2. C. R. Rivero, J. Pucheta, S. Laboret, D. Patiño, and V. Sauchelli, "Forecasting Short Time Series with Missing Data by Means of Energy Associated to Series," *Appl. Math.*, vol. 06, no. 09, pp. 1611–1619, 2015.

TOWARDS VIRAL INFECTIOUS DISEASES CASES MONITORING SUPPORTED BY BUSINESS INTELLIGENCE METHODS AND TOOLS

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Introduction and Problem Statement. The outbreak of disease COVID-2019 caused by a novel coronavirus SARS-CoV-2 has spread to almost all countries and regions. Humanity faces and will face such calls in future, therefore solution of these problems needs analytical support. In response to ongoing public health emergency, the interactive dashboard appeared [1]. Such tool, however, should be customizable and interoperable. Therefore, we have used Business Intelligence (BI) tool Microsoft Power BI to design open and exntensible dashboard on a well-known platform.

Materials and Methods. In order to design a BI dashboard to support COVID-2019 disease cases monitoring, the free and open dataset with timeseries of deaths, recoveries and general confirmed cases by countries and dates in February and March 2020 have been used [2]. Generic structure of the used data warehouse (DWH), as well as its transformation and cleansing procedure are shown in Fig. 1.

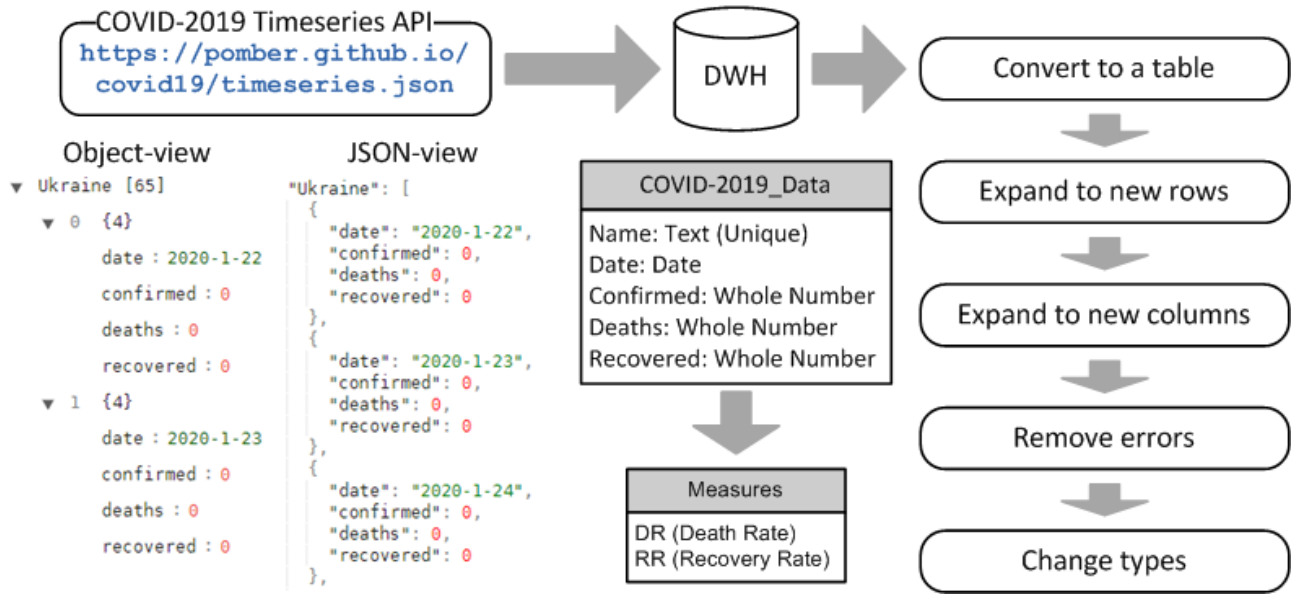

Fig. 1 – DWH structure and data processing scenario

Timeseries API (Application Programming Interface) is represented as a JSON (JavaScript Object Notation) object, which fields correspond to country names, while their values are represented as lists of objects. Each of these objects correspond to a single timestamp (see Fig. 1), descibed by a date (of measured indicators), confirmed (disease cases), deaths, and recovered fields. Generic JSON document was converted into a table of 2 columns – country and list of timeseries records, which then were expanded to new rows with duplicated country name. Fields “date”, “confirmed”, “deaths”, and “recovered” were expanded to new columns, after the whole dataset was cleansed from errors (e.g., missing values or inappropriate types). For the most meaningful fields “date”, “confirmed”, “deaths”, and “recovered” were assigned the data types specific for Power BI environment: Date and Whole Number (some sort of “integer” numerical type). Besides the explicit columns obtained directly from a data set, we have also created two measures that describe Death Rate (DR) and Recovery Rate (RR) characteristics. DR measure is calculated using the following expression:

$$\mathrm{DR} = \mathrm{FORMAT}\left(\frac{\mathrm{MAX}\left(\text{'COVID 2019\_Data'[Value.deaths]}\right)}{\mathrm{MAX}\left(\text{'COVID 2019\_Data'[Value.confirmed]}\right)}, \text{"0.00\%"}\right).$$

Here FORMAT is a function that converts values to text according to specified format (percents “0.00%”), MAX is the function that returns the largest value in a column, “COVID2019_Data” is the considered dataset, while [Value.deaths] is the specific column in the dataset that stores information about death cases, as well as [Value.confirmed] stores information about all confirmed cases. RR is calculated as:

$$\mathrm{RR} = \mathrm{FORMAT}\left(\frac{\mathrm{MAX}\left(\text{'COVID 2019\_Data'[Value.recovered]}\right)}{\mathrm{MAX}\left(\text{'COVID 2019\_Data'[Value.confirmed]}\right)}, \text{"0.00\%"}\right).$$

Here [Value.recovered] is the column that stores data about recovery cases.

Results. Proposed dashboard design is demonstrated in Fig. 2. It allows users to slice data by a certain country or several countries, as well as to slice data by period of observation. The most crucial indicators, such as confirmed disease cases or death cases are demonstrated using cards, as well as DR and RR measures.

Selected states are demonstrated on the world map, color intense corresponds to the number of confirmed COVID-2019 cases. The line chart outlines cases growth.

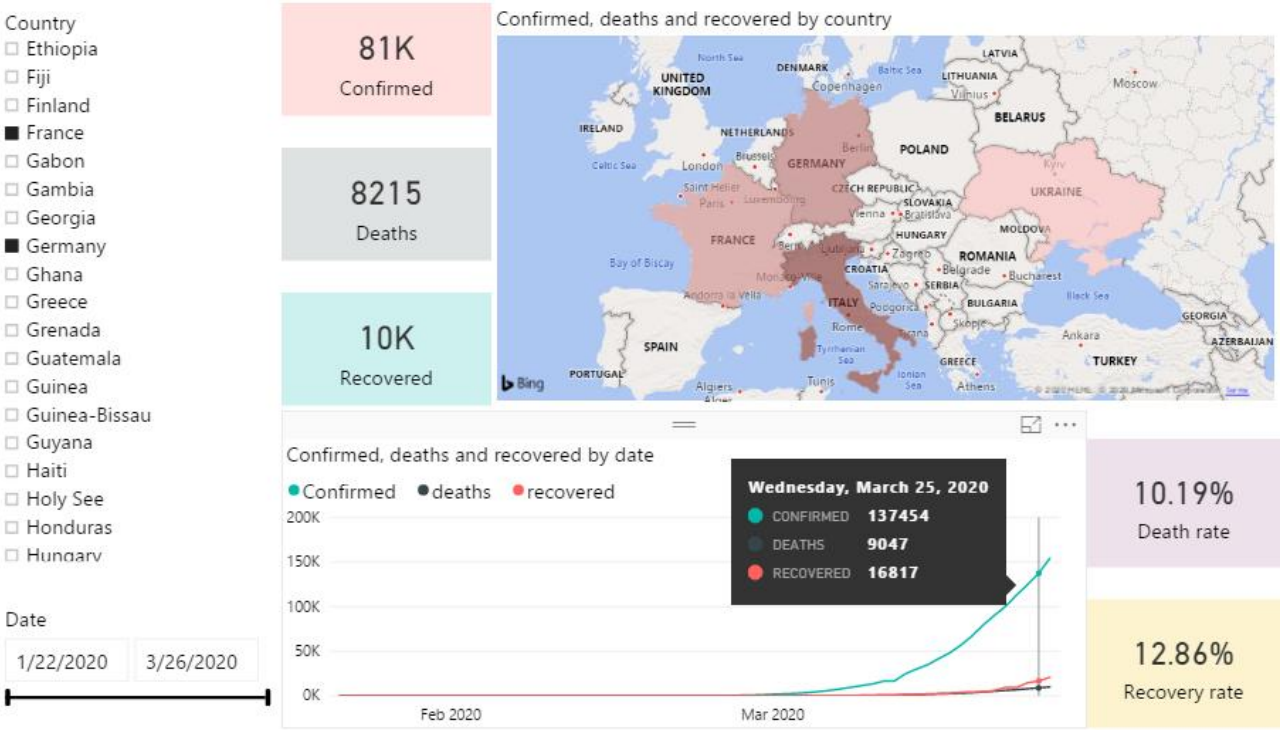

Fig. 2 – Proposed BI-dashboard design

Conclusion. Developed dashboard is available in open GitHub repository [3], it could be easily deployed to free Power BI Desktop or Power BI SaaS (Software as a Service) platform, where further can be extended and/or customized by users.

References

1. Dong E., Du H., Gardner L. An interactive web-based dashboard to track COVID-19 in real time // The Lancet Infectious Diseases. – 2020.

2. JSON time-series of coronavirus cases // https://github.com/pomber/covid19

3. powerbi-covid-2019 // https://github.com/andriikopp/powerbi-covid-2019

ПІДТРИМКА ПРОЦЕСУ МОНІТОРИНГУ СТАНУ ОБЛАДНАННЯ ЗАСОБАМИ МАШИННОГО НАВЧАННЯ ТА TELEGRAM-БОТУ

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Вступ і актуальність проблеми. Моніторинг стану обладнання, зокрема електричного, дозволяє знизити негативні наслідки його відмов, які зазвичай спричинють порушення ізоляції, що можуть трапитися в будь-який час.

Згідно з сучасною концепцією індустрії 4.0, обробка даних, отриманих з IoT-сенсорів (internet of things, інтернет речей) пристроїв моніторингу, дозволяє сповіщувати працівників, відповідальних за профілактичне обслуговування, про стан працюючого обладнання [1].