
Data Visualization with Data Mining

—

VEGA
Capstone
Spring 2020

Andrew

1 Overview and ACM Keywords

- Overview of the Project is to mine, store, and visualize data.
- ACM keywords include:
- Database Administration
- Web Mining
- Web Applications
- Database Design and Models

Discussion of data in today's society

- Data is really all around us, and can be inferred from multiple means.
- Many businesses use data in their operations.
- Inside many business, data is used differently among divisions (e.g. comparing marketing uses to HR uses).
- As a result, many companies sell tools to facilitate storage and visualization.
- Examples include SAP, Salesforce, Tableau, Microsoft PowerBI.
- Database examples include MS SQL Server, and Oracle Database.



1.1 Problem

- While there are many excellent data visualization and storage tools, they cost money.
- Non-profits, startups, small businesses, etc. may struggle with paying those fees.
- Also, for some issues, a tool may not even exist for it.
- Hence, we have to devise a way to mine, store, and visualize data. Making our own tool.
- Many of our coworkers may not be tech people, so it has to be easy to use.

1.2 Motivation

- Our motivation stemmed from our common interest in data and databases.
- We wanted to utilize our classroom knowledge, but also build upon it, through implementation and deployment.
- Doing this project would also give us valuable experience for jobs we envisioned and wanted for ourselves.
- Working, as two groups of two, we each had our own goals, but wanted to see how we could merge.



1.3 Description

- Would be full stack
- Would feature a mobile app web viewer
- Would have data in a database, which could be called upon to be visualized
- Could also offer the data, as a stand-alone, to those who had their own means to work with it.

1.4 Scope

- Goes without saying, COVID really set society, as a whole back.
- We were limited in face to face, in-person interaction.
- We couldn't really go about handling account creation, management, authorization.
- We didn't really have time to develop API keys for our project.
- Finding free APIs to work with.
- Balancing this class with our other classes, work, etc.



Eduardo

2 Team and Tasks

- Andrew
 - Suggested use of APIs, and making own.
 - Established database scheme, and designed the backend code. Web-master.
- Eduardo
 - Took reigns of app development.
 - Learned about App Inventor.
 - Assisted with testing and quality check, overall for project.

2 Team and Tasks

- Victor
 - UI/UX Lead.
 - Javascript guru.
 - Did the most lines of code of the whole endeavor.
- Giovanni
 - Assisted with design, CSS, etc.
 - Helped in keeping the two teams on track and on schedule.
 - Got members, such as Andrew, up to speed on what tools are out there for data visualization.

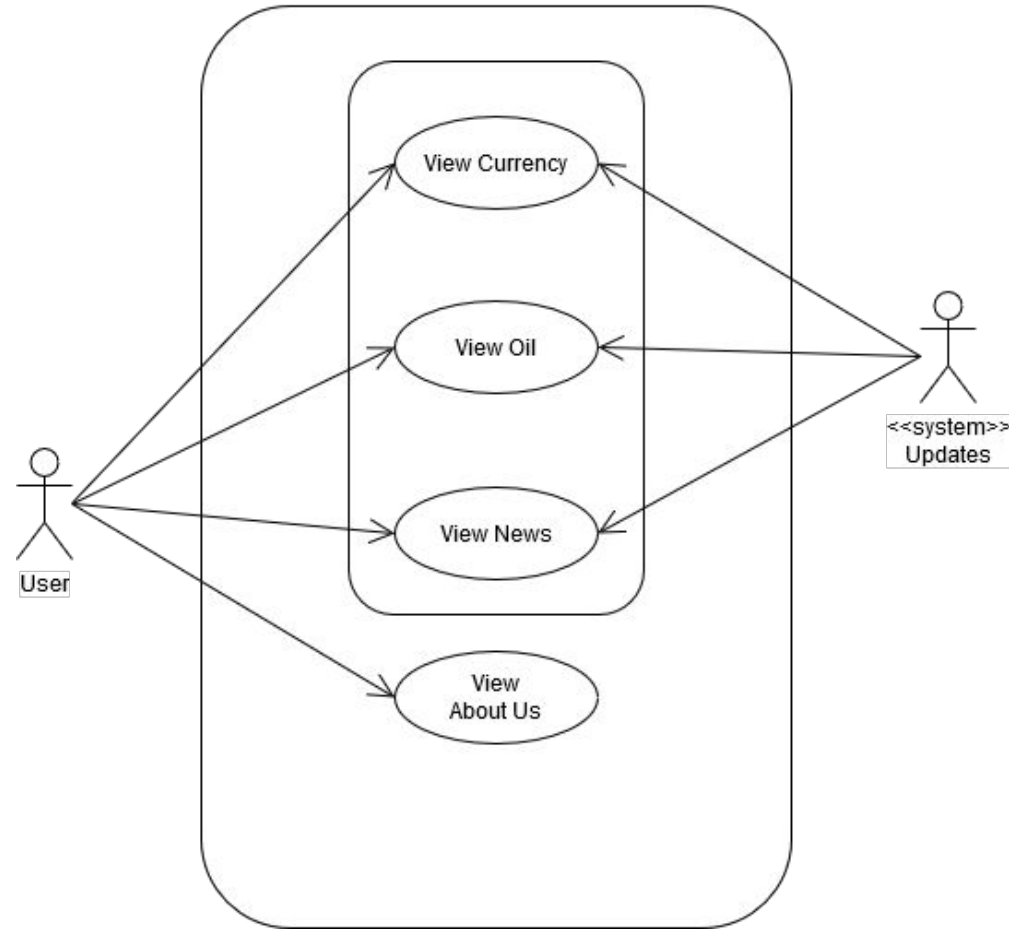
3.1 Architecture (languages, tools, etc.)

- XAMPP
- HTML / CSS / core JS / JQuery/ AJAX / loader.js
- JSON
- RESTful APIs (primarily consumption GET)
- GoDaddy and cPanel
- Google Play Console
- Exchangeratesapi.io , oilpricepi.com, newsapi.org, iexcloud.io
- Postman



3.2 Data Analysis

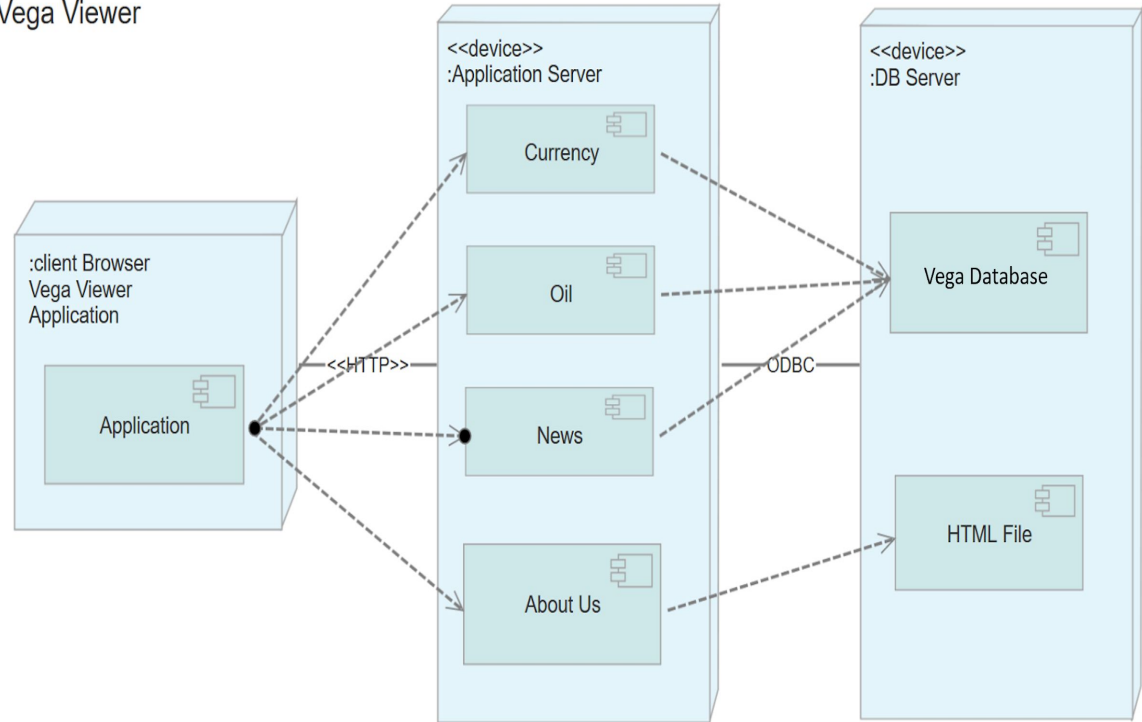
- Use Case: Using Vega Site
- Overview: Whenever a User accesses the Vega site, and click one of the tabs, they're taken to current graphs and charts based on what they chose.
- Actors: User, System
- Main Scenario:
 - a. This begins when a user accesses our site
 - b. Then whenever the user clicks one of the tabs, they're taken to point on the site
 - c. That point on the site is a graph or chart with current stats
 - d. Or they can go to the site that gives the details about the page creator



3.2 Data Analysis

- When the user reaches the site, they're accessing it from some form of web browser.
- To get to our site, a http connection is needed.
- Then once on the site you're shown the main page with tabs to the section you want to view.
- Through an open database connection we can see where the data is being pulled from.

UML Diagram:
Vega Viewer



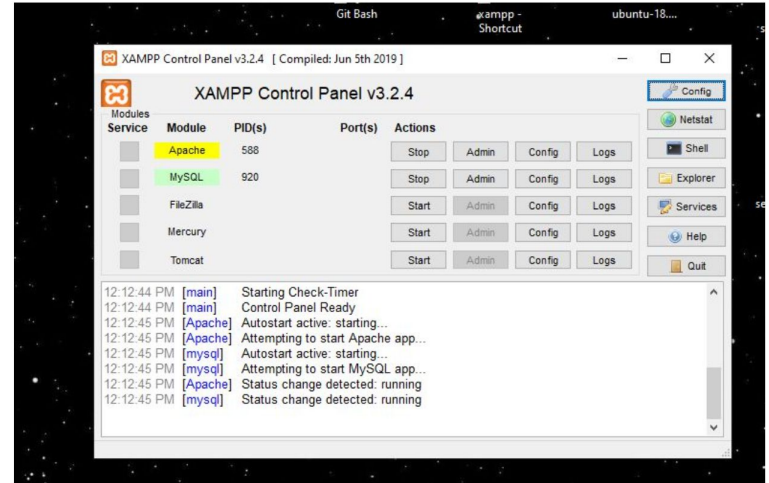
Giovanni

3.3 Supporting Images

- XAMPP was a collection of multiple tools, and allowed a main control panel.

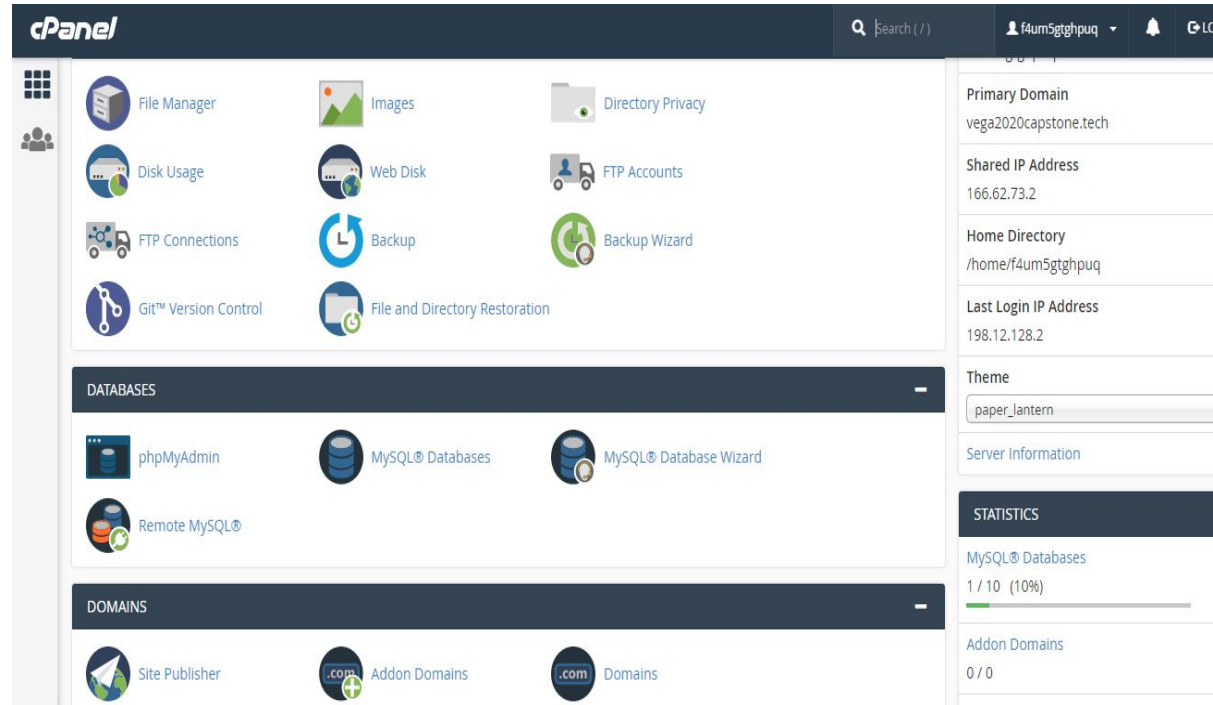
Working with XAMPP

- Allows us to turn our computer into server (localhost), and run server side operations.
- Same for database events.
- Open Control Panel ShortCut
- Click start on Apache and MySQL parts



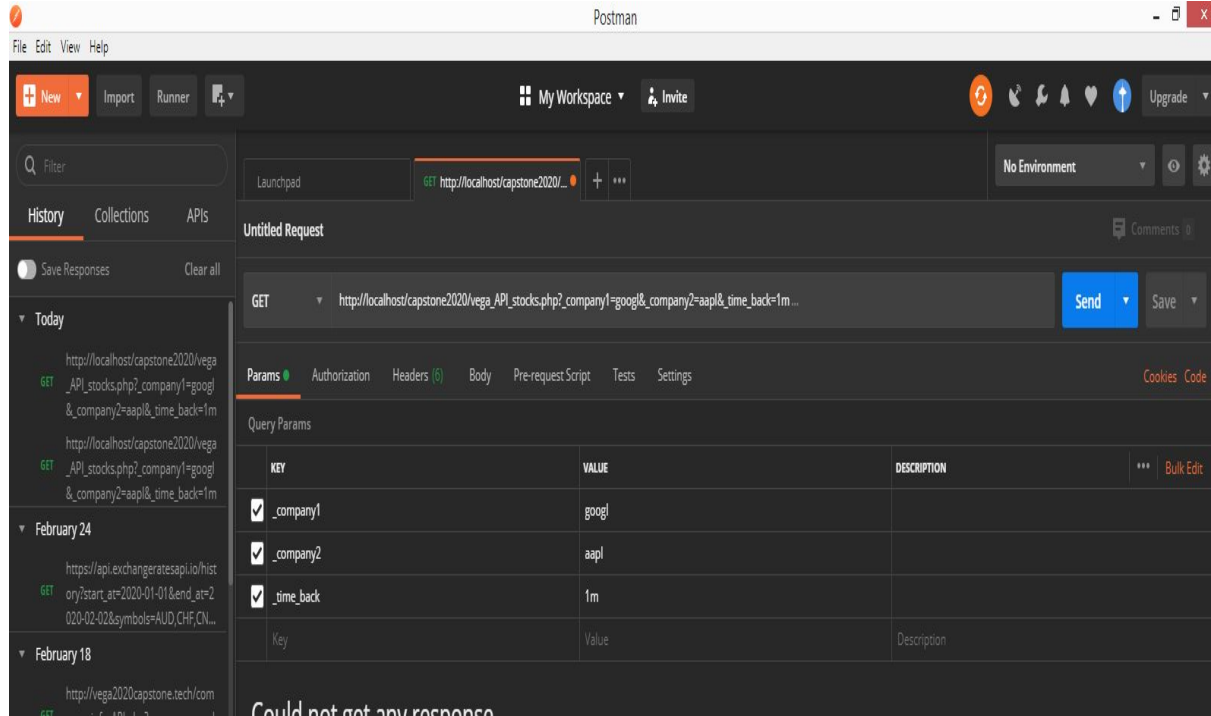
3.3 Supporting Images

- cPanel tool suite, when logged into GoDaddy. Able to handle system admin roles from here.
- Tools include:
 - Analytics
 - Firewall Admin
 - Cron



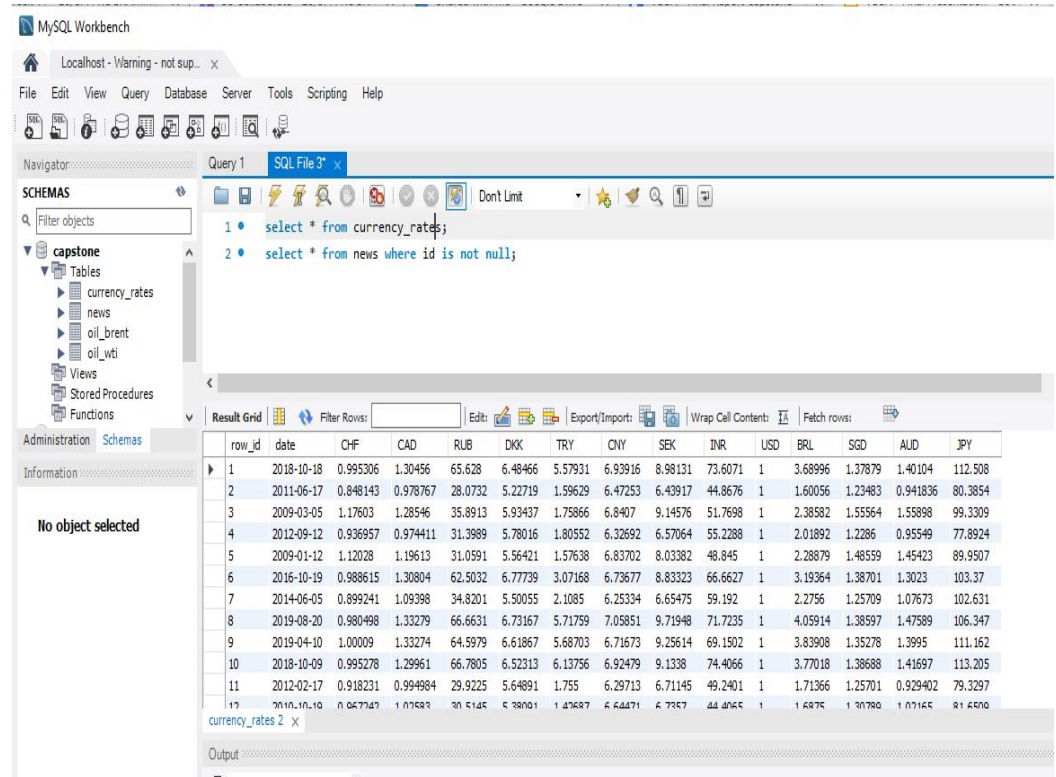
3.3 Supporting Images

- Using Postman to test APIs.



3.3 Supporting Images

- Using SQL workbench for sql queries to analyze the data.
- This is a visual database design tool that integrates
 - SQL development,
 - administration,
 - database design,
 - creation
 - maintenance
- All into one.



3.3. Supporting Images

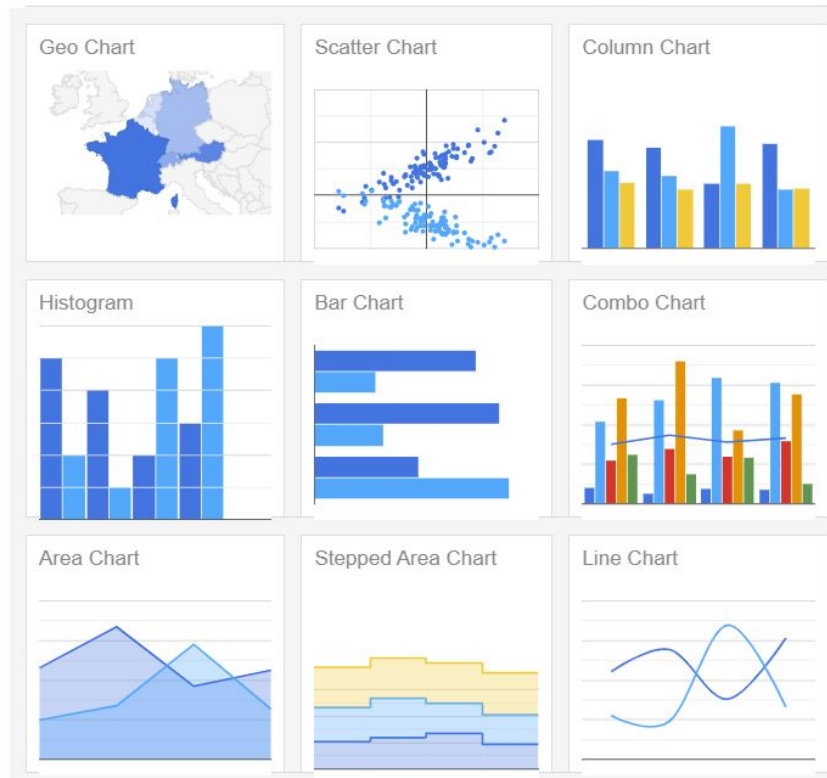
- Google Charts library
- Provides a perfect way to visualize data on your website.
- Used by embedding JavaScript to web page
- Provides a large amount of different charts that can be used

Chart Gallery

[Send feedback](#)

Our gallery provides a variety of charts designed to address your data visualization needs. These charts are based on pure HTML5/SVG technology (adopting VML for old IE versions), so no plugins are required. All of them are interactive, and many are pannable and zoomable. Adding these charts to your page can be done in [a few simple steps](#).

Some additional community-contributed charts can be found on the [Additional Charts](#) page.



4 Challenges and Takeaways

- Started out keeping realistic expectations, to avoid unexpected road bumps.
- Discussed things greatly, before undertaking.
- We decided we couldn't include API keys, which are used in real world cases to impose quota. Wouldn't administer accounts.
- Had to use free/cheap APIs. Meant data wouldn't be all the way up to date (close in majority of cases)
- We couldn't find time to make an app from scratch, and since it was viewer, used App Inventor.
- Really wanted to apply machine learning, but would take too long to set up the data specifically.

Victor

Our Code

```
function splitToChunks(array, parts ){
  let result = [];
  for (let i = parts; i > 0; i--){
    result.push(array.splice(0, Math.ceil(array.length/i)));
  }
  return result ;
}

function properForm(array){
  var x1 = array;
  var z1 = [];
  test2A= [];
  var y1 = ['Date', 'CHF', 'CAD', 'DKK', 'TRY', 'CNY', 'SEK', 'USD', 'BRL', 'SGD', 'AUD'];

  x1len = x1.length;

  var myArray1 = [[]];
  myArray1[0] = y1;

  for (i=0; i<x1len; i++){
    z1.push(x1[i].date , x1[i].CHF, x1[i].CAD, x1[i].DKK, x1[i].TRY, x1[i].CNY, x1[i].SEK, x1[i].
    USD, x1[i].BRL, x1[i].SGD, x1[i].AUD);
  }
  z1len = 2843;
  result1 = splitToChunks(z1, z1len);
  for (i=0; i<z1len; i++){

    test2A = result1[i].map(Number);

    vals1 = test2A.slice(1,11);

    date1 = result1[i].slice(0,1);
    z1.push(date1[0]);

    final1 = z1.concat(vals1);
    z1 = [];
    myArray1.push(final1);

  }

  return myArray1;
}
```

```
function drawChart() {

  var jsonData = $.ajax({

    url: "getData.php",
    dataType: "json",
    async: false
  }).responseText;
  var x = JSON.parse(jsonData);

  console.log(x);

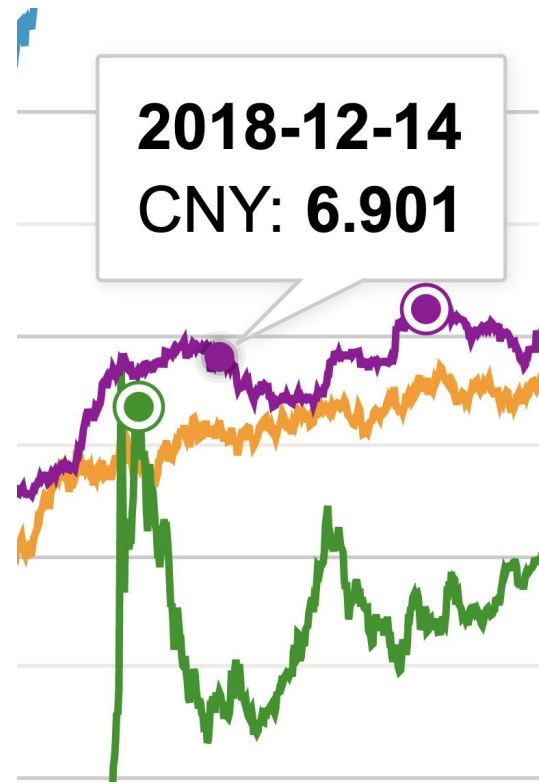
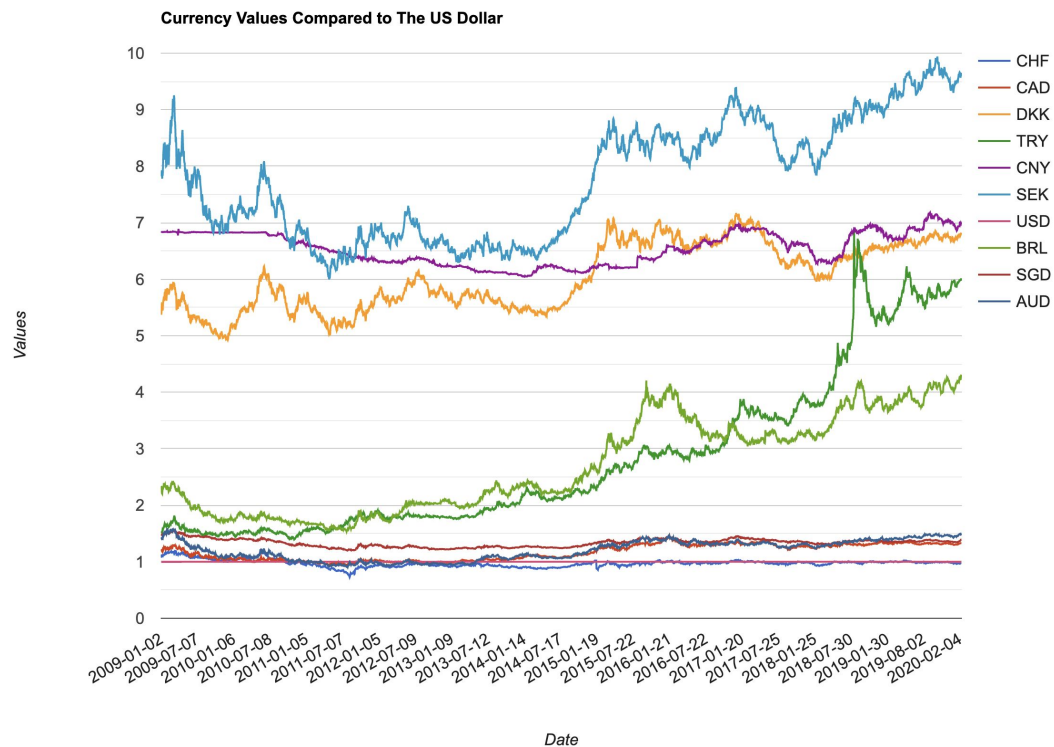
  Test12 = properForm(x);
  console.log(Test12);

  var data = new google.visualization.arrayToDataTable(Test12);

  var options = {
    title : 'Currency Values Compared to The US Dollar',
    chartArea: {width: 9000},
    chartArea: {margin:{left:5}},
    selectionMode: 'multiple',
    zoomable: true,
    pannable: true,
    vAxis: {title: 'Values'},
    hAxis: {title: 'Date'},
    series: {5: {type: 'line'}}
  };

  var chart = new google.visualization.ComboChart(document.getElementById('chart'));
  chart.draw(data, options);
}
```

Graphs produced



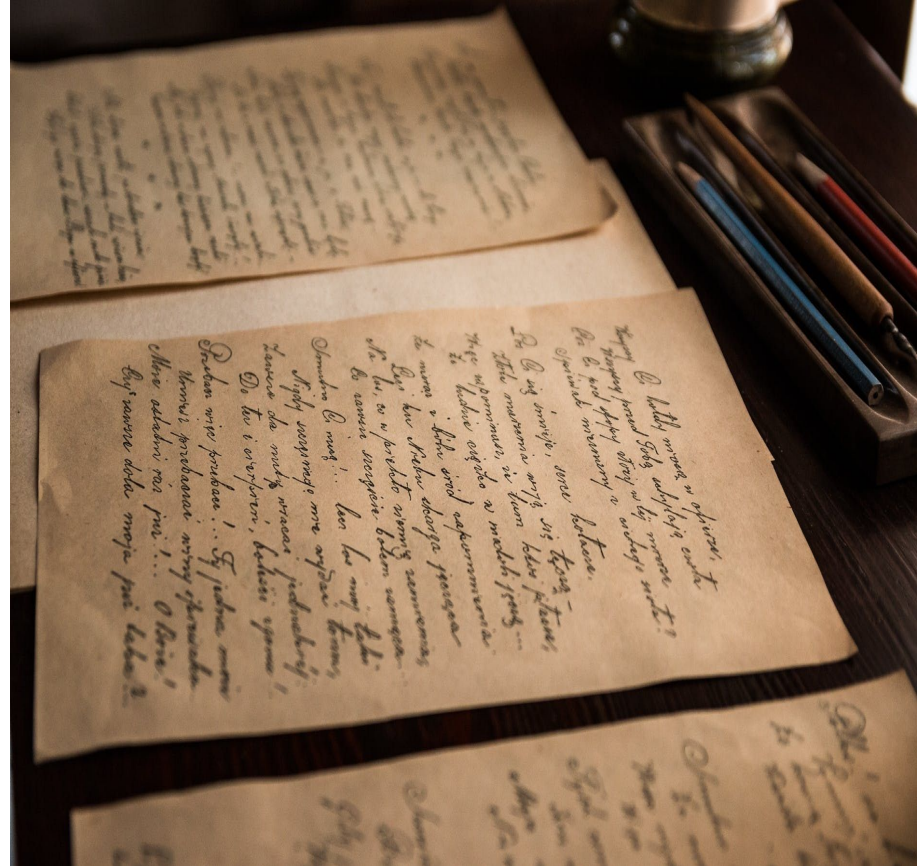
5 Future

- We are proud of how hard and tirelessly we worked.
- Not only did we develop technical skills, but soft skills like communication.
- Would like to see how creating and administering accounts could have went.
- Could have also seen how it would have worked with API keys.
- Would have liked to learn the emerging Kotlin language, inorder to make an Android App from ground up,...or Xamarin (.net/c#) to make Android/IOS/Windows in one fell swoop.



6 Additional Notes

- In Order to have accomplished this, we needed deeper understanding of web technology.
- Needed to keep track of terms learned.
- Recommended for groups in general, as it validates project if end result is underwhelming.



6. Additional Notes

Another example was mobile development. We understood how it worked from a technical standpoint, but wanted to really learn how App Publishing worked. All while learning even more about the coding aspect. (External links in blue, and we originally used font size 14 for this)

- [Postman API tool - tutorial](#)
- [JSON vs JSONP](#)
- [Fetching HTTP headers current request in PHP](#)
- [finding Errors with PHP cURL](#)
- [Pagination of API results](#)
- Handling nested JSON arrays with PHP
- [VMware interfering with XAMPP](#)
- [JS libraries that can help with data visualization](#)
- [AWS calculator to help business estimate cloud costs](#)
- [List and descriptions of all AWS services](#)

6. Additional Notes

- [Another neat AWS link](#)
- [API gateway with PHP and Lumen](#)
- [REST with PHP](#)
- [cURL vs Postman](#)
- [Idempotent \(Can be used in Math or CS\)](#)
- [some API terms](#)
- [more API terms](#)
- [storage Engines](#)
- [algorithms and storage engines](#)
- [info on embedded database engines](#)
- [examples of embedded database](#)
- [in-memory databases](#)
- [list of in-memory databases](#)
- API documentation providing embedded code samples for multiple languages

7. References

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Theuwissen, M. (n.d.). The different data science roles in the industry. Retrieved from <https://www.kdnuggets.com/2015/11/different-data-science-roles-industry.html>

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(2020). Retrieved from

<https://www.pexels.com/photo/photo-of-people-doing-handshakes-3183197/>

And a look into the working project.

- Desktop View
- www.vega2020capstone.tech
- Android App
- https://play.google.com/store/apps/details?id=appinventor.ai_granaded.test



Fin.

Questions? Comments?