CS590RA Real-Time Big Data Analytics
Challenge #1: Hackathon
Submission Deadline: September 28 (S), Midnight

I. Submission

1) **Source code submission** to CS590RA blackboard/Exam/Challenge1-SourceCode. Submit a word document file including all source codes (IMPORTANT: just in case you use someone's code and include the reference – URL)
2) **GitHub submission:** Submit your report and source package (source code, library, date, etc) to your GitHub site and include the GitHub link to your report
3) **Report submission to** CS590RA blackboard/Exam/Challenge1-Report. Submit your report (word document). Check out the report guideline below.

II. Overview

CS590RA Challenge#1 aims to explore students to hack on anything that involves real-time big data processing and analysis to do some interesting and innovative things. In this hackathon, you are supposed to build a mobile application for sentiment analysis of social data such as tweets.

You need to know about general sentiment (i.e. positive or negative), while are others are interested in specific moods or opinions. Some support tailoring to a specific cultural context or industry vertical, while others help evaluate conversation in a broad, general context. You may want to analyze sentiment in a global context — including native natural language processing for different languages, each with their own norms related to sarcasm, puns, irony, etc. Content format is a major focus as well. Evaluating 140 characters rich with hashtags and URLs on Twitter requires a much different approach than evaluating a WordPress blog post.

These are all valid use cases for sentiment analysis, and all come with unique nuances and benefit from different techniques. Sentiment analysis is a critical category of tool for broader social data analysis, but at the same time, it's *not* a monolithic category. If you're building a product to analyze social data and want to evaluate sentiment, the good news is that you can pick from a wide range of approaches or tools (or maybe even choose more than one?) for sentiment analysis that is suited to the business problem you're trying to address, and the content you're trying to analyze.

Each student is expected to output your "hacked" deliverables as follows:

- Publish cloud-based real-time big data analytic services.
- Design new algorithms or models for sentiment analysis
- Develop mobile/web apps that leverage real-time big data analytics

Some optional deliverables are include:

- Optimize performance and scalability
- Visualize sentiment analysis of social data for better user experiences.

At the end of the hackathon, a couple of students will be selected/recognized for a demo and presentation about their project. We expect that you could benefit from this hackathon:

- Embrace and learn more about real-time big data analytics, especially tweet sentiment analysis
- Share your ideas with the people attending.
- Find out about interesting apps being created, and get to play around with them as well.

We are problem solvers, let's make it work and have fun!

III. Design & Implementation

You have the freedom to choose, to make your own choices for your application domain, datasets, and big data analytics technologies (e.g., Cloudera/Storm/Kafka/HBase).

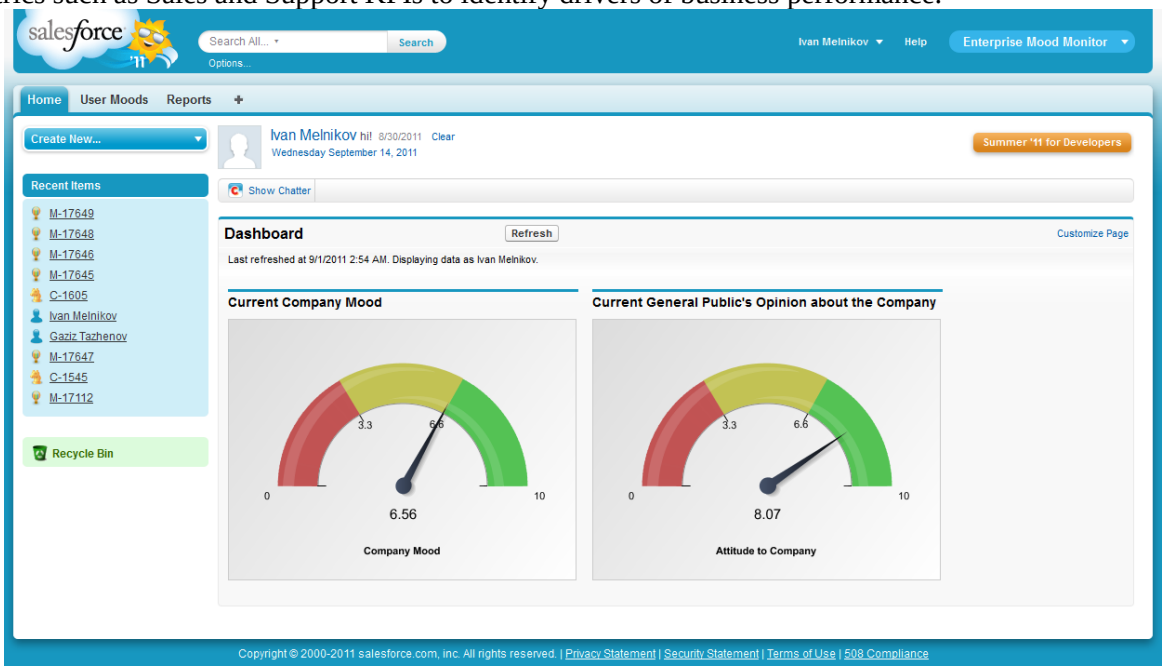
1. Selection of datasets from at least two different domains (e.g., twitter and Youtube)
2. Sentiment Analysis models and algorithms
3. Predictive/recommendation models and algorithms
4. Mobile App/Web design

You can use any open source projects or available APIs/Web services. But you need to cite them properly both in report and code. You are not allowed to discuss and share your solutions with other students. Your source code should be deployed to your GitHub site.

IV. Use Cases

We list some use cases for sentiment analysis of social data that aim real-time big data analysis and provide users useful recommendations or customized mobile apps. You may see the different use cases for sentiment analysis and the types of social content being analyzed demand tailored sentiment tools. Sentiment analysis has clearly become important to social data analysis, and vice versa, social data is really attractive to companies and researchers seeking ways to understand the moods and opinions of broad populations of consumers and citizens.
Here are some of the highlights of the business cases that were presented:

The Enterprise Mood Monitor pulls in data from a variety of social media sources, including the Gnip API, to provide real-time and historical information about the emotional health of the employees. It shows both individual and overall company emotional climate over time and can send SMS messages to a manager in cases when the mood level goes below a threshold. In addition, HR departments can use this data to get insights into employee morale and satisfaction over time, eliminating the need to conduct the standard employee satisfaction surveys. This mood analysis data can also be correlated with business metrics such as Sales and Support KPIs to identify drivers of business performance.



Discovery is hard. If you're monitoring a brand or keyword for popularity (positive or negative sentiment), it's challenging to keep track of fan pages that crop up without notice. With Gnip, you can

receive real-time notification when one of your search terms is found within a fan page. Discover when a community is forming around a given topic, product, or brand before others do.
We currently support the following endpoints, and will be adding more based on customer demand.

- Keyword Search – Search over all public objects in the Facebook social graph.
- Lookup Fan Pages by Keyword – Look up IDs for Fan Pages with titles containing your search terms.
- Fan Page Feed (with or without comments) – Receive wall posts from a list of Facebook Fan Pages you define.
- Fan Page Posts (by page owner, without comments) – Receive wall posts from a list of Facebook Fan Pages you define. Only shows wall posts made by the page owner.
- Fan Page Photos (without comments) – Get photos for a list of Facebook Fan Pages.
- Fan Page Info – Get information including fan count, mission, and products for a list of Fan Pages.

- **Mood Analysis Informs Market Decisions at ThomsonReuters** — Scanning a broad swath of social content and news allows ThomsonReuters to build their MarketPysch Indices, including their "Gloom Index," which they've demonstrated provides a leading indicator for market drops. ThomsonReuters' Aleksander Sobczyk made an interesting point for our readers: the social content they focus on is long form only (i.e. blogs), and not short form content like Twitter. Developing the depth of insight and certainty essential to their current solution requires a bigger text sample than Twitter provides.
- **Guiding Product Development at Dell** — Through its Social Media Listening Command Center, Dell picks up on customer sentiment and uses it to drill in and learn more. For instance, they picked up negative sentiment about a new Alienware laptop right after a release: units were overheating. The negative sentiment tipped them off, and their product team took action to learn more from users. Through engaging their customers online, they were able to discover an idiosyncrasy in laptop use among power users. When plugged into big auxiliary monitors, users were keeping the laptop screen nearly closed, blocking the exhaust fans. Dell fixed the fan placement and eliminated the problem for future customers. Knowing very specifically what the negative sentiment was about was critical to catching a problem spot among loyal fans and power users.
- **Understanding Weibo Emotions**— Detecting sentiment in other languages with different linguistic structures and use habits can be difficult, which is why Soshio has tried to normalize around universal emotions to help Western brands make sense of what Chinese weibo (microblog) users are saying about their brands. According to Ken Hu, Soshio's founder, they're actually having to translate written language "into sound" to address sentiment challenges like written puns that only make sense when pronounced audibly.

V. Report Guideline

1. Design
    - Data model (features)
    - Sentiment analysis model and algorithm
    - Predictive/recommendation model and algorithm
    - Selection of datasets
    - Mobile App/Web design
2. Features Implemented
    - Sentiment analysis algorithms
    - Predictive algorithms
    - Mobile User Interface
        1. Your own design
        2. Existing design
3. Outputs: description with screenshots of the features
4. All the Web Service and Web Site URLs

5. Your midterm Github URL
6. Limitations
7. References

Twitter: The Streaming APIs
https://dev.twitter.com/streaming/overview
Tweet Sentiment Visualization App
http://www.csc.ncsu.edu/faculty/healey/tweet_viz/tweet_app/
List of 20+ Sentiment Analysis APIs
http://blog.mashape.com/list-of-20-sentiment-analysis-apis/
Developing the Twitter Sentiment Analysis
http://blog.datumbox.com/how-to-build-your-own-twitter-sentiment-analysis-tool/

VI. Datasets

Here is a list of datasets you can use for this hackathon**.** You can use other external datasets as long as you use the ones provided.

- Public Data Sets on AWS: http://aws.amazon.com/publicdatasets/
- Yahoo Big Data Sets: http://m.cnbc.com/bigdata/
- U.S. Government's open data http://www.data.gov/
- DataGov Interactive Platform https://explore.data.gov/
- Infochimps datasets http://www.infochimps.com/datasets
- Data repositories http://oad.simmons.edu/oadwiki/Data_repositories
- IBM academic initiative University of Arkansas datasets http://enterprise.waltoncollege.uark.edu/IBM.asp
- City Forward Datasets http://cityforward.org/wps/wcm/connect/cityforward_en_us/city+forward/about/data+catalog/data+catalog+table+content
- City of Chicago Data Portal Datasets https://data.cityofchicago.org/
- University of California Machine Learning Datasets http://archive.ics.uci.edu/ml/
- Open Datasets http://www.data.gov/opendatasites

Image Datasets

- ImageNet http://www.image-net.org/
- 80 Million Tiny image dataset (from Antonio Torralba's group) http://goups.csail.mit.edu/vision/TinyImages/
- CIFAR-10 http://www.cs.toronto.edu/~kriz/cifar.html

Text Datasets:

- Open web directory http://www.dmoz.org/
- Wikipedia http://en.wikipedia.org/wiki/Wikipedia:Database_download

Network Datasets and collections:

- A collection of moderately-sized to larger datasets http://graphlab.org/downloads/datasets
- Twitter 2010 graph with 1.4B edges http://bickson.blogspot.com/2012/03/interesting-twitter-dataset.html
- A collection of moderately sized datasets http://socialcomputing.asu.edu/pages/datasets?att=numAttributes&order=ASC
- Trec datasets http://trec.nist.gov/data.html
- KDD cup datasets http://www.kddcup2012.org/
- Click-through rate dataset from HW1 http://www.kddcup2012.org/c/kddcup2012-track2
- Lemur project http://lemurproject.org/clueweb09/
- The Graph 500 Benchmark http://graph500.org/

Data repositories http://www.kdnuggets.com/datasets/

- AWS (Amazon Web Services) Public Data Sets, provides a centralized repository of public data sets that can be seamlessly integrated into AWS cloud-based applications. http://aws.amazon.com/publicdatasets/
- BigML big list of public data sources. http://blog.bigml.com/2013/02/28/data-data-data-thousands-of-public-data-sources/#comment-7538
- Bioassay data, described in *Virtual screening of bioassay data*, by Amanda Schierz, J. of Cheminformatics, with 21 Bioassay datasets (Active / Inactive compounds) available for download. http://www.jcheminf.com/content/pdf/1758-2946-1-21.pdf
- Bitly 1.usa.gov data, anonymized clicks on gov links. http://www.usa.gov/About/developer-resources/1usagov.shtml
- Canada Open Data, pilot project with many government and geospatial datasets http://www.data.gc.ca/
- Causality Workbench data repository. http://www.causality.inf.ethz.ch/repository.php
- Corral Big Data repository at Texas Advanced Computing Center, supporting data-centric science. http://www.tacc.utexas.edu/resources/data-storage/#corral
- Data Source Handbook, A Guide to Public Data, by Pete Warden, O'Reilly (Jan 2011) http://shop.oreilly.com/product/0636920018254.do
- Datacatalogs.org, open government data from US, EU, Canada, CKAN, and more. http://datacatalogs.org/
- Data.gov.uk, publicly available data from UK (also London datastore.) http://data.gov.uk/
- Data.gov/Education, central guide for education data resources including high-value data sets, data visualization tools, resources for the classroom, applications created from open data and more http://www.data.gov/education
- DataMarket, visualize the world's economy, societies, nature, and industries, with 100 million time series from UN, World Bank, Eurostat and other important data providers. http://datamarket.com/
- Datamob, public data put to good use. http://datamob.org/
- DataSF.org, a clearinghouse of datasets available from the City & County of San Francisco, CA. http://datasf.org/
- DataFerrett, a data mining tool that accesses and manipulates TheDataWeb, a collection of many on-line US Goverment datasets. http://dataferrett.census.gov/
- Delve, Data for Evaluating Learning in Valid Experiments http://www.cs.toronto.edu/~delve
- EconData, thousands of economic time series, produced by a number of US Government agencies. http://inforumweb.umd.edu/econdata/econdata.html
- Enron Email Dataset, data from about 150 users, mostly senior management of Enron. http://www.cs.cmu.edu/~enron/
- Europeana Data, contains open metadata on 20 million texts, images, videos and sounds gathered by Europeana - the trusted and comprehensive resource for European cultural heritage content. http://data.europeana.eu/
- FEDSTATS, a comprehensive source of US statistics and more http://www.fedstats.gov/
- FIMI repository for frequent itemset mining, implementations and datasets http://fimi.cs.helsinki.fi/
- Financial Data Finder at OSU, a large catalog of financial data sets. http://fisher.osu.edu/fin/fdf/osudata.htm
- GDELT: The Global Data on Events, Location and Tone, described by Guardian as "a big data history of life, the universe and everything. http://www.guardian.co.uk/news/datablog/2013/apr/12/gdelt-global-database-events-location
- GEO (GEO Gene Expression Omnibus), a gene expression/molecular abundance repository supporting MIAME compliant data submissions, and a curated, online resource for gene expression data browsing, query and retrieval. http://www.ncbi.nlm.nih.gov/geo/
- GeoDa Center, geographical and spatial data. http://geodacenter.asu.edu/datalist/

- Google ngrams datasets, text from millions of books scanned by Google. http://ngrams.googlelabs.com/datasets
- Grain Market Research, financial data including stocks, futures, etc. http://www.grainmarketresearch.com/
- Hilary Mason research-quality Big Data sets collection - many text and image datasets. https://bitly.com/bundles/hmason/1
- ICWSM-2009 dataset contains 44 million blog posts made between August 1st and October 1st, 2008 http://www.icwsm.org/2009/data/
- Infochimps, an open catalog and marketplace for data. You can share, sell, curate, and download data about anything and everything. http://infochimps.org/
- Investor Links, includes financial data http://www.investorlinks.com/
- KDD Cup center, with all data, tasks, and results http://www.sigkdd.org/kddcup/index.php
- Kevin Chai list of datasets, for text, SNA, and other fields. http://kevinchai.net/datasets/
- KONECT, the Koblenz Network Collection, with large network datasets of all types in order to perform research in the area of network mining. http://konect.uni-koblenz.de/
- Linking Open Data project, at making data freely available to everyone. http://www.w3.org/wiki/SweoIG/TaskForces/CommunityProjects/LinkingOpenData
- Million Song Dataset http://labrosa.ee.columbia.edu/millionsong/
- MIT Cancer Genomics gene expression datasets and publications, from MIT Whitehead Center for Genome Research. http://www-genome.wi.mit.edu/cgi-bin/cancer/datasets.cgi
- ML Data, the data repository of the EU Pascal2 networks.http://mldata.org/
- NASDAQ Data Store, provides access to market data https://data.nasdaq.com/
- National Government Statistical Web Sites, data, reports, statistical yearbooks, press releases, and more from about 70 web sites, including countries from Africa, Europe, Asia, and Latin America http://www.archive-it.org/
- National Space Science Data Center (NSSDC), NASA data sets from planetary exploration, space and solar physics, life sciences, astrophysics, and more http://nssdc.gsfc.nasa.gov/
- Open Data Census, assesses the state of open data around the world. http://census.okfn.org/
- OpenData from Socrata, access to over 10,000 datasets including business, education, government, and fun. http://opendata.socrata.com/
- Open Source Sports, many sports databases, including Baseball, Football, Basketball, and Hockey http://www.opensourcesports.com/
- Peter Skomoroch dataset Bookmarks http://www.delicious.com/pskomoroch/dataset
- PubGene(TM) Gene Database and Tools, genomic-related publications database http://www.pubgene.org/
- Quandl, a collaboratively curated portal to millions of financial and economic time-series datasets. http://www.quandl.com/
- qunb, a platform to find and visualize quantitative data. http://www.qunb.com/
- Robert Schiller data on housing, stock market, and more from his book*Irrational Exuberance*. http://www.econ.yale.edu/~shiller/data.htm
- SMD: Stanford Microarray Database, stores raw and normalized data from microarray experiments. http://genome-www5.stanford.edu/MicroArray/SMD/
- Jerry Smith dataset collection, with Finance, Government, Machine Learning, Science, and other data. http://datascientistinsights.com/2013/02/02/data-monetization-road-paved-on-top-of-data-sets/
- SourceForge.net Research Data, includes historic and status statistics on approximately 100,000 projects and over 1 million registered users' activities at the project management web site. http://www.nd.edu/~oss/Data/data.html
- StatLib, CMU Datasets Archives http://lib.stat.cmu.edu/datasets/
- STATOO Datasets part 1 and STATOO Datasets part 2
- http://www.statoo.com/en/resources/anthill/Datamining/Data/
- http://www.statoo.com/en/resources/anthill/Data_Sets/

- Time Series Data Library http://robjhyndman.com/TSDL/
- Visual Analytics Benchmark Repository. http://kdd.ics.uci.edu/
- UCI KDD Database Repository for large datasets used in machine learning and knowledge discovery research. http://archive.ics.uci.edu/ml/
- UCI Machine Learning Repository. http://archive.ics.uci.edu/ml/
- UCR Time Series Data Archive, offering datasets, papers, links, and code. http://www.cs.ucr.edu/~eamonn/time_series_data/
- United States Census Bureau http://www.census.gov/
- Wikiposit, a (virtual) amalgamation of (mostly financial) data from many different sites, allowing users to merge data from different sources http://wikiposit.org/
- Wolfram Alpha disease and patient level data http://blog.wolframalpha.com/2010/06/29/disease-and-patient-level-statistics-with-wolframalpha/
- Yahoo Sandbox datasets, Language, Graph, Ratings, Advertising and Marketing, Competition http://webscope.sandbox.yahoo.com/catalog.php
- Yelp Academic Dataset, all the data and reviews of the 250 closest businesses for 30 universities for students and academics to explore and research. http://www.yelp.com/academic_dataset

VII. Useful Sites for web services/APIs

- Foursquare website https://foursquare.com/
- Foursquare API https://developer.foursquare.com/start
- Google Earth Vehicle Simulators http://www.gelib.com/simulators.htm
- Text-to-speech http://www.oddcast.com/home/demos/tts/tts_example.php
- Google Developer Site https://developers.google.com/
- Amazon Web Service API http://docs.aws.amazon.com/AWSECommerceService/latest/DG/Welcome.html
- Yahoo Developer Site http://developer.yahoo.com/
- Twitter Developer Site https://dev.twitter.com/
- Facebook Developer Site https://developers.facebook.com/