Ernane Rosa Martins
(Organizador)

Princípios e Aplicações da Computação no Brasil 3

Atena Editora
Ano 2019

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APRESENTAÇÃO

O volume 3 da referida obra “Princípios e Aplicações da Computação no Brasil” apresenta 15 novos capítulos, que abordam assuntos importantes sobre o panorama atual da computação no Brasil, tais como: desenvolvimento de aplicativos móveis, VoIP, modelagem computacional, simulação, recurso educacional aberto, projeto de banco de dados, mobile learning, robótica, avaliação automática de código-fonte e agrupamento difuso multivariado.

Deste modo, esta obra reúne debates e análises acerca de questões relevantes, tais como: desenvolvimento de uma aplicação móvel para realização de recargas, consultas e simulação de saldo na carteira de transporte público, usando o método Design Constructal para melhorar a configuração geométrica de um novo layout para TCSA com quatro dutos; analise dos benefícios da tecnologia VoIP como alternativa de baixo custo a um serviço de telefonia institucional gerenciado por minicomputadores Raspberry e adaptadores ATA; analise do comportamento mecânico de placas finas de materiais compósitos laminados reforçados por fibras submetidas a esforços de flexão, comparando-as com o de uma placa de aço, usando modelagem computacional utilizando o software Abaqus 2017 Student Version®; apresentação de uma arquitetura de sistemas de simulação para área de convergência; desenvolvimento de uma abordagem para auxiliar o docente na criação de atividades com REA’s que quando executados pelos alunos gerem o registro de suas experiências; análise da gestão de recursos humanos na administração pública por meio de um projeto de banco de dados; analise dos recursos disponíveis no WhatsApp Messenger, que oferecem possibilidades de uso no ambiente escolar como recurso pedagógico que pode auxiliar o processo de ensino e aprendizagem; simulação de um agente robótico capaz de realizar busca e exploração visual num ambiente virtual; e o desenvolvimento de uma ferramenta de análise e avaliação automática de código-fonte como alternativa para a otimização do processo de ensino-aprendizagem de programação.

Nesse sentido, esta obra apresenta enorme potencial para contribuir com análises e discussões aprofundadas sobre assuntos relevantes da área da computação, podendo servir de referência para novas pesquisas e estudos nesta área. Agradecemos em especial aos autores dos capítulos apresentados, e desejamos aos leitores, inúmeras reflexões proveitosas sobre as temáticas abordadas nesta obra.

Ernane Rosa Martins

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DEVELOPMENT OF A BIG-FIVE PERSONALITY TRAITS CLASSIFICATION APPROACH VIA ANALYSIS OF TEXTS IN BRAZILIAN PORTUGUESE

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ABSTRACT: Effective collaborative learning must take into account a grouping strategy to ensure that students will interact with each other in work groups. Since these interactions are influenced by the behaviors and characteristics associated with the learner personality traits and the use of a questionnaire to assess them is undesirable, in this paper, we present our work toward the development of transparent way to assess this personality traits that can be included in a virtual learning environment. Our approach involves processing students' texts and extracting word categories to be the input of a personality trait model. The results of the initial experiments pointed an existing relationship between some LIWC word categories and Big-Five traits.

KEYWORDS: Natural Language Processing, LIWC, Collaborative learning.

RESUMO: A aprendizagem colaborativa eficaz deve levar em conta uma estratégia de agrupamento para garantir que os alunos interajam entre si nos grupos de trabalho. Como essas interações são influenciadas pelos comportamentos e características associados aos traços de personalidade do aprendiz e o uso de um questionário para avaliá-las é indesejável, neste trabalho, apresentamos nosso trabalho para o desenvolvimento de uma forma transparente de avaliar esses traços de personalidade que podem ser incluídos em um ambiente de aprendizagem virtual. Nossa abordagem envolve o processamento de textos dos alunos e a extração de categorias de palavras para ser entrada em um modelo de traço de personalidade. Os resultados dos experimentos iniciais apontaram uma relação existente entre algumas categorias de palavras do LIWC e características do Big-Five.

PALAVRAS-CHAVE: Processamento de Linguagem Natural, LIWC, aprendizagem colaborativa.

DESENVOLVIMENTO DE UMA ABORDAGEM DE CLASSIFICAÇÃO DE TRAÇOS DE PERSONALIDADE DO BIG-FIVE VIA ANÁLISE DE TEXTOS EM PORTUGUÊS DO BRASIL

1 I INTRODUCTION

According to [1], three attributes are linked to effective learning: active learning and knowledge building, cooperation and teamwork, and learning using problem solving. Some theories also classify learning as a social process that occurs more effectively through interpersonal interactions in a cooperative context [18], since an individual, working in collaboration with others, is exposed to different viewpoints, questioning their initial understanding and motivating learning [1]. Thus, encouraging students to work together on collaborative tasks is an important way to help them to develop, for instance, critical-thinking, self-reflection and take responsibility for their own knowledge acquisition.

The collaborative learning involves individuals coordinate efforts to work and learn together, which means they are building social interactions [6]. Although the collaboration positive effect on student learning, there are several factors influencing this process, such as the group composition and task characteristics [11]. Once the group formation influences how people work together to reach a goal, this is one of the most important aspect to be considered in order to allow knowledge acquisition via collaborative activities [14].

One way to support collaboration is to be concerned with the selection of individuals to compose the groups, since the composition of a group is considered crucial to trigger productive interactions between the peers [13] and avoid social conflicts that may make the collaboration impracticable. Besides the group formation support, since Big-Five personality traits are correlated with learning gains, they can be used to understand how each trait affects learning process and propose ways to support students based on their personality characteristics [2].

In order to make the personality traits available to be included in educational systems and to be used to support collaborative learning, we propose to assess students' personality traits, according to the Big-Five model [15], from student texts collected while they are interacting within a virtual learning environment. This work presents the initial phase of our work toward the model to assess Big-Five personality traits via student's text analyses.

This paper is divided into five sections. Natural language processing, the Big-Five model and how they are related to personality detection are explained in section 2. How texts and Big-Five scores will be collected and processed in order to develop the model to assess personality traits is described in section 3. The result of a correlation analysis using the texts in the Big-Five inventory is presented in section 4. The fifth and last section is the conclusion and future perspective.

2 I BACKGROUND

When students are learning via virtual learning environments without a present teacher supervision, it became hard for the teacher to know about the users' characteristics in order to support their learning process. Trying to address this challenge, several works were developed in order to extract knowledge about the learner. Wen et al. work [19], for instance, applied linguistics analyses to students' forum posts to find the relation between language use and learner motivation and cognitive engagement in massive open online courses context. Kumar and Rose [9] incorporated natural language processing into a conversational agent in order to help students working in a collaborative activity and support productive conversations.

In addition to the information about learners motivations, learning processes and collaboration one can infer by analysing the texts that a student wrote, as the language is the way people express their thoughts and emotions, it usually carries part of the characteristics of the interlocutor. Then, looking at the words someone chooses in a conversation, it is possible to find a relationship between the words used and the personality [17].

Some studies were conducted with the aim of finding such a relationship. Kwantes et al.[10], for example, studied when words can be used to evaluate the Big-Five personality traits in written texts and noted evidence of the traits in the texts tested.

Machado et. al. [12] developed an initial study with the intention of constructing a lexicon to help extract information about the Big-Five in texts written in Brazilian Portuguese and found some words related to the traits. Paim et al. [16] developed a method of inference of personality through Portuguese texts, acquired in the social network Facebook, using regression algorithms to build his models to infer the Big-Five personality traits. The objective of the study was to contribute to the detection of personality traits in Brazilian Portuguese. To validate the proposal, they also asked the individuals involved in the experiments to respond to the Big-Five's personality inventory, finding a moderate correlation between personality traits and texts extracted from the social network. Both [12] and [16] indicate the possibility of contributing to improve the quality of the inference methods of the personality through texts written in Brazilian Portuguese.

The use of the Big-Five to evaluate the traits of an individual is motivated by the fact that it has been extensively tested and studied in a large number of cultures, and for this reason, is considered a reliable tool to evaluate personality traits [8, 5, 15].

The term Big-Five, usually assigned to Goldberg [7], is used to express the model comprehensiveness in the personality representation. The model is hierarchical and organized in five basic personality traits that group several distinct and specific personality characteristics [15]. Each trait is bipolar and represents a behaviour tendency, according to the score in that trait.

The trait name represents the characteristics related to higher scores. Neuroticism is usually related to individuals that express high levels of negative emotions and are usually hostile, wary and emotionally unstable. Extraversion characterizes people that are gregarious, talkative and usually show positive emotions. Openness characterizes the tendency of being curious, inquisitive, interested in new ideas and arts. Agreeableness is related to the ability to be cooperative, warm-hearted, mild and agreeable. Conscientiousness represents people that are responsible and well-organized. A person who gets a low score in certain trait will tend to show the opposite characteristics.

Considering the possibility of detecting traces in texts written in Brazilian Portuguese, this paper aims to classify students in the five personality traits of the Big-Five, analyzing the texts written by them, thus contributing to the creation of an automatic model to infer students' personality traits. Our strategy includes the use of word categories, instead of the words itself, since models such as bag-of-words, are hard to apply in new contexts and use linguistic features based on the literature is effective in practice [19].

3 I RESEARCH METHODOLOGY

Once immersed in a virtual learning environment, the user can interact with different objects, virtual tutor and other students, for example. These interactions usually happen via conversational tools, such as forums and chats. All this information remains stored in the environment logs or database containing lots of data about user-platform interactions. By collecting and processing the texts resulting from student interactions we calculate the metrics used by the personality trait classifier. The flux of collection and processing student's texts is presented in Figure 1.

The process of text evaluation starts with text treatment using the Python library to handle natural language, the Natural Language Toolkit (NLTK) [4]. The treatment of conversations removes stopwords, accentuation and punctuation and then extract the words in the text. Instead of using the words itself, the Linguistic Inquiry and Word Count (LIWC) [17] was applied to categorize the word resulting of the text treatment using NLTK. Using the categorized words, the frequency of each category was computed.

The LIWC is a text analysis software which provides an internal dictionary of word categories used to compute the degree of use of those categories in a text. The version developed to categorize word written in Brazilian Portuguese is the Brazilian Portuguese LIWC2007 Dictionary [3].

The LIWC dictionary was chosen because it has some categories related to the Big-Five personality traits. For example, since neuroticism is a trait characterized by negative emotions, when classifying the words of a text using the LIWC categories,

it is expected to find words related to the categories negemo (negative emotion), anger, sad (sadness) and anx (anxiety).

An individual highly scored in agreeableness will be likely to use positive words and avoid criticism and negative words. Due to the social behaviour, people high in extraversion will also be likely to use positive words. Then, both traits are expected to be related to the LIWC categories social (social process) and posemo (positive emotions). By observing a person who is high in openness, one can expect to find words in his/her texts falling in the tentat, insight, and cogmech LIWC categories. Since conscientiousness is related to be diligent and task oriented, texts written by a person high in conscientiousness may be full of words related to the LIWC categories work and achieve.

This work is limited to the study of the relationship between the LIWC categories and personality traits in order to select those categories that should be used to feed the personality trait classifier. In order to find if the categories we have selected based on traits characteristics have some correlation and seem to be good as trait predictor, we applied a bivariate linear correlation.

As future work, we are planning to use regression models and decision tree, once these models were used in some related works using the selected categories in order to develop a model to infer the personality traits (e.g. [16]). Since those algorithms need some initial data to be trained, we are currently preparing to collect texts in Brazilian Portuguese and applying the 44-item Big-Five inventory to form a database of texts associated with trait scores.

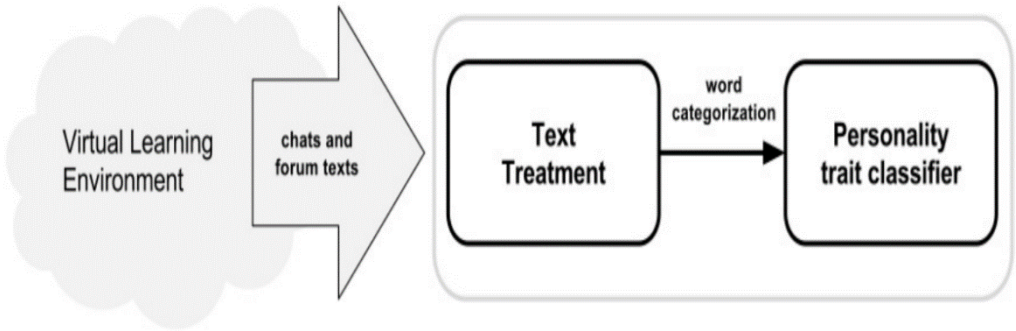

Figure 1 - Flux of student's data processing and analysing.

4 I EVALUATION OF INVENTORY TEXTS

Each item in the Big-Five inventory is a short sentence about how an individual may feel in some situation. For instance, among the items related to extraversion one can find "is talkative, communicative", positively related to the trait, and "tend to be

quiet, silent" negatively associated with the trait.

In order to test and improve our text processing scripts and try to find some relationship between words and BigFive personality traits, we applied the text processing in the big five inventory items. Each inventory item was considered a text that an individual has written and the score assigned was 1 for those positively related to the trait, otherwise, the score assigned was 0.

After being processed, the result set of words was classified using the Brazilian Portuguese LIWC2007 Dictionary. Using the categorized words, we calculate the category frequency in each text. The dataset of traits scores and categories frequency associated to the 44 inventory items was used as the input of a bivariate linear correlation analysis, ran in order to find the relationships between each category and a specific Big-Five personality trait.

According to the traits definition, it was expected positive correlation between positive emotions and extraversion and positive correlation between neuroticism and negative emotions. It was also expected agreeableness related to positive emotions. According to the correlation analysis results in the Table 1, although neuroticism is correlated with almost all negative emotion categories, it seems to not be related to anger. It may sign that sadness and anxiety categories are the negative emotions more related to high scores in neuroticism.

Openness is a trait related to intelligence and interest to new things and ideas, then it should be the trait associated with the word category insight. Although the correlation in Table 2 is positive, it does not seem to be strongly correlated to the trait. On the other hand, as expected, conscientiousness is related to the categories work and achieve.

Among the other categories tested, the category social, that was expected to have a positive correlation with agreeableness and extraversion, exhibited a stronger correlation with openness. Probably because an individual high in openness may seek for new relationships in order to feed their need for new knowledge and different viewpoints. Although, tentat and cogmech shown a positive relation with conscientiousness, they do not seem to be related to openness as we suppose based on openness characteristics.

	Neuroticism	Extraversion	Agreeableness
Neg. emotion	0.19	-0.16	-0.77
Anger	-0.49	0	-0.58
Anxiety	0.29	0.35	o
Sadness	0.29	0	0
Pos. emotion	-0.05	0.37	0.76

Table 1 - Correlations between personality traits and affective word categories

	Conscientious-ness	Openness
Insight	-0.32	0.02
Work	0.61	-0.66
Achieve	0.61	-0.22

Table 2 - Correlations between personality traits and personal concerns categories

5 I CONCLUSION AND FUTURE WORK

The collaborative learning process depends on good social interactions to be effective. Without interaction the group members are not able to share knowledge and define responsibilities. A way to increase to probability of good social interactions is apply a grouping strategy that take into account student characteristics, such as personality traits.

Using a questionnaire to get such information may not be desirable since the student may refuse to answer it. Thus, in this paper, we presented our work toward a model to assess Big-Five personality traits transparently by processing student texts and to make the personality traits available to be included in educational systems and support collaborative learning.

Although this study is in its early stage, the results obtained by analyzing the texts of the 44-item Big-Five inventory pointed some positive results in associating the percentages in LIWC word categories and personality traits.

Since the results present in this paper were obtained from the text of questionnaire items, we can find different results when analysing the texts and scores of real students. Thus, as future work, we plan to run experiments with students in order to find the categories associated with personality traits and, then, build a model to infer them from the text.

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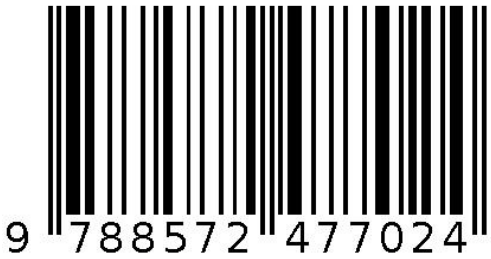
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