Visualization and Tracking Web Application for Diseases and Medical Purposes

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***Index Terms*–Data, Insights, Dashboard, Visual Analytics, COVID-19, Single-Page Application.**

I. Motivation

The events related with the outbreak of the COVID-19 pandemic going on during the previous year have proven many things to modern society. On one hand they have shown people and institutions the lack of readiness the society has in order to face unexpected events like a global pandemic. And on the other hand, they have brought up the relevance of technology for our society, especially those technologies related with Information Technology (IT) [1]. Along with the realization the society has had, several technologies started appearing to avoid the spread of the virus, control the infected people, monitor the state of the hospitals, and make easier the lives of those working from home. Such technologies have brought new users to old and emerging technologies and platforms. For example, governments had to provide families from the countryside with computers and smartphones in order for students to connect with their schools at home. Therefore, many families from the countryside worldwide started using new technologies to involve in their daily life [2].

As an outcome of the creation of these webpages, mobile applications, APIs and other technologies along with the increase on their user base and usage, lots of new data have been being generated. This data that can only be understood by experts, computers and those who created them, and most of the data urges to be transformed into a format that is understandable for third-party users, such as the public in the case of COVID-19 test recompilation data. [El checo]. As well, there is a tendency in the industry to generate insights and statistics according to the data obtained, and this new data is not the exception. Along with the tendency to generate statistics and insights, there is a need to generate infographics and display this information in a way that external users can read it, understand it, and draw conclusions out of it.

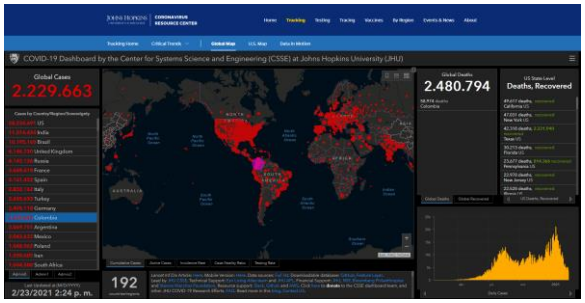
As it has been implied previously the focus of this project goes along with the generation of reports provided by apps that help institutions and governments to track COVID-19 infections, and the need third-party users like medics and directives must understand these reports out of it and obtain the most information in the simplest way possible. More precisely, the purpose of this project is to provide a control panel/dashboard/visualization tool for the reports and other data obtained from the mobile app *SeneCare* (mobile app used by the students from Universidad de los Andes in Bogotá to inform the University if they have any symptoms or have COVID-19) so that a group of doctors can keep track of the infections and obtain information related to the general state of the students from Universidad de los Andes. As a result, it will make keeping track of the current state of a student easier for the doctor, as well as knowing the state of the campus on a determined day. Also, it will help the directives to get relevant information and insights from the data generated. For futures iterations, this project can be replicated and adapted in order to keep track of vaccination and other health related issues.

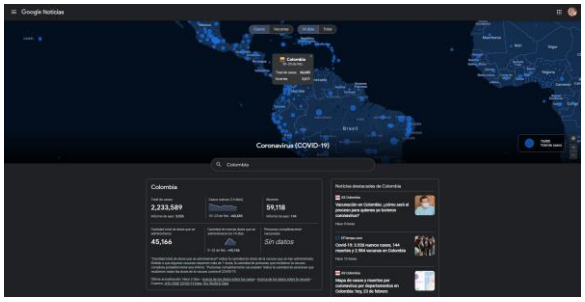
II. Related work and state-of-the-art

Since the COVID-19 outbreak, many studies have been released to track its spread, inform people about it and understand its behavior. Many big companies like Facebook and Google have developed their own “COVID-19 information center” as well as many governments and various universities. Probably the most popular COVID-19 dashboard is the one developed by John Hopkins University.

Those dashboards mainly stand out visualizations such as maps for organizing data geographically, bar charts and line

graphs. In such cases, the map visualization comes with a news section:





Harvard University is involving students in research projects with the help of its Coronavirus Visualization Team, in which students publish their visualizations related to the virus so they can provide people information. It is important to mention that this team has over 600 members, 20 projects, and 20 publications.

Czech Republic released a Web-Based App that displays tables, graphs, and maps as data their data visualizers. With those visualizers they were able to clearly explain information such as tests, confirmed cases, COVID-19-related deaths, amount of vaccinated people, among others. Their line graphs and bar charts primarily display an overview from the past 14 days:

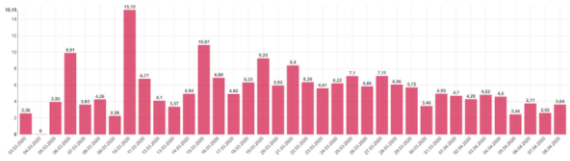


Figure 4. Daily trend in the percentage of persons with confirmed coronavirus disease in the overall number of persons tested on a given day.
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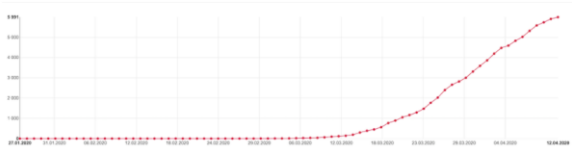

Figure 5. Overall (cumulative) number of persons with laboratory-confirmed coronavirus disease according to reports by regional public health authorities and laboratories.
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In a closer context like Colombia, the Ministry of Health and Social Protection releases every day a report of the pandemic evolution in the country, which they publish in media:

On the other hand, SALUDATA is a local Bogotá government solution to track this disease. It is important to show that even though there is not a lot of map-based visualizations,

SALUDATA uses other interesting visualization such as pie charts and tendency graphs.

III. General and specific objectives

General Objective

Design a prototype of analytics dashboard and backend services that provides physicians, doctors and administrative staff useful COVID-19 related information from the population at Universidad de los Andes.

Specific Objectives

1) To analyze the way in which doctors, physicians and administrative staff would like to visualize the data provided by the mobile app *SeneCare*, agreeing and validating which insights and statistics are relevant to be shown.
2) To research and identify the best visualization methods to display the data as the doctors, physicians and administrative staff want.
3) To constantly validate with the administrative staff the new visualizations to understand if it satisfies their expectations considering metrics such as performance, data integrity, usability, and usefulness.

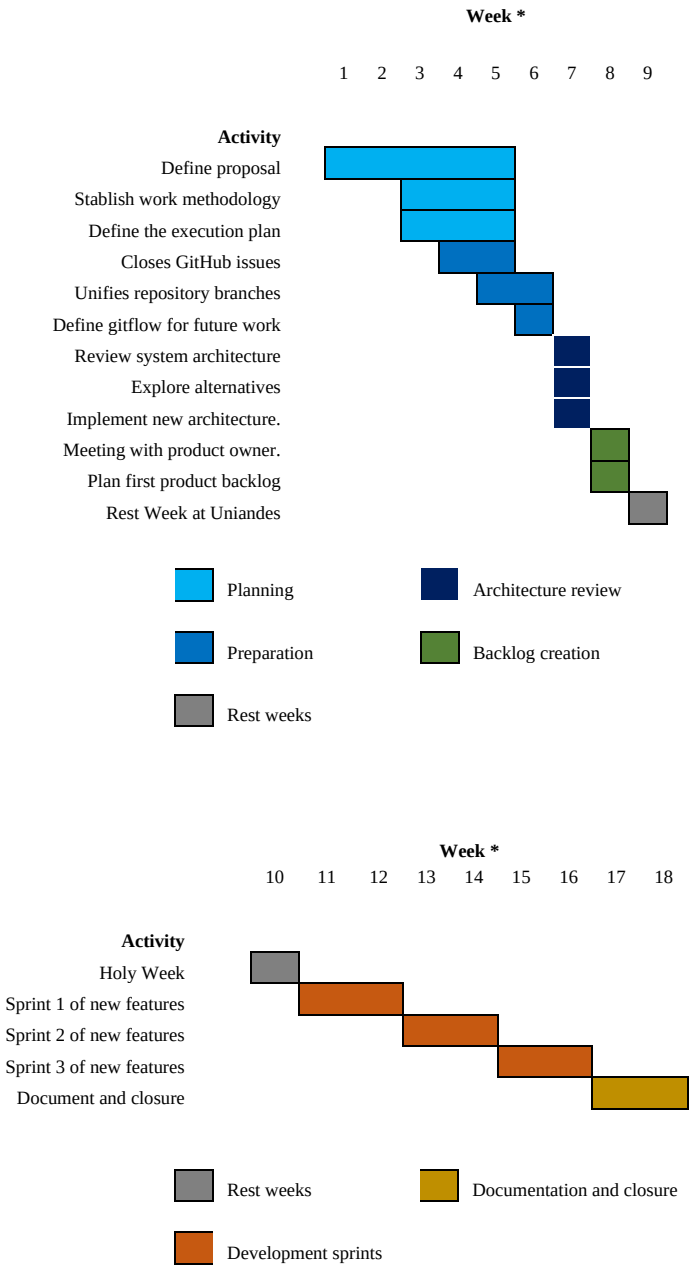
IV. Execution plan

The intention is to use the SCRUM agile development methodology, which in this case will be composed by 15-days sprints.

Weekly a meeting with the tutor in charge will take place to plan or review the product backlog. He will take the position of Scrum Master and will leader the development team.

Eventually there will be meeting with the doctors of the University, which in this SCRUM comparative will be the real product owners.

Phase	Activities
Planning	Define proposal.
	Stablish work methodology.
	Define the execution plan.
Preparation	Closes GitHub issues in both front and back repositories.
	Unifies repository branches to have only master and develop.
	Define gitflow for future developments.
Architecture review	Review system architecture.
	Explore alternatives.
	Define and implement a new architecture in case of needed.
Implementation	Meetings with product owner and SCRUM master.
	Review of features.
	Development and testing of new features.
Sprints iterations	Meetings with product owner and SCRUM master.
	Backlog creation.
	Review of new features.
	Development and testing of new features.
Documentation and closure	Create document with results and closes repository.



** Number of the week beginning on 25th - 30th January (1st week of classes at the University) and ending on 24th - 30th May (last week of classes at University).*

V. Expected results.

By the end of the execution plan, it is expected to have both the backend and the SPA dashboard.

For the backend service, it is planned to have implemented all the services so that the mobile app *SeneCare* can register the reports and other data generated by the user, keeping the information secure to protect the integrity of the user information, all the services so that the dashboard can consume and display the information, and all the analyzers that provide insights and statistics from the collected data.

On the dashboard, it is expected to have a control board where doctors can keep track of a specific user's symptoms and general status, as well as modifying some of the user's information. Also, the purpose is to accompany the control panel with infographics and data visualizers that give the doctors and the directives an overview of the situation along the campus.

In order to know how usable and useful the infographics are, the end user will provide feedback in company with a user experience form. For other aspects like performance, metrics given by Google LightHouse will be considered.

VI. References

[1] UCLG, "Digital technologies and the COVID-19 pandemic", UCLG, 2020

[2] UNDP, "How Digital technologies help in rural areas during COVID-19 outbreak", UNDP, 2020.

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[7] Alcaldía de Bogotá, "SALUDATA: Observatorio de Salud de Bogotá", Alcaldía de Bogotá, 2021.