Optimizing Performance of Crowdfunding Actors using Neural Networks

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Abstract— Crowdfunding is the practice of funding a common source or venture by various resources that include capital revenue, investment of monetary shares, or hard revenue which is typically done via the internet services. It includes non-profit organizations, donations, creative works, products etc.[1] It facilitates the raising of capital for a variety of purposes, using numerous variations of the model by bringing in multiple scalable actors and platforms that define themselves in a sectoral vertical rather than by the type of finance they provide, or the type of ideology being invested upon.

As referred, by one early-stage equity expert, described it as "the practice of raising funds from two or more people over the internet towards a common Service, Project, Product, Investment, Cause, and Experience or SPPICE."[2] From Generations, the technique has been disciplined to various genres of the society using statistical methods by the agents to necessitate the goal of achieving an idea into a project.

This paper presents the idea of dealing with the optimization of the results of the Crowd Funding enabling a win-win situation to all three parties involved in the transaction, using a custom-built highly sophisticated Neural Schema. The intricacies involved in establishing connectivity between the investor and entrepreneur is fore come by involving adaptation and learning algorithm, implemented in particular by neural networks by a simple convolution designed in a flow to implicate 'Trust' as a factor in the transaction. The initial transaction involves in raising the required fund from a particular investor, followed by which the subsequent transactions focused to achieve more than a minimum profit to all three individuals, the first focus being on entrepreneur which means a keep-it-all strategy is considered in the beginning and moving toward achieving maximum profit for all three, resulting in All-or-Nothing(AON). The so designed pattern throughout runs on unsupervised learning mechanism for the neurons which are exposed to uncertain data, and how it has a natural proclivity to tend to achieve AON regardless of the sensitivity of the information required and the variability of parameters at different stages.

Post successful implementation of the said work-set would lead to a robust and a more optimized mechanism of handling situations where multi-party investments exist.

Index Terms— Crowd Funding, Artificial Neural Networks, All or Nothing, SPPICE, Keep-It-All, Neural Schema.

1 INTRODUCTION

THE concept of crowdfunding[3] can be seen as part of the broader concept of crowdsourcing, which uses the "crowd" to obtain ideas, feedback and solutions in order to develop corporate activities.

The process should take place when a profit oriented firm out- sources specific tasks essential for the making or sale of its product to the general public (the crowd) in the form of an open call over the internet, with the intention of animating individuals to make a [voluntary] contribution to the firm's production process for free or for significantly less than that contribution is worth to the firm.[4]

The Crowdfunding model is predominantly fuelled by three types of actors: the project entrepreneur who proposes the idea and/or project to be funded; investor or groups who support the idea; and a moderating organization or agent that brings the parties together to launch the idea, also called the platform. In the real life scenarios, the agent/the platform acts as a bridge for the entrepreneur and the investor to come on the same/similar level to discuss the ideology on which the preposition is done in the upcoming scaled tenure. There are two basic models Keep-it-all (also referred to as KIA), where the entrepreneur keeps all the funds raised irrespective of the goal being met and All-or-Nothing (also referred to as AON), where the entrepreneur keeps nothing unless the goal is met, are dealt in this paper.

The distinction with open-source practices becomes even more obvious when related to Crowdfunding, since capital cannot be shared. Unlike an idea or a software code, capital is not a public good in the economic sense that assumes non-rivalry and non-excludability. Under these conditions, a public good is a good that can be used by many consumers at the same time, without duplicating costs.

The tailored concept of plotting statistics for two different parties involved is done by the agent to retrieve the best people to land in a transaction, has been followed lately but has been resultant to the cause of arrears as it is a human effort and several factors might have been ignored. Particularly the inferential statistics involves certain errors. Also the idea of computing the transaction feasibility is done by studying or keeping only the current financial suite of the investor and the entrepreneur into consideration and not the trust they might have developed over a period of time formed due to various non-functional factors like past failure/success history in terms of ideology and implementation. Statistics laws are true on average. Crowdfunding statistical methods usually employ penalized logistic regression method to predict the dependent variable *funded*.

Due to the same issues persisting, during a multiparty transaction, the data does not suffice the matching of the best available combination of investor and entrepreneur. Also the entrepreneurs' view of the investment will be the only guideline for the investors or the mediocre, causing a major constraint of the not optimized profit realization. With our focus firmly placed on our client's specific market and competitors, our aim is to do the legwork so that we are able to provide a solid basis of information relevant to informing and assisting in strategic and operative corporate decision-making, by implementing Neural Networks to accomplish the linking of the right investor to the right entrepreneur. Indemnifying the loss incurred due to the non-optimized profit realizations done in support of statistical methods, a generic pattern of computing such situations has been introduced, we have been able to merge our well-founded research ingenuity and structured analytical approach with our keen business insight to deliver the high standard of service our clients require and expect.

To do so, a generic neural graph has been introduced where more than one neuron mode can participate with explicit integration of 'Trust factor' as a pre-primary composite of the complete pattern.

2 IMPLEMENTATION

2.1 Implementation of Neural Schema

In order to define the basic lingual of neural schema pattern required for optimizing profit, the neurons will get trained using unsupervised learning being exposed to various input sets, being able to predict the most appropriate combination of investor-entrepreneur.

To achieve this, various inputs should be made available for different neurons and thus requires huge data to be segregated and stored in an effective way which paves way for the use of neural schema, which will enable the development and execution of complex behaviours involving adaptation and learning.

There are two types of schemas internal and external. *The internal schema* describes how the data will be physically stored and accessed, using the facilities provided by a particular DBMS. But we require a database which has different views for different users. In a relational DBMS, the conceptual schema describes all relations that are stored in the database. *The external schemas* specify views that enable different users of the data to see it in different ways. Hence we use external schema in our neural schema implementation. As a simple example, some users of policy data might not require details of the commission paid. By providing them with a view that excludes the Commission Rate column, we would not only shield them from unwanted (and perhaps unauthorized) information, but also insulate them from changes that might be made to the format of that data.

2.2 Mathematical Implementation

2.2.1 Arriving at All-Or-Nothing from Keep-it-All:

To optimize the profit for Investor, Entrepreneur and Agent, we start with the model of Keep-it-All, which is focused for the maximum profit for the Entrepreneur initially. The Profit term 'P' made in a transaction involving all three parties, is proportional to the ratio of revenue $\sum$ and investment 'I'.

$$P\alpha \sum /I.$$

Assuming, a constant 'k' to remove the physical proportionality,

$$P = k * \sum /I$$

The initial set of transactions focus more on the maximum profit segregation for the entrepreneur, being the originator of the idea.

In the subsequent transactions, the amount made by the entrepreneur 'Ep' will get increased along with the importance given to maximize Investors profit 'Ip'. Post these transactions, the amount made by both entrepreneur and investor constantly surge and also the agent will be focused to make money out of it for establishing the connectivity between entrepreneur and investor, the agent's profit being 'Ap' . Now this in mathematical form will be:

$$(I_p * \sum /I)\alpha(A_p * \sum /I)\alpha(E_p * \sum /I)$$

Furthermore we need to consider the intricacy that out of the three important actors in Crowdfunding, it is the agent that gets minimum among all three, for the simple reason that he is just feeding input to an already laid network. Hence we record the maximum profit obtained by the entrepreneur and investor and not the agent as depicted, and hence seen like the below.

$$\Delta_{(0\to x)}x + \delta_A = \sum_0^x x * E + \delta_E = \sum_0^x x * I + \delta_I$$

$$^{0\to x}(\frac{\partial}{\partial x}(x)) * A = \int_0^a x * E = \int_0^a x * I$$

The pictorial representation take of the learning curve is shown in the below figure.

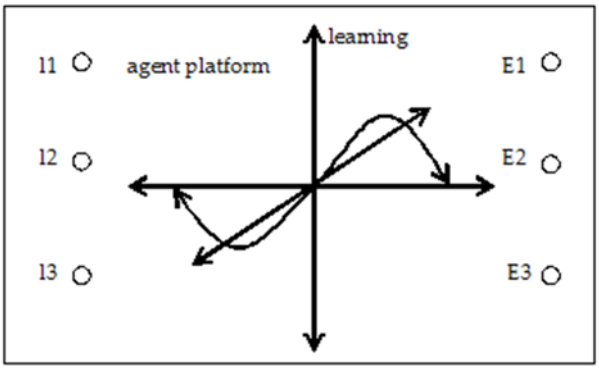

Fig. 2. Unsupervised learning curve for entrepreneur, agent and investor neurons depicting the continuous learning leading to optimizing of the profit for all three actors.

This ultimately, leads to a model which makes maximum profit in its own way to all three and is achieved by a continuous learning mechanisms, which gives us

$$I \alpha A \alpha E.$$

2.2.2 Training of Neurons representing Entrepreneur, Investor and Agent:

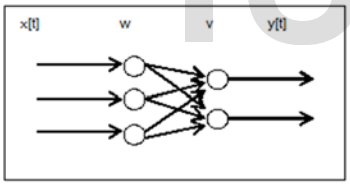

Fig. 1. Neural network representing the entrepreneur, agent and investor neurons and the resultant output y[t] is shown for the considered weight 'w'.

The three actors in a transaction will have different set of input data vector, hence Independent Components Analysis is used. When the input is composed of a combination of independent signals, linear methods such as principal components analysis, in general are incapable of separating the independent sources. Jutten and Herault developed a learning procedure, INCA, for extracting statistically independent components of the input vector, when the input vector x is modelled as an additive mixture of unknown independent signal components

$$x(t) = Az(t) \quad (1)$$

where the matrix A consists of unknown real scalars. A recursive network very much like Foldiak's symmetrical net, the figure shown above, is used to produce outputs

$$y_i(t) = x_i(t) - \sum_{k \neq i} v_{ik}(t) y_k(t) \quad (2)$$

which come to approximate the independent signal components. Using the fact that if all higher order moments of two signals are uncorrelated, the signals are independent, a modified Hebb rule is proposed.

$$v_{jk}(t) = v_{jk}(t-1) + ef(y_j(t))g(y_k(t)) \quad (3)$$

This rule de correlates higher-order moments f and g of the inputs. One choice of functions used in many of Jutten and Herault's simulations, which they claim worked well for most of their test problems is

$$f(x) = x^3 \quad (4)$$

$$g(y) = tan^{-1}(y) \quad (5)$$

2.2.3 Inclusion of 'Trust' factor

Given the lack of knowledge of crowd funders and the motivation forces affecting the engagement practically it is not feasible to expect the appropriate behaviour of the schema being implemented. Therefore, the pragmatic involvement of factors personalized to the investor/entrepreneur is important, and hence we have to weigh whether there are any intrinsic or extrinsic motivational factors and if so what sort of relationships exist between the nature of incentives, profit sharing, and peer influence on crowd funders' behaviour.

Research in related fields such as crowdsourcing, online collaboration, investment decision-making and informal investing will be used as a starting point in order to investigate the relationships which will be tested through a quantitative analysis. At the very first implementation, for every defined project there is a project profile in the system. The possible status of a defined project can be any of the below:

1. Active (defined project where the project sponsor is actively seeking financing).
2. Closed/Successful (defined project that is closed because the targeted financing was achieved).
3. Closed/Failed (defined project that is closed but the targeted financing was not achieved).
4. Pulled (defined project was posted on a Crowdfunding website and then removed from that website).
5. Cancelled (defined project was cancelled by the project sponsor).
6. Unknown.

The investor will look into 'Active' for investing, but also to others to know the history of a particular

entrepreneur. Likewise before launching a project, the entrepreneur should know the behaviour of the investors before getting involved in the business. Hence there should be a parameter which decides the transaction survival, based on the human intrinsic and extrinsic behaviour which is 'Trust'. Inclusion of 'Trust' factor comprises of credibility, Learning function, Stability and Capital stability to ensure the pellucidity and reliance on the transactions or the output of the Neurons itself, in the above input vector set for different neurons eliminating the need for looking at whole of tables for an end user.

The designed pattern adds structure and transparency to crowdfunding by aggregating project financing data and social networking data which results from the process of Crowdfunding projects, regardless of the type of projects or geography of projects, incorporating Independent component analysis, an unsupervised learning technique for which tools for building applications for optimizing profit for all three actors is developed, it makes Crowdfunding and tracking other types of company transactions more efficient for market participants with analytical software resulting from data collection combined with the predicted outcome of the best combination of the Investor and Entrepreneur.

Thus, the raw data from a variety of public sources including the Internet, disclosure documents, press releases, and social networking platforms, is used as the foundation for the system and the building blocks for developing project profiles for analysis. The various attributes associated with all three different neurons i.e. for investor neuron, entrepreneur neuron and the agent neuron, can be fed from the database either manually or can be automated to trigger a query so as to fetch the relevant data.

3 Practical Implementation

Crowdfunding can be applied to fund a vast range of projects, including but not limited to business ventures, creative arts, NGO funding, and charities. Currently, a substantial portion of Crowdfunding platforms revolve around creative projects with music[9] and movie[10] projects taking centre stage. However, it is important to acknowledge that Crowdfunding is being adapted by other industries as well, including most recently those of journalism (spot.us12), software (Blender Foundation13) (Lambert and Schwienbacher, 2010) and sporting clubs (MyFootballClub14).

This unique idea, optimizing the benefits of Crowdfunding can add to the debate of value creation in and through online collaboration. Other potentially relevant implications can be found in areas such as the predictive or trendsetting powers of Crowdfunding projects in complex sectors, such as creative arts and perhaps in terms of informal investing and venture capital.

For equity based Crowdfunding, the algorithm matches the opposite investor with entrepreneur inclusive or exclusive the agent, making optimum profit for all three. For example if Entrepreneur requires 10 million fund to be raised, then the best match would give close to more than 10% of the required amount as the sum of related investors. At the successful close, the last transaction will achieve the maximum profit for all three, the agent gaining the least among them.

4 Conclusion

Creative individuals increasingly rely on online Crowdfunding platforms to crowd funding for new ventures. For novice Crowdfunding project creators, however, there are few resources to turn to for assistance in the planning of Crowdfunding projects. This is the first attempt towards establishment of a tool for neophyte project creators to get feedback on their project designs. One component of this tool is a comparison to existing projects. As such, we have applied unsupervised learning to train the neurons depicting the three actors, influencing concept of a successful online Crowdfunding project at the time of project launch. Currently prediction with roughly 77.45% accuracy, whether a project will be successful or not (is achieved which is 160+ days old analysis). The classification results will eventually power a prediction segment of the proposed feedback tool. Future work involves turning the results of the machine learning algorithms into human-readable content and integrating this content into the feedback tool.

5 Future Enhancement

A possible future enhancement encompasses publication, over the Internet and through the system web interface, of news or editorial stories based on the analytical software employed by the system. These may be supplemented by independent research and include such items as information about the founders of the project, the project operating sector, the project idea, the project financials, the project business plan, etc. A community component that allows other people to compose write-ups on the defined project, blog and comment about the defined project, rank the popularity or viability of the defined project, post third-party research on the defined project, and include news postings related to the defined project is also part of the system. This type of information can generally be referred to as soft data as opposed to statistical facts, financial information and identification information which is often referred to as hard data. This can also include data storage for similar projects posted on, for example, listing websites and their associated

data including things like type of project, amount of financing raised/sought, status of a defined project, venue or location of the intended activities related to the defined project, number of investors, and geography. Users of the system will be able to see a list of all the fees that the project sponsor paid, including fees paid to any listing website, and any other fees including finder fees, and professional fees.

Once the defined project has been successfully funded and the defined project is converted to full operations (referred to as the "funded company" or the "company") in order to implement the intentions and purposes of the defined project, the system allows for posting of post-deal information such as company performance data after funding, links to the company's website, news about the company, who the company's legal counsel or accountant is, etc. A benefit of the invention is in tracking the entities involved with these deals such as the service providers. This allows numerous stake holders to follow the success/failure and activities of the defined project and the entities associated with the defined project. The system accordingly allows for blogging or social networking type commentary and reviews by third-parties related to experiences with the defined project.

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