

Project Initial Design

Project Type and Infrastructure

I will do a data analysis and exploration project with a little bit of touch on interactive system implementation. The programming environment I have been using is RShiny and Javascript. The JS file is stored in a www folder in the RShiny application that also has HTML files for the homepage. Basic plot tools include plotly and leaflet, where shinyjs is also referenced.

Design

Task Abstraction

1. What is the current situation of COVID-19 worldwide and how long does it take to double the positive cases in each country? What are the positive cases trajectories difference?

Actions	Targets
Discover COVID-19 worldwide patterns	Choropleths of spatial Data
Lookup a specific country	Trends/Features
Identify and compare cases/deaths patterns	Distribution/Extremes
Derive index of cases/deaths doubling	Correlation

2. How to define COVID-19 test efficiency so far?

Actions	Targets
Identify and compare cases/tested patterns	Distribution/Extremes
Derive index of test efficiency	Features
Summarize over multiple counties in Colorado	Similarity/Correlation

3. Is there a deep relationship between lung-related chronic diseases and positive cases of COVID-19?

Actions	Targets
Identify and compare between lung-related chronic diseases and COVID-19 cases	Similarity/Correlation
Derive correlation index	Features
Summarize relationship statistics	Distribution

4. What do we know about COVID-19 risk factors, according to existing research papers? Are people smoking or having chronic lung diseases are prone to get infected?

Actions	Targets
Discover and present COVID-19 related topics	Distribution
Locate topics related to chronic lung diseases	Similarity
Annotate and record topic selection	Features

5. What are good suggestions for people with lung diseases or smoking to be less likely to get infected than they are supposed to be, if the answer for task 4 is yes, based on current research of COVID-19?

Actions	Targets
Discover and present COVID-19 related topics	Distribution
Locate topics related to chronic lung diseases	Similarity
Annotate and record topic selection	Features

Visualization Design First Stage

1. UI & Interactions

Homepage: 3 bootstrap pages that lead to different tab panels of our interests: COVID-19 worldwide browser, COVID-19 in Colorado, and Open research database

COVID-19 Worldwide Browser COVID-19 in Colorado Open Research Database

COVID-19 Worldwide Cases Visualization

Go >

COVID-19 in Colorado

COVID-19 Worldwide Cases Visualization

Open Research Database

COVID-19 Worldwide Cases Visualization

COVID-19 in Colorado

Open Research Database

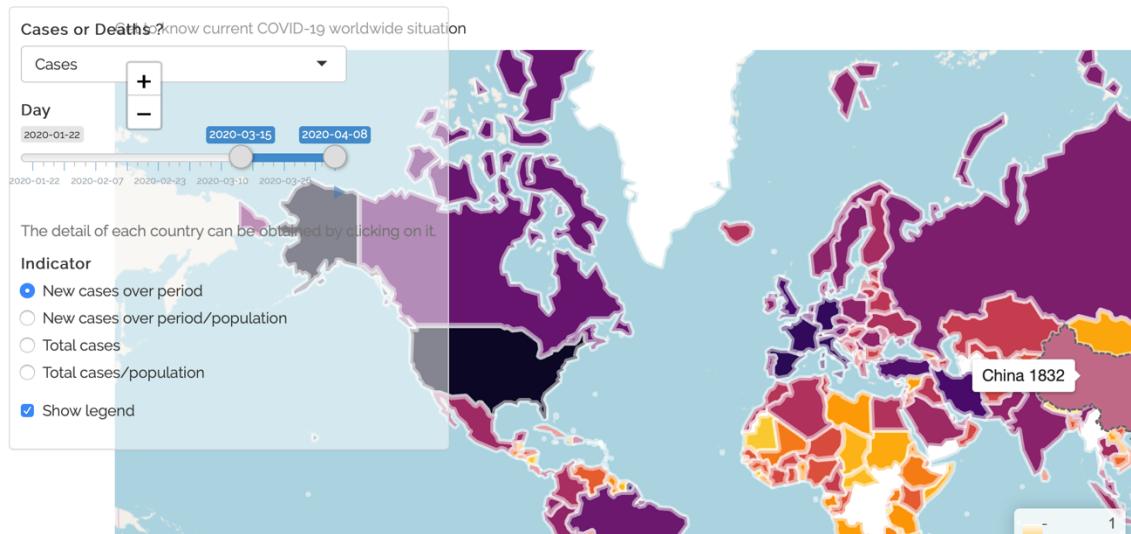
COVID-19 Worldwide Cases Visualization

Open Research Database

Tab Panel COVID-19 Worldwide Browser: Task 1 & 2

COVID-19 Home COVID-19 Worldwide Browser COVID-19 in Colorado Open Research Database

COVID-19 WORLDWIDE BROWSER



An interactive map with choropleths of countries worldwide, with hues indicating COVID-19 figures selected from the hovering transparent panel of controls. The control panel functions as a filter and consists of 3 parts: a text selection between COVID-19 cases and deaths, an animated slider indicating the number of days or specific continuous dates, and a multiple selection widget to choose from either cumulated figure or daily figure. Changing the selection from the control panel automatically refreshes the map. Also, the map has a mouse-over effect that circles out the choropleths with a label indicating the figure after filtering. This map is designed to help users explore and discover COVID-19 trends and patterns worldwide and is also able to derive new indexes visualized through multiple views below the map, which are going to be triggered by clicking on a specific country. A line chart with total cases/deaths and a line chart with daily cases/deaths will show up for the result of clicking in the bottom area. Also a data table with derived indexes for all countries will be put to the right of the existing map later on. This panel is working smoothly for now, as it only concentrates on spatial data for countries. The scalability might become an issue when expanding to counties become necessary, which could be possibly solved through aggregating first and then unfolding the spatial data according to users' needs.

Tab Panel COVID-19 in Colorado: Task 2 & 3

COVID-19 Home COVID-19 Worldwide Browser COVID-19 in Colorado Open Research Database

COVID-19 IN COLORADO

What we have observed in Colorado

This panel serves to explore the relationship between COVID-19 cases/deaths and smoking/asthma prevalence in Colorado. One solution would be to use a Scagnostics plot to detect outliers with COVID-19 cases/deaths in one dimension and smoking/asthma in the other. A multiple selectable data table with attributes ordering will work with the Scagnostics plot at the same time, which aims to discover the relationship between lung-related chronic diseases and positive cases of COVID-19. The existing smoking/asthma data already has statistical confidence intervals, so these could be added to another sub-panel that contains multiple views for smoking/asthma data only and each view could be a line chart with traces in parallel/a box plot. Because the number of counties in Colorado is only a dozen, scalability is not a big issue here.

Tab Panel Open Research Database: Task 4 & 5

COVID-19 Home COVID-19 Worldwide Browser COVID-19 in Colorado Open Research Database

OPEN RESEARCH DATABASE

What open research tells about who are more vulnerable

This panel will contain a file upload/simple text line that indicates the topic of the users' interests and it will be used as keywords to find top 20/50 related scholarly articles from the COVID-19 Open Research Data. Here according to the task, we assume users are interested in finding whether people with smoking habits/asthma are prone to get infected with COVID-19. As a result, users could check results from topic modeling based on a multiple selectable data table that contains details of the articles filtered, including pubmed_id, title, abstract, and hyperlinks. This panel could serve other topic interests as well depending on the text input. There are 29,000 articles in total, so only the top results will be shown instead of all.