TagCurate: Crowdsourcing the Verification of Biomedical Annotations to Mobile Users

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NETTAB 2013
1. Introduction
2. TagCurate System
3. Android-NLP Integration
4. Conclusion
Natural Language Processing (NLP)

Definition
A branch of Artificial Intelligence that uses various techniques to process content written in a natural language, e.g., English or German.

Bottleneck: Gold Standard Corpora
Manually annotated documents required for training & testing NLP pipelines (especially for machine learning components).
Can we ‘crowdsource’ some of this work to mobile users?

Challenge: Current Web-based annotation frameworks (e.g., GATE Teamware) not designed for mobile use
1. Introduction

2. TagCurate System
   - System Architecture
   - Web-based Interface
   - Android App

3. Android-NLP Integration

4. Conclusion
**Client-Server Model**

- RESTful communication over HTTP
- *Tagreement* component is responsible for managing the crowdsourcing as well as measuring (dis)agreements

**User Groups**

- **Task Managers**, define verification tasks using the web-based interface
  - e.g., *NLP pipeline developers, literature curators, ...*
- **The Crowd**, verify (biomedical) annotations using the Android app
  - i.e., *Virtually anyone with access to an Android-enabled device*
Task Managers can define and supervise crowdsourcing tasks

Currently, only accepts GATE-formatted corpora
Tagreement Web-based Interface

- **Task Managers** can define and supervise crowdsourcing tasks
- Currently, only accepts GATE-formatted corpora
- Stores an internal representation of each tag for distributed verification

![Tagreement Web-based Interface](image-url)

- **New Task**
  - Please upload the GATE-formatted corpus containing your documents:
  - Corpus file: [Choose File] (no file selected)
  - [Upload]

- **Current Tasks**
  - Fungi-12584027
  - Fungi-Saha2003
  - Austin_facs_11747
TagCurate Android App

- Developed based on the latest Android distribution (Jelly Bean version 4.3)
- Responsive design for phones and tablets
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- Users *pull* tags from server
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- Modify tags features
  - Pairs of *< key, value >*
  - Modifications reflect in the tag representation
What about the missing tags?

**Manual Annotation**

Users select a text span and assign type and features to the generated tag.

**Pros**
- Human-generated tags usually have a higher quality

**Cons**
- Difficult task on devices with small screen
- Difficult to achieve an adequate inter-annotator agreement
- Requires well-established annotation guidelines

**Automatic Annotation**

Users invoke domain-specific text mining pipelines that generate various tags from text.

**Pros**
- Reuse existing text mining pipelines

**Cons**
- Text mining techniques are resource-intensive
1 Introduction

2 TagCurate System

3 Android-NLP Integration
   - Mobile Applications of NLP
   - Semantic Assistants Framework
   - Developing NLP Android Apps

4 Conclusion
Mobile Applications of NLP

- **Automatic Summarization**
  - Condensed version of document(s)
  - Various types: Generic, Focused, Update
  - e.g., Summly

(Image Courtesy of Yahoo!)
Mobile Applications of NLP

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  - Identifying instances of specific classes
    - *e.g.*, Persons, Organization, Events, etc.
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Content Development
- Combining other NLP services
- Generate new or complementary content
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- **Other domain-specific services**
  - e-Health, e-Learning, etc.
Mobile Natural Language Processing

What we know
- Numerous mobile applications can benefit from NLP support
- Robust, open-source NLP frameworks are already available
- However, NLP analysis is a very resource-intensive task!

Semantic Assistants Android-NLP Integration
- Novel Android-NLP integration approach
- Provides Separation of Concerns
  - NLP developer does not need to know Android
  - Android app developer does not need to know NLP
- Android library for NLP service execution, rather than multiple apps
- Enable users to benefit from complex NLP services in their tasks

[B. Sateli, G. Cook, R. Witte, “Smarter Mobile Apps through Integrated Natural Language Processing Services”, MobiWIS 2013]
Semantic Assistants Framework

- Existing open-source (AGPL3) service-oriented architecture
- Brokers NLP pipelines as standard W3C Web services
- Avoids context-switching of user to external text mining applications
- Brings NLP analysis directly to various applications via plug-ins
Client-Server Model
- Client is an Android app
- Server-side component is the Semantic Assistants server

RESTful communication over HTTP(S)

Handles various NLP service result formats
- Annotation, e.g., a person name in text
- Document, e.g., summary of a long webpage
- Files, e.g., an HTML document
Developing NLP Android Apps

Separation of Concerns

Android Developer

- Identify the NLP task
- Extend the SA intents by choosing a unique package name for this new service
- Embed the SA Android library in a new Android app
- Invoke the intent in app using the library

NLP Developer

- Develop the concrete NLP pipeline
- Deploy the pipeline on a SA server
Summary and Outlook

Summary

- Distribute annotation jobs to large user groups
- Expert annotators can focus on quality control and difficult cases
- Easily bring NLP pipelines to (Android) mobile apps

Ongoing work

- TagCurate app facelift
- Expanding the user profiles
- Finding incentives and introducing social aspects
- Add annotation capabilities (both manual and semi-automatic)

Find out more...

- Twitter: @SemSoft
- Web: http://www.semanticsoftware.info/