

Web Intelligence Centre Universidad de Chile

A VERY SHORT INTRODUCTION ABOUT WIC-CHILE ACTIVITIES

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ABSTRACT

Web Intelligence Centre from Universidad de Chile started in 2010 as professor Juan D. Velásquez received from the Web Intelligence Consortium's academic and orientation support to create a research centre focused on web user behaviour analysis. The centre grew and established alliances with Medicine School at the same university, developing health-engineering projects with the aim to improving people's health through high-end technologies. It has developed 13 projects, given the opportunity to 100 students to develop their thesis, published near 100 new papers and won 16 funds. Now, it has 5 emblematic projects that are currently impacting health systems and health professional's and patient's lives.

I. THE BEGINNING

The Web Intelligence Centre (WIC) was created back in 2010 by the professor Juan D. Velásquez after the Web Intelligence Consortium gave its academic and orientation support, establishing a participation agreement on the Consortium's events. Its initial aim was to research about web users behaviour analysis (1). It began with him, two more researchers, five undergraduate students and two postgraduate students willing to research and generate new knowledge. The first subject that was treated and researched by the engineering group was, as the centre name says, Web Intelligence (2), approaching to sub topics like Web Mining, Text Mining, Natural Language Processing and Web Opinion Mining. In order to finance the research, the team started to applying into public research competitive funds, having a very good winning rate. Those funds allowed the centre to grow and have

more students working on their thesis at the centre, students that later on became engineers and stayed working there, generating more knowledge.

The topics on which the centre has expertise are Analytic and Data Science, Business Intelligence, Artificial Intelligence Software Development, Data Architecture and Engineering, Computer Vision, Big Data Analysis, Predictive Analysis and Natural Language Processing; leading to the centre's vision:

"We create information technologies using data science to support decision making at innovative organizations. We believe that this discipline can generate a big impact on society and that passionate us".

As the years went by, important alliances have been carried out, highlighting the one with Medicine School, establishing a new pathway for the centre: health engineering projects, with the aim to improve people's health using new high-end technologies and creating new multidisciplinary knowledge. Thus, the centre's mission is:

"We want to be a relevant stakeholder on data science area and its applications in healthcare. For that, we will have 3 transferred projects to healthcare centres by 2022".

The centre has given the opportunity to 100 undergraduate, postgraduate and PhD students to develop their thesis on investigation projects, 40 students to continue their studies at foreign universities, as University of Tokyo, San Diego University, Merbourne University, KAIST South Korea, KU Leuven University, among others. It has published at least 30 ISI papers, 50 conference papers, 4 books and 12 book chapters, won 16 funds for the different projects it has developed, 13 in total. In 2018 it

organized the International Conference on Web Intelligence from IEEE-ACM-WIC, and nowadays it has 5 operating funds and waiting for the results of some more.

Finally, one of the main differentiators of the centre is its focus on technology transfer, in other words, every technology it develops is accompanied by a transfer strategy to the public or private entity that will use it, and this is because one of the WIC's philosophy is to truly impact society and public policies using the developed technologies. Moreover, currently it is participating in the construction of a strategic plan to approach the usage and analyze artificial intelligence impact in Chile at the Senate of the Republic, and also as part of the expert panel summoned by the presidency to elaborate a national intelligence strategy for the country.

II. EMBLEMATIC PROJECTS

The centre has developed a high number of projects, with different objectives, technologies and alliances. Below, we list the most important projects for the centre nowadays, those projects that are reaching the expected impact, that have allowed other technologies to emerge, that are paying back for all the effort invested and that have a promising future.

A. Docode

For the acronym DOCument COpy DETector, DOCODE is the very first project of the WIC. The first idea of this technology dates back to 2008, when professor Velasquez started researching about plagiarism detection algorithms using text mining (3). It won 4 funds to finance the research needed to build the engine behind and a usable tool

for customers. It took about 8 years for it to debug in what it is now, an automatic plagiarism detector in documents against indexed web pages, repository or other specific documents, the outcome is a side by side comparison between the original document and the ones reviewed, giving a plagiarism index of easily interpretation (4; 5). In 2011 won the first place on the global plagiarism detection contest in Amsterdam, Netherlands. Actually it is been used by Universidad de Chile and by 1 other university that buy Docode's services as well as 5 more big clients from the government and Chile's state, besides 10 smaller clients, being small enterprises and professors. And the most important thing is that this platform is helping not only to reduce plagiarism, from 40% to 1%, but also to assure original content and teach the importance of citing, creating original content and avoiding copy and plagiarism.

B. Akori

From the acronym Advanced Kernel for Ocular Research and web Intelligence, Akori also means "Falcon" in "Mapudungún"¹, and was the first joint project between WIC and the Faculty of Medicine, back in 2012. It started with the idea of getting to know if it was possible to identify if a web user liked or disliked something in a webpage by looking at his pupils, thing that was studied using eye-tracking, electroencephalogram and key object identification by web mining (6) and determining if click intention could be predicted (7; 8). Nowadays, Akori is a platform that uses web intelligence and physiological variables to determine the web page salient objects for users, it analyses a web page image and returns a heat map whether the looking preferences of the users should be. This project won 2 funds and, by now, is at the stage of improving the algorithms to give faster results.

C. Sonama

Sonama, Social Network Analysis for Marijuana and Alcohol, is a platform that analyses social media information

to study marijuana and alcohol prevalence in Chile. Its aim is to give a high value and complex prediction about the potential behaviour of social media users with respect of marijuana and alcohol consumption, opinion and dependency. The technologies used for this purpose are data mining and information fusion, and the main results obtained from the development of the research are (9):

- Data extraction algorithms from Twitter.
- Behavioural model for predicting marijuana consumption.
- Web application prototype to visualise the above results. It allows to see the evolution of some indicators trough time.

The platform extracts Twitter user information, like posts, user data and relationship between users to create indicators of prevalence and risk perception of marijuana (9) and a predictive model to improve substance use surveillance (10). The purpose of this project is to help health authorities take fast and well informed decisions with respect of narcotic policies, which, nowadays are taken using a national survey, taken every 2 years. The National Service for Prevention and Rehab of Drugs and Alcohol Consumption, the health entity in charge of this issue, participated in the design stage of the project and validated the results obtained.

D. Prevedel

Prevedel, for "Preventing Delirium", also developed jointly with the Medicine Faculty, aims to preventing the "delirium" condition affecting senior hospitalized patients. It first started in 2017 from Medicine's idea that some other measures combined in an app could prevent delirium condition in a better way and less invasive than medication, establishing the alliance with WIC and winning 2 funds for its development. The first one finished with a complete developed and proven software for Android devices with little games that stimulate reorientation, cognitive aspect, early moving, sensory help promotion, sleep hygiene and pain management optimization. The software incorporated horizontal disposition, color contrast, big interaction in-

terest areas and customization. The results were that 91% of the population studied could reach the software performances without instructions, and 100% after them, and there was 60% less delirium in the group that used the app (11). The second part of the study, the one financed by the second fund, is taking place right now, and looks forward to proving the efficacy of the software in truly preventing delirium.

E. Kefuri

Kefuri, kidney in Mapudungún, is a web platform to warn the Procurement team about the arrival of a possible organ donor to the Emergency Room (ER). This project, developed jointly with Medicine school, began as a student project that was sponsored by the centre, whose aim was to increasing organ donation rate in a country, Chile, that has had a historically low donation rate despite communicational efforts encouraging donation (12). The first steps of the project were research for all the processes that take place to achieve an actual organ donor and discover the bottle neck stages that could have solution using high-end technologies. In those researches, the investigation team discovered various inefficiencies and inefficiencies, but that the very first stage, the one where the possible organ donor came in to the hospital was the weakest one because ER personnel did not warn Procurement unit, the one in charge of organ donation in hospitals, about the arrival of the patient (13). The project won one fund to develop and test the software, now available for Android and iOS, at the "Hospital del Salvador", where physicians and nurses can easily and quickly warn about this type of patients just by entering 4 variables and pressing "advise", where the Artificial Intelligence algorithm makes the calls to the procurement unit and Intensive Care Unit to speed up the entrance of the patient for his metabolic and hemodynamic stabilization.

Improving the first stage of the process will show other process bottle necks, which have been studied and will be tackled during the second part of the project. The important thing is that

¹It means "land language" in the language of Mapuche, the Chilean original habitants

Kefuri aims to increasing the number of organ donors available for transplantation, fact that can save the lives of those patients with end stage organ diseases waiting for a transplant, and, as a second derivative, making the system more efficient by procuring several patients at low cost due to innovative technologies, making public health insurance save money.

III. LOOKING TO THE FUTURE

The main goal of the centre is to become the most important Health-Engineering centre in Chile, and all the steps that have been taken during this years point that way. WIC works with vision, empowerment, resilience, excellence and compromise; all its workers and students do a first class research to generate new knowledge about novel high-end technologies, how to develop them for the user, understanding the context in which they will be inserted, how to apply them into real world, how to improve them every day and how to transfer them in a proper way, a way that ensures its usage and their possibility to change the world and improve health professionals' and patient's lives.

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