# Mining Churning Factors in Indian Telecommunication Sector using Social Media Analytics

Nitish Varshney and S.K. Gupta

Department of Computer Science and Engineering,
Indian Institute of Technology Delhi, India
{nitish.mcs12,skg}@cse.iitd.ac.in

**Abstract.** As the subscriber base of telecommunication services reaches a saturation level, churning becomes a challenging problem with serious impact on revenues. We explore techniques like social media analytics and association rule mining to understand causes of churning in Indian context which may assist in churn reduction.
Enormous feeds are available on social media indicating a subscriber's satisfaction or dissatisfaction. These user's opinions include various parameters which point towards churning and can be effectively analysed for understanding causes of churning. In this paper our experiments are based on data taken from twitter. In the first phase, only telecom specific tweets are pulled from twitter, which are further cleaned for misspelled words. Stemming is then performed to tackle ambiguity. After transforming tweets into relational format we classify them using lexicon based classifier. Association rule mining is then applied to find the dominant churn factor out of a selected few factors as determined by domain expert.

**Keywords:** Twitter, Sentiment analysis, Social data analysis, Data mining applications : Telecommunication, Churn pertaining factors

## 1 Introduction

First mobile telephone service in India started in 1995. In recent years, mobile service usage has increased rapidly following the reduction in call cost and emerging use of new mobile phone technologies. Currently India's telecommunication network is the second largest in the world in terms of total number of telephone users (both fixed and mobile phone) [1] and it has one of the lowest call tariffs enabled by the mega telephone network operators and hyper-competition among them. On 30th September, 2013, country's telecom subscriber's base was as huge as 899.86 million [2] and penetration rate was about 71%. Out of these 899.86 million subscribers, about 97 % utilize wireless services. We therefore focus our attention to wireless telecom services and mobile service providers as they are predominant in numbers.

Above situation depicts a condition where market is almost saturated and telecom service providers are stable. It leads to intensification of competition among existing mobile service providers in order to maintain their subscriber base. In such a situation, the significant business drivers would be:

- Retention of customer subscribers base: As cost of acquisition of a new customer can substantially exceed the cost of retaining the existing customer [4].
- Increase in average revenue per customer.

There is a trade off in these business drivers. Customer retention depends on factors like call rate and quality of services, a service provider provides. A superior quality of service imposes heavy implementation cost which has to be passed on to the customer. This has twin fall back of either higher call rate charges or subscriber churning. Hence, telecom service providers would want optimal values for both. In 1996, Reichheld [3] estimated that, with an increase in customer retention rate by 5%, average net present value of a customer increases from 35% to 95% in different domains.

In telecommunication, customer movement from one service provider to other service provider is defined by term churn rate. Churn rate is the percentage of subscribers who discontinue services with a service provider and change their service provider willingly. Customer churn rate is of great concern for any service provider. However according to statistical information provided by Telecom Regulatory Authority of India (TRAI) already 100+ million users have utilized mobile number portability service [2]. This is relatively very high, specially when the aim is to retain the existing customers. In order to better manage customer churn, companies need to fully understand the factors leading to the customer churn. These problems affecting churn have not been fully addressed in the literature. In this paper, we present a data mining based approach to determine factors affecting churn in Indian Telecom sector.

## 2 Paper Preparation

Springer provides you with a complete integrated LaTeX document class (`llncs.cls`) for multi-author books such as those in the LNCS series. Papers not complying with the LNCS style will be reformatted. This can lead to an increase in the overall number of pages. We would therefore urge you not to squash your paper.

Please always cancel any superfluous definitions that are not actually used in your text. If you do not, these may conflict with the definitions of the macro package, causing changes in the structure of the text and leading to numerous mistakes in the proofs.

If you wonder what LaTeX is and where it can be obtained, see the "*LaTeX project site*" (`http://www.latex-project.org`) and especially the webpage "*How to get it*" (`http://www.latex-project.org/ftp.html`) respectively.

When you use LaTeX together with our document class file, `llncs.cls`, your text is typeset automatically in Computer Modern Roman (CM) fonts. Please

do *not* change the preset fonts. If you have to use fonts other than the preset fonts, kindly submit these with your files.

Please use the commands `\label` and `\ref` for cross-references and the commands `\bibitem` and `\cite` for references to the bibliography, to enable us to create hyperlinks at these places.

For preparing your figures electronically and integrating them into your source file we recommend using the standard LaTeX `graphics` or `graphicx` package. These provide the `\includegraphics` command. In general, please refrain from using the `\special` command.

Remember to submit any further style files and fonts you have used together with your source files.

**Headings.** Headings should be capitalized (i.e., nouns, verbs, and all other words except articles, prepositions, and conjunctions should be set with an initial capital) and should, with the exception of the title, be aligned to the left. Words joined by a hyphen are subject to a special rule. If the first word can stand alone, the second word should be capitalized.

Here are some examples of headings: "Criteria to Disprove Context-Freeness of Collage Language", "On Correcting the Intrusion of Tracing Non-deterministic Programs by Software", "A User-Friendly and Extendable Data Distribution System", "Multi-flip Networks: Parallelizing GenSAT", "Self-determinations of Man".

**Lemmas, Propositions, and Theorems.** The numbers accorded to lemmas, propositions, and theorems, etc. should appear in consecutive order, starting with Lemma 1, and not, for example, with Lemma 11.

### 2.1 Figures

For LaTeX users, we recommend using the *graphics* or *graphicx* package and the `\includegraphics` command.

Please check that the lines in line drawings are not interrupted and are of a constant width. Grids and details within the figures must be clearly legible and may not be written one on top of the other. Line drawings should have a resolution of at least 800 dpi (preferably 1200 dpi). The lettering in figures should have a height of 2 mm (10-point type). Figures should be numbered and should have a caption which should always be positioned *under* the figures, in contrast to the caption belonging to a table, which should always appear *above* the table; this is simply achieved as matter of sequence in your source.

Please center the figures or your tabular material by using the `\centering` declaration. Short captions are centered by default between the margins and typeset in 9-point type (Fig. 1 shows an example). The distance between text and figure is preset to be about 8 mm, the distance between figure and caption about 6 mm.

To ensure that the reproduction of your illustrations is of a reasonable quality, we advise against the use of shading. The contrast should be as pronounced as possible.

If screenshots are necessary, please make sure that you are happy with the print quality before you send the files.

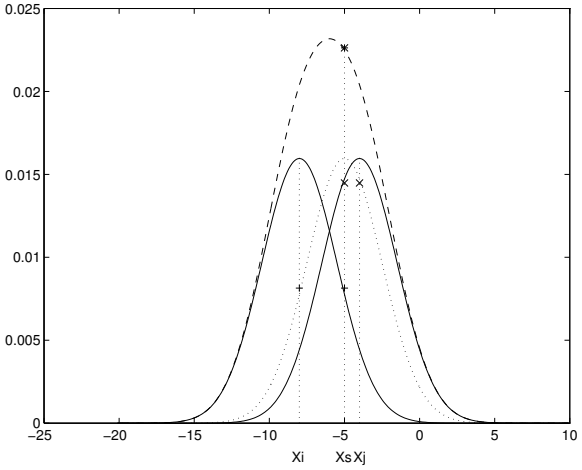


**Fig. 1.** One kernel at $x_s$ (*dotted kernel*) or two kernels at $x_i$ and $x_j$ (*left and right*) lead to the same summed estimate at $x_s$. This shows a figure consisting of different types of lines. Elements of the figure described in the caption should be set in italics, in parentheses, as shown in this sample caption.

Please define figures (and tables) as floating objects. Please avoid using optional location parameters like "`[h]`" for "here".

*Remark 1.* In the printed volumes, illustrations are generally black and white (halftones), and only in exceptional cases, and if the author is prepared to cover the extra cost for color reproduction, are colored pictures accepted. Colored pictures are welcome in the electronic version free of charge. If you send colored figures that are to be printed in black and white, please make sure that they really are legible in black and white. Some colors as well as the contrast of converted colors show up very poorly when printed in black and white.

### 2.2 Formulas

Displayed equations or formulas are centered and set on a separate line (with an extra line or halfline space above and below). Displayed expressions should be numbered for reference. The numbers should be consecutive within each section or within the contribution, with numbers enclosed in parentheses and set on the

right margin – which is the default if you use the *equation* environment, e.g.,

$$\psi(u) = \int_o^T \left[\frac{1}{2}\left(\Lambda_o^{-1}u, u\right) + N^*(-u)\right] dt\,. \tag{1}$$

Equations should be punctuated in the same way as ordinary text but with a small space before the end punctuation mark.

### 2.3 Footnotes

The superscript numeral used to refer to a footnote appears in the text either directly after the word to be discussed or – in relation to a phrase or a sentence – following the punctuation sign (comma, semicolon, or period). Footnotes should appear at the bottom of the normal text area, with a line of about 2 cm set immediately above them.[1]

### 2.4 Program Code

Program listings or program commands in the text are normally set in typewriter font, e.g., CMTT10 or Courier.

*Example of a Computer Program*

```
program Inflation (Output)
  {Assuming annual inflation rates of 7%, 8%, and 10%,...
   years};
   const
     MaxYears = 10;
   var
     Year: 0..MaxYears;
     Factor1, Factor2, Factor3: Real;
   begin
     Year := 0;
     Factor1 := 1.0; Factor2 := 1.0; Factor3 := 1.0;
     WriteLn('Year  7% 8% 10%'); WriteLn;
     repeat
       Year := Year + 1;
       Factor1 := Factor1 * 1.07;
       Factor2 := Factor2 * 1.08;
       Factor3 := Factor3 * 1.10;
       WriteLn(Year:5,Factor1:7:3,Factor2:7:3,Factor3:7:3)
     until Year = MaxYears
end.
```

(Example from Jensen K., Wirth N. (1991) Pascal user manual and report. Springer, New York)

[1] The footnote numeral is set flush left and the text follows with the usual word spacing.

### 2.5 Citations

For citations in the text please use square brackets and consecutive numbers: [1], [2], [4] – provided automatically by LaTeX's `\cite ... \bibitem` mechanism.

### 2.6 Page Numbering and Running Heads

There is no need to include page numbers. If your paper title is too long to serve as a running head, it will be shortened. Your suggestion as to how to shorten it would be most welcome.

## 3 LNCS Online

The online version of the volume will be available in LNCS Online. Members of institutes subscribing to the Lecture Notes in Computer Science series have access to all the pdfs of all the online publications. Non-subscribers can only read as far as the abstracts. If they try to go beyond this point, they are automatically asked, whether they would like to order the pdf, and are given instructions as to how to do so.

Please note that, if your email address is given in your paper, it will also be included in the meta data of the online version.

## 4 BibTeX Entries

The correct BibTeX entries for the Lecture Notes in Computer Science volumes can be found at the following Website shortly after the publication of the book: `http://www.informatik.uni-trier.de/~ley/db/journals/lncs.html`

**Acknowledgments.** The heading should be treated as a subsubsection heading and should not be assigned a number.

## 5 The References Section

In order to permit cross referencing within LNCS-Online, and eventually between different publishers and their online databases, LNCS will, from now on, be standardizing the format of the references. This new feature will increase the visibility of publications and facilitate academic research considerably. Please base your references on the examples below. References that don't adhere to this style will be reformatted by Springer. You should therefore check your references thoroughly when you receive the final pdf of your paper. The reference section must be complete. You may not omit references. Instructions as to where to find a fuller version of the references are not permissible.

We only accept references written using the latin alphabet. If the title of the book you are referring to is in Russian or Chinese, then please write (in Russian) or (in Chinese) at the end of the transcript or translation of the title.

The following section shows a sample reference list with entries for journal articles [1], an LNCS chapter [2], a book [3], proceedings without editors [4] and [5], as well as a URL [6]. Please note that proceedings published in LNCS are not cited with their full titles, but with their acronyms!

## References

1. Smith, T.F., Waterman, M.S.: Identification of Common Molecular Subsequences. J. Mol. Biol. 147, 195–197 (1981)
2. May, P., Ehrlich, H.C., Steinke, T.: ZIB Structure Prediction Pipeline: Composing a Complex Biological Workflow through Web Services. In: Nagel, W.E., Walter, W.V., Lehner, W. (eds.) Euro-Par 2006. LNCS, vol. 4128, pp. 1148–1158. Springer, Heidelberg (2006)
3. Foster, I., Kesselman, C.: The Grid: Blueprint for a New Computing Infrastructure. Morgan Kaufmann, San Francisco (1999)
4. Czajkowski, K., Fitzgerald, S., Foster, I., Kesselman, C.: Grid Information Services for Distributed Resource Sharing. In: 10th IEEE International Symposium on High Performance Distributed Computing, pp. 181–184. IEEE Press, New York (2001)
5. Foster, I., Kesselman, C., Nick, J., Tuecke, S.: The Physiology of the Grid: an Open Grid Services Architecture for Distributed Systems Integration. Technical report, Global Grid Forum (2002)
6. National Center for Biotechnology Information, `http://www.ncbi.nlm.nih.gov`

## Appendix: Springer-Author Discount

LNCS authors are entitled to a 33.3% discount off all Springer publications. Before placing an order, the author should send an email, giving full details of his or her Springer publication, to `orders-HD-individuals@springer.com` to obtain a so-called token. This token is a number, which must be entered when placing an order via the Internet, in order to obtain the discount.

## 6 Checklist of Items to be Sent to Volume Editors

Here is a checklist of everything the volume editor requires from you:

- ☐ The final LaTeX source files
- ☐ A final PDF file
- ☐ A copyright form, signed by one author on behalf of all of the authors of the paper.
- ☐ A readme giving the name and email address of the corresponding author.