

C Vjs-19

computer sciences (wIn) 2021
project documentation
covjs.herokuapp.com/

Yannick Spriessler

Date: 7.-8. Sem. 2020-2021
Supervisor: U. Dammer
Due: 12.04.2021

1 Project

The aim of this demo project was to develop a web application that graphically displays the development of the CoVid-19 pandemic in 2020ff. both internationally and at Gymnasium Liestal. This should be achieved using JavaScript/JSON and nodeJS.

2 npm/nodeJS

With NodeJS, it is possible to run JavaScript code server-side. NodeJS can therefore be used not only to run an application server-side but is also able to setup a server and to return data.

NodeJS is able to connect to a database and provides a file system. It comes with a lot of on-board modules and can be extended using the package manager npm, which is open-source and developed by the NodeJS community.

It is also possible to create custom npm modules in order to create a specific NodeJS function. This package-based method of development enables programming without reinventing things every time they are required.¹

2.1 Installation

NodeJS is operated by using the command line interface (CLI). It can be installed on the device by using an installer. Once installed, NodeJS is initialized by typing

```
npm init
```

into the console. The created program afterwards is locally (using localhost) executed by typing

```
node index.js
```

.¹

¹ L. (2020, June 19). Node.js Tutorial – Der ultimative Leitfaden für Anfänger. webdeasy.de. <https://webdeasy.de/das-ultimative-node-js-einsteiger-tutorial/#what-is-nodejs>

2.1.1 npm express/configuration file

To display the web content to the user, the node module “express” is required. It has to be included in the server configuration file (index.js). In the configuration file, NodeJS has to be told what to do and where to find the required files and paths.¹ The configuration file for COVjs-19 looks as follows:

```
//index.js
//Start by typing "node index.js" into the console.
//For further information, see https://webdeasy.de/das-ultimate-node-js-einsteiger-tutorial/#what-is-nodejs
const express = require('express');    //Require npm:express
const app = express();                 //Initialization of express module
const path = require('path');          //Require file path

const hostname = 'localhost';          //Server hostname
const port = 3000;                     //Set server port

//Static files
app.use(express.static('.'));           //Access files in upper folder
app.use('/css', express.static(path.join(__dirname + '/css/style.css')));    //Link css file
app.use('/images', express.static(path.join(__dirname + '/images')));        //Link images
app.use('/js', express.static(path.join(__dirname + '/js')));                //Link js files

//Views Files (https://raddy.co.uk/blog/nodejs-setup-with-html-css-js-ejs/)
app.set('views', './views');           //Access html subpages
app.set('viewengine', 'ejs');          //Set server render engine to ejs

// Navigation
app.get('/', (req, res) => {             //Routing
  res.sendFile(path.join(__dirname + '/index.html'));    //Send html file; __dirname : resolve to project folder
});

app.get('/worldwide', (req, res) => {
  res.sendFile(path.join(__dirname + '/worldwide.html'));
})
app.get('/switzerland', (req, res) => {
  res.sendFile(path.join(__dirname + '/switzerland.html'));
})

// Listen
app.listen(port, hostname, () => {
  console.log(`Connected successfully. Server running at http://${hostname}:${port}/`);    //{}: Reference on hostname and port
});
```

2.2 Asynchronous data transfer

NodeJS uses asynchronous data transfer. While normally the browser has to wait to execute the next request until the response of the previous one, asynchronous data transfer enables requests before the response to the previous one comes. This enables requesting simultaneously. It therefore prevents code blocking.²

² S. (2016, April 8). Asynchronous programming in Node.js - Codeforgeek. Asynchronous programming in Node.js - Codeforgeek. <https://codeforgeek.com/asynchronous-programming-in-node-js/>

3 Development

The COVjs-19 application consists of three pages, “Gymnasium Liestal”, “International” and “Schweiz”.

The “Gymnasium Liestal” page shows the development of the corona virus at the gymnasium Liestal. This is achieved by using JavaScript and chartJS.

The “International” page shows two charts from OurWorldinData.³ On the same page, chartJS is used to display the average stringency index of some countries of Europe.

“Schweiz” simply shows an iframe displaying the corona-data.ch web page and the current measurements in Switzerland.

3.1 chartJS^{4,5}

3.1.1 Case/quarantine chart (Gymnasium Liestal)

ChartJS is a JavaScript framework to display an array as chart. The CDN has to be included in the head of the .html file in a script tag:

```
src="https://cdn.jsdelivr.net/npm/chart.js@2.9.4/dist/Chart.min.js"
```

The array data is to be drawn into an html canvas.

In the case data/quarantine data files, the chart data has to be defined as a JSON array:

```
var jsonfile = {  
  "jsonarray": [{ //Create JSON Array;  
    "date": "[DATE OF COUNT]",  
    "cases": [# CASES]  
  }, {  
    "date": "[DATE OF COUNT]",  
    "cases": [# CASES]  
  }  
}]
```

³ Roser, M. (2020, March 4). Coronavirus Pandemic (COVID-19) - Statistics and Research. Our World in Data. <https://ourworldindata.org/coronavirus>

⁴ C. (n.d.). Introduction · Chart.js documentation. Chart.js Documentation. <https://www.chartjs.org/docs/latest/>

⁵ Displaying JSON data in Chartjs. (2017, July 8). Stack Overflow. <https://stackoverflow.com/questions/44990517/displaying-json-data-in-chartjs/44990697#44990697>

To create the chart, the chart labels and the corresponding data have to be defined:

```
var labels = jsonfile.jsonarray.map(function (e) {    //Set labels;
    return e.date;
});
var jsonarray = jsonfile.jsonarray.map(function (e) {    //Set jsonarray;
    return e.cases;
});
```

Having the data defined, the structure of the chart has to be defined. There are loads of settings which are explained in the chartJS documentation. For the case/quarantine data, the structure looks as follows:

```
var ctx = document.getElementById('cases_gym'); //Get canvas to draw into;
var config = {
  type: 'line',    //Chart type;
  data: {
    labels: labels,
    datasets: [{
      label: '#Cases',    //Chart label;
      data: jsonarray,
      backgroundColor: 'rgba(245, 20, 20, 0.5)'    //Chart color;
    }]
  }, options: {
    scales: {
      yAxes: [{
        ticks: {
          beginAtZero: true    //Start graph at 0;
        }
      }]
    }
  }
};

var chart = new Chart(ctx, config);
```

3.1.2 Stringency Index (International)

The stringency index is a tool to compare the strictness of measurements in different countries. The OurWorldinData project provides this information on their webpage.

To generate the numbers for the JSON array value of the stringency index ('stringency'), the application calculates the average of the monthly stringency

index (taken manually from the website) of Switzerland, Germany, France, Italy and Austria:⁶

```
//Take value on 30th of each month;  
//Template: [J, F, M, A, M, J, J, A, S, O, N, D];  
var sui_data = [0, 19, 73, 69, 56, 35, 39, 43, 43, 38, 57, 60]; //Stringency Switzerland  
var sui = Math.round(sui_data.reduce((p, c, _, a) => p + c / a.length, 0));  
//Calculate avg
```

The basic structure of the chart works according to the case/quarantine charts. The difference is the chart type “radar” which requires more parameters to work properly. These settings are also to be found in the chartJS documentation file.

3.2 Other

3.2.1 Progress bar, prediction (Gymnasium Liestal)

On the page “Gymnasium Liestal” there is a progress bar that shows the percentage of already infected people of all students and staff (based on the prediction of 1'350 people).

```
var s = 1350; // #students and staff;  
var cps = (cTot / s * 100);  
// Divide cases by number of students (casesPerStudents);  
var cps_fix = cps.toFixed(1); // Round cps to 1 decimal;
```

Based on these calculations, the CSS style type “aria-valuenow” of the bootstrap progress bar on the page is updated:

```
// Update progress bar: https://stackoverflow.com/questions/21182058/dynamically-change-bootstrap-progress-bar-value-when-checkboxes-checked;  
document.getElementById('spread').innerHTML = cps_fix + '%';  
document.getElementsByClassName('progress-bar').item(0).setAttribute('aria-valuenow', cps_fix);  
// Set aria-valuenow of progress bar = cps_fix;  
document.getElementsByClassName('progress-bar').item(0).setAttribute('style', 'width: ' + Number(cps_fix) + '%'); // Update css settings of progress bar;
```

Additionally, the application calculates a prediction on how long it will take to infect as many members of Gymnasium Liestal at the current infection level as

⁶ Calculation taken from <https://stackoverflow.com/questions/10359907/how-to-compute-the-sum-and-average-of-elements-in-an-array>

needed for herd immunity (based on the assumption of the impossibility of re-infections):

```
//Calculate prediction;
//TODO: Slider for changing herd immunity rate r
var r = 3.4;      //Infection rate / infected person
var herdImmu = 1-(1/r); //herd immunity
var w = jsonarray.length; //Weeks
var cpw = (cTot / w);
var week_prediction = Math.round((s * herdImmu - cTot) / cpw);
//DEBUG:
console.log('weeks since count:' + w);
console.log('cases per w:' + cpw);
console.log('Herd immunity:' + herdImmu);
console.log('Prediction of weeks:' + week_prediction);
```

3.2.2 Herd immunity

The herd immunity is calculated by subtracting $1/r$ rate from 1. The r rate for SarsCov-2 without any measurements is assumed to be ~4.5 people per infected person.⁷

3.2.3 Herd immunity slider ! Only Mozilla Firefox!

The website calculates the herd immunity based on the default value of 4.5. This value can also be changed using the implemented slider, which updates the “ r ” value in `<case_data_gym.js>`⁸. This update of the “ r ” value leads therefore to a reload of all calculations based on “ r ”, such as the prediction and the fraction.

⁷ maiLab. (2021, 28. Januar). So endet Corona [Video]. YouTube.

<https://www.youtube.com/watch?v=pGJEVXvOcRY&t=58s>

⁸ mozilla. (2021, 27. März). - HTML: HyperText Markup Language | MDN. `<input type="range">` - HTML: HyperText Markup Language | MDN. <https://developer.mozilla.org/en-US/docs/Web/HTML/Element/input/range>

```
//Slider function
var slider = document.getElementById("myRange");
var r = slider.value;

var update = () => r = slider.value;
slider.addEventListener('input', update);
update();
//DEBUG:    check if value is read
//alert(r);
console.log("Updated r to " + r);
```

Regrettably, the function can **only** be used/forced in **Mozilla Firefox**, presumably the value is saved somewhere as a session cookie.

Due to this, this function is blocked in all other browsers⁹. This is achieved by the following code:

```
<script>
  //Show chromium-based broken slider only in better firefox ;)
  if (navigator.userAgent.toLowerCase().indexOf("firefox") > -1) {
    $("#slidecontainer").style.display;
  }
  else {
    $("#slidecontainer").hide();
  }</script>
```

4 Deploying/publishing

The nodeJS app is published on the Heroku app hoster ([Heroku.com](https://heroku.com)). To get information about deploying, read the [documentation](#). By hosting, the page is accessible via <https://covjs.herokuapp.com/>.

4.1 Setup

In the "script" section of the package.json file, the start file has to be specified:

```
"scripts": {
```

⁹ stackoverflow.com. (2015, 4. Juni). How to show/hide a jquery script only on Firefox. Stack Overflow. <https://stackoverflow.com/questions/30636463/how-to-show-hide-a-jquery-script-only-on-firefox>


```
"start": "node index.js",
"test": "echo \\\"Error: no test specified\\\" && exit 1"
},
```

In index.js, the development routing uses

```
//Dev server
const hostname = 'localhost';    //Server hostname
const port = 3000;              //Set server port
```

To use the development server (localhost:3000) *and* the deploy server (heroku), the index.js file specifies the listen server as follows:

```
// Listen for development
app.listen(port, hostname, () => {
  console.log(`Connected successfully. Server running at http://${hostname}:${port}/`);    //${}:
Reference on hostname and port
});
//Listen for deploy
app.listen(process.env.PORT || 3000);
```

4.2 Commit to heroku

To commit changes, write in console:¹⁰

```
$ git commit -am "make it better"
$ git push heroku master
```

5 Additional

On some pages, iFrames from other websites were implemented in order to complement the project. This is the case for “International” and “Schweiz”. If there was too much time, it would have been possible to fetch real data from other similar websites like corona-data.ch or the BAG website in order to program similar charts and functions.

¹⁰ Dudler, R. (n.d.). git - the simple guide - no deep shit! Git - the Simple Guide. <https://rogerdudler.github.io/git-guide/>