

CONCO-Team: CONtrol COvid19 Team

May 3, 2020

1 Introduction

CONCO-Team¹ is composed of different researches from universities and non-profit organizations of Spain, Italy, France, Germany, United Kingdom and Argentina. It was founded in March 2020. The main goals of CONCO-Team are:

- (i) To join the efforts of different research groups to provide a coordinated and interdisciplinary response to Covid-19 pandemic.
- (ii) To analyze state of the art in terms of availability of open data resources, and data-driven methodologies.
- (iii) To develop methodologies and algorithms to generate consolidated data series to monitor and model the pandemic.
- (iv) To develop epidemic models for the better understanding and control of the pandemic.

2 CONCO-Team members

Different researchers, from different countries and backgrounds, have already joined the team²:

- Spain:
 - University of Seville:
 - * Dep. Ingeniería de Sistemas y Automática: Teodoro Alamo, Daniel Limón, Daniel Rodríguez, David Muñoz de la Peña, Daniel Carnerero, Pablo Krupa, David Soto, Juan Garrido.
 - * Dep. Ingeniería Electrónica: Daniel G. Reina, Sergio Toral.
 - Universidad de Loyola Andalucía. Dep. of Engineering : Pablo Millán.
 - University of Almería. Department of Informatics. Automatic, Robotics and Mechatronics research group: Manuel Berenguel, Jose Luis Guzmán and Pablo Otálora.

¹Conco is a little village in Veneto region, north Italy.

²If you are interested in joining the team, please contact Teodoro Alamo at conco.team@gmail.com

- University of Huelva. Dep. of Economics: Emilio Congregado and Antonio Golpe.
- Italy:
 - National Research Council of Italy, Turin: Fabrizio Dabbene, Martina Mammarella and Chiara Ravazzi.
 - University of Trento:
 - * Department of Industrial Engineering : Giulia Giordano.
 - * Centre for Computational and Systems Biology (COSBI): Luca Marchetti.
 - Division of Infectious Diseases I, Fondazione IRCCS Policlinico San Matteo, Pavia: Marta Colaneri and Alessandro Di Filippo.
- Germany:
 - Technische Universität Berlin: Sergio Lucia.
 - Fiware Foundation: Alberto Abella.
 - Otto-von-Guericke University. Magdeburg: Rolf Findeisen, Anton Savchenko and Eric Bullinger.
- United Kingdom:
 - University of Oxford: Mark Cannon and Paul Goulart.
- France:
 - LAAS, Toulouse: Sophie Tarbouriech and Isabelle Queinnec.
 - Gipsa-Lab, Grenoble: Mirko Fiacchini, Mazen Alamir, Paolo Frasca and Federica Garin.
- Argentina:
 - CONICET, Santa Fe: Antonio Ferramosca.

3 Covid19 initiatives organized or participated by CONCO-Team members

We enumerate here some of the initiatives that have been led, coordinated, or participated by members of CONCO-Team in the context of Covid-19. The list is not exhaustive, and some of the initiatives have also been promoted by other research groups or institutions.

3.1 Publications

1. **Modelling the COVID-19 epidemic and implementation of population-wide interventions in Italy** [4]: <https://www.nature.com/articles/s41591-020-0883-7>

Abstract: In Italy, 128,948 confirmed cases and 15,887 deaths of people who tested positive for SARS-CoV-2 were registered as of 5 April 2020. Ending the global SARS-CoV-2 pandemic requires implementation of multiple population-wide strategies, including social distancing, testing and contact tracing. We propose a new model that predicts the course of the epidemic to help plan an effective control strategy. The model considers eight stages of infection: susceptible (S), infected (I), diagnosed (D), ailing (A), recognized (R), threatened (T), healed (H) and extinct (E), collectively termed SIDARTHE. Our SIDARTHE model discriminates between infected individuals depending on whether they have been diagnosed and on the severity of their symptoms. The distinction between diagnosed and non-diagnosed individuals is important because the former are typically isolated and hence less likely to spread the infection. This delineation also helps to explain misperceptions of the case fatality rate and of the epidemic spread. We compare simulation results with real data on the COVID-19 epidemic in Italy, and we model possible scenarios of implementation of countermeasures. Our results demonstrate that restrictive social-distancing measures will need to be combined with widespread testing and contact tracing to end the ongoing COVID-19 pandemic.

CONCO-Team co-authors:

- **Giulia Giordano.** Department of Industrial Engineering. University of Trento. Italy.
- **Alessandro Di Filippo and Marta Colaneri.** Division of Infectious Diseases I, Fondazione IRCCS Policlinico San Matteo, Pavia. Italy.

2. **Open Data Resources for Fighting COVID-19** [2]: <https://arxiv.org/abs/2004.06111>

Abstract: We provide an insight into the open data resources pertinent to the study of the spread of Covid-19 pandemic and its control. We identify the variables required to analyze fundamental aspects like seasonal behaviour, regional mortality rates, and effectiveness of government measures. Open data resources, along with data-driven methodologies, provide many opportunities to improve the response of the different administrations to the virus. We describe the present limitations and difficulties encountered in most of the open-data resources. To facilitate the access to the main open-data portals and resources, we identify the most relevant institutions, at a world scale, providing Covid-19 information and/or auxiliary variables (demographics, mobility, etc.). We also describe several open resources to access Covid-19 data-sets at a country-wide level (i.e. China, Italy, Spain, France, Germany, U.S., etc.). In an attempt to facilitate the rapid response to the study of the seasonal behaviour of Covid-19, we enumerate the main open resources in terms of weather and climate variables.

CONCO-Team co-authors:

- **Teodoro Alamo.** Dep. Ingeniería de Sistemas y Automática. University of Sevilla. Spain.
- **Daniel G. Reina and Pablo Millán Gata.** Dep. Ingeniería Electrónica. University of Sevilla. Spain.
- **Martina Mammarella.** National Research Council of Italy, Turin.
- **Alberto Abella.** Fiware Foundation. Germany.

3. **Data-Driven Methods to Monitor, Model, Forecast and Control Covid-19 Pandemic: Merging Data Science, Epidemiology and Control Theory [1]**

Abstract: We analyze the role of data-driven methodologies in Covid-19 pandemic. We provide a SWOT analysis and a roadmap that goes from the access to data sources to the final decision-making step. We aim to review the available methodologies while anticipating the difficulties and challenges that might be encountered in the development of data-driven strategies to combat the Covid-19 pandemic. We present a 3M-analysis: Monitoring, Modelling and Making decisions. We focus on the potential of well-known data-driven schemes to address different challenges raised by the pandemic: i) monitoring and forecasting the spread of the epidemic; (ii) assessing the potential impacts of government decisions not only from a health-care point of view but also from an economic and social one; (iii) making timely decisions. We detail each step of the roadmap through a review of consolidated theoretical results and their potential application in the Covid-19 context. When possible, we provide examples of their application on past or present epidemics. We do not provide an exhaustive enumeration of methodologies, algorithms and applications. We do try to serve as a bridge between different disciplines required to provide a holistic approach to the epidemic: Data Science, Epidemiology, Economics, Decision-Making, etc. That is, we highlight effective data-driven methodologies that have been shown to be successful in other contexts and that have potential application in the different steps of the proposed roadmap.

CONCO-Team co-authors:

- **Teodoro Alamo.** Dep. Ingeniería de Sistemas y Automática. University of Sevilla. Spain.
- **Daniel G. Reina.** Dep. Ingeniería Electrónica. University of Sevilla. Spain.
- **Pablo Millán Gata.** Dep. Ingeniería. Universidad de Loyola Andalucía. Spain.

3.2 Workshops

IEEE-CSS Italy Chapter has organized an online workshop entitled “*Modeling and Control of the Covid-19 Outbreak. How dynamical models can help control the epidemic*”. The workshop took place on Friday, April 24, from 9.30 AM to 5.20 PM (Italian time). All talks³ are posted separately on the YouTube Channel of IEEE-CSS Italy⁴.

CONCO-Team participants:

- **Fabrizio Dabbene** (National Research Council of Italy, Turin) organized the workshop as chair of the IEEE-CSS Italy Chapter.
- **Giulia Giordano**, (Department of Industrial Engineering, University of Trento) presented the work *A new epidemiological model to understand and predict the Covid-19 outbreak: the Italian case*. A joint work with **Alessandro Di Filippo and Marta Colaneri** (Division of Infectious Diseases I, Fondazione IRCCS Policlinico San Matteo, Pavia) and other researches [3]. The presentation is available on the YouTube Channel of IEEE-CSS Italy⁵.

References

- [1] Teodoro Alamo, Daniel D. Reina, and Pablo Millan Gata. Data-Driven Methods to Monitor, Model, Forecast and Control Covid-19 Pandemic: Merging Data Science, Epidemiology and Control Theory. *Under Preparation*, 2020.
- [2] Teodoro Alamo, Daniel G Reina, Martina Mammarella, and Alberto Abella. Open data resources for fighting covid-19. *arXiv preprint arXiv:2004.06111*, 2020.
- [3] Giulia Giordano, Franco Blanchini, Raffaele Bruno, Patrizio Colaneri, Alessandro Di Filippo, Angela Di Matteo, and Marta Colaneri. A new epidemiological model to understand and predict the Covid-19 outbreak: the Italian case. In *Modeling and Control of the Covid-19 Outbreak. How dynamical models can help control the epidemic*. IEEE-CSS Italy Chapter, 24th April 2020.
- [4] Giulia Giordano, Franco Blanchini, Raffaele Bruno, Patrizio Colaneri, Alessandro Di Filippo, Angela Di Matteo, and Marta Colaneri. Modelling the COVID-19 epidemic and implementation of population-wide interventions in Italy. *Nature Medicine*, pages 1–32, apr 2020.

³Final program available at <http://www.ieeecss.it/events/covid.html>.

⁴<https://www.youtube.com/channel/UCu9VNSqqvD2FrV6ieA...t1w>.

⁵https://www.youtube.com/watch?v=_UQaanq1Fc0