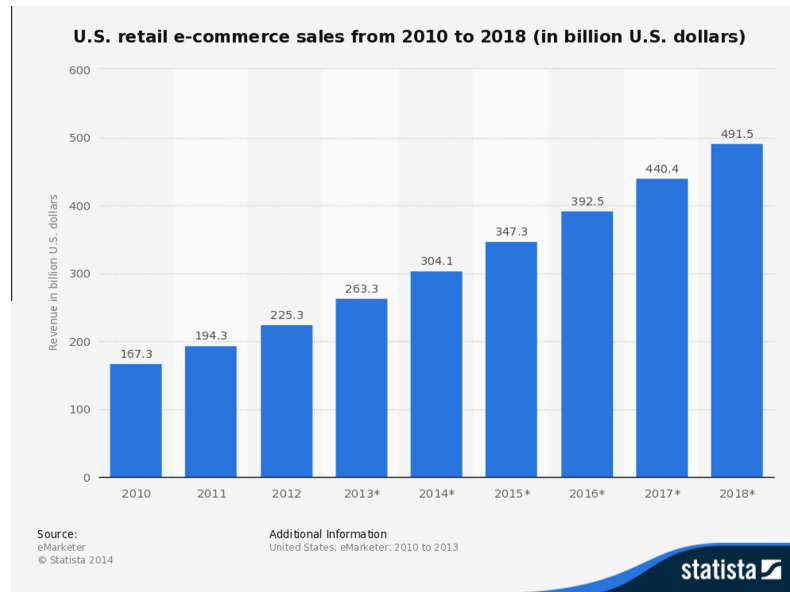[1] http://www.forrester.com.

Fig. 1. Figure report on the past E-commerce sales in U.S. Projections up to 2018 show a continuously and increasing marketplace.

Pearl, 1984; Polya, 1945), or rules of thumb (Gigerenzer, 2007; Waksberg, Smith, & Burd, 2009), employed by individuals to arrive at decisions and purchases (Hogarth, 1987; Jedetski, Adelman, & Yeo, 2002).

Authors of D'Avanzo and Kuflik (2013), investigating exactly the role that these strategies play both on the seller's and the buyer's side, found that among these heuristics, implemented on the seller's site as web services, *users' reviews* and *professional reviews* are expected to be implemented as web services by more than 80% of buyers. This result has also been found to be correlated with the *frequency heuristics* according to, the mere number of positive or negative attribute of a product (i.e., *product polarity*), plays a key role in buyer's decision making. As properly supported by Vinodhini and Chandrasekaran (2014), a need to organize the E-commerce reviews arises to help users and organizations in making an informed decision about the products.

This paper introduces a cognitive based methodology (Gopnik et al., 2004) to identify the *user/product polarity*. The approach, described in Section 3 employs a well known learning algorithm and an accomplished feature selection method, respectively a *Bayesian learner* and a *TF-IDF* based selector.

The approach has been tested on two kinds of market reviews gathered on the Facebook page, namely *smartphones* (i.e., Nokia) and *fashion* (i.e., Zalando and Privalia). The approach, tested using standard evaluation metrics such as those employed by related applications reported in Section 2, shows stimulating results. As ongoing work we are testing how the buyer's benefits from the use of a visual summary of products' reviews in her/his shopping activity. In other words the systems will be tested as a decision support system able to increase the buyer's level of satisfaction and a corresponding decreasing of his overload while shopping online. On the whole, buyers benefit of the social roots of the reviews mined, emulating a well-known approach used in collaborative learning, that is Vygotsky's theory of *zone of proximal development* (ZPD) (Chiu, 2000). As is known ZPD is the difference between what a learner can do without help and what he or she can do with help Lee and Smagorinsky (2000). In our case the ZPD is the difference between what a buyer can do without help and what he or she can do with help of the social opinion mining tool tested in this work.

2. Motivation: sellers' opportunities and buyers' behaviors

Even though *online shopping* is mostly considered in the same ways as *E-commerce*, actually *online shopping* is a sub-category of E-commerce as it predominantly refers to business-to-consumer (B2C) transactions such as online retail or online auctions (Drigas & Leliopoulos, 2013). *Online shopping* also refers to online purchases from bricks-and-mortar retailers or from online retailing corporations such as Amazon.com or Alibaba. According to STATIS-TA,[2] the *online shopping* marketplace has considerably grown over the past decade. For instance, in 2012 U.S. E-commerce sales amounted to 289 billion U.S. dollars, up from 256 billion U.S. dollars in 2011, with the largest share of online revenue produced by retail shopping websites that earned 210.3 billion U.S. dollars in 2013. According to a current STATISTA E-commerce forecast, online retail revenue in the U.S., as shown in Fig. 1, are expected to increase up to 500 billion U.S. dollars in 2018.

In terms of development, facts and figures do not change if we turn our attention to online marketplaces outside U.S. For instance, in Germany retail revenues were about 43 billion U.S. dollar in 2013 and are projected to grow to 58.38 billion U.S. dollars in 2017 in spite of the cutting economic crisis prevailing in Europe. Developing markets as well show final balance revenues at the moment and promise growing markets for the future. India's E-commerce sales in 2013 amounted to 3.59 billion U.S. dollars and are expected to grow up to 14 billion U.S. dollars in 2017. China's market then represents a phenomenon on its own if we consider that in 2013 retail E-commerce sales amounted to 141.64 billion U.S. dollars and are projected to grow to 665.07 billion U.S. dollars in 2017. Fig. 2 show the monthly reach of retail websites across BRIC countries as of March 2013, when retail websites reached around 60.3% of the online audience in India, 62.7% in Russia, 77.3% in Brazil, and 84.1% in China (see Fig. 2).

Looking at the share in global internet reach, *Amazon* is one of the leading E-commerce platforms worldwide, reaching 20.4% of worldwide internet users. Fig. 3 shows the global market reach of the largest online retail and auction sites in June 2011. Immediately

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[2] STATISTA (www.statista.com) is the world's largest statistics portal, providing access to relevant data from over 18,000 sources.