



CRM For Non – Profit Organizations Using Machine Learning Heuristics

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Abstract—There are many non-profit organizations incorporated but only a few survive the long run. This is because of the increased financial constraints and lack of volunteers. Considering the fact that the primary source of income for such organizations are donations and the primary source of manpower is by word of mouth and mass communication means, this proposed hypothesis is to connect non-profit organizations to potential volunteers and donors who will be interested in the organization's cause and vision, eventually supporting them by donations and manpower during community events hosted by the organization, at an affordable cost.

Keywords—machine learning applications, non-profit organizations, social networks.

I. INTRODUCTION

Social media is always been and is a platform to share a person's interests by sharing status updates and post about things which the user is interested and concerned about. Now that smartphones have become cheap and affordable and on the other hand social networking sites getting more popular and common, we're left with large sets of data which can be processed to gain insights. One such attempt is to classify user interests by parsing the status updates which the user posts through machine learning algorithms, predict their area of interest and eventually connect them to non-profit organizations who work in the same domain as of the user's interest.

II. LITERATURE REVIEW

Quora, an online forum where you can ask questions and get them answered by the worldwide community uses one such feature where your questions will be automatically classified into their topic categories so that experts and users who are sound in that topic can address the proposed question. Even though Quora uses complex and complicated algorithms, there has to be a simpler way which can be modeled and used by

non-profit organizations at an affordable cost. E-Commerce sites like eBay and Amazon also use a similar mechanism to classify user interests which are commonly referred as 'recommender engines' which processes the history of your online purchase and suggests commodities which you'll be interested in. Facebook, the largest social-networking site is no exception to this concept of topic classification. The Facebook platform analyses the statuses and posts the users share and categorize them as 'trending topics' in our newsfeed.

These initiatives were the motivation for our proposed hypotheses to classify user interests in a simple and intuitive which can be cost efficient.

III. ANALYSIS

A. Existing System

By consulting many non-profit and non-government organizations, it is found that donors are approached irrespective of their interest and eventually leading to the rejection of the proposal. Also, this is done through mass communication methods like bulk emailing and word of mouth, which in turn brings down the organization's credibility due to spam flags and lack of response.

1) Professional Fundraisers

Many non-profit organizations take advantage of the services of professional fundraisers. These fundraisers may be paid for their services either through fees unrelated to the amounts of money to be raised or by retaining a percentage of raised funds (percentage-based compensation). The latter approach is expressly forbidden under the Code of Ethics of the Association of Fundraising Professionals (AFP), a professional membership body. However, by far the most common practice of American non-profits is to employ a staff person whose main responsibility is fund raising. This person is paid a salary like any other employee and is usually a part of the top management staff of the organization.

Some non-profit organizations nonetheless engage fundraisers who are paid a percentage of the funds they raise. In the United States, this ratio of funds retained to funds passed on to



the non-profit is subject to reporting to a number of state's Attorneys General or Secretaries of state. This ratio is highly variable and subject to change over time and place, and it is a point of contention between a segment of the general public and the non-profit organizations.

The term "professional fundraiser" is in many cases a legislated term referring to third-party firms whose services are contracted for, whereas "fundraising professionals" or development officers are often individuals or staff at charitable non-profits. Although potentially confusing, the distinction is an important one to note.

Fundraising professionals, who have been employed with not-for-profit organizations as fundraisers or as fundraising consultants, for at least sixty (60) months, can become certified as a Certified Fund Raising Executive (CFRE). The CFRE credential is administered by CFRE International, an independent 501(c)6 whose sole mission is dedicated to setting standards in philanthropy through a valid and reliable certification process.

A specialty within the fundraising profession is the "grant professional." Grant professionals with at least three years of experience and other requirements can become certified as Grant Professional Certified (GPC). The GPC credential is administered by Grant Professionals Certification Institute, whose mission is to strengthen the nonprofit sector's ability to pursue and maintain public sector and private sector funding by promoting competency and ethical practices within the field of grantsmanship. The certification process is designed to measure minimum knowledge and skills related to all aspects of grant development and management, including but not limited to such areas as grant research or pre-production, grant construction, grant reporting, public sector funding, private sector funding, ethics and grant accountability.

2) Religious Organizations

Equally important are fundraising efforts by virtually every recognized religious group throughout the world. These efforts are organized on a local, national, and global level. Sometimes, such funds will go exclusively toward assisting the basic needs of others, while money may at other times be used only for evangelism or proselytism. Usually, religious organizations mix the two, which can sometimes cause tension.

3) Political Campaigns

Fundraising also plays a major role in political campaigns. This fact, despite numerous campaign finance reform laws, continues to be a highly controversial topic in American politics. Political action committees (PACs) are the best-known organizations that back candidates and political parties, though others such as 527 groups also have an impact. Some advocacy organizations conduct fundraising for-or-against policy issues in an attempt to influence legislation.

4) Public Broadcasting

While public broadcasters are completely government-funded in much of the world, there are many countries where some funds must come from donations from the public. In the United States, less than 15% of local public broadcasting stations' funding comes from the federal government. Pledge drives, a type of annual giving, commonly occur about three times each year, usually lasting one to two weeks each time. Viewership and listenership often decline significantly during funding periods, so special programming may be aired in order to keep regular viewers and listeners interested.

5) Types

Many non-profit organizations receive some annual funding from a financial endowment, which is a sum of money that is invested to generate an annual return. Although endowments may be created when a sizable gift is received from an individual or family, often as directed in a will upon the death of a family member, they more typically are the result of many gifts over time from a variety of sources.

Non-profit organizations also raise funds through competing for grant funding. Grants are offered by governmental units and private foundations/ charitable trusts to non-profit organizations for the benefit of all parties to the transaction.

A capital campaign is when fundraising is conducted to raise major sums for a building or endowment, and generally, keep such funds separate from operating funds. These campaigns encourage donors to give more than they would normally give and tap donors, especially corporations and foundations who would not otherwise give. A capital campaign normally begins with a private phase before launching a public appeal.

Charitable giving by corporations is estimated to be \$15.29 billion in 2010. This consists of corporate grants as well as matching gift and volunteer grants. 65% of Fortune 500 companies offer employee matching gift programs and 40% offer volunteer grant programs. These are charitable giving programs set up by corporations in which the company matches donations made by employees to eligible non-profit organizations or provides grants to eligible non-profit organizations as a way to recognize and promote employee volunteerism.

Special events are another method of raising funds. These range from formal dinners to benefit concerts to walkathons. Events are used to increase visibility and support for an organization as well as raising funds. Events can feature activities for the group such as speakers, a dance, an outing or entertainment, to encourage group participation and giving. Events can also include fundraising methods such as a raffle or charity auction. Events often feature notable sponsors or honoree. Events often feature a charity "ad book" as a program



guide for the event, but more importantly, as another fundraiser providing members, supporters, and vendors to show their support of and to the group at the event by way of placing an ad-like page, 1/2 page, 1/4 page, stating or showing support. Events and their associated fundraisers can be a major source of a group's revenue, visibility and donor relations.

While fundraising often involves the donation of money as an outright gift, money may also be generated by selling a product of some kind, also known as product fundraising. Girl Scouts of the USA are well known for selling cookies in order to generate funds. It is also common to see on-line impulse sales links to be accompanied by statements that a proportion of proceeds will be directed to a particular charitable foundation. Tax law may require differentiating between the cost of an item versus its gift value, such as a \$100.00 per person dinner, for a \$25.00 cost meal. Fundraising often involves recognition to the donor, such as naming rights or adding donors to an honor roll or other general recognition. Charity Ad Books are another form of donation for recognition, sponsorship or selling of ads often in an event related program or group directory.

When goods or professional services are donated to an organization rather than cash, this is called an in-kind gift.

A number of charities and non-profit organizations are increasingly using the internet as a means to raise funds; this practice is referred to as online fundraising. For example, the NSPCC operates a search engine which generates funds via Pay per click links, and Better The World operates tools allowing funds to be raised via members viewing ethical ads on a browser sidebar and/or blog widget. Save the Children's Dave Hartman wrote after the \$1 Million Operation Sharecraft online campaign, "We may have reached our mark, but this is just the beginning of a new era of fundraising and using social media and digital technology to better the world.

Some of the most substantial fundraising efforts in the United States are conducted by colleges and universities. Commonly the fundraising, or "development" / "advancement," program, makes a distinction between annual fund appeals and major campaigns. Most institutions use professional development officers to conduct superior fundraising appeals for both the entire institution or individual colleges and departments. Examples of this include athletics and libraries.

The donor base (often called a file) for higher education includes alumni, parents, friends, private foundations, and corporations. Gifts of appreciated property are important components of such efforts because the tax advantage they confer on the donor encourages larger gifts. The process of soliciting appreciated assets is called planned giving.

The classic development program at institutions of higher learning includes prospect identification, prospect research, and verification of the prospect's viability, cultivation, solicitation, and finally stewardship, the latter being the process of keeping donors informed about how past support has been used.

B. Proposed System

To test the proposed hypothesis, we chose Facebook as our social media platform and Indico, a machine learning API to parse the status updates of the user. The Graph API is the primary way to get data out of and put data into, Facebook's platform. It's a low-level HTTP-based API that you can use to programmatically query data, post new stories, manage ads, upload photos, and perform a variety of other tasks that an app might implement. The Graph API is named after the idea of a 'social graph' - a representation of the information on Facebook composed of:

- **nodes** - basically "things" such as a User, a Photo, a Page, a Comment
- **edges** - the connections between those "things", such as a Page's Photos, or a Photo's Comments
- **fields** - info about those "things", such as a person's birthday, or the name of a Page

The Graph API is HTTP-based, so it works with any language that has an HTTP library, such as cURL and urllib. By virtue, it would be meaningless to parse just one status update to analyze the user's interest. So we pulled the latest 64 status updates and the posts which the user shared, filtered out the statuses and messages which are more than 20 characters and sorted them to a payload array which will be sent to the 3rd party REST API provided by Indico. Refer figure 1 for illustration.

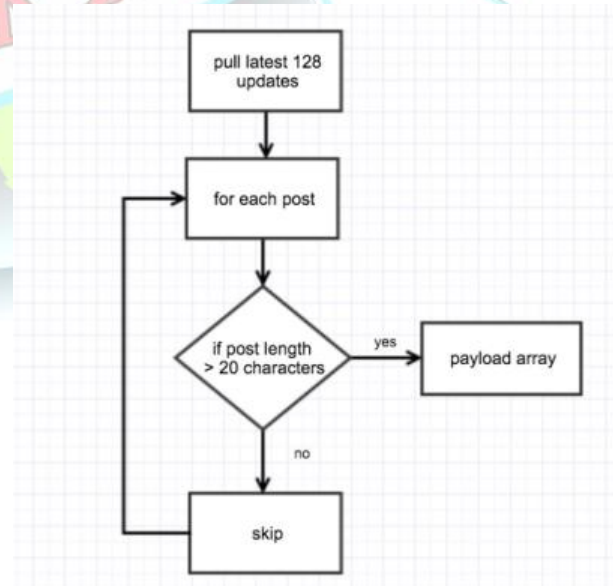


Fig. 1. Payload filtering mechanism.

Once the data is processed in the remote API, we'll be getting a response in the form of an associative array with key value



pairs of the topic detected and its probability. We'll be aggregating the topics along with their sum weight. The top 3 of the aggregate calculated along with the key value will be assumed as the user interest. Refer Figure-2 for illustration.

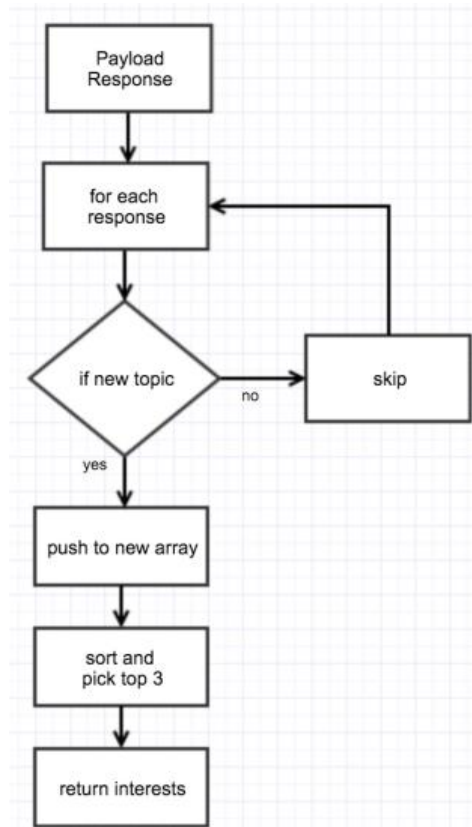


Fig. 2. Classification mechanism.

Now that we have the users associated with their interests, we can connect them to the non-profit organizations who are working in those domains.

IV. IMPLEMENTATION

Facebook is chosen as the data source due to the large online community available. The other reason to consider Facebook for testing this hypothesis is because of the extensive support and service development kit provided. Nevertheless, similar stock and community developed service development kit are available in Github for Facebook and other social networking platforms with developer APIs available. Similarly, Indico is chosen because of the simple testing process needed. Other APIs and the custom algorithms can be developed in frameworks like Flask, Django, and Rails, giving more control and robustness over the deployed code.

The readymade availability of Facebook's SDK for PHP is also another reason to consider Facebook as the data source to experiment the hypothesis. The script used to pull data from Facebook's Graph API can be found in figure 3. The response

data from Facebook is of JSON format and hence it has to be decoded for further processing.

```
// <-- Facebook Graph API Call -->
$fb = new Facebook([
    'app_id' => env('FACEBOOK_ID'),
    'app_secret' => env('FACEBOOK_SECRET'),
    'default_graph_version' => 'v2.5',
]);

try {
    $response = $fb->get('/'. $user->id . '/posts?limit=128', $user->token);
} catch(FacebookResponseException $e) {
    echo 'Graph returned an error: ' . $e->getMessage();
    exit;
} catch(FacebookSDKException $e) {
    echo 'Facebook SDK returned an error: ' . $e->getMessage();
    exit;
}

$body = $response->getBody();
$jsonBody = json_decode($body);
$userPosts = []; // payload array of status

foreach($jsonBody as $data){
    foreach($data as $d){
        if(property_exists($d, 'message')){
            if(strlen($d->message) >= 15){
                array_push($userPosts, $d->message);
            }
        }
    }
}
```

Fig. 3. Script to pull status from Facebook.

Once the statuses are filtered as per the requirements, it has to be passed to the machine learning API. This process is also made easier by the availability of the Indico's PHP SDK. Refer figure 4 for the script which parses the status.

```
// <-- Indico API Call -->
IndicoIo::$config['api_key'] = env('INDICO_KEY');
$topics = IndicoIo::text_tags($userPosts, ['top_n' => 1]);

$collection = [];

foreach($topics as $topic){
    $temp = array_keys($topic);
    array_push($collection, $temp[0]);
}

$aggregate = array_count_values($collection);
arsort($aggregate);
$result = array_slice($aggregate, 0, 3);
$result = serialize($result);
```

Fig. 4. The script for parsing user status.

V. CONCLUSION

The proposed system produces satisfactory results and this can be an affordable solution for non-profit organizations to get prospective volunteers and donors. For the purpose of testing the proposed hypothesis, Facebook and Indico were used. There is no compelling reason to stick on to these services. For instance, Twitter and Instagram can be used as the data source and for analysis and analytics services like Meaningcloud and Aylien can be used or even a custom machine learning algorithm can be written in python and hosted for more flexibility.



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The entire concept can be fabricated into a SaaS application and the service can be given to non-profit organizations or the concept can be encapsulated into a platform agnostic library and can be hosted onGithub for open source access and make it open for contributions from the open source community.

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