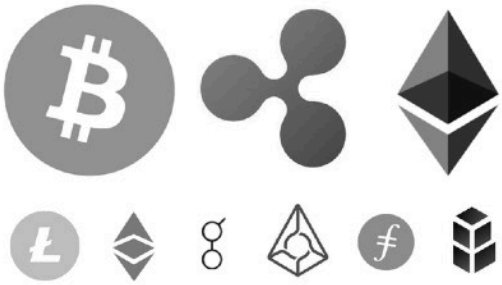
Process Book

Data Visualization - Project

Visualize cryptocurrencies in a new way



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Overview, Motivation and Target Audience

The initial idea came from our impression of seeing always similar visualizations when talking about the value of cryptocurrencies among time. This usual representation as lines made us dazzled because people without any financial knowledge would not understand much. Here is an example from the website coinmarketcap.com/currencies/bitcoin.

When we look at this representation with a fresh eye, the difference between the blue and green curve is unclear. The gray bar graph below is also unclear. Also when looking at the duplicated curve in the brush area it seems that the evolution is different than the green curve.

Moreover the logarithmic scale can be very difficult to understand for people without background in mathematics.

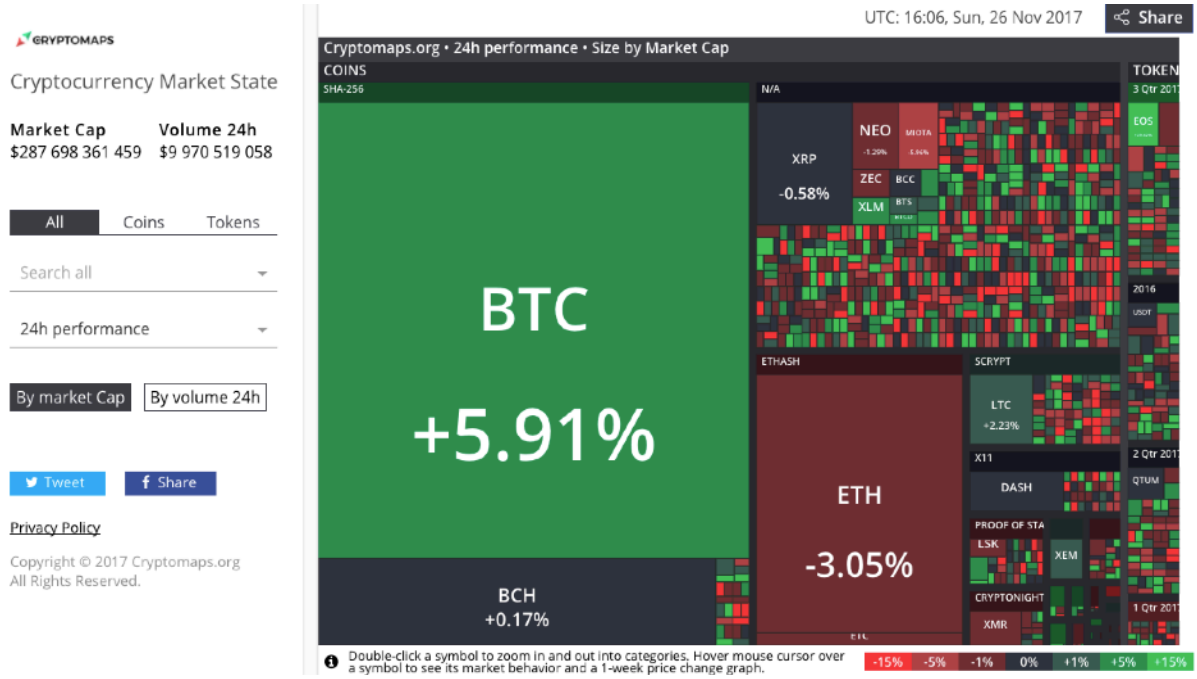
This aside, with this many information it is impossible to have multiple cryptocurrencies displayed at the same time.

For this project, we decided to tackle the problem of visualize the evolution of cryptocurrencies for a public without strong financial or mathematical backgrounds. The idea is to express quickly the intuition of win or loss on a given period of time for the selected cryptocurrencies.

We would then target newcomers to cryptocurrency world and help them appreciate the evolution by simulating a past investment.

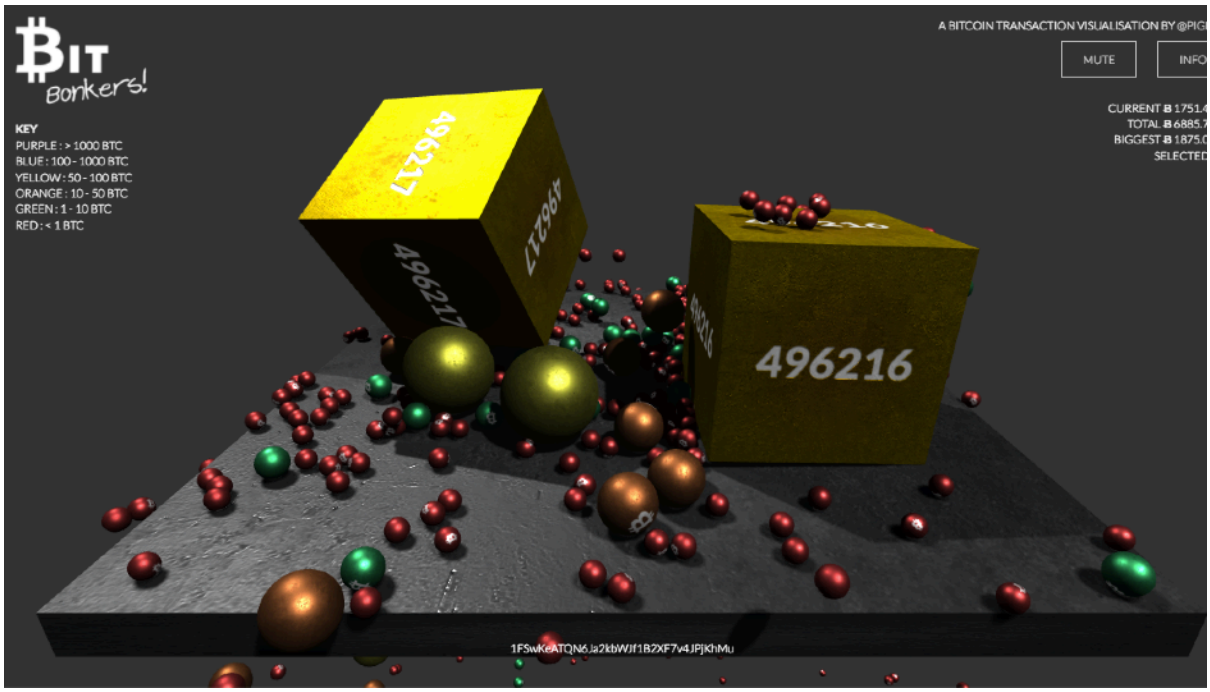
Related Work and Inspiration

During our research to get ideas of visualization, here is what we encountered :



Source : http://cryptomaps.org/

What we liked about this visualization is that area provides instant impression and comparison (when the differences are as big as in this view). Although the smaller areas are very difficult to understand. We thought that the colors did not mean much either.

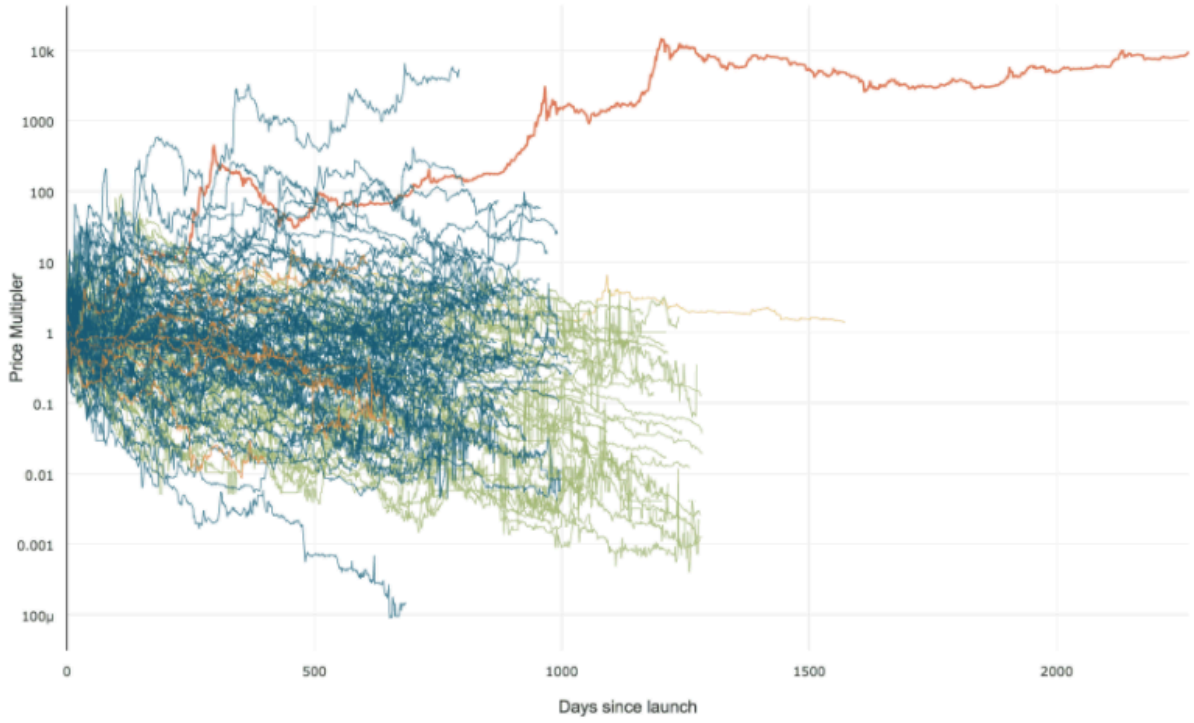


Source : https://bitbonkers.com/

What we liked about this visualization is that you realize easily that the cryptocurrency market is always moving. It took us some time to understand what the colors meant and what the cubes are. The colors are actually interval of values of transactions which is also encoded with the size of the spheres. The bloc are mined items. The gravity to make the sphere is not fully respected, which is acceptable, but the only purpose of having the spheres drop is not to surcharge the screen. In the end, we did not really get the use of 3D scene.

Source : https://blocks.wizb.it/

This visualization helped us understand what we did not want in our visualization. The animation is moving very fast, making it hard for the eye to understand that the globe actually rotated from the USA to Europe and back to USA in a very short time. Also the exact position and amount is, in our opinion, too much detail for the goal of our visualization.



Source : http://woobull.com/data-visualisation-118-coins-plotted-over-time-this-is-why-hodl-alt-coin-indexes-dont-work/

This is more data art than a visualization but we enjoyed that it showed the fact that we hear a lot of the very successful cryptocurrencies but the many loose value. It is a rare point of view. We also very well see that this phenomenon is recent and has a lot of activity.

Question

What am I trying to show with my visualization ?

The aim of our visualization is to show quickly the gain or loss of different cryptocurrencies and easily compare them.

We wish to provide a tool that beginners in cryptocurrencies can use to evaluate which cryptocurrency would have provided the best investment on the time period of their choice. This would be in percentages or with an absolute amount that the user can input.

Indeed when start wondering about investments in cryptocurrencies, you could wish to play with different setups (which cryptocurrency to invest in, one or several, what amount to invest, at what time, what would have been your output money if you had sold on this specific date, etc.). Our goal is to provide this tool with a clear distinction between win and loss. We would not want people to only think that they can win with this kind of investments. This is also a way to demonstrate the variations over time and there is no secret combination to win.

Dataset

Where does it come form, what are your processing steps ?

Our original dataset comes from the platform Kaggle. We used the dataset originally aimed to be used in a Machine Learning challenge. Here is the link : https://www.kaggle.com/sudalairajkumar/cryptocurrencypricehistory .

We chose this dataset as we had various cryptocurrencies in the same format. Moreover with the preview available on the Kaggle platform we knew that the data was clean enough to be able to work quickly. We also had the possibility to work on specific visualization of either Bitcoin or Ethereum as those two cryptocurrencies had some additional files.

This dataset is interesting as we have the data for a significant time period. Indeed we have the evolution from April 28, 2013 to September 14, 2017. Although the Bitcoin existed before this period of time we did not try to gather the former data as the cryptocurrency world was at the time only composed of experts and scientists.

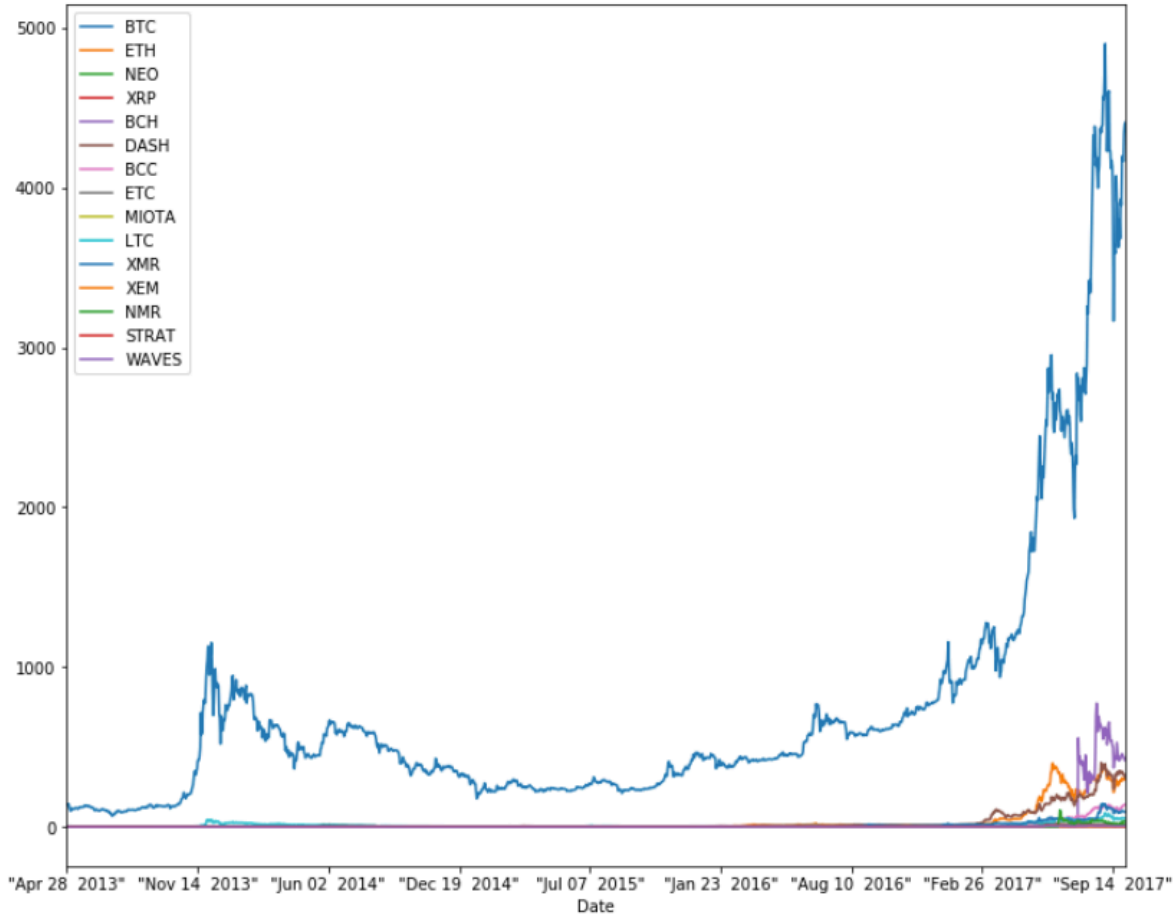
About the preprocessing, what we did is basically merge all the separate price files. In order to do this we used a Jupyter notebook and the Pandas library. The header of every file, giving the column names, is the following : Date, Open price, High price, Low price, Close price, Volume, Market Cap. In the purpose of this visualization we are only interested in the Open price. This can easily be changed later.

We implement a function, named csv_into_df, that given the path to a file and the name to attach to this cryptocurrency returns a Pandas Dataframe with each Date associated to the Open price. Once we have this we create the final Pandas Dataframe by merging the data frames given by the function csv_into_df. The result will be a column with the date and a column per cryptocurrency with the open price as values. We make sure that there are no missing values by setting the unknown to zero. Finally we export the final Dataframe as a csv file, which is a format easily readable with the d3 library.

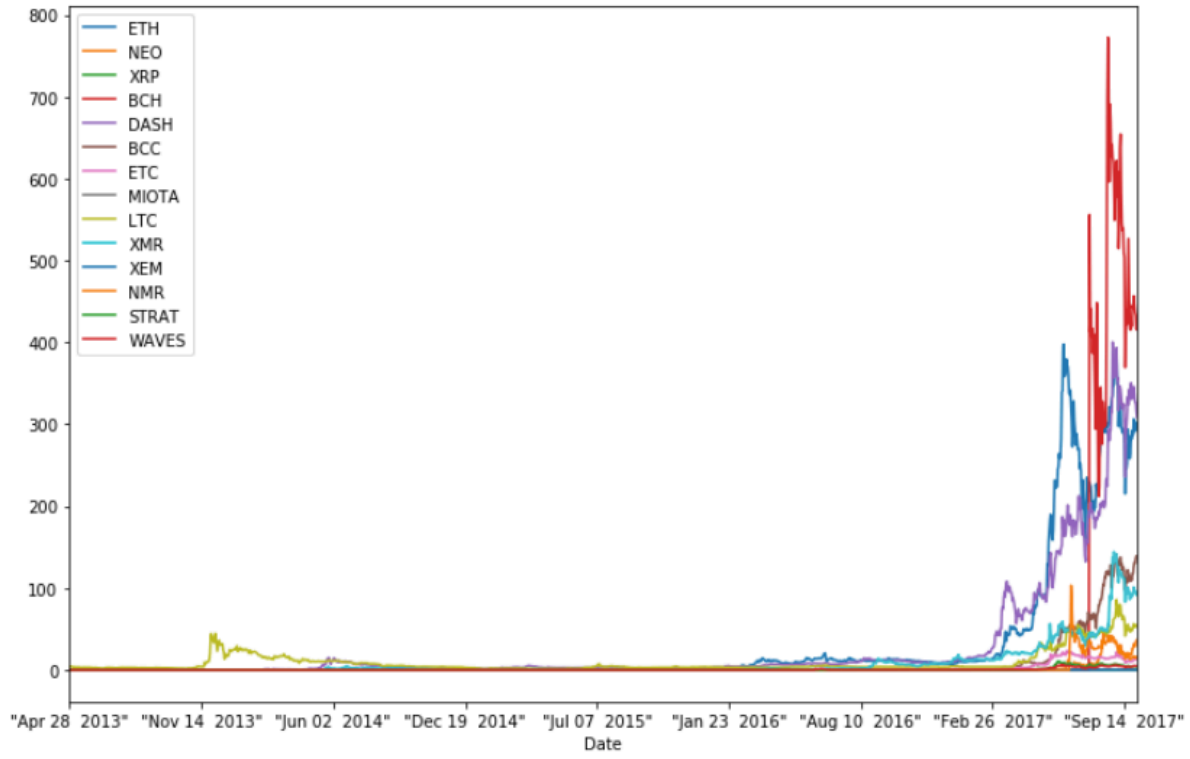
Exploratory Analysis

What visualization have you used to gain insights on the data ?

As our data is based on a suite of numerical values that corresponds to a time evolution, we used the basic representation that we want to escape from to know what our data looks like. That is to say we plotted a line plot with time as x-axis and a curve per cryptocurrency.



In this first plot we show the evolution of the opening price of all the cryptocurrencies for which we have some data. As we see that the graph is very dominated by the Bitcoin, we provide another view without this cryptocurrency.

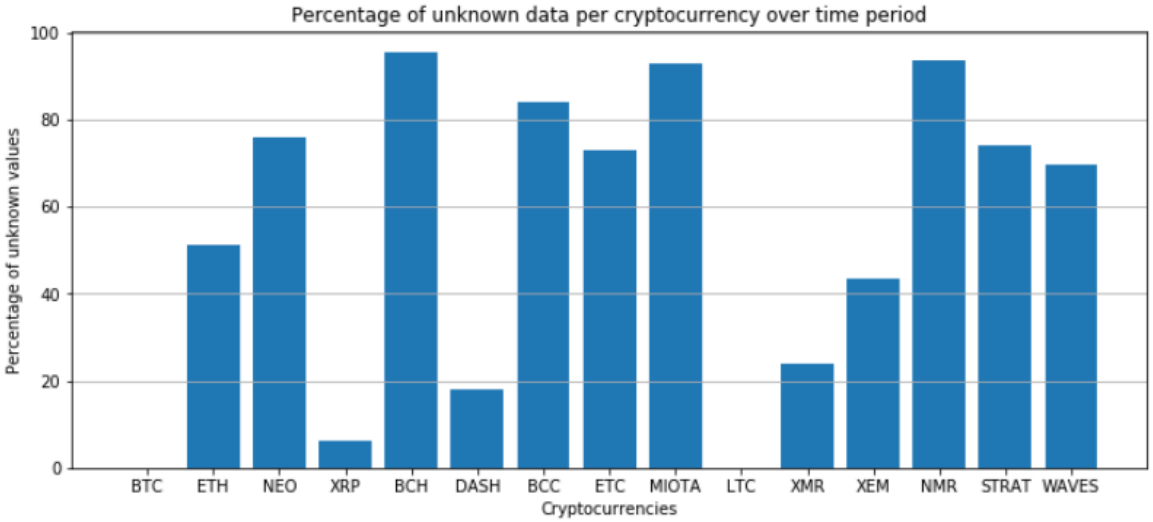


We can see in this visualization that the data is concentrated after February 2017. Most cryptocurrencies saw their value rise considerably after this date. This is something to keep in mind as we go and implement our visualization. Indeed, for most of the time intervals (approximately before January 2016), we have a limited number of cryptocurrencies to compare.

To investigate this last point we illustrate in the following figure the start date of each cryptocurrency, according to our dataset. We can see that we have the value of Bitcoin (BTC) from the moment that LiteCoin was created (LTC).

```
BTC  from  "Apr 28  2013"
ETH  from  "Aug 07  2015"
NEO  from  "Sep 09  2016"
XRP  from  "Aug 04  2013"
BCH  from  "Jul 23  2017"
DASH  from  "Feb 14  2014"
BCC  from  "Jan 20  2017"
ETC  from  "Jul 24  2016"
MIOTA  from  "Jun 13  2017"
LTC  from  "Apr 28  2013"
XMR  from  "May 21  2014"
XEM  from  "Apr 01  2015"
NMR  from  "Jun 23  2017"
STRAT  from  "Aug 12  2016"
WAVES  from  "Jun 02  2016"
```

To quantify in a better way of much of the data was unknown, or equivalently how recent a cryptocurrency is, we did a plot of the percentage of unknown data per cryptocurrency.



We verify here that Bitcoin and LiteCoin have no unknown data (percentage is 0) and that the most recent cryptocurrency, namely Bitcoin Cash (BCH), has the higher percentage of unknown data (95.49 %).

Design

What are the different visualizations you considered ? Justify the design decisions you made using the perceptual and design principles

Our design process followed the design sheets that were provided in the course. You will find them in the appendix in full version. We will provide some insights here.

Understand

Brainstorm design requirements :

- Differentiate cryptocurrencies (while being consistent with other website representations)
- Select different periods of time (start & duration)
- Easily measure win or loss values
- Show timeline

Rank requirements :

1. Show timeline
2. Easily measure win or loss values
3. Differentiate cryptocurrencies
4. Select different period of time

Ideate

How might we questions :

- How might we show the win/loss value ?
- How might we select the cryptocurrency ?
- How might we select the time period ?

Our first sketch had drop down select menus for start date, end date and cryptocurrencies.

We later changed this to a list of button to select or not each cryptocurrencies and a time line under the graph to select an interval of dates.

The second sketch displayed the cryptocurrencies as lines which is what we don't want to keep in the usual graphs.

In the final sketch we made a bar chart centered at 0 bars would be going up to show a positive value (meaning a win) and down for a negative value (meaning a loss).

We still regret that we can only have one period of time selected at once on a single window.

Make

Achievable goal : communicate without financial knowledge the potential past win or loss of investment in cryptocurrencies.

Encoding & Layouts :

- Cryptocurrency : name, abbreviation, logo, usually associated color
- Time : horizontal axis, selection with an interval on the axis
- Win/Loss : bar chart centered around 0, different colors for positive and negative bars

Interactions :

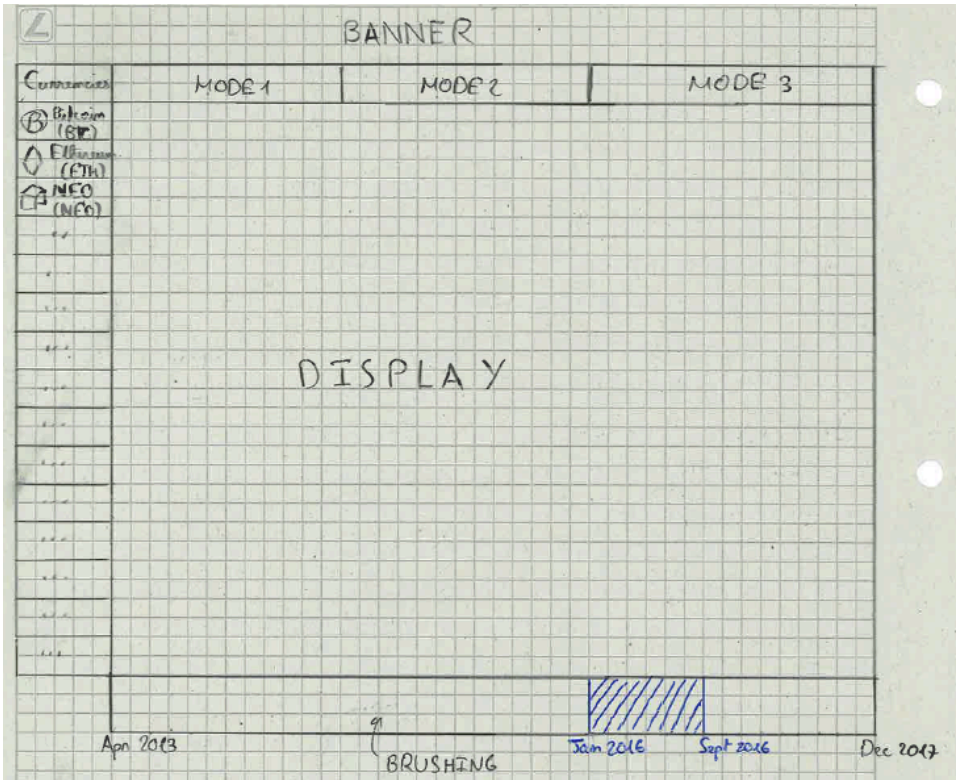
- Selection of time period
- Shift selected period in time
- Selection of desired cryptocurrencies
- Hover a cryptocurrency to make it more visible

Additional views :

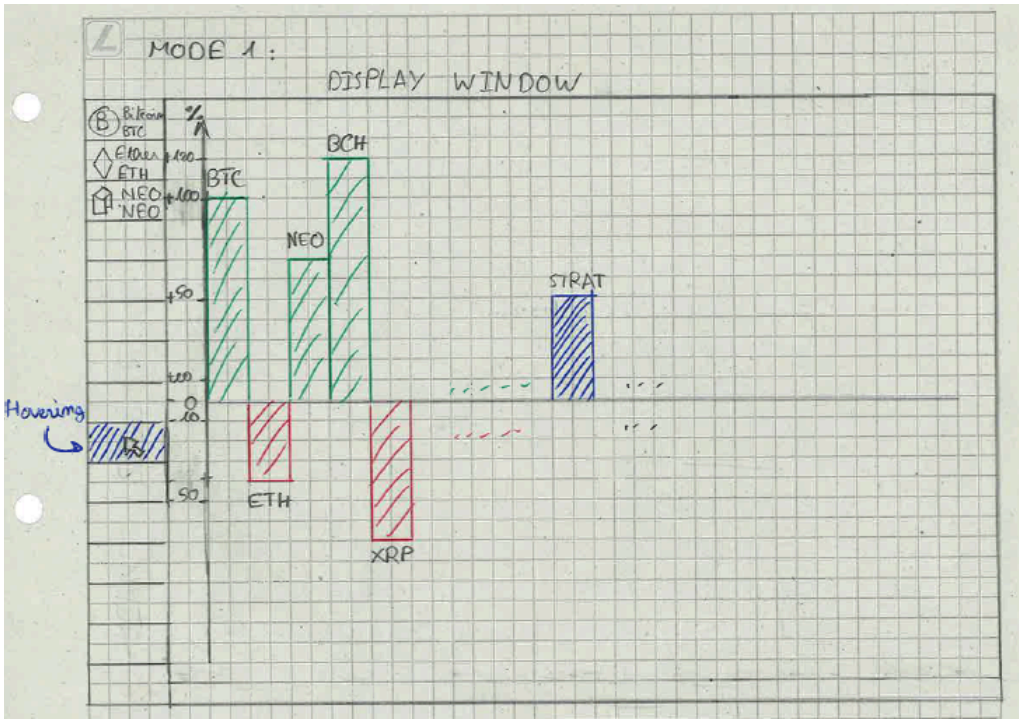
1. Isolated view : Given a duration (a week, a month, two months,…), give for every interval the best cryptocurrency to invest in
2. Consecutive : Given a duration and an amount, give the final amount you would have earned if you had invested this amount every duration in the best cryptocurrency during this duration.

Limitation : Data is limited to a limited number of cryptocurrencies and we cannot predict the future evolution, all computations are past-based.

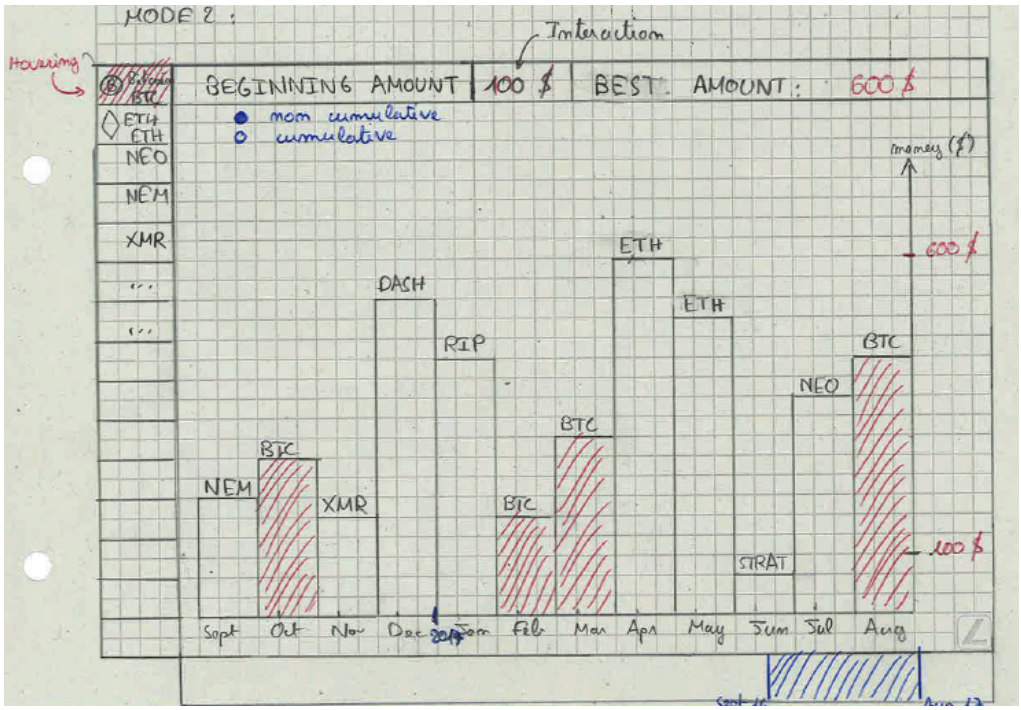
The following scheme shows the general structure of our visualization. The « Display » area will welcome the graphs, the buttons on the left will present the different cryptocurrencies, the button on the top will provide the different modes and we find in the bottom the time axis.



With the following figure we illustrate the first mode, we see in this mode the cryptocurrencies win or loss in percentages on the selected period of time according to the brush cursor on the time axis. By hovering one button we can highlight the desired cryptocurrency.



In this last view we present the second mode, here we find the input to enter the amount of investment. We can also see on the time period given (here one month) the best cryptocurrency to invest for every time period and the amount you get at the end.



Deploy

Usability concerns :

- Find a way to nicely represent the time interval (the area on the time axis might not be precise enough)
- Find a way to indicate which cryptocurrencies present on the left side were not existing in an early period.

Aesthetics :

Method to evaluate :

Deviation from initial project

Implementation

Describe the intent and functionality of the interactive visualization you implemented. Provide clear and well-referenced images showing the key design and interaction elements.

Evaluation

What did you learn about the data by using your visualization ? How did you answer your questions ? How well does your visualization work and how could you further improve it ?

Peer Assessment

- *Preparation : were they prepared during team meetings ?*

- *Contribution : did they contribute productively to the team discussion and work ?*

- *Respect for others' ideas : did they encourage others to contribute their ideas ?*

- *Flexibility : were they flexible when disagreements occurred ?*

Appendix

1. Design Sheets
    1.1. Understand Sheet
    1.2. Ideate Sheet
    1.3. Make Sheet
    1.4. Deploy Sheet

Understand

#1

goal: gather, observe, and research available information to find the needs of the user

artifacts: design requirements

generate

1) identify the challenge & users

*think big! what is the **problem**? **who** is affected by it? what is known/unknown? orient yourself with all of the project's who, what, why, when, & how.*

Cryptocurrencies charts are hard to understand w/o financial background
Difficult for people who are beginners to finance.

2) find questions & tasks

*what can you **ask** about the challenge? what do users want to do with data? think high and low level. revisit this worksheet to break these down further.*

What information do we want to see at first glance?
from what data will we visualize?
→ Past? Prediction?

!! box #3 may help you revisit this box later

3) check with users or explore data

users: what did you find out? what sparked curiosity? data: characterize aspects of the data. what is it like?

I know what I would have earned

!! get the real data and talk to real users if possible!

4) brainstorm design requirements

*what are recurring trends? what are key design **opportunities**? are there **constraints** worth listing?*

- Differentiate cryptocurrencies
- Select different periods of time (start & duration)
- Easily measure +/- values
- Show timeline

evaluate

5) compare and rank design requirements

*choose a method for comparison: **pros/cons table**, **rank** based on your findings/user needs/tasks, **cross out** the list based on listed justifications, or **pick top 3** to keep and why. explain and review with a group or partner.*

1 - Show timeline (make evident that it is in past)
2 - Easily measure +/- values (represent win or loss of money)
3 - Differentiate Cryptocurrencies (people rarely invest in everything)
4 - Select different periods of time

!! is this the right challenge to tackle? is there enough detail? or too much? too many or not enough requirements? complete this worksheet again to refocus the project.

Ideate

#2

goal: generate good concepts and ideas for supporting some of the project's design requirements

artifacts: ideas & sketches

generate

1) select a design requirement

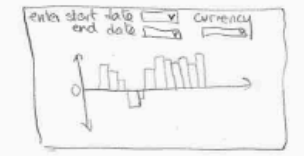
how might we address the challenge using the requirement? which questions would a user ask? revisit this worksheet for each important design requirement.

HMW show the win/loss value?
HMW select the cryptocurrency?
HMW select time period?

!! revisit this worksheet for all important design requirements for your project

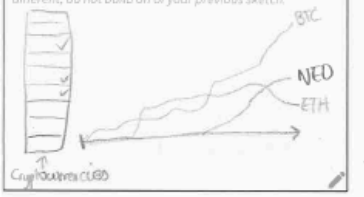
2) sketch first idea

*show how to address this requirement using an **informal sketch** - focus on the big idea not the details.*



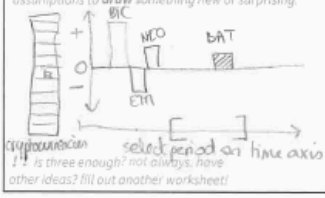
3) sketch another idea

*try another **sketch**, think of a new perspective, be different, do not build off of your previous sketch.*



4) sketch a final idea

*think of a different abstraction. challenge constraints and assumptions to **draw** something new or surprising.*



!! is three enough? not always. have other ideas? fill out another worksheet!

evaluate

5) compare and relate your ideas

*for each sketch, break apart **what works well (+)** and **what doesn't (-)** in the **table** below. make connections. reflect on best parts. can you **combine ideas**? review the table with a partner or group.*

sketch #1	sketch #2	sketch #3
+ win/loss is obvious + length of bar gives the magnitude - manually input period of time - manually input currency	+ comparison btw the currencies + selection of currency is easy - No choice of time. - classical view	+ selection of time easy + selection of currency easy + comparison easy + win/loss is obvious - only on period of time selected on one screen

!! combining ideas and sketches is not easy. sometimes it may open up new possibilities and ideas - guess what, ideate again!

Make

#3

goal: concretize ideas into tangible prototypes which are approximations of a product in some aspects

artifacts: prototypes

generate

1) set an achievable goal

*what should the prototype **achieve**? what are the specific **criteria for success**? break a larger goal into parts with clearer feature sets.*

Communicate without financial knowledge the potential past win/loss of investment in cryptocurrencies.

!! break a goal apart into multiple and create a worksheet for each sub-goal

2) plan encodings & layouts

*what are good visualization **encodings** or **layouts** for which data? use the ideas you just came up with, and remember to justify for users and their tasks.*

cryptocurrency: name, abbreviation, usually associated color, logo
time: axis and selection of interval.
win/loss: barchart centered around 0. (+/- scale)

3) plan support for interactions

*what can the user do? what is required given the chosen encodings? **justify** your design decisions.*

User can select his time period and make it shift on axis.
He can select the desired currencies.
He can hover on currency to make it more visible.

4) sketching additional views

what other parts of the data must be seen? brainstorm how to show this data in the tool.

With period of time (1 week / month, 2 months...) for every interval what was best cryptocurrency to invest in.
Consecutive periods or isolated.

!! if you are thinking up new ideas to visualize, go back to the ideate activity!

evaluate

5) build the prototype and check-in

*are your **goals met** by the prototype? test with users if possible. are design decisions properly justified? do any need to be revisited? were any new constraints or limitations discovered? write down your progress and additional justifications below. review this progress and the prototype with a partner or your group.*

Goals are met.
Limitations: retreived data of limited number of cryptocurrencies and cannot predict in future evolution

!! did the prototype meet its goals? measure its success. make sure you have addressed the design requirements. does the prototype try to do too much?