Reputation Systems for Online Communities

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*THE REAL SCIENCE

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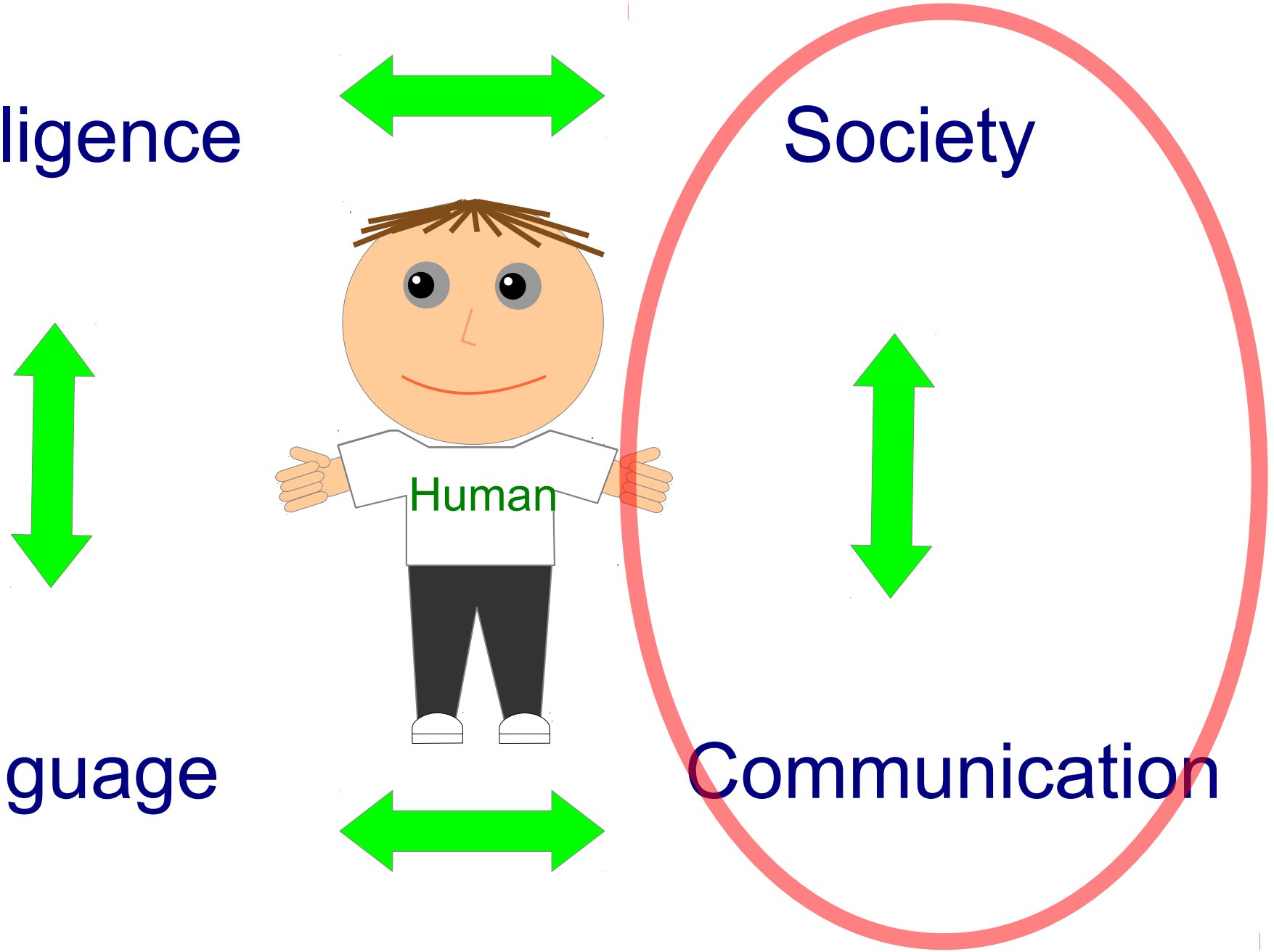
Evolution of Social Complexity



Social Communication Challenges

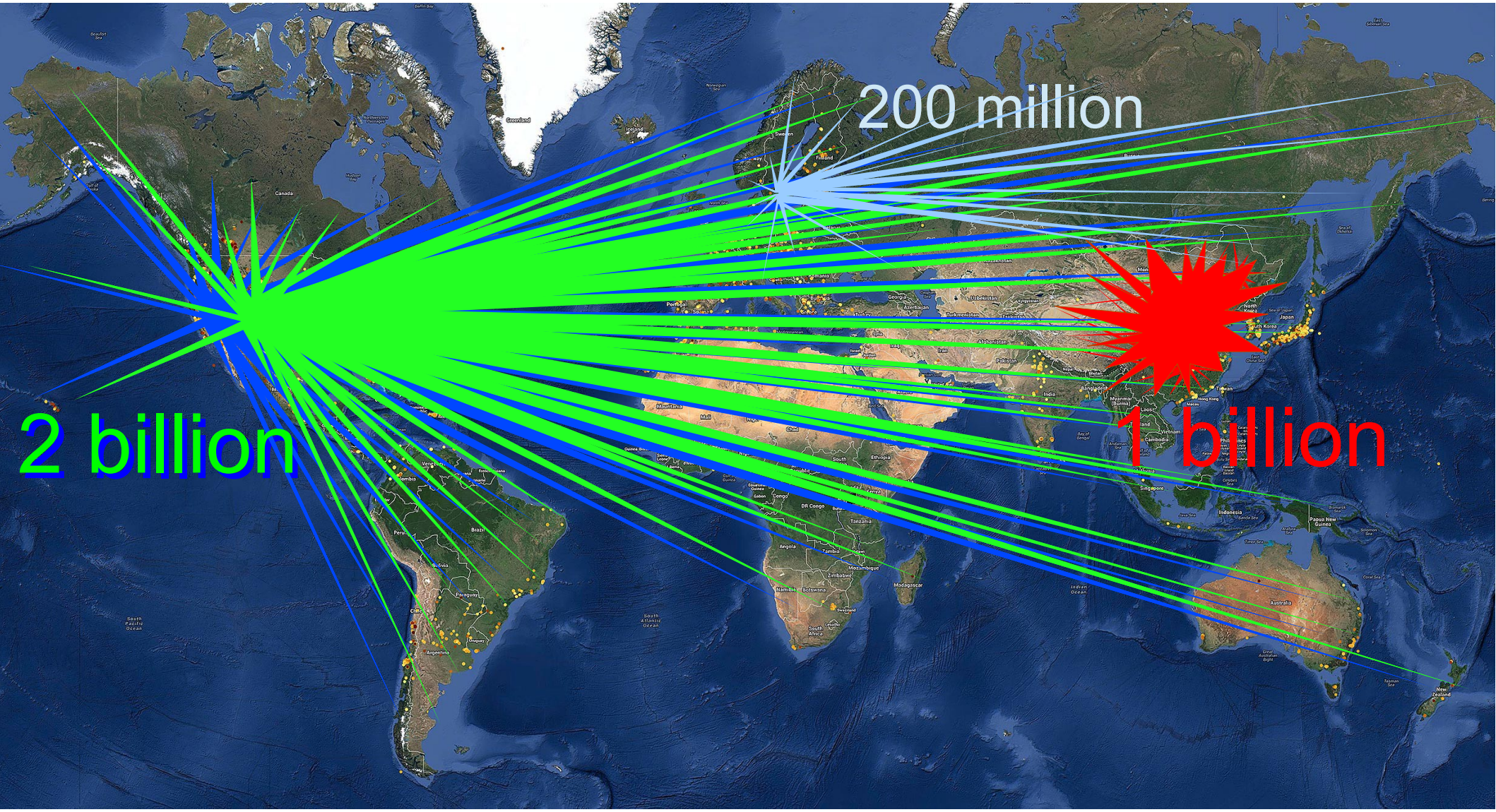
What have changed in last 50 years?

Connectivity – ~~tens~~ *millions* of people

Speed – of ~~speaking and writing~~ *light*

Reliability – ~~relatives/neighbors~~ *strangers*

People involved in “social computing” monthly:
Google+Facebook – worldwide, Telegram – worldwide
WeChat+Baidu+QQ - in China



World-wide social network of 7.5 billion humans, is accompanied with 15 billion IoT devices in 2018 with many of them supplied with AI in the next years

Reputation Systems – Solving Problems

Marketplaces	Unfair competition, gaming ratings
News filtering	Fake news, information wars
Social Networking	Spam, abuse, harassment
Psychological security	Broken relationships
Financial security	Scam
Blockchain consensuses	Consensus takeover
Liquid Democracy	State instability

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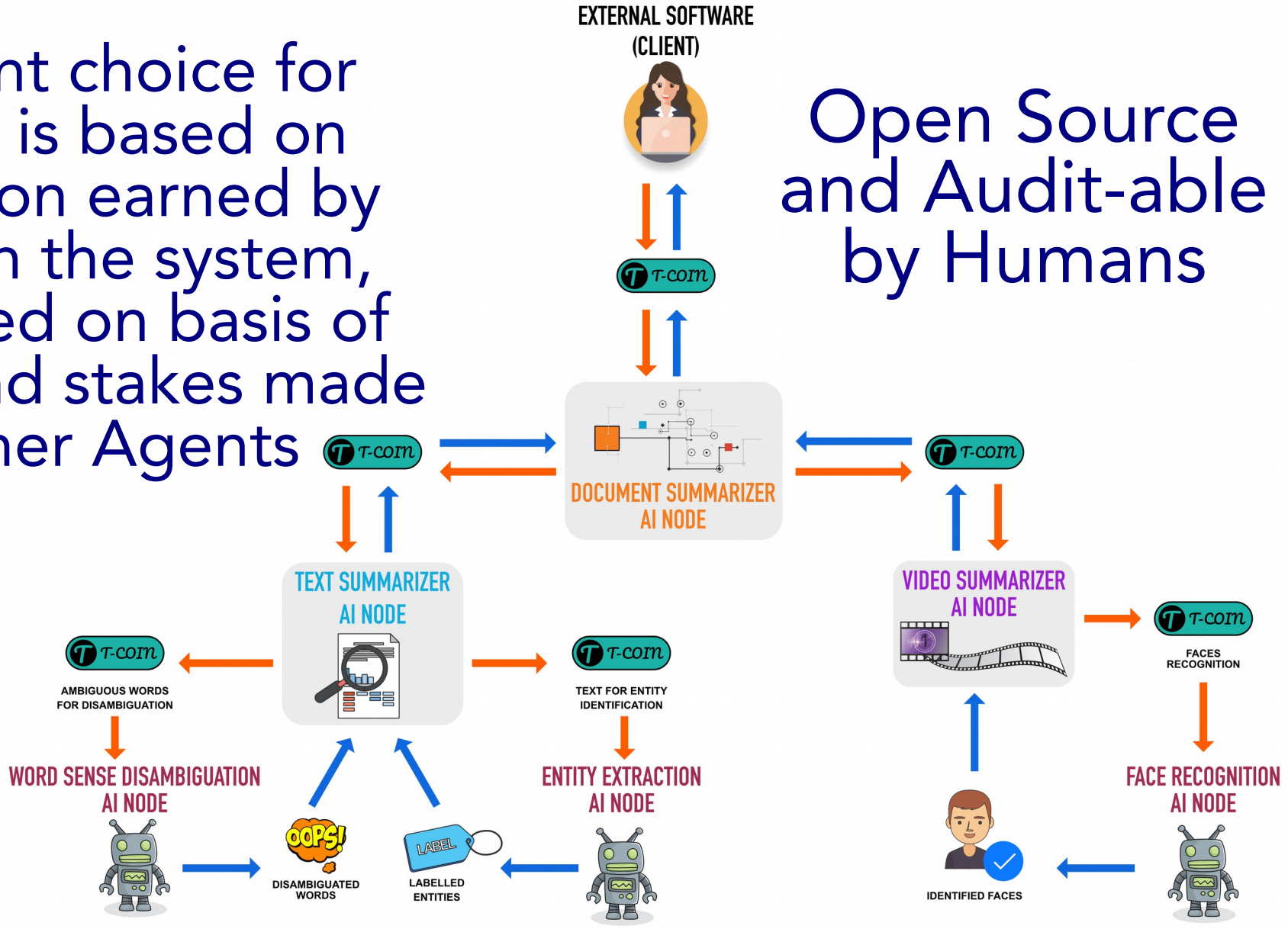
Marketplaces and for Products and Services:

AI Agent choice for service is based on reputation earned by Agent in the system, computed on basis of ratings and stakes made by other Agents

Open Source and Audit-able by Humans



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Marketplaces and for Products and Services:

Reputation System	AR	Good	Bad	Good2Bad	MVR	Bad/Good2Bad	LTS	PFS
None	2	42845	5164	2036	**8.3**	2.54	4.8%	39%
Regular RS	2	43994	5692	2291	**7.7**	2.48	5.2%	40%
Weighted Rank	2	42884	5391	2291	**8.0**	2.35	5.3%	42%
Weighted Denominated	2	42332	6100	2333	**6.9**	2.61	5.5%	38%
No RS	10	42763	1129	2036	**37.9**	0.55	4.8%	180%
Regular RS	10	45705	991	2291	**46.1**	0.43	5.0%	231%
Weighted Rank	10	42425	1242	204	**34.2**	6.09	0.5%	16%
Weighted Denominated	10	42338	1022	2296	**41.4**	0.45	5.4%	225%
No RS	20	42763	561	2036	**76.2**	0.28	4.8%	363%
Regular RS	20	45705	491	2291	**93.1**	0.21	5.0%	467%
Weighted Rank	20	45672	570	204	**80.1**	2.79	0.4%	36%
Weighted Denominated	20	42338	505	2296	**83.8**	0.22	5.4%	455%

Expected summary for Reputation System usability with no Liquid Rank, where reputaion of the raters can not be accessed (based on "10 agents operating during 10 days with FR=4 (fairness ratio), TR=1, AR=2,10,20, supliers=50%, consumers=50%"):

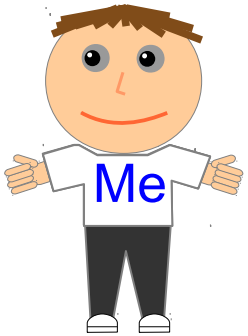
1) MVR below 10 - better not use any reputation system at all

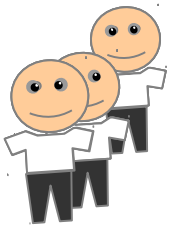
2) MVR above 10 - A MUST to use "Weighted Rank" based reputaion system

3) For MVR below 10 - need to find way to access reputation of the raters

Collaborative News Filtering with Aigents:

Monitoring web pages and extracting textual information with account to Personal and Social relevances





Friends

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trump

today

clapper was one of four top security and intelligence officials who put their names behind a january 6 report that said russian president vladimir put behind a complex effort of hacking and misinformation to influence the 2016 election in trump's favor
http://www.digitaljournal.com/news/world/hollywood-stars-ex-spies-launch-russia-investigation-campaign/article/502876

today

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http://www.reuters.com/theWire

today

the more intense scrutiny comes after president donald trump called for a review of the controversial program
http://www.reuters.com/video/2017/09/20/red-tape-ties-up-h-1b-visas-for-skilled?videoId=372572112&videoChannel=1

yesterday

and is examining any financial entanglement between russia and president trump his associates
http://www.nytimes.com/

2017-09-14

president trump came under sharp attack on thursday for appearing to set aside a border wall fight while reaching a deal on daca immigrants
http://www.nytimes.com/

2017-09-10

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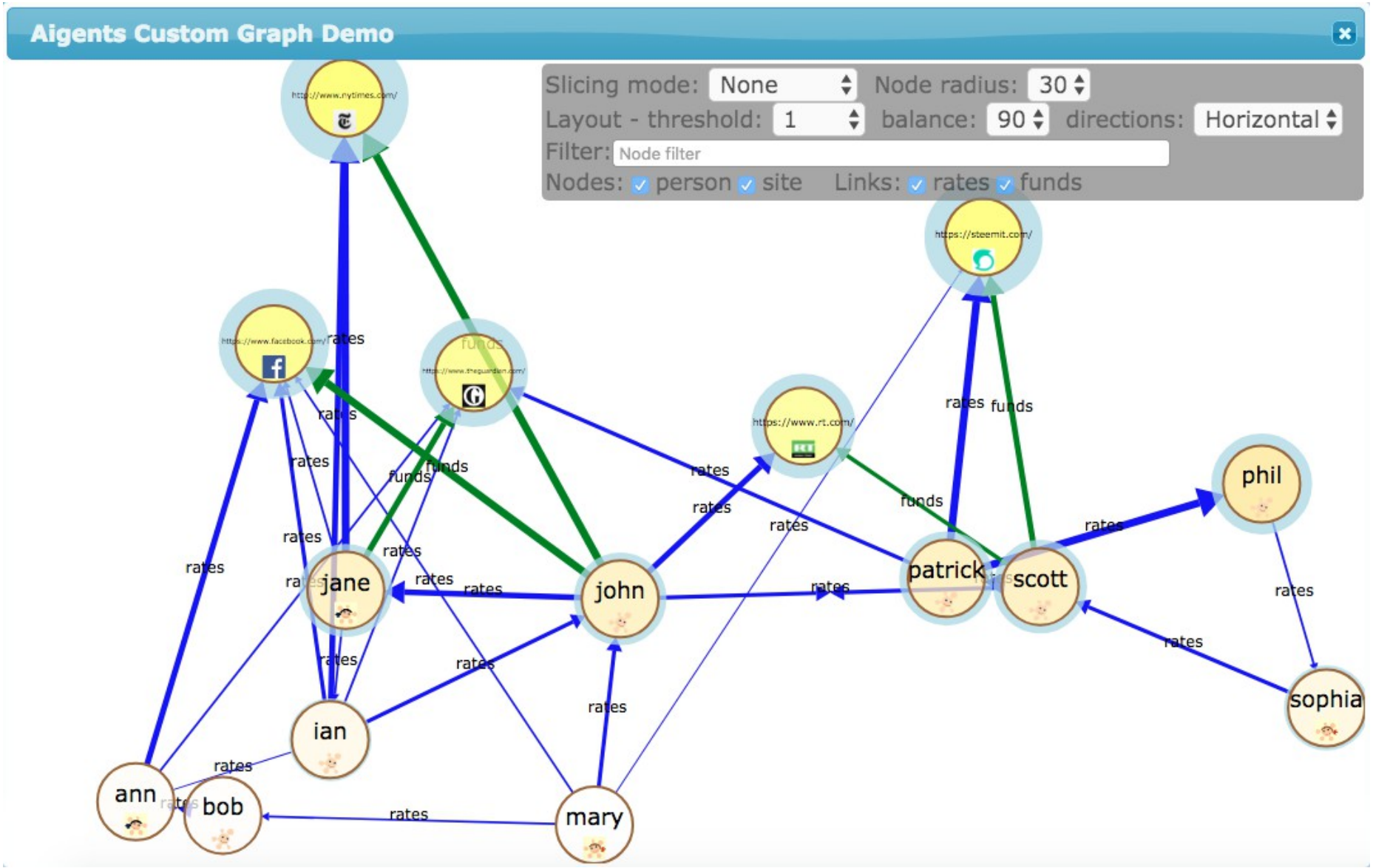
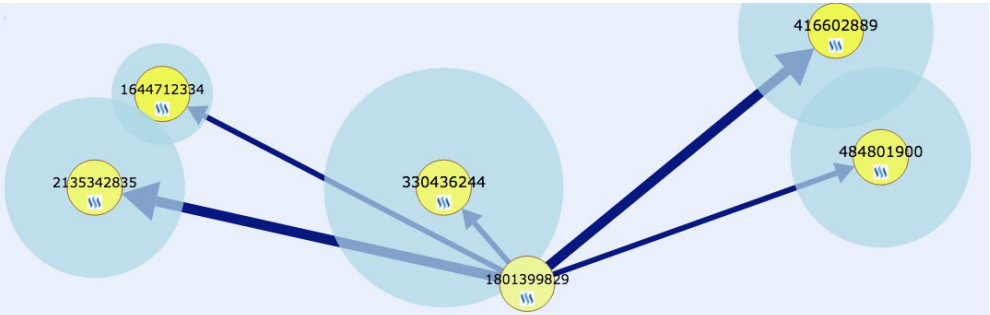
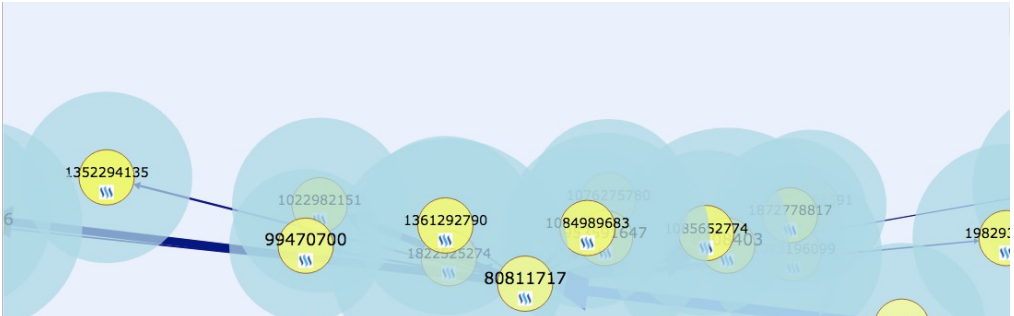
Social Networking: Helping community to understand opinion leaders and news agenda makers, helping leaders to understand audience (demonstration example, not real data).



Social Networking: Helping community members to understand themselves better and perform more efficiently online – using tracks in social networks and online resources, capture interests, relationships, communication patterns and social structures.

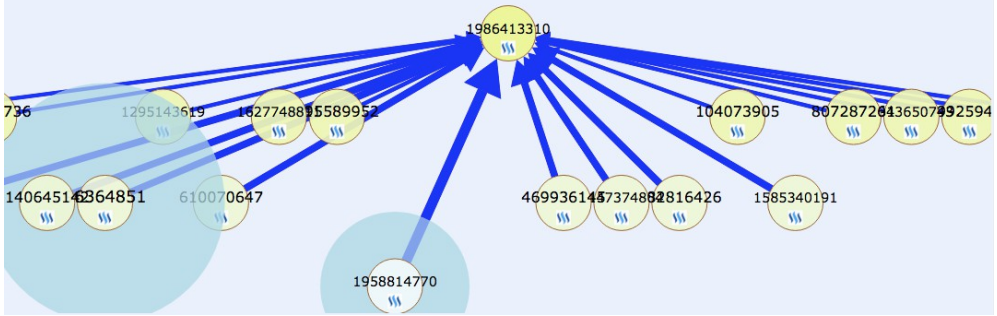


Social type: follower

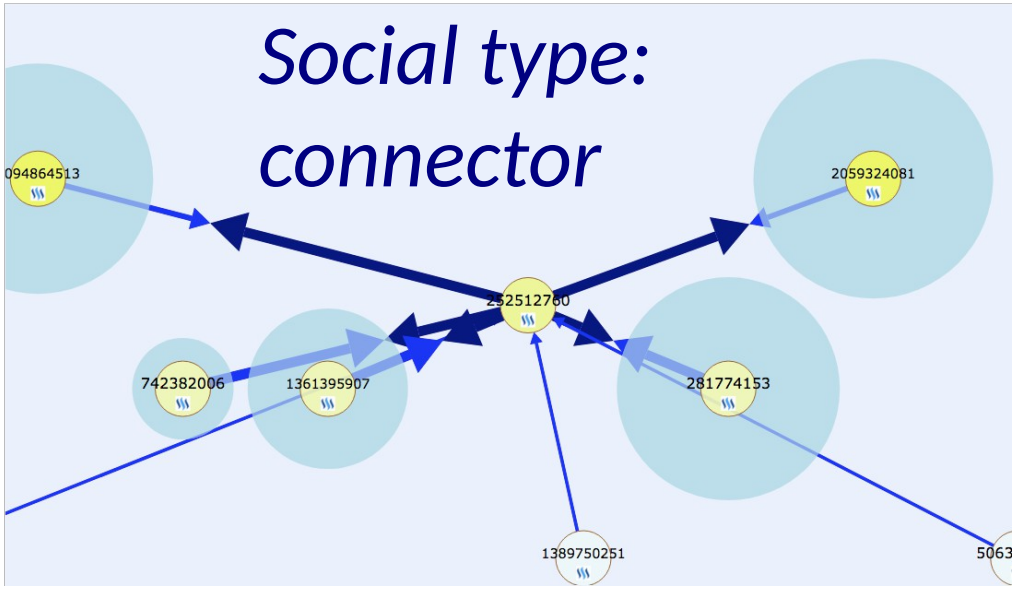


Social type: peer

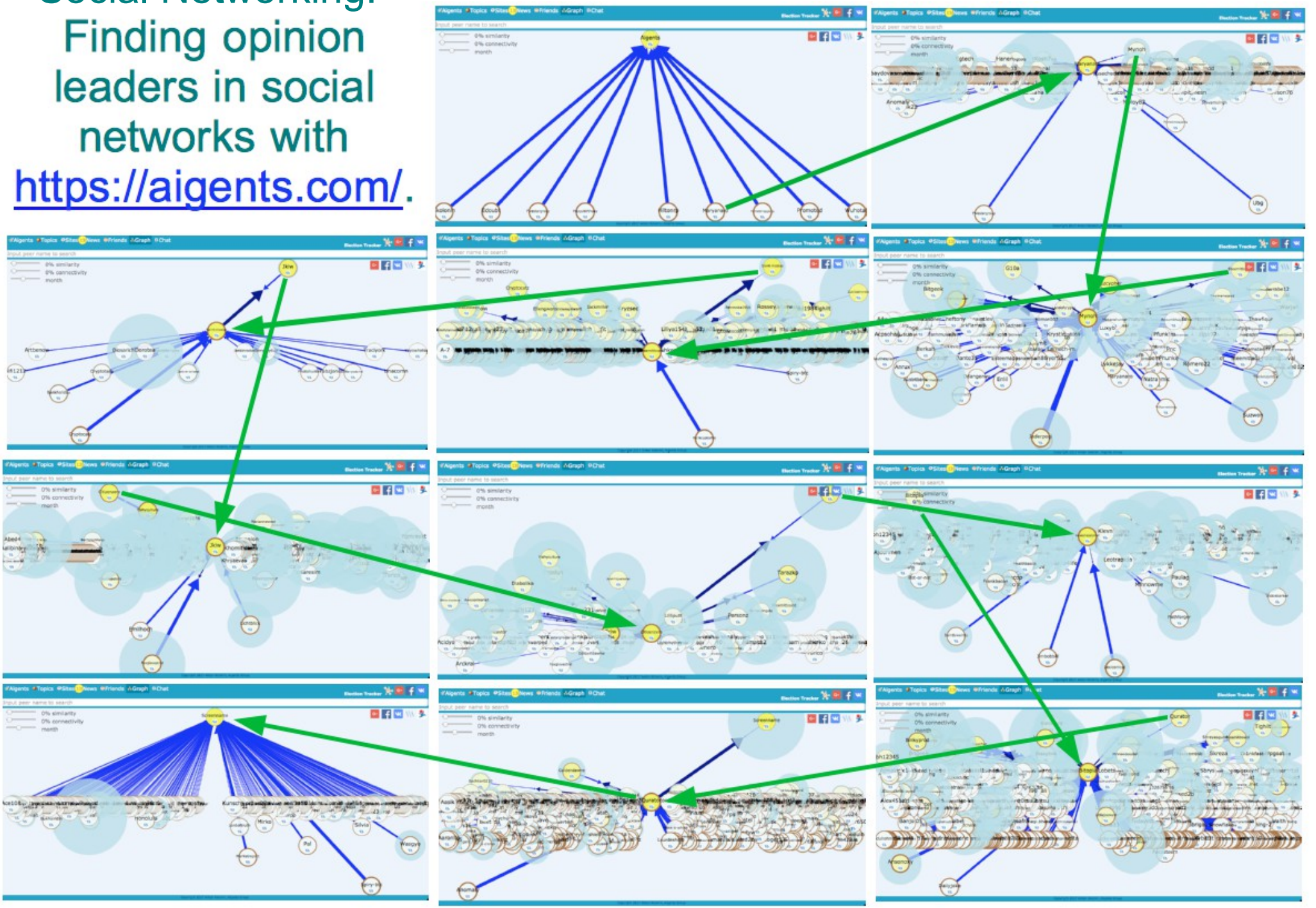
Social type: opinion leader



Social type: connector

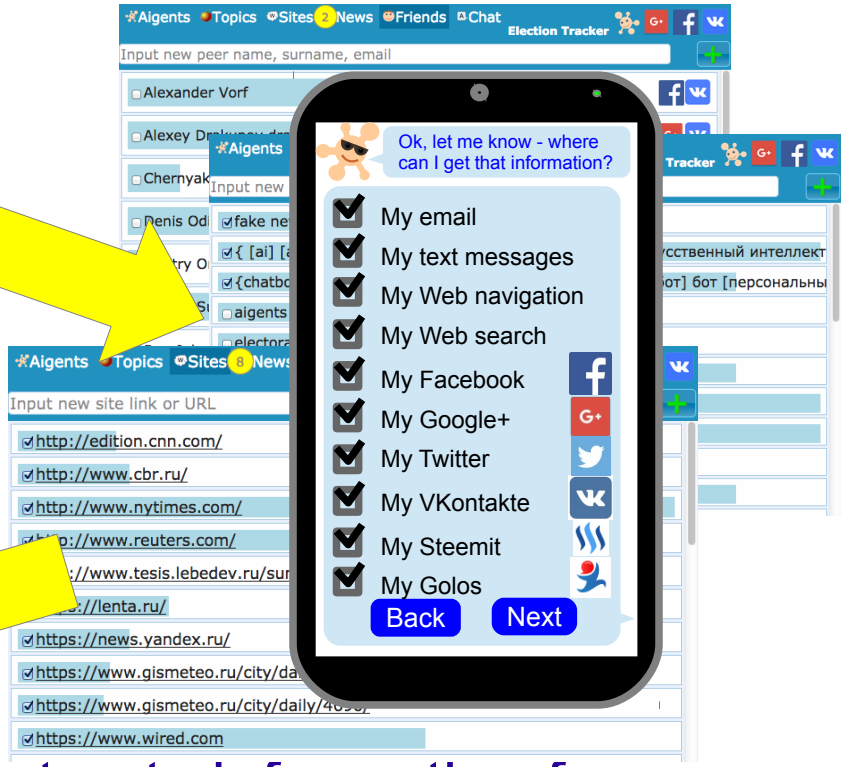


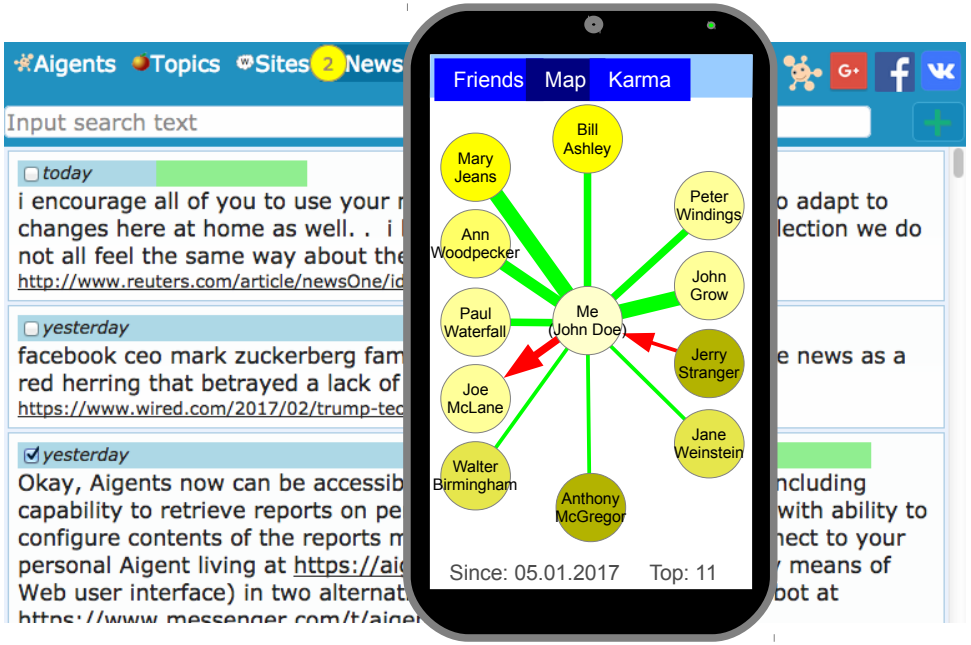
Social Networking: Finding opinion leaders in social networks with https://aigents.com/.



Socio-psychological Security: Encouraging users to conduct positive and effective communications with partners while guarding users from being manipulated themselves or being offensive to others.

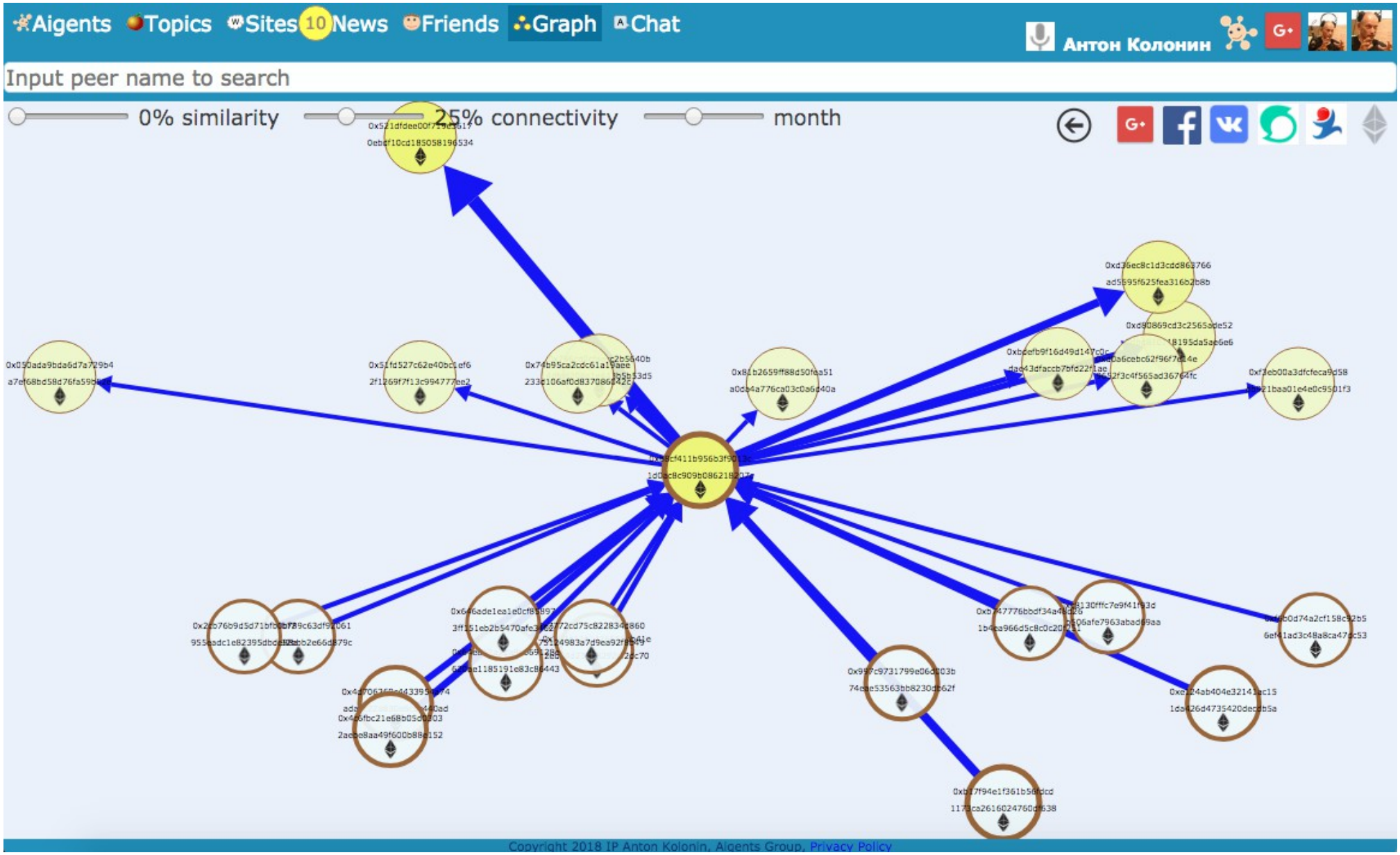
I connect my “virtual agent” to my social networks and communication channels and let it learn about my partners and preferences.



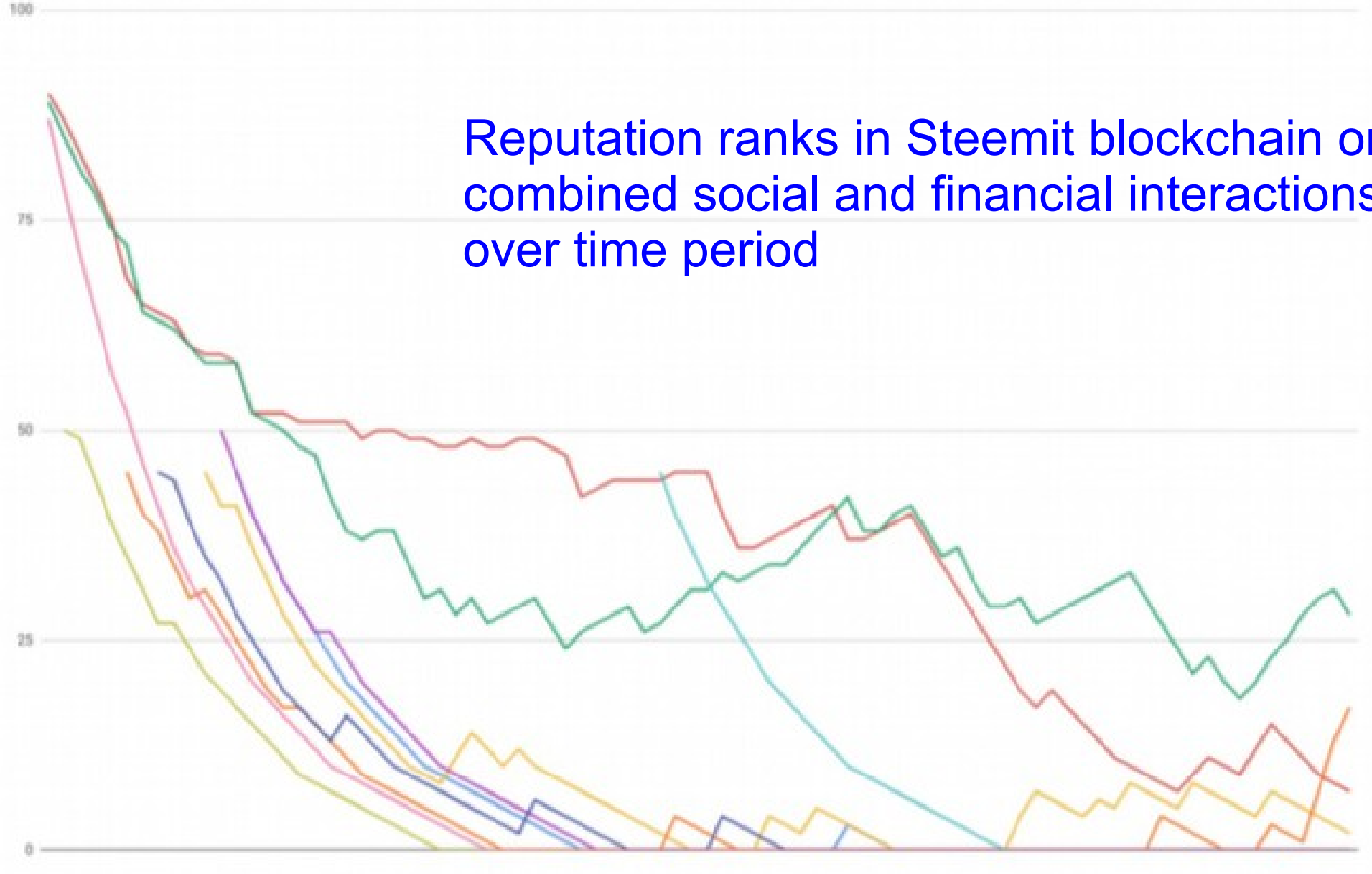


“Agent” extracts information from networks and online communications automatically, analyses all posts, comments and messages and alerts once there are important messages coming in or out – encouraging and positive or manipulative and offensive.

Financial Security: Making sense of financial ecosystem, cash flows and transaction patterns in blockchains such as Ethereum.

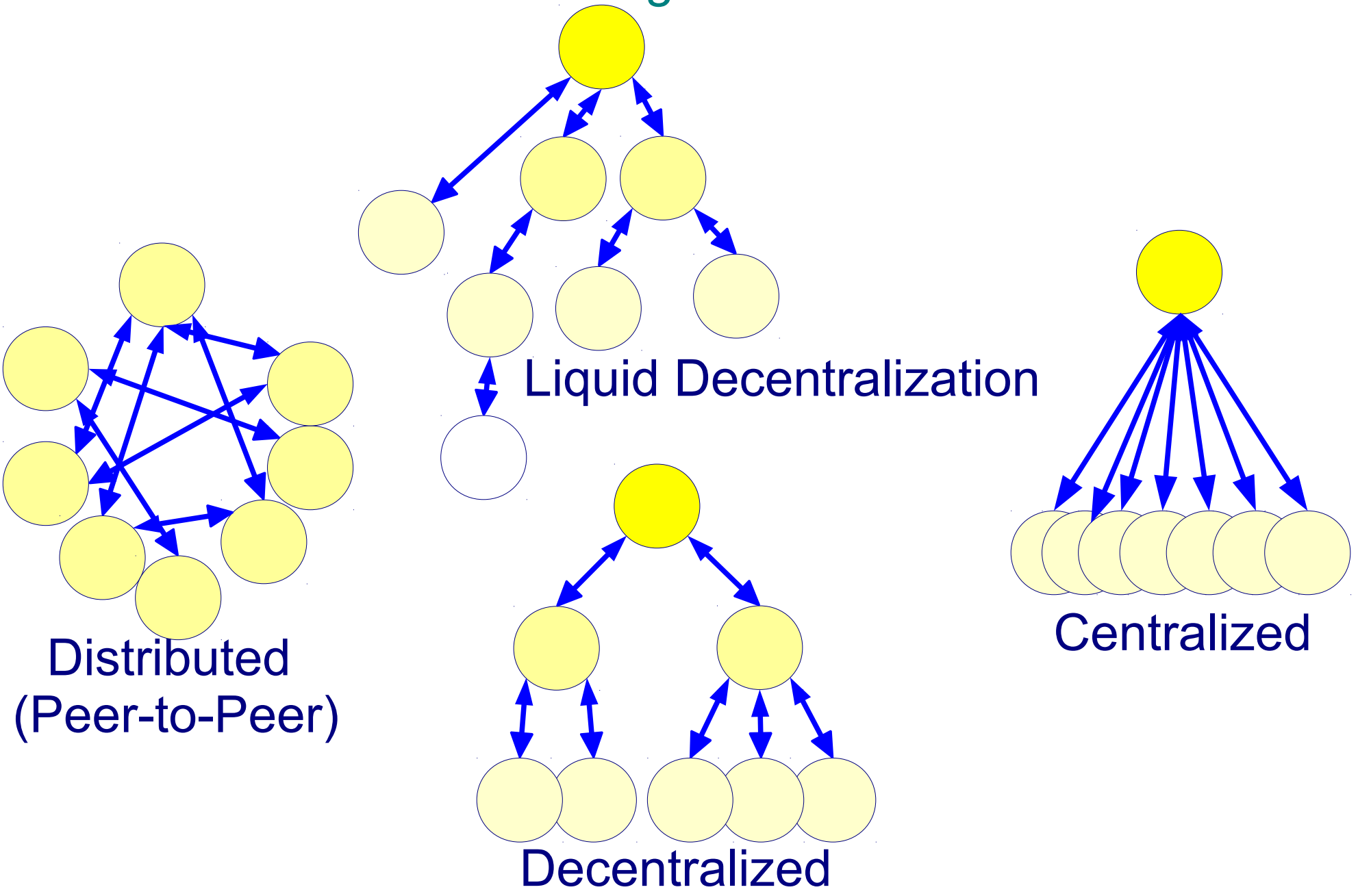


Financial Security: Evaluate trustworthiness and its dynamics for anonymous accounts in open public networks based on reputations computed on explicit and implicit rating data.



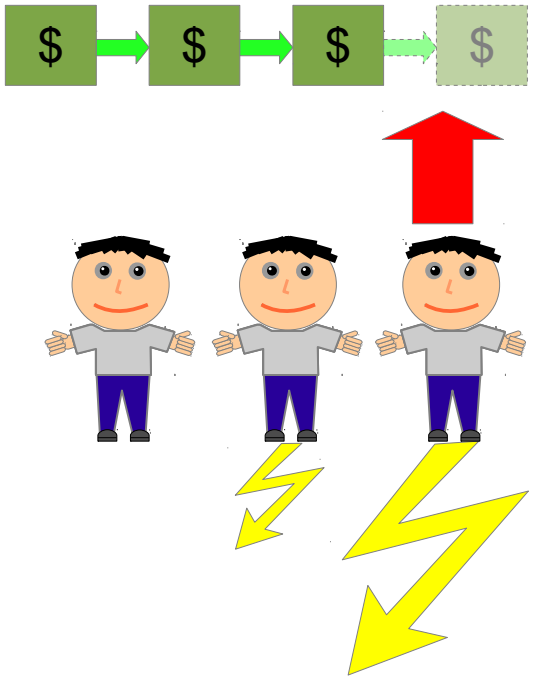
Reputation ranks in Steemit blockchain on combined social and financial interactions over time period

Managing Decentralized and Distributed Systems: based on Distributed Ledger and Consensus Protocols



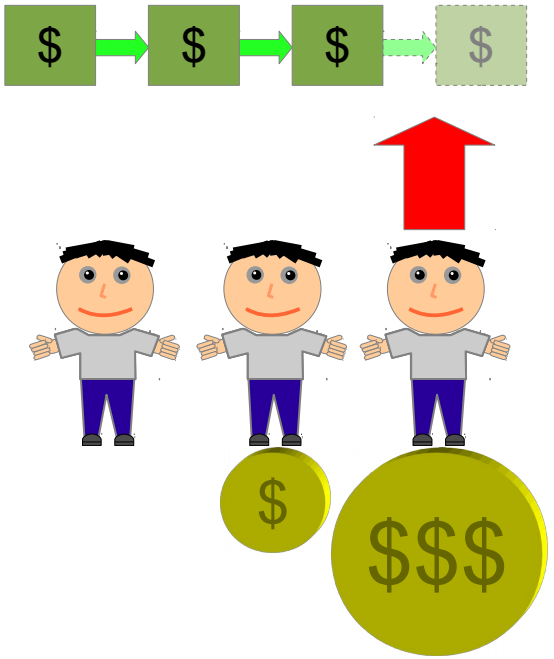
Consensus – technology to govern distributed multi-agent systems such as blockchains or societies, resistant to takeover and scam.

Proof-Of-Work



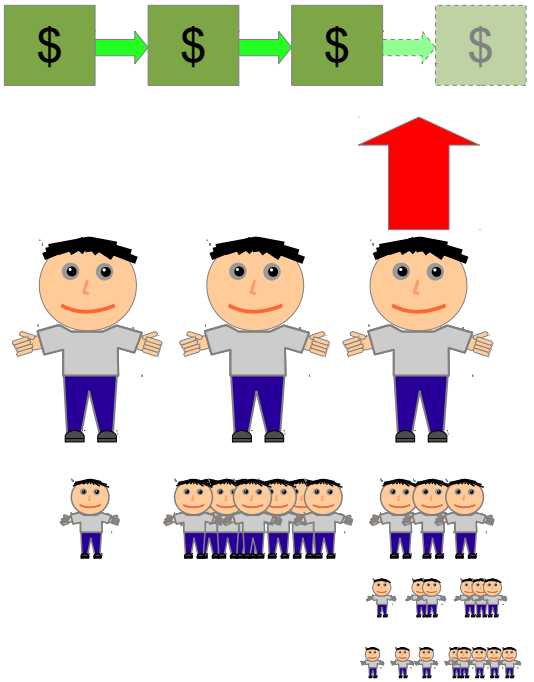
Force is Power:
Those who own more computing resources govern the network.

Proof-Of-Stake



Money is Power:
Those who have more money govern the network.

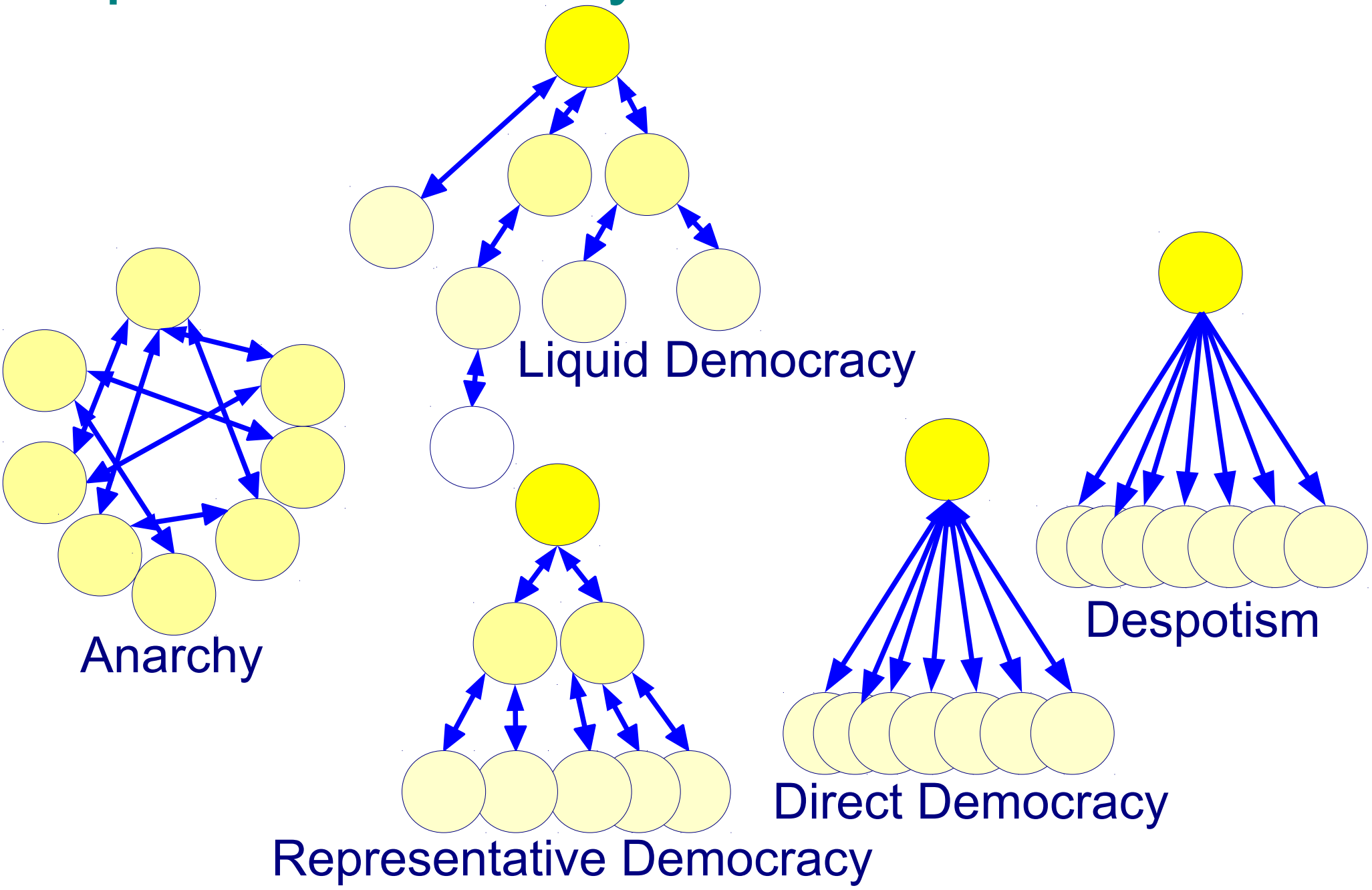
Proof-Of-Reputation



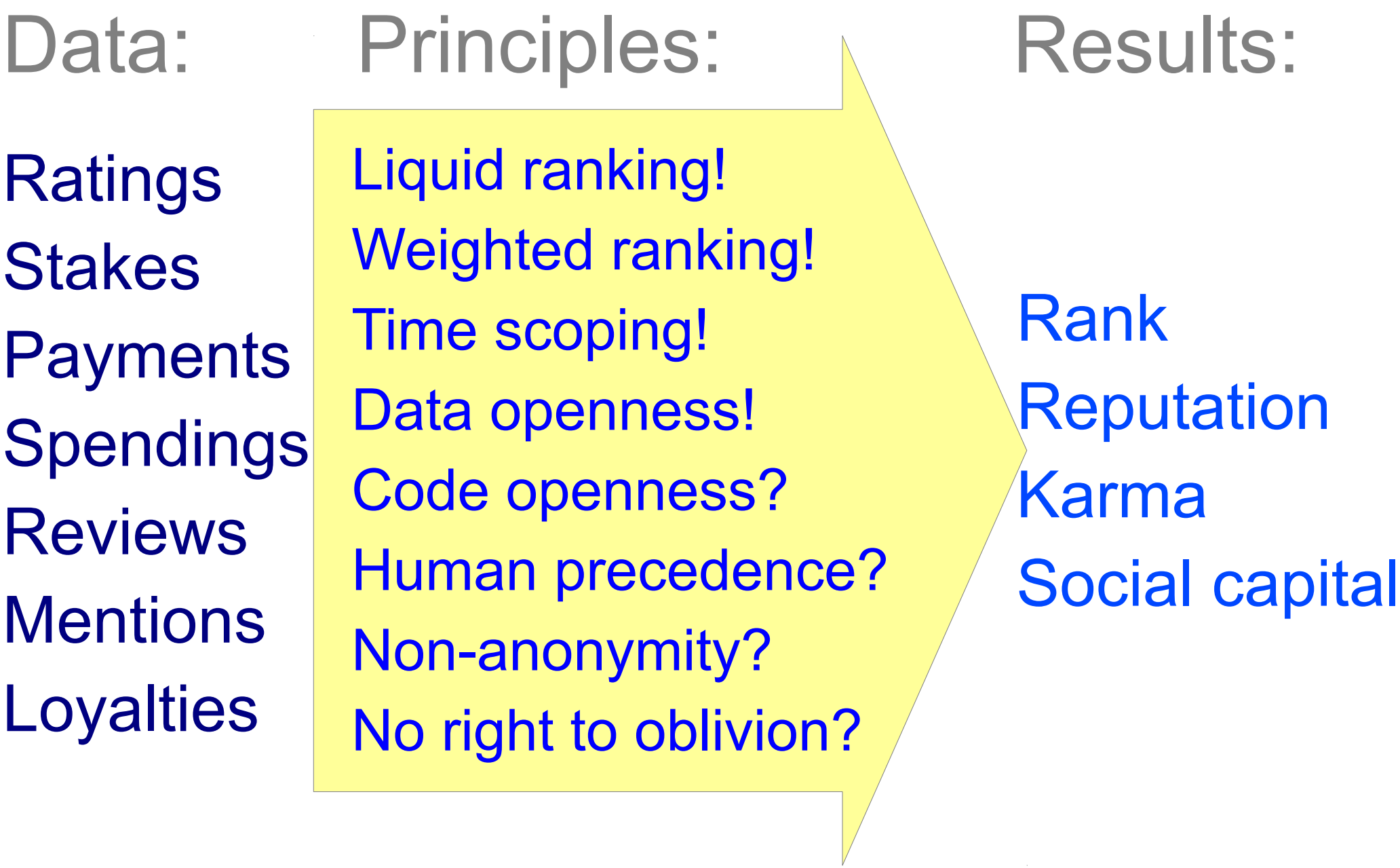
$$R_i = \sum_t \sum_j (R_j * V_{ijt})$$

Reputation is Power:
Those who earn a better reputation and a greater long-term audience base govern the network.

Liquid Democracy in Human Societies



Reputation Systems Ingredients



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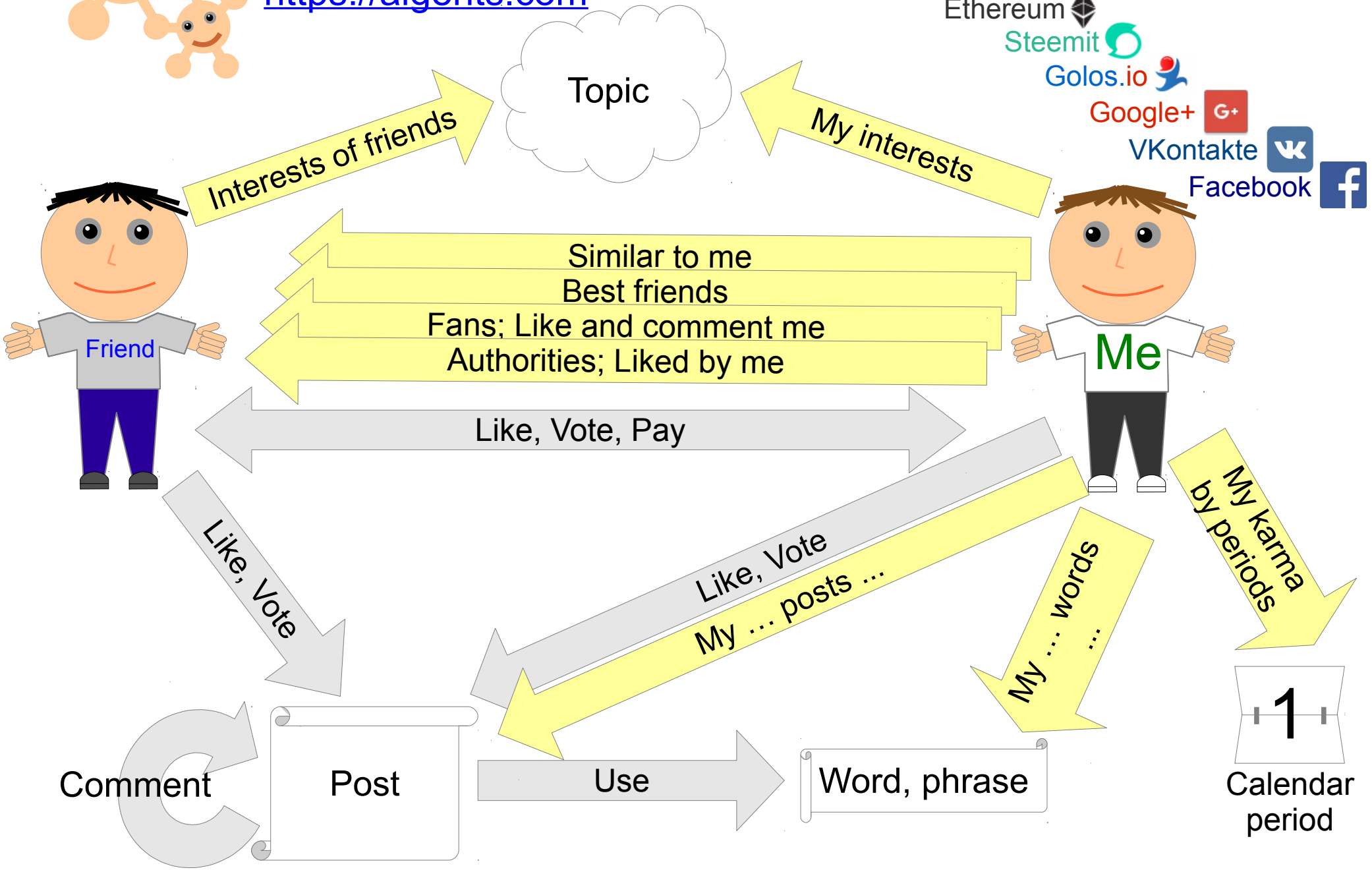
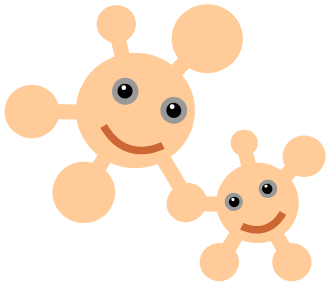
Reputation Agency

Ethereum
Steemit
Golos.io
Google+
VKontakte
Facebook





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Social Computing

Ethereum
Steemit
Golos.io
Google+
VKontakte
Facebook

Best friends

$$B_{ij} = (L_{ij}+C_{ij})*(L_{ji}+C_{ji}) / Max_{j=1,J} ((L_{ij}+C_{ij})*(L_{ji}+C_{ji}))$$

Fans and followers

$$F_{ij} = ((L_{ji}+C_{ji})/(1+L_{ij}+C_{ij}))/Max_{j=1,J} ((L_{ji}+C_{ji})/(1+L_{ij}+C_{ij}))$$

Like and comment me

$$F'_{ij} = (L_{ji}+C_{ji}) / \mathrm{Max}_{j=1,J} (L_{ji}+C_{ji})$$

Authorities and opinion leaders

$$A_j = ((L_{ij}+C_{ij})/(1+L_{ji}+C_{ji})) / Max_{j=1,J} ((L_{ij}+C_{ij})/(1+L_{ji}+C_{ji}))$$

Liked by me

$$A'_j = (L_{ij}+C_{ij}) / Max_{j=1,J} (L_{ij}+C_{ij})$$

My karma by periods

$$K_{it} = \sum_{j,t} (L_{ij}+C_{ij}) / Max_{t=1,T} \sum_{j,t} (L_{ij}+C_{ij})$$

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Weighted Liquid Rank

Algorithm 1 Weighted Liquid Rank (simplified version)

Inputs:
1) Volume of rated transactions each with financial value of the purchased product or service and rating value evaluating quality of the product/service, covering specified period of time;
2) Reputation ranks for every participant at the end of the previous time period.

Parameters: List of parmeters, affecting computations - default value, logarithmic ratings, conservatism, decayed value, etc.

Outputs: Reputation ranks for every participant at the end of the previous time period.

1: **foreach of** *transactions* **do**
2: **let** *rater_value* be rank of the rater at the end of previous period of default value
3: **let** *rating_value* be rating supplied by trasaction rater (consumer) to ratee (supplier)
4: **let** *rating_weight* be financial value of the transaction of its logarithm, if logarithmic ratings parameter is set to true
5: **sum** *rater_value*rating_value*rating_weight* for every ratee
6: **end foreach**
7: **do** normalization of the sum of the muliplications per ratee to range *0.0-1.0*, get *differential_ranks*
8: **do** blending of the old_ranks known at the end of previous peiod with differential_ranks based on parameter of conservatism, so that *new_ranks = (old_ranks*conservatism+N*(1-differential_ranks))*, using decayed value if no rating are given to ratee during the period
9: **do** normalization of *new_ranks* to range *0.0-1.0*
10: **return** *new_ranks*

- R_d - default initial reputation rank;
- R_c - decayed reputation in range to be approached by inactive agents eventually;
- *C* - conservatism as a blending "alpha" factor between the previous reputation rank recorded at the beginning of the observed period and the differential one obtained during the observation period;
- *FullNorm* – when this boolean option is set to *True* the reputation system performs a full-scale normalization of incremental ratings;
- *LogRatings* - when this boolean option is set to *True* the reputation system applies *log10(1+value)* to financial values used for weighting explicit ratings;
- *Aggregation* - when this boolean option is set to *True* the reputation system aggregates all explicit ratings between each unique combination of two agents with computes a weighted average of ratings across the observation period;
- *Downrating* - when this boolean option is set to *True* the reputation system translates original explicit rating values in range *0.0-0.25* to negative values in range *-1.0* to *0.0* and original values in range *0.25-1.0* to the interval *0.0-1.0*.
- *UpdatePeriod* – the number of days to update reputation state, considered as observation period for computing incremental reputations.

Reputation systems and liquid democracy may become key elements in human-computer environments

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