

Data-mining including Social Media: Set-up and use

Bill Howell, 03Nov2011 initial outline, 15Nov2011 additional material, 30Dec2011 end of writing

Summary

A very large and diverse set of data-mining tools and systems are available for a wide range of needs, and it is not the intent of this document to overview the toolsets for data-mining. Instead, several “under-the-hood” capabilities (HOW) are discussed as are WHAT we might be seeking to achieve with Data-mining and Social Media. Key “low level” recommendations are:

1. Allow END-USER specification of access control for “sources” [files, directories, web-pages, wiki-pages, blogs, [Facebook, LinkedIn, etc], Twitter, etc], including access [vetting, review] capabilities such as [general and automated policy, automated classification assist, automated warning – detection, automated auditing, manual review/ auditing etc]
2. Provide fully-pre-indexed search capabilities – hopefully with Google-like algorithms & semantics, in native-file format (this latter is somewhat debatable perhaps (only for semantics, not for text!), but it is a huge advantage and has long existed (20+ years) for text indexing). A key trick here (for the future) is to “index” structured information (hierarchies, spreadsheets etc) PLUS social graphs and social sets!
3. Cover a broad range of “sources” [files, emails, wiki pages, web pages, blogs, spreadsheets, databases, [Facebook, LinkedIn, etc], Twitter, etc] - ALL NRCan electronic content is the “theoretical” objective. In practice, it is best to start with the “easy” sources, and leave the tough challenges for later once the overall concept is established in practice.
4. Implement “Information Redundancy Reduction” systems, addressing/ including:
 - o Information indexing and chunking
 - o Information reduction through abstraction (these are explained in the document)
5. Select a variety of tools that broaden the scope and type of indexing provided, looking especially for capabilities to “index” social graphs and social sets (structure is critical, and so are dynamics!)
6. Provide tools to cull information from general information streams, in a manner to improve the [Saliency, Pertinency, Priority, Critical Novelty] of what the user sees.

[16Nov2011 Howell – The above list is incomplete. Also, recommendations for the “use” of data-mining with social media have not been prepared yet...]

As given in a later section:

“... If most or nearly all future development of capabilities etc actually come from commercial systems as opposed to “in-house” developments, then this entire point (and this paper!) are not really relevant! In that case, customization within the constraints and functionality of commercial systems becomes the issue (as it is with for essentially all of NRCan’s main systems, following years of upgrades to internally-developed systems (eg SAP, Peoplesoft, Connexus, etc). ...”

At this time, existing integrated commercial systems cover only the easy parts of the scope envisaged by this paper...

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Objectives

From 28Oct2011 meeting with Chrystia Chudczak:

Thinking/ writing - I am to think about how to set up/ use data mining with Social media (2-3 hours next week). She has 5 areas for an overall KM system in discussions with André Arsenault:

1. Policy
2. ?Admin?
3. Regulatory (out of Calgary) - Mgmt of process, NEB filing
4. External Reach - section 35, Aboriginal
5. Knowledge Mgmt (KM) - underlies all of the above

Key issue is that few staff aware of details from 30 years ago. One guy has that, but retiring Mar2012

This paper ONLY addresses the fifth point above, and more specifically to data mining. Implementations of a general nature, as well as specialized arrangements for the targeted communities in points 1 through 4, cannot be addressed by myself at this time due to time constraints.

The concepts in this paper act more as “soft requirements and constraints” for the construction of data mining within a social media context, and not so much as “system descriptions, specifications”.

Introduction

A very large and diverse set of data-mining tools and systems are available for a wide range of needs, and it is not the intent of this document to overview the toolsets for data-mining. Instead, this document discusses changes to:

- The behaviour of [individual, organisational, social sets, social graphs] in the context of [information, communications, processes, grouping], including the clarification of [responsibilities & rights, ethics, professionalism, practices ???]
- the way information systems are designed and used, as distinctly different from all classical rdbms, MIS, Enterprise systems.
- Effectiveness with respect to [GIS-like capabilities, mobility,
- Addressing – a few of the key challenges identified so far from the social media implementations in the workplace.

Several basic issues have already been listed in an incomplete report “SPINE – Systems design issues for social media 110902 Howell.doc”. To avoid repetition, only some of the points in that report are alluded to here, but it should be considered as an essential companion to this document’s data mining theme.

It may seem strange that I have placed the “WHAT” section after the “HOW” section, but that has been done as the HOW is perhaps of more immediate use to targeted readers, and is also “crisper” and clearer.

From communications, tracking & reports through to Knowledge

Scoping

It's NOT sufficient to look at “marginal effects/ functionalities” to accommodate Social Media, as the Knowledge Management foundations for classical flows are sporadic and rapidly evolving.

Context

- HUMAN resources will always be difficult to obtain.
- Organisational process are becoming rapidly more onerous and counterproductive. In essence there has been a huge, negative marginal impact of modern management [fashions, cults, religions], and “expertise” (perhaps to a lesser extent)
 - e.g. “Management by obstacle courses”
 - we need to assess the costs-benefits of this over the last 30-50 years, as I doubt very much that the costs have any real association with the benefits of technology-driven changes (i.e. there should be a HUGE negative cost of management trend, but the opposite is occurring.)
- Computing and Communications resources are in an ongoing, radical revolution – vastly lower costs, vastly greater capabilities
- Cognitive/ conceptual machine capabilities have really started to kick in. Earlier versions often related to military, security-intelligence, and financial systems. Next crept into consumer gaming, military training & operations. Now in consumer phones etc. Next may be mainstream corporate internally, as opposed to external services, some of which have long had this.

Random thoughts on HOW we might achieve our WHATs

Some related material for social media systems is discussed in a preliminary and incomplete document:

Bill Howell 02Sep2011 “SPINE – Systems design issues for social media”

http://www.gcpedia.gc.ca/gcwiki/images/c/c6/SPINE_

[%E2%80%93 Systems design issues for social media 110902 Howell.doc](#)

To avoid repetition, only some of the points in that report are alluded to here, but it should be considered as an essential companion to this document's data mining theme. Two key points are summarized in the sub-section below "Initial, simple requirements".

Even worse, a related document on "Social graphs, social sets, and social media" has not yet been initiated, and the most profound and powerful ideas that I have to discuss as related to social media are planned for that document. I necessarily make reference to a few selected concepts on "Social graphs, social sets, and social media" here, but without a document to refer to, the reader will be frustrated.

Please keep in mind that I have intentionally kept a discussion of data-mining methods and their implementation issues out of this paper, given my own ignorance-in-spite-of-some-familiarity, and the fact that I would rather focus on "value added points" that one won't necessarily see in the common literature.

"... As the HOW is directly affected by WHAT we are trying to achieve, and because the WHAT section of this document is very incomplete and limited, one should expect the same limitations on this "HOW" section. That is, additions or changes that are currently missing from the WHAT section, will likely require related changes to the HOW section. ..." (This paragraph may give you a headache. If so, I apologize and please ignore it.)

[Essential, Nice] Technology Foundations

(outside of data-mining systems themselves, a very small selection of many, many important tools)

Quick definitions

- “sources” – here refers to [entire, portions, related] of [files, emails, wiki pages, web pages, blogs, spreadsheets, databases, [Facebook, LinkedIn, etc], Twitter, etc]
- “chunks” is used here as a crude term, based on an analogy with a “common sequence of [words, phrases, sentences, paragraphs, sections, chapters, books, etc]” (just as word are character chunks). This is generalized from text to [semantics, social graphs and sets, concepts, higher-order derived abstractions, etc].
- “contexts” (a better term is needed) – refers to non-content [class, location, format markers, structures, graphs, sets, trends, correlations, cause-effect, from-to, process] and [scale, scope,

Initial, simple requirements - These will be of no surprise to those who have heard me pushing this as before:

- END-USER specification of access control for “sources” [files, directories, web-pages, wiki-pages, blogs, [Facebook, LinkedIn, etc], Twitter, etc], including access [vetting, review] capabilities such as [general and automated policy, automated classification assist, automated warning – detection, automated auditing, manual review/ auditing etc]
- Fully-pre-indexed search capabilities – hopefully with Google-like algorithms & semantics, in native-file format (this latter is somewhat debatable perhaps (only for semantics, not for text!), but it is a huge advantage and has long existed (20+ years) for text indexing). A key trick here (for the future) is to “index” structured information (hierarchies, spreadsheets etc) PLUS social graphs and social sets!
- “Sources” [files, emails, wiki pages, web pages, blogs, spreadsheets, databases, [Facebook, LinkedIn, etc], Twitter, etc] - coverage of ALL NRCan electronic content is the “theoretical” objective. In practice, it is best to start with the “easy” sources, and leave the tough challenges for later once the overall concept is established in practice. In this sense, spreadsheets

As simple as they SEEM, these points are a perennial failure of the last 30 to 40 years of systems, even if they have been properties of essentially all operating systems for even longer! It is a “psychological hurdle” that few are able to get over. Perhaps the best example, is that after using a huge number of relational databases over that last 3 decades, not one system, or rdb professional, addressed this (for good reason in most cases). The only exceptions that I can think of are web-based systems of amateurs (maybe that says something?).

Without addressing these issues, all systems are doomed to be “siloed, myopic, and security-leaky”. To be sure, opening up end-user definable access presents serious security risks, especially if bad habits develop, and if the IT/systems thinking is inadequate. It is likely that “open systems” will always tend to be “security leaky”. Additionally, given the decades-long

failures by essentially all systems to handle this concept of end-user defined access control, one shouldn't assume that it will be addressed correctly and pragmatically any time soon.

Information Redundancy Reduction – a first step to compactification, and automatic identification and rationalization of “concept chunks”

In large organizations, common usage of operating systems (eg files, directories, emails, the universal failures regarding end-user control over file-access , etc) leads to massive information redundancy. Just think of an email with attachments to an entire department, with the saving of the documents by many people (even if only a small percentage of the total staff of the department) in personal directories. This redundancy (in theory, if not in practice), adds a huge cost burden to every system of analysis downstream.

Some basics – without any specific [algorithms, tools, systems]

- always save the originals in accessible archives! (with whatever access delays are practical and economic)
- incremental “indexing and analysis” - As with the backup of files, this principle has long been practiced for indexing (...it goes without saying...).
- Information modularization and chunking - chunking applies to portions of an “entity”, and is multi-scalar, multi-tensorial (direction counts!)
- Associate chunks to originals (bi-directional information makes the entire system far more robust, reliable, and verifiable!)
- automated identification of chunks – is essential, from the simple text level through to the dynamics of [social graphs, social sets]. There is no way of doing this economically as humans for anything but microscopic bites of the whole.

Challenges (here emphasizing the much simpler [text, semantic] chunking

- scalable, end-user control over access - as per last section, but ALSO PERTAINING TO chunks etc
- “disappearing content”
- dangers as with historical interpretations

“Concept chunks” as related to semantics

- text is easy to “chunk” (same words or whatever), but what do we mean by “semantic chunking”? Here my guess is that “fuzzy equivalencies” (metaphors) are required. It may be much harder to get filesize reduction and speed of processing improvements with semantics, but any success could lead to benefits far, far beyond mere “text chunking”. My guess is that separate files will be required for the semantic chunking, making sure that “semantically chunked files” link back to the the original files or “text chunked files”, and that all of these are readily available.

“Concept chunks” as related to [social graphs, social sets, social media] and their [structure, state, dynamics]

- who has what – basis for building graphs

- reminds me of:
 - Artificial Neural Networks (ANNs)
 - Biological, Psychological, and Sociological themes – eg Neuroscience, Brain modeling, etc
 - polymorphisms in category theory (fundamental mathematics)

It should be stressed that “redundancy reduction” is not an end in itself, in the sense that if one can only deal with the IT system at hand, it will be necessary to implement without “redundancy reduction”, until it becomes available. For example, toolsets for the chunking of “social graphs and social sets”, in terms of [structure, function, dynamics] will likely take much longer than for text and semantics!! These will also be far more challenging, but ultimately far more important. Perhaps they will eventually subsume all of the text & semantic approaches.

Information indexing and chunking – avoidance of improperly “blended” data and concepts

The structure of documents, emails, databases, spreadsheets etc is such that diverse words or chunks that can be found in different sections of the file may relate to completely different themes. Therefore, a text, semantic, graph, or chunk search may result with a hit for the file as a whole, when no section actually has that combination of concepts that are being looked for, so there may be no equivalent “chunk”. For example, think of a search covering an entire encyclopedia. For a small number of false hits, this is not a problem, but for huge sources it could make the results unusable.

I’m not sure of any existing analogies to this – there probably are many, but I’ll have to see if I can think of any of them.

Information reduction through abstraction

Concept chunks –

- with “Information Redundancy Reduction ” the automated identification occurs at a simple level
- with “Information modularization and chunking” the essence is to go beyond the text level through concept abstraction (deductive – the weakest approach, inductive, and abductive) and building sets of nuances on ideas, with an indication of where the latter are most important.
- Social graphs and social sets are very much a target for this!

Open, flexible, evolving standards for [data, semantics, social graphs and social sets, etc]

????????????????????

Even though proprietary systems usually REQUIRE their own proprietary standards, it may be possible to automatically translate the required information into an open standard that can be used. Facebook, for example, provides developing toolsets to access SOME key information about the social graph. I expect that this information has to come from the open community as the development of toolsets to do it is probably beyond NRCan capabilities.

[Accessible, global, full] indexing of [Text AND Semantic AND ?Graph-Set Structure & Dynamics?]

This is BY FAR the most important requirement in this paper, beyond the “Initial, simple requirements”! The expectation is that the capabilities of social media and its spin-offs will evolve rapidly with time. Another expectation is that [toolset, software, systems] suppliers cannot possibly keep up with all capabilities of interest to all customers.

It is therefore essential that USERS (and NOT just IT, software, and other specialists) have direct access to the underlying indexing and content FOR WHICH THEY HAVE ACCESS rights (at the chunk level at least – i.e. if most of a document is Protected B, then access to a paragraph or section that is not protected should be possible). This simple principle allows for the development of “open-source-like” wildcat concepts and tools, from which the future systems are most likely to emerge. This can make all of the difference in the world to contracted developers trying to build on an existing system.

As counter-points:

- the “proprietary lock-in of customers” is needed by most software companies to compete (i.e. to stabilize a customer base and revenues, to find investors for growth, etc).
- “open source standards” may not provide stable foundations for the development of commercial systems, and may be far too slow or ineffective in applications.
- *If most or nearly all future development of capabilities etc actually come from commercial systems as opposed to “in-house” developments, then this entire point (and this paper!) are not really relevant! In that case, customization within the constraints and functionality of commercial systems becomes the issue (as it is with for essentially all of NRCan’s main systems, following years of upgrades to internally-developed systems (eg SAP, Peoplesoft, Connexus, etc).*

“Multiple conflicting hypothesis” – a diversity of [different, competing, collaborating] times [concepts, toolsets, systems]

“Multiple conflicting hypothesis” is a favourite concept of mine explained elsewhere, that I have used for explaining and analyzing the catastrophic failure of my own thinking, and that of essentially all scientists, with respect to [rational, logical, scientific] thinking (i.e. – this is a trait of homo sapiens, but for very good reasons).

Somewhat related to, and wholly dependent on, the points below,

- *Open, flexible, evolving standards for [data, semantics, social graphs and social sets, etc]*

- “[Accessible, global, full] indexing of [Text AND Semantic AND ?Graph-Set Structure & Dynamics?] ” is the desirability of being able to build diverse (“multiple conflicting”) hybrid systems and new capabilities out of systems on hand. This is particularly critical for “short-life-cycle” specialized systems that have to be [built up, operate, torn down] quickly and cheaply. That ability is also partially dependent on having a DIVERSE set of tools, rather than permitting only one or two approaches for a given functionality. In other words, development of new capabilities and concepts requires an environment that diverges from standard IT, Enterprise systems thinking and management.

Having “diverse and open” [data, functionality, processes] for [use, comparison, measure], and with [hooks, toolsets] to allow one to build new amalgams that use them together. The hope is that over time “better” [hooks, toolsets] will be selected through competitive comparisons across many applications.

Saliency, Pertinency, Priority, Critical Novelty – Selecting from torrents of communications

Strangely, even though everyone by now probably suffers from a vast “excess information flow”, other than spam filters, not much is being done to help with this. While it is easy enough to ignore most information flows, and to focus in a traditional manner on special sources, that means that crucial information from “rich and diverse sources” will be ignored.

Realistically, in order to usefully cull information from “rich and diverse sources”, tools for VERY selectively picking out items on the basis of [Saliency, Pertinency, Priority, Critical Novelty] are required. While that is one of the intents of Data Mining, the only tool for this that I have regularly used are Google Search, and filters for [spam, viruses, Trojan horses, etc].

[16Nov2011 Howell – I have no time to elaborate on the rest of this section “[Essential, Nice] Technology Foundations ”, nor to extend the list...]

Randomness as a critical, central tool

Information theoretics

Phase synchronisation within dynamic networks

Machine Consciousness

Changes with [People, Practices]

[Information, Privacy, Management, Employee, Society] Rights, and [Ethical, Professional, Legal] Standards for Behaviour

No time to develop this now – the idea is to suggest that “privacy” in the workplace needs to relax its grip in some ways, and establish new protection in others. This applies not just at the team level, but also with respect to manager’s control over information, and for the organization as a whole. Perhaps at no other time in history has it been easier to provide access to information, but “excessive hoarding and control” can certainly prevent that.

As an example for Treasury Board, the Auditor General, RCMP, and Task ?Comissioners?, it should be much easier to “swim around in the data” to track and investigate. This will help enormously in effectively following up, and potentially in identifying problems as they develop.

Especially for machines...

Addressing [People, Organizations, Initiatives] by [Function, Role, Process Steps]

Organisations and responsibilities morph and change almost as fast as the individuals in a specific role.

Fuzzy Sets rather than Individuals

Default, pre-defined time-based release of information

A huge amount of work is often required to release information:

- cost and time to contact industrial clients,
- lack of consensus following completion of a project,
- changes to the contact people, and the new people aren’t familiar with the report and don’t want to put time into reading the report, so it’s easier to say no

As can be seen from the examples below, the proposal here is that NO work should be required for the automatic release of a report as agreed and approved. In contrast, serious work and approval at senior levels (perhaps in other sectors) should be required to change the conditions of release.

1. Contract reports

In order to make information available, release [date-sequences, audiences, locations, notifications] should be pre-set during proposal preparation, and confirmed at the time of approval. If changes to the release [date-sequences, audiences, locations, notifications] are requested (for example, by demand of a company for a cost recovery project), then an official amendment, signed and approved by ALL parties to an agreement, and signed / approved by a DG, ADM or DM (depending on thresholds) must be approved at least 3 months before the release date. An automated “release notification” to the “audience” should be sent. For example, a standard practice might be 6 months prior to the pre-set release date, and repeated as a second notification 4 months prior. Special conditions can be set with ADM approval.

Another important detail here is the final report must be posted to an automated project management system (SAP – Meritas, for example, is only used in CANMET), to multiple repositories. For example, ALL reports would go to NRCan libraries for access according to the specified audiences, copies of some may go to business offices, institutes, associations etc). Obviously, the libraries have to be experts at handling access control levels, up to PROTECTED B (secret presumably is out of the question).

Workers’ rights to associate, by default, restricted according to information type etc

Although this might sound a bit like communism, it is a serious issue for organizations....

Random thoughts on WHAT we could be looking to achieve

As mentioned in the “Summary”, it may seem strange that I have placed the “WHAT” section after the “HOW” section, but that has been done as the HOW is perhaps of more immediate use to targeted readers, and is also “crisper” and clearer.

By its very nature, this section is far more “fuzzy” than the last. It is also very incomplete and limited, meaning that one should expect the same limitations on the “HOW” section.

People and Dynamically formed/ dissolved Teams

Organisational View

Applications & Toolsets View

Part I of my paper “Semantics beyond search” describes a number of capabilities that may arise from improved automated semantic capabilities, and which might be kept in mind when designing systems for “Data-mining including Social Media”.

Bill Howell 2011-09-05 "Semantics beyond search" http://www.gcpedia.gc.ca/gcwiki/images/0/0b/SPINE%E2%80%93Semantics_beyond_search_110905_Howell_.doc

Here is a quick list of the capabilities mentioned, but keep in mind that this is very incomplete, and the reader may have their own list.

[...list...]

As the list above is based on a narrow focus (semantic capabilities), it's appropriate to augment it from a generalized data-mining framework.

A broader, more advanced and profound discussion of capabilities to look for in Social Media is being prepared in a document:

Bill Howell in preparation as of 03Nov2011 “Social graphs and social sets, including dynamics”

Automated & Semi-automated Conceptual Processing

For decades, we have been used to very complex, automated [numerical, predefined text fields] processing. [Relational databases, management information systems, pictures, videos, etc] are examples of this.

However, REAL information of a much higher level of abstraction and value is contained in [emails, reports, blogs, etc, etc]. Systems designed to use “real-world”, un-prepared, and un-formatted data which have not had nearly as processing of “free format”

... haven't started ideas yet

Emergent, complex, and automated or semi-automated [models, concepts, abstractions]

From information to actions

Recommendations

Interactions with work of user

enddoc