DATA, TOOLS AND RESOURCES FOR MINING SOCIAL MEDIA DRUG CHATTER

Abeed Sarker
Health Language Processing Lab
Institute of Biomedical Informatics
Email: abeed@upenn.edu

Perelman
School of Medicine
UNIVERSITY *of* PENNSYLVANIA

Overview

- Social media data and pharmacovigilance
- NLP for pharmacovigilance
  - Data collection and annotation
- Drug-related chatter from Twitter
- Data and resources for mining
- Utilities and future tasks

Social media and pharmacovigilance

- Over **770,000** people are injured or die each year in hospitals from ADRs[1]
  - Improved reporting mechanisms recommended
- 30% of adults are likely to share health-related information on social media[2]
- Social media has large user base (and growing)
  - Provides access to large volumes of drug-related chatter

[1] Agency for Healthcare Research and Quality http://www.ahrq.gov/research/findings/factsheets/errors-safety/aderia/index.html [accessed: 12/10/2016]

[2] https://getreferralmd.com/2013/09/healthcare-social-media-statistics/ [accessed: 12/29/2015]

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Twitter drug-related chatter sample

- i hate how this **firbo** and **gabapentin** robs me if my life … **i just hate feeling so useless and worthless feeling tired**
- Off to see the gi consultant this week. Hope theres something other than **humira** to try as **not working** also **hair falling out**.
- The 100mg tabs of **trazodone** my gp prescribed are too much, now that I don't take them every night. Still **zombieish** after an hour awake
- Gone from 50mg to 150mg of **Serequel** last night. **Could barely wake up** this morning and I feel like my **body is made of lead**
- **snorted** 2 15mg **oxycodone** ($24)
- **can't sleep**, **temazepam** myself into a coma, pass out for hours on end. finally wake up, **feel like shite** for days. Oh I love my life! :-/
- just got retested for jcv. **tecfidera** **did not work out well** for me, so i'm onto **tysabri**. #ms #multiplesclerosis

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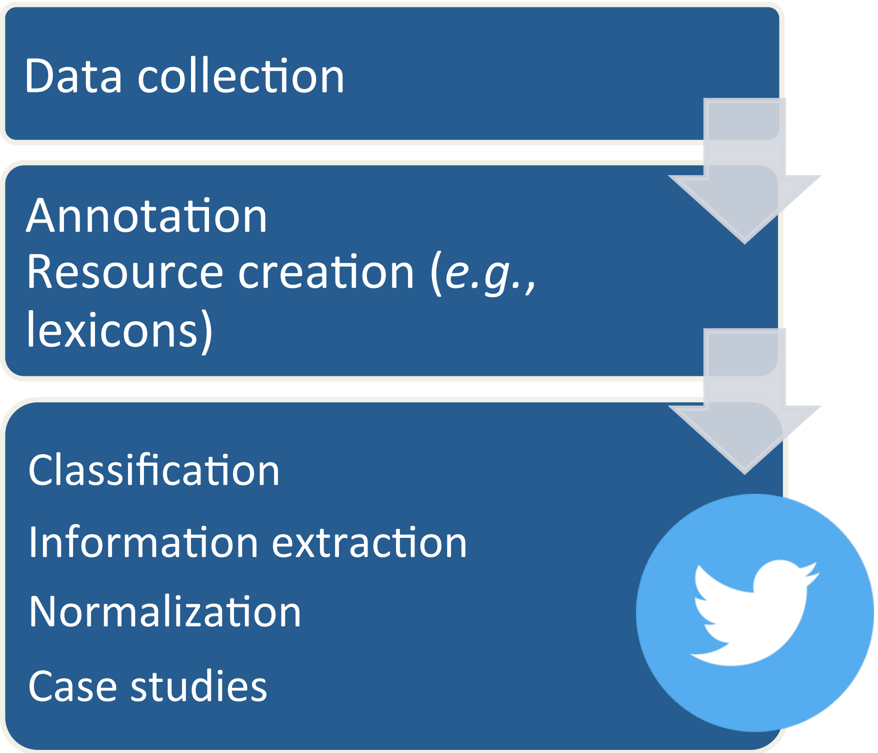
Social media mining pipeline



Data collection

Annotation
Resource creation (*e.g.*, lexicons)

Classification

Information extraction

Normalization

Case studies

- Data collection from Twitter uses drug names and their common misspellings as keywords
- Approach is semi-automatic. Available at: http://diego.asu.edu/Publications/ADRSpell/ADRSpell.html
- Annotations performed for classification, information extraction and normalization of ADRs, and other tasks
- Iterative annotation. Sample (thorough) guidelines made available for several tasks http://diego.asu.edu/guidelines/adr_guidelines.pdf

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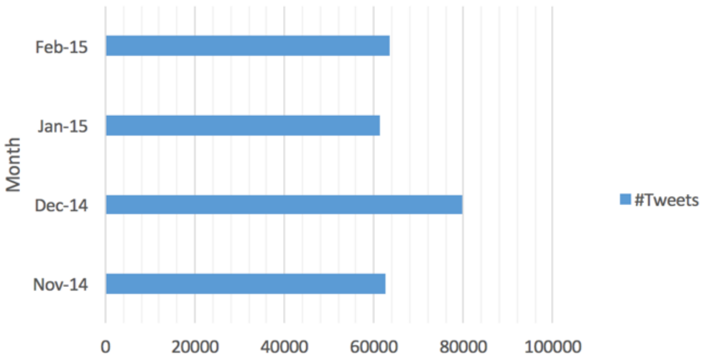
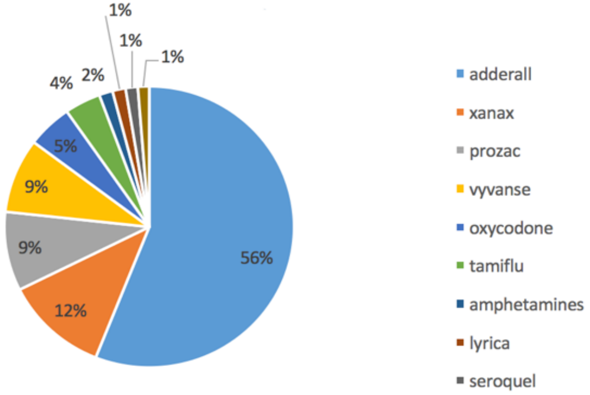
Unannotated data

- About 4 million posts mentioning medications (in-house)
- Recently released a set of unannotated data over 4 months
  - – Data is accompanied by sequential and distributed language models





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Annotated data

- Binary annotations indicating ADR/nonADR posts.
  - Over 20,000 annotations. 10,000+ are publicly available
- Span annotations indicating ADRs and indications/symptoms
  - ~2000 full annotations available
- Normalization annotations with ADR mentions mapped to UMLS CUIs
  - ~2000 annotations available
- Other annotations (*e.g.*, prescription medication abuse) available

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Data, resources and tools

- Annotated and unannotated data are available with various machine learning resources (*e.g.*, lexicons and topics)
- Tools include pre-trained classifiers and source codes
- Available at:
  - https://healthlanguageprocessing.org/software-and-downloads/
- Earlier tools available at:
  - http://diego.asu.edu/

Utilities

- Pharmacovigilance
  - Normalization and signal generation are still important tasks
- Medication abuse
- Sentiment analysis of users of drugs
- Estimating effectiveness of drugs
- Learning entity associations from unlabeled data

Contacts and research updates

- Follow us on Twitter to obtain data releases: @UPennHLP

Abeed Sarker
Research Scientist
Institute of Biomedical Informatics
Perelman School of Medicine
abeed@upenn.edu
Twitter: @sarkerabeed

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University of Pennsylvania

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