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Psychoinformatics: a theoretical approach on information science and psychology

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Abstract

This article provides insight into an emerging research discipline called Psychoinformatics. In the context of Psychoinformatics, we emphasize the co-operation between the disciplines of Psychology and Information Science which handles large data sets is derivative from severely used devices like smartphones or any online social networking in order to highlight psychological qualities including both personality and mood. New challenges await psychologists considering the result "Big Data" sets because classic psychological methods will only in part be able to analyze this data derived from ubiquitous mobile devices as well as other everyday technologies. Consequently, psychologist must enrich their scientific methods through the inclusion of methods from informatics. Furthermore, we also emphasize on data which is derived from Psychoinformatics to combine in a such a way to give meaningful way with data from human neuroscience. We close the article with some observations of areas for future research and problems that require consideration within this new discipline.

1. Introduction

In spite of the ancient roots of Information Science, it was only at the end of the 1950s that the term "Information science" appeared in the literature as a natural evolution from documentation, boosted by the new Information and Communication technologies and by the development of scientific and technical information [1]. Information science is an academic field which is primarily concerned with analysis, collection, classification, manipulation, storage, retrieval, movement, dissemination, and protection of information [2]. Information science is poised to have a tremendous impact on psychology. The systematic and objective Psychology study is to study of people behavior specially how they think and behave. Its goals are to describe, explain, predict, and control behaviour and mental processes [3]. Besides experiments and questionnaires, information science establishes a third fundamental research technique: - the observation of human-device interaction on a very large scale. It allows psychologists to analyse variables such as personality traits (e.g. extraversion versus introversion), aptitudes (e.g. political), and cognitive functions (e.g. Cognitive aging process), as well as behaviour (e.g. hazardous driving behaviour or active lifestyle). Tracking hundreds of thousands of users, the resulting Big Data requires substantial modelling and cleaning. However, its sheer size in combination with machine learning techniques leverages statistical power [4].

The challenges of two science involved the approached which is founded by Psychoinformatics. Significantly, the two have to learn how to cooperate and eventually shape individually new discipline of Psychoinformatics . Psychoinformatics is well defined by Yarkoni that it is a developing self-restraint that learn from computer and information sciences tools and techniques to recuperate how to acquire, organized and synthesis psychological data. The psychological science depends on two fundamental ways of collecting data that is experimented, questionnaires and the interviews done one by one. Experiment research is done on small number of group of people where you need to experiments the things. Self-report questionnaires or interviews also encounter problems, since humans find it hard to reliably recollect past events. In contrast, modern computer or information science introduces entirely new methods of assessing participants behaviour longitudinally, on large scale, and in comparison, to self-reports, in a rather objective manner. Thus, the main aim of the present work on Psychoinformatics is to highlight potential avenues of exploitation of data derived from digital technologies.

2. Developments in the information industry giving way to psychoinformatics:

In the past twenty years, the information industry has produced a large range of powerful technologies, which have become ubiquitous in everyday life. Smartphones and other mobile devices provide constant connectivity and in doing so have changed our daily lives together with online platforms such as Facebook, they have become a central venue to communicate, shop, play, or study. Consequently, digital technologies are pervasive in everyday life and data from such devices could be recorded on a large scale. The new technological inventions give support for traditional methods of psychological like experiments and questionnaires methods. It is possible to tests neuropsychological and other traditional tests through application on smartphones which cannot study only patients but also a broad population. Yes, Psychoinformatic experiments can be conducted several times per day over an extended period, thus generating a larger number of data points per user. Secondly, they allow for questionnaires to be administered over mobile phones, potentially asking the participant to contribute data on a daily level, again collecting more data points per user and can serve as data sources.

3. The internet of things and psychoinformatics: -

The foremost benefit of Psychoinformatics is that it takes over on the tradition approach of psychological techniques and have the capability to track human machine interaction on the devices directly. For example, one can easily track interaction of human over the smartphones which was not their earlier. This approach can also be extended to online platforms, such as social networks or shopping sites. Data is captured and transferred to a central server for further analysis, without requiring any interaction from the user. Such tracking outperforms traditional methods in terms of both the scale and quality of the data collected. First, it allows researchers to track a very large number of participants, up to hundreds of thousands. Secondly, it collects data from the participants without any demand at numerous points per day. As people are moving into technological world in this digital era, it is easy to gather data richer and able to provide on per day points. Along with this it becomes more in abundant as everyone is going towards digital world. Tracking behaviour on the smartphone is likely to lend the greatest insight into human behaviour. It gathers many features of life in a broad ways of methods as one can track through GPS about their social network, way of communication and infer mood through their online world. It is full of radars through which it can interconnect its data automatically to a remote server. It is central device which access the whole online activity like accessing the web, shopping online, connecting with friends through social media and playing online games. People have such a device so it comes under research budget which is important. According to statista.com in 2016, more than two billion humans will use a smartphone. With this enormous distribution of smartphones worldwide, they are predestined to turn into the most prominent data source for scientists [5-7].

4. Research agenda psychoinformatics: -

Naturally, there have been previous collaborative efforts between the areas of psychology and information science and the research is done which includes engineering, e-learning, interaction and information. It traces many areas which is already studied by psychologists while focusing the users. Specifically, this discipline of computing reacts and copycats the human imitate. More narrowly focused, Human-Robot Interaction focuses on the interface between users and robots, thus also touching on aspects of psychology. The collaboration between computer science and psychology will finally allow the psychologists to apply more practically many of their scientific results. Quantitative method of research has enjoyed practical impact in psychology as it gives face to face interaction with the participants and conduct in a wisely designed questionnaire or laboratory experiments and it is not clear about the results as it can be generalized to real life. Results from psychology test can be authenticated with reaction of everyday life and combined with logic of IT systems as like cars will recognize when driver will be sleepy or irritated through driving pattern of driver. Learning software will realize when a student attention is slipping. Such "affective computing science" will be an integral part of most of the devices that surround us [8-9].

The immediate practical value can be achieved through these application rather than findings and many psychological results from previous periods. This can create a questions on Psychoinformatics whether they can have their own unique research or not. We can easily figure out through literature review of this paper that

Psychoinformatics is done to achieve many psychological questions on research which is tested outside the laboratory strict settings in day to day life. Testing results on varied setting will be a big challenge for all important psychological research in laboratory specially on wider scale as the smartphone data through GPS gives its time and location point too which could be connected to many external variables. We can say that through smartphone or GPS we can get information at large scale which can be considered for many research questions but it was unconsidered previously. Clearly, this also poses fundamental challenges for ethics committees in determining what can and cannot be studied after the data has been collected. While smartphones and social networks may be an important source for understanding individual psychological processes, we must also be mindful that these devices are designed for social interaction [5-7]. Recently in many years, number of studies are increasing and it can be fit into the category of Psychoinformatics.

The term itself has been independently coined by several workgroups and these studies mostly deal with the data sources collected through online platform like social networks connection on web. We will brief about the studies and give review on psychological variables which we got from social networks like Facebook, Twitter, Instagram etc. It is possible to see the variations in cognitive function through smartphone which imparts itself to learn cognitive decrease in elderly societies like in Germany. Dufau.et al. studied and have relevant another prospective. Quality and generalizability is the main perception of validity and reliability in Psychology to find anything from psychological studies. We have to consider proper validation of data collected from questionnaire through smartphone which can be similar and have same ability of psychometric properties for the results from Psychoinformatics as data collected through traditional approach that is paper pencil questionnaires must be tested systematically.

The people with high scores on measures of neuroticism tend to use words such as "sick of," "depression," "alone," or "lonely" more frequently on social networks. Thus, quantifying the use of such words in different communications channels by means of text mining would produce an interesting variable to be combined with neuroscientific data [11]. Moreover, personality traits should be reasonably stable across all kinds of different behaviours and diverse situations in everyday life. According to Mischel and Shoda, they describe how stability of personality must be established across different contexts, (e.g., a boy behaves in a stable way, shy when being around girls but not shy when he is with a male peer-group), so anxiety may also be reflected in the way we drive cars or our communication patterns via e-mail [12].

Thus, we argue that Psychoinformatics must be incorporated into the assessment of human behaviour, as such recorded behaviour may be more closely linked to our biology than self- report assessments.

5. Challenges:-

The core challenge for Psychoinformatics lies in its interdisciplinary. Neither psychology nor computer/information science can achieve this level of progress independently. Psychologist do not have skill to build large scale tracking systems and also they are not able to manage the subsequent data. They are good at benefitting data modelling and mining methods whereas computer scientists don't have their field knowledge and also lack in long tradition research on human subjects. Both sciences need to develop common ground knowledge, a recognized approach, terminology and methodology. They need to nurture a common basic research culture. Currently, results in information science are largely published at large conferences; journal articles frequently only extend previous conference publications. Psychology mainly publish in journals and both have their own speed of publication that is on equal peer reviewed journals. Similarly, universities must adapt to interdisciplinary research undertakings. They need to support careers that are not particularly advanced inside computer science but conduct ground-breaking research in collaboration with psychologists. As with any technological paradigm shift, there are ethical challenges to be addressed. Naturally, data privacy is a major concern. However, psychological research has dealt with private and intimate data since its inception and has an established code of conduct for handling data, which can be readily adapted to include digital data.

Though Psychoinformatics is stagnant in its immaturity and not recognized as in a way it should and still the path of it missing. Over the next decade, we will see numerous and massive research undertakings between psychology and computer/information science. As soon as the research community will realize that the efforts

they are putting is not for one events but it's a part of paradigm shift. Very soon two sciences can determine common ground, unquestioned methodologies, and taxonomies, as well as common ethical standards and finally this research will direct and give direction to new field in its own way.

Further, uses of latest tools like face recognition technology can also help in monitoring of psychological state of an individual, this can only happen with the role of information science [1]. In near future, the role of artificial intelligence can also add new facelift to psychology. As there has been rapid expansion in the role of information science in recent years in every field such as sports, e learning, medical, e-vehicles etc [14]. Further research is highly essential in order to expand the role of Psychoinformatics.

Conclusions: -

The next decade will see an increasing number of research undertakings, residing squarely between information science and psychology. Most might not be coined as Psychoinformatics. Several may not include traditional trained computer scientists or psychologist, many are there who are not aware that they are practicing a psychological questions. Many may not involve traditional approach of trained computer. But yes at some level, computer and information science change the views and the old traditional methodologies in Psychology.

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