

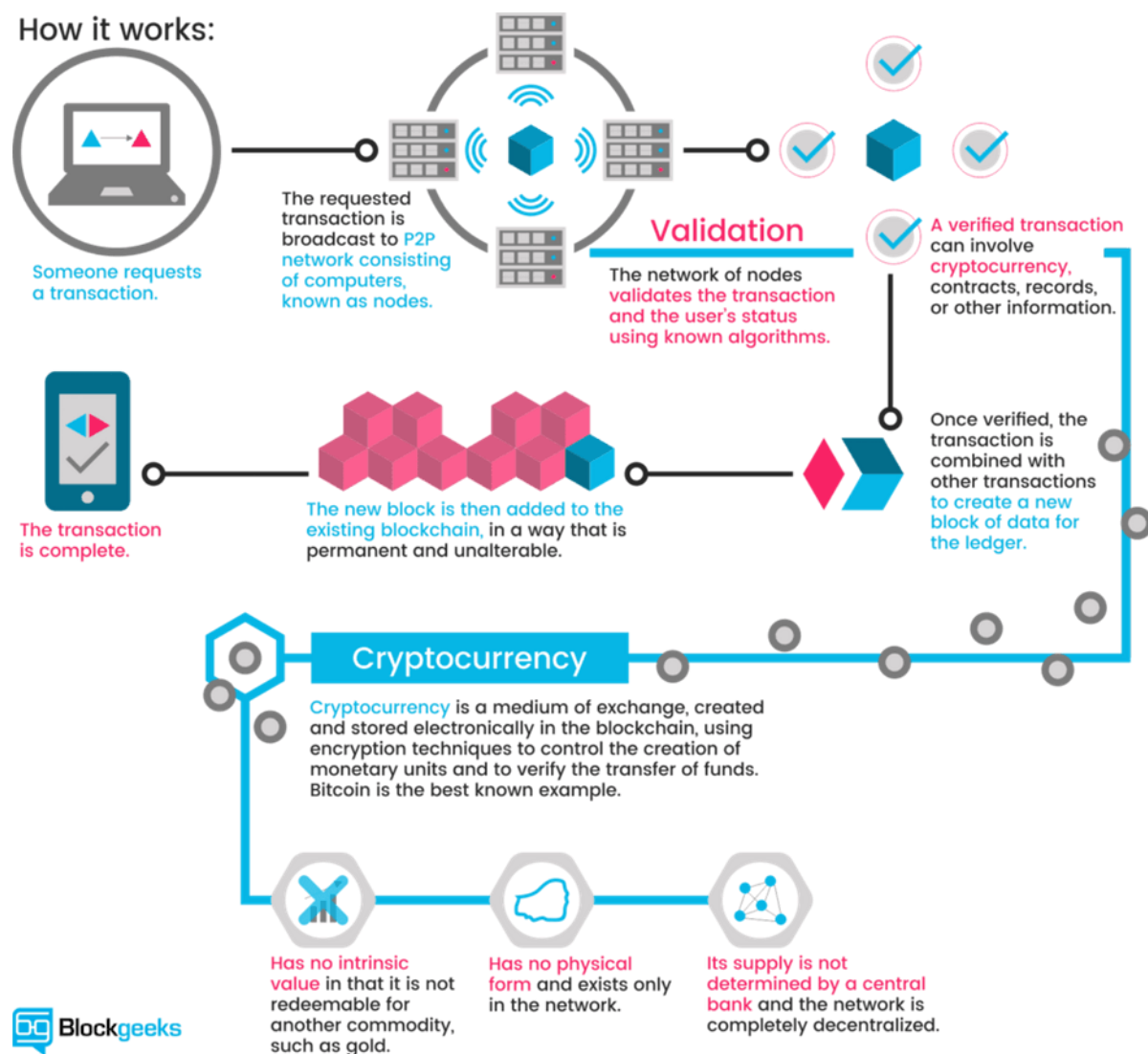
# Trust in Cryptocurrency

**Course:** BIA 658-B Social Network Analysis (Spring 2018)  
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## Introduction:

A **cryptocurrency** is a digital asset designed to work as a medium of exchange that uses cryptography to secure its transactions, to control the creation of additional units, and to verify the transfer of assets.

Below image is describing how cryptocurrency transaction works:



URL: <https://blockgeeks.com/guides/what-is-cryptocurrency/>

Bitcoin Alpha (<https://btc-alpha.com/exchange/>) is who-trusts-whom network of people who trade using Bitcoin.

Since Bitcoin users are anonymous, there is a need to maintain a record of users' reputation to prevent transactions with fraudulent and risky users.

Members of Bitcoin Alpha rate other members in a scale of -10 (total distrust) to +10 (total trust).

### **Goal:**

From the dataset, I would like to find out about the user that, Is a user a fraud user? Giving most reviews as Distrust rates and does some month have significantly high Distrust transaction than another month or not?

### **Dataset:**

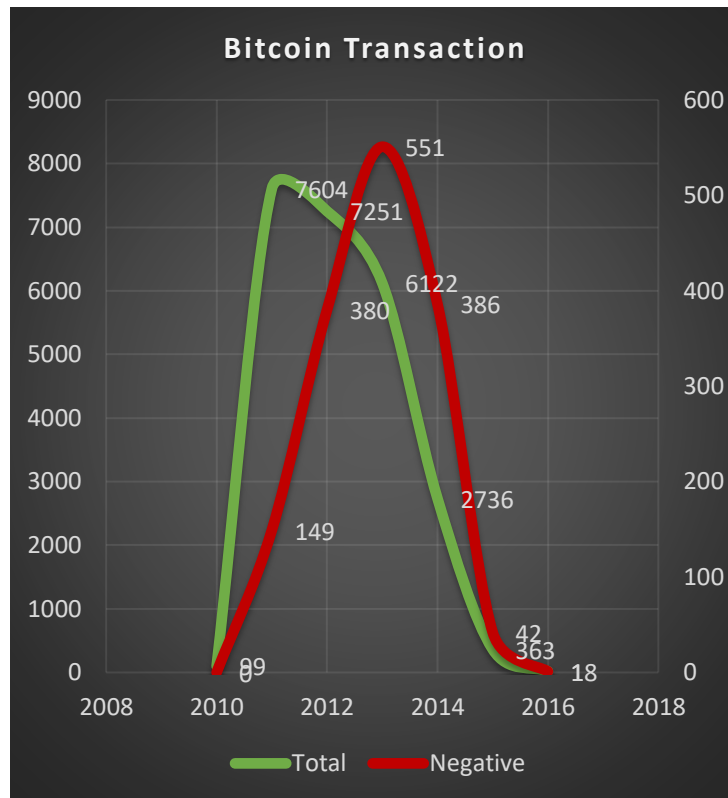
I have taken data from SNAP (Stanford Network Analysis Project). The SNAP library is being actively developed since 2004 and is organically growing because of research pursuits in analysis of large social and information networks.

**Data format:** SOURCE, TARGET, RATING, TIME

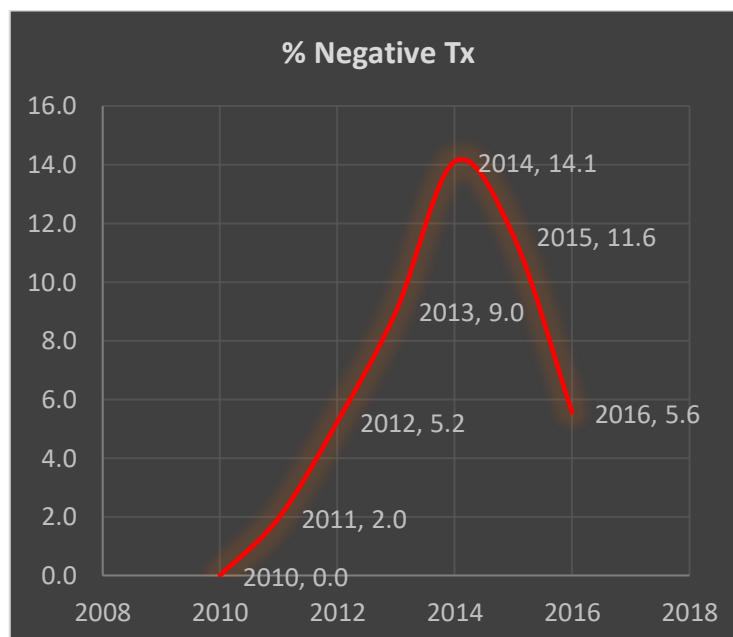
- **SOURCE:** Node id of source, i.e., rater
- **TARGET:** Node id of target, i.e., ratee
- **RATING:** Source's rating for the target, ranging from -10 to +10 in steps of 1
- **TIME:** The time of the rating, measured as seconds since Epoch.

Dataset statistics	
Nodes	3,783
Edges	24,186
Range of edge weight	-10 to +10
Percentage of positive edges	93%
Date Range	2010 - 2016

Below graph describes total number of bitcoin transaction and number of Negative (distrust) transaction over period of year from 2010 to 2016.



Below graph describes percentage of Negative (distrust) transaction over period of year from 2010 to 2016. One can easily say that from 2010 to 2014, rate of Negative (distrust) transaction were increasing gradually.



## Data Transform:

As time in data set was seconds since Epoch, I have used python script to change it to human readable date.

Changed column name from Rating to Weight, as I am using Gephi for data visualization, it takes this dataset format as an input.

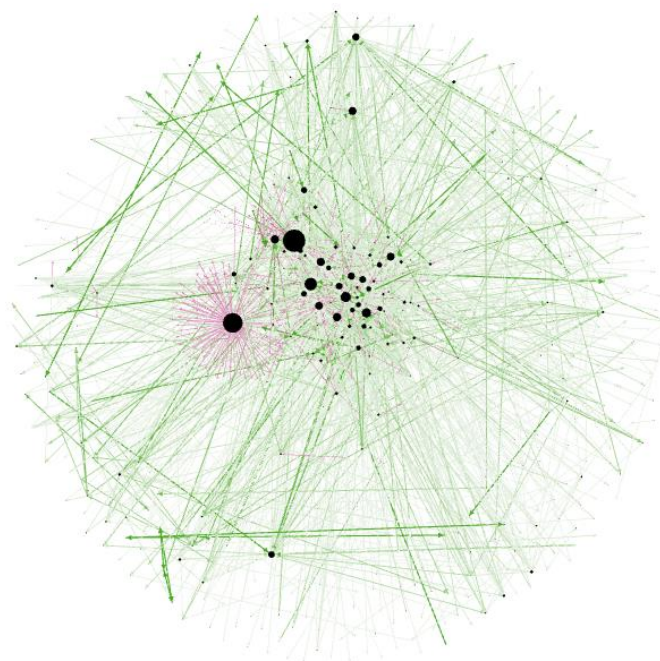
SOURCE	TARGET	RATING	TIME
160	25	10	1394683200
95	35	9	1384578000
377	513	-7	1414728000



SOURCE	TARGET	WEIGHT	TIME
160	25	10	3/13/2014
95	35	9	11/16/2013
377	513	-7	10/31/2014

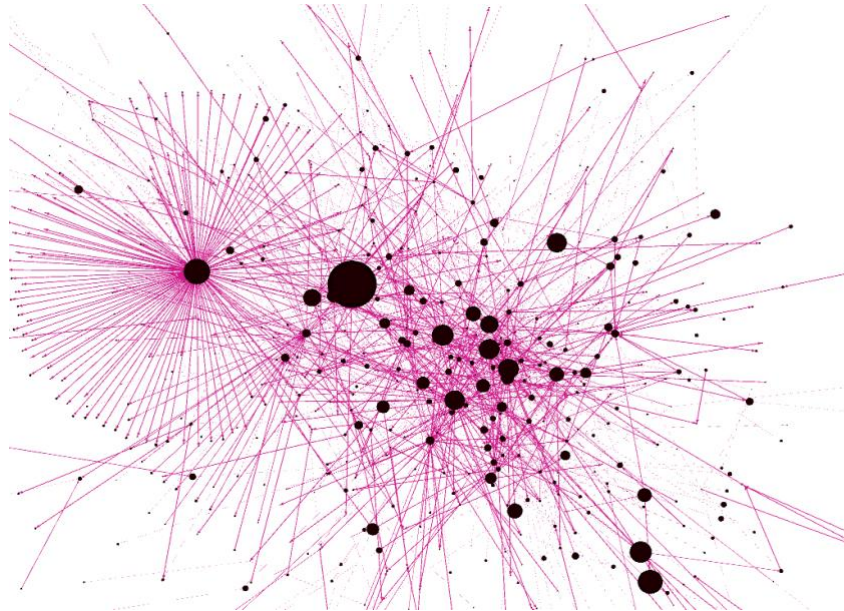
## Data Visualization:

Using Gephi software, the final working subset of the data was imported to form a network of nodes which were defined by the combination of attributes forming each transaction. Source and Target users of the transaction become nodes and directed edge from source to target having weight as rating of that transaction.



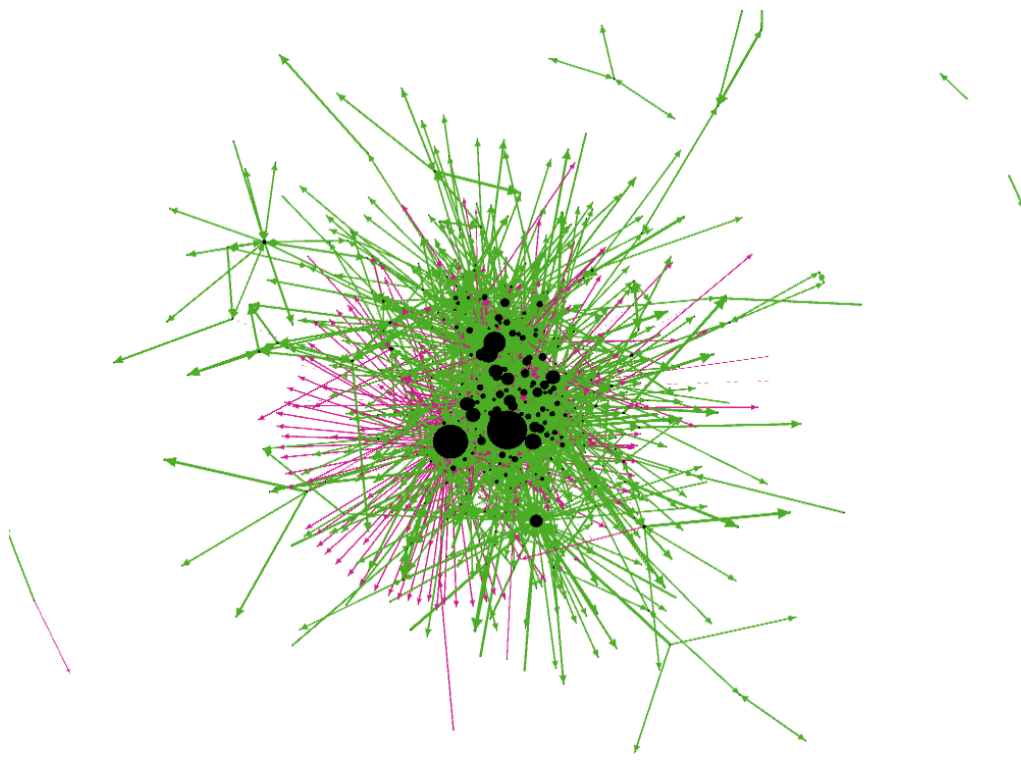
Above image is visualization of every transaction and edges having colour from green for positive rating and red for negative rating.

After filtering out only negative transaction, visualization looks like:



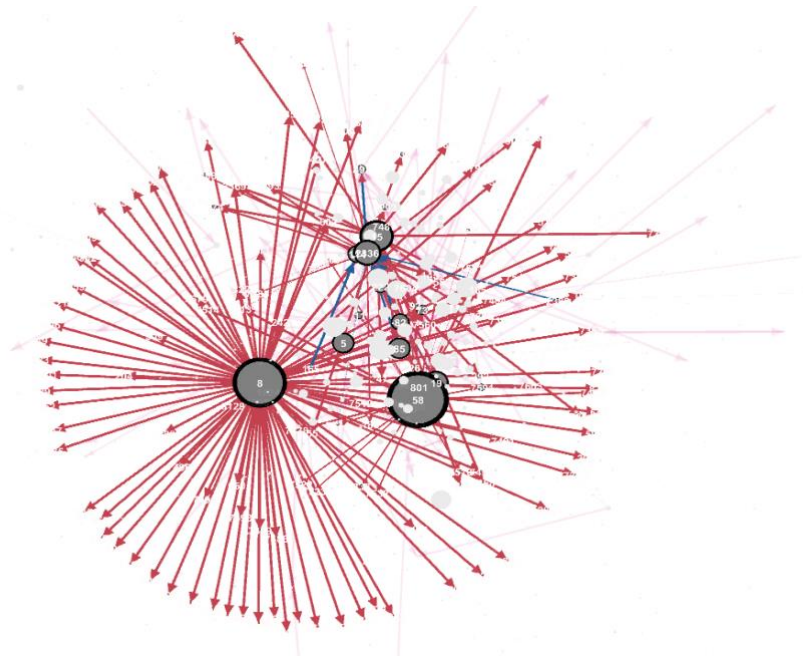
It is very hard to identify some pattern from this much dense graph visualization. Therefore, to find better patterns from graph, I have divided data set by their time of year.

Now, I have taken only data of year 2014 and visualize in Gephi, that can visualize as below:





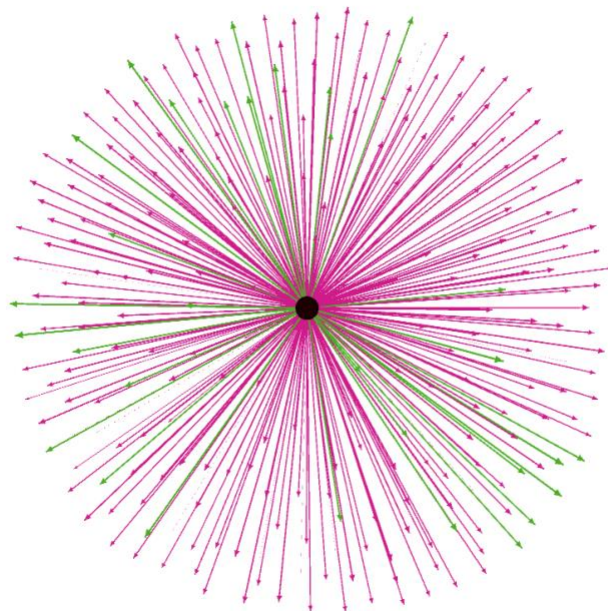
After filtering out only negative transaction, visualization looks like:



In this graph, we can identify some of user that has given many of the reviews as negative.

Like example in above graph, we can see that Node 8 has given so many negative reviews it looks like centre of the graph.

Now, I have taken all the outgoing transaction if Node 8, and visualization look likes below:

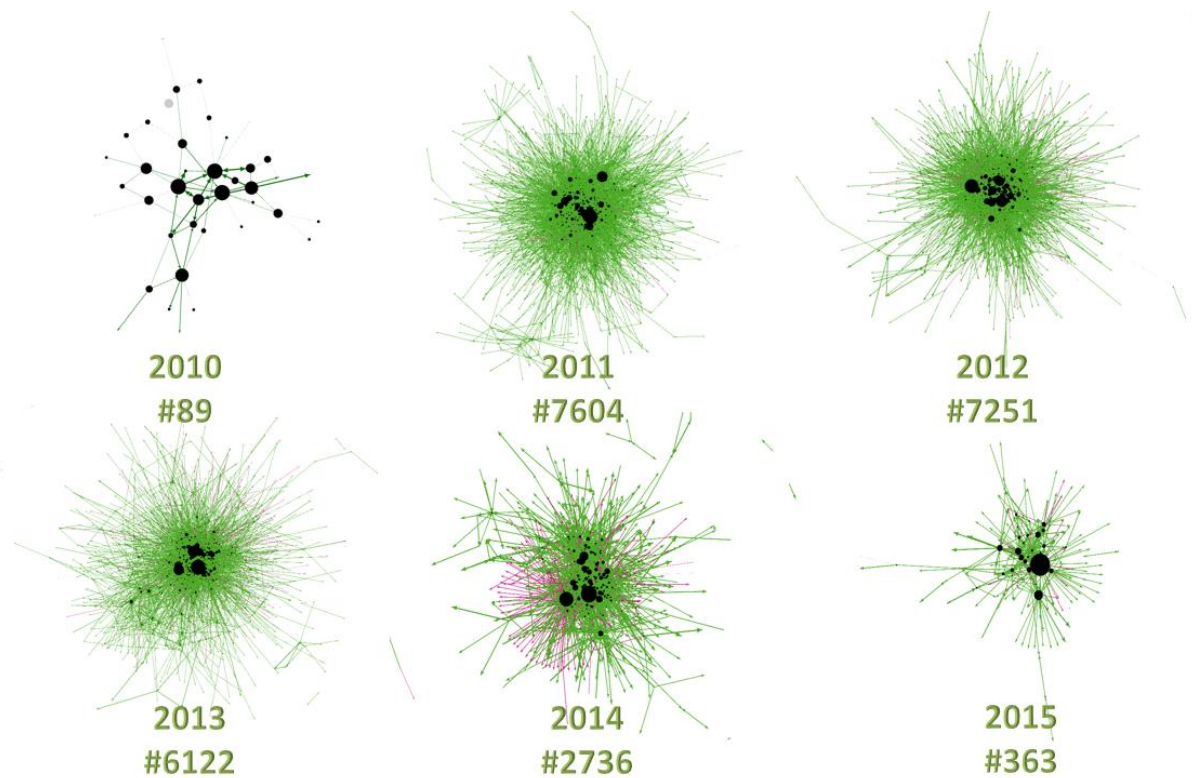


From this graph of Node 8, we can easily say that this user has given most review as negative reviews and we can mark this type of user as a fraud user.

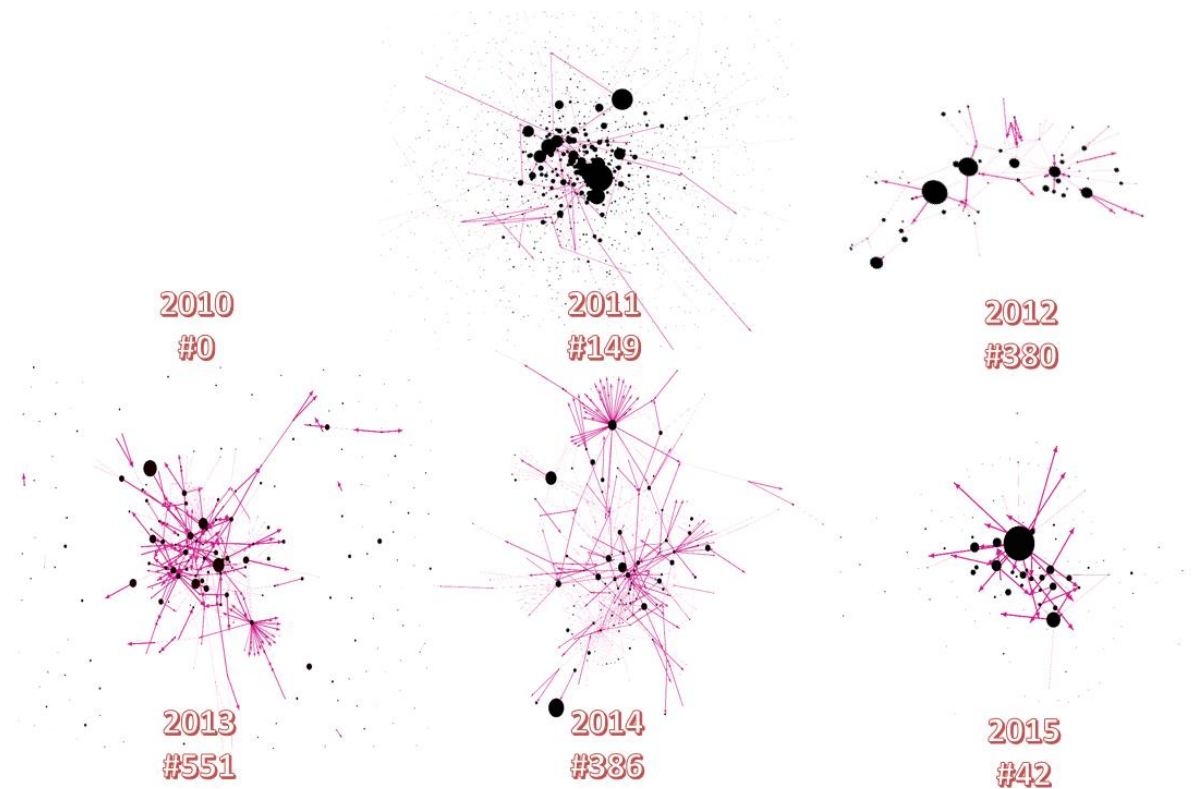
This user node's out degree is 260, from which positive is 63 and negative is 197 (75%).

Therefore, out degree of negative transaction can determine if a user is a fraud or not.

Now I have visualized every transaction by its year of data:



After filtering out only negative transaction, visualization looks like:

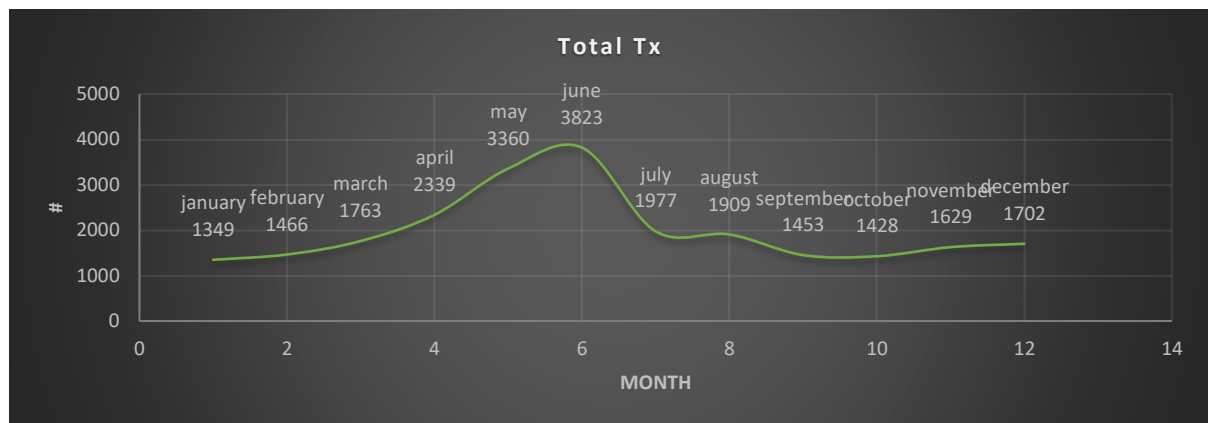


This is visualization of a year wise transaction of the data.



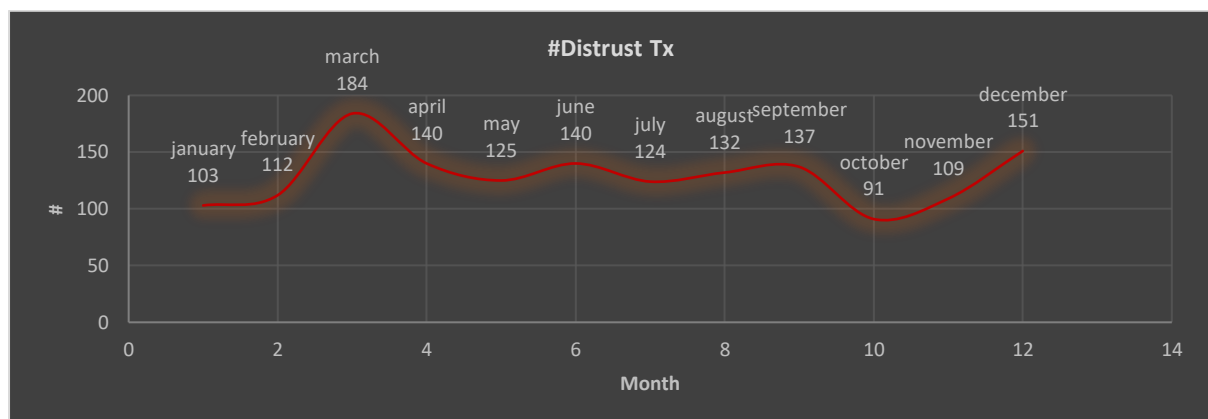
Now to found out about another goal, does some month have significantly high Distrust transaction than another month or not? I have divide dataset in 12 parts as a month.

Below graph describes total number of bitcoin transaction over period of month:



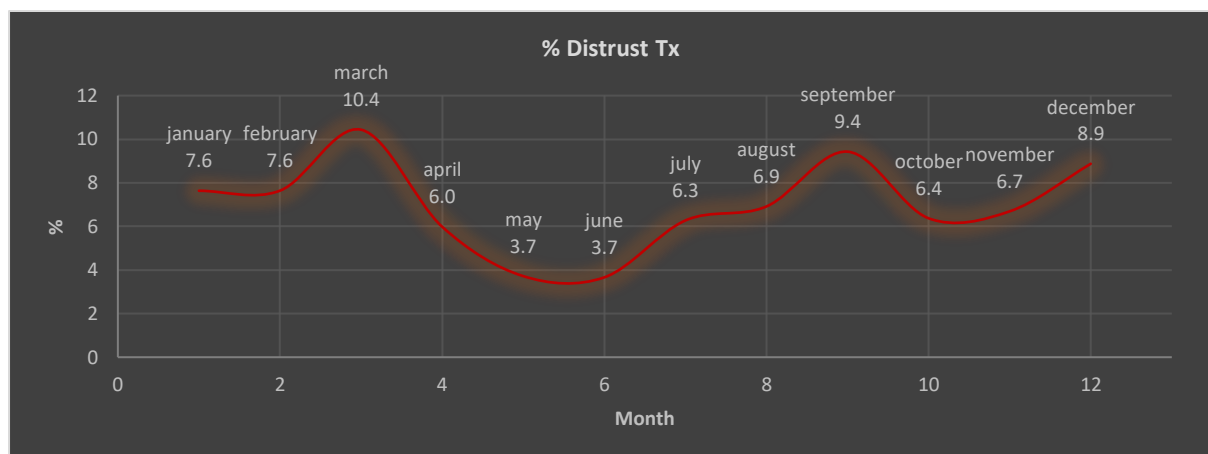
We can say that June month have higher number of total transaction than other.

Below graph describes total number of negative(distrust) transaction over period of month:



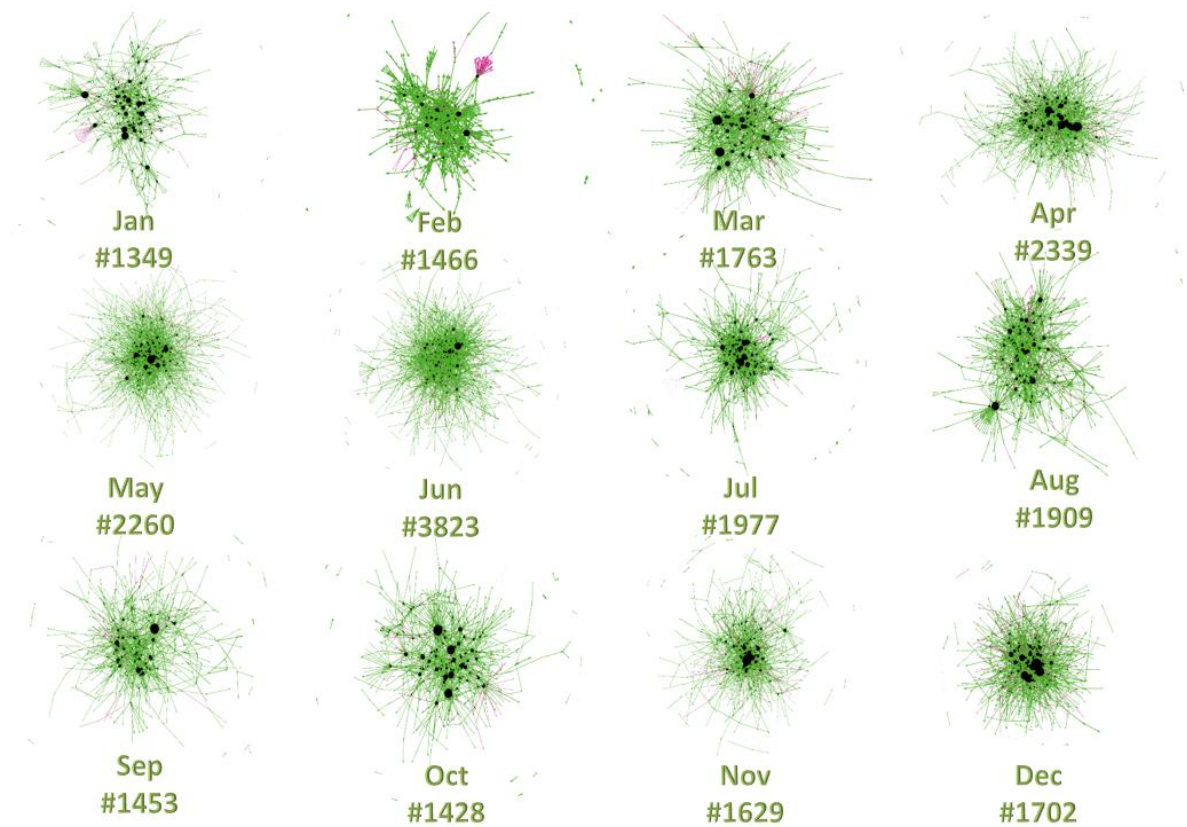
We can say that march month have higher number of negative transaction than other.

Below graph describes percentage of negative(distrust) transaction over period of month:

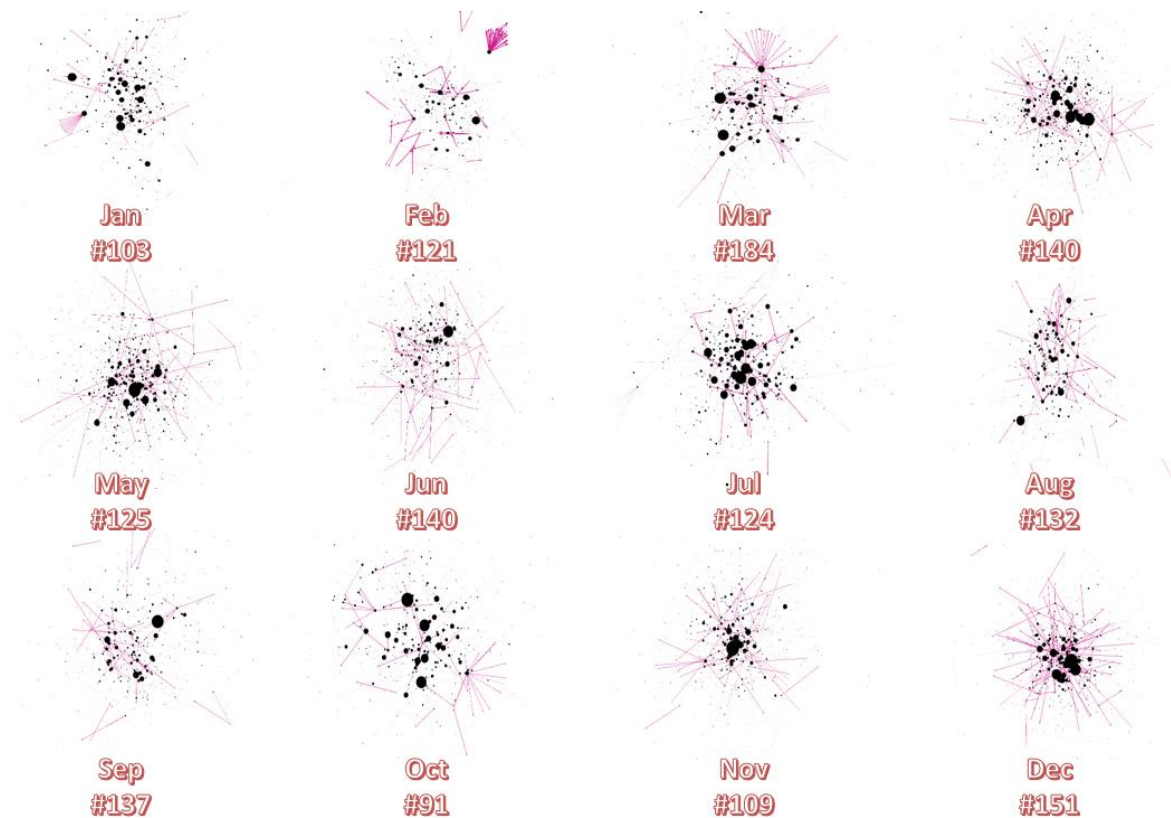


We can say that mar, sep, and dec months have higher % of negative transaction than other.

Now I have visualized every transaction by its month for any year of data:



After filtering out only negative transaction, visualization looks like:



**Conclusion:**

- From out degree of a user node for negative transactions, user can be classified as fraud or not.
- March, September, and December months have more percentage or chances of distrust transaction than other months.
- May, and June months have less percentage or chances of distrust transaction than other months.

**Future Enhancements:**

- Using Multiple Regression Analysis or Logistic Analysis predict the fraudulent behaviour of the user.

**References:**

<https://blockgeeks.com/guides/what-is-cryptocurrency/>

<https://snap.stanford.edu/data/soc-sign-bitcoinalpha.html>

<https://cs.stanford.edu/~srijan/pubs/wsn-icdm16.pdf>

<https://btc-alpha.com/exchange/>

<https://gephi.org/>