Text Analytics in Fraud and Risk Management

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## Part 1: Data Analytics (Structured Data)

<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Address</th>
<th>City</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mickey</td>
<td>Mouse</td>
<td>123 Fantasy Way</td>
<td>Anaheim</td>
<td>73</td>
</tr>
<tr>
<td>Bat</td>
<td>Man</td>
<td>321 Cavern Ave</td>
<td>Gotham</td>
<td>54</td>
</tr>
<tr>
<td>Wonder</td>
<td>Woman</td>
<td>987 Truth Way</td>
<td>Paradise</td>
<td>39</td>
</tr>
<tr>
<td>Donald</td>
<td>Duck</td>
<td>555 Quack Street</td>
<td>Halliard</td>
<td>65</td>
</tr>
<tr>
<td>Bugs</td>
<td>Bunny</td>
<td>567 Carrot Street</td>
<td>Rascal</td>
<td>58</td>
</tr>
<tr>
<td>Willey</td>
<td>Coyote</td>
<td>999 Acme Way</td>
<td>Canyon</td>
<td>61</td>
</tr>
<tr>
<td>Cat</td>
<td>Woman</td>
<td>234 Purfect Street</td>
<td>Hairball</td>
<td>32</td>
</tr>
<tr>
<td>Tweety</td>
<td>Bird</td>
<td>543</td>
<td>Ibotlaw</td>
<td>20</td>
</tr>
</tbody>
</table>
Part 2: Leveraging Unstructured Data
Why text is so powerful

Communicative

Emotional

Social
I wanted to congratulate Lisa on her really outstanding presentation at the meeting! The update was easy to follow and was very well received by the group. Great job, Lisa! Kim also gave a nice presentation. We appreciate you both.
Real emails

To: Briber
From: Employee taking bribe
-------------------------------
Thank you for the “little” token – I park it in the driveway - my neighbors are so jealous! Can’t wait to take it out this weekend to see what it can do on the open highway (wow!)

To: Boss
From: Accountant
-------------------------------
Making sure I understand, these sales will not be posted to (the Company), but to (your Company), right?

To: Employee/co-conspirator
From: Outside conspirator
-------------------------------
Send the invoice to me. I’ll mark it up and send it on to the printers. Keep 10% for yourself.

To: Employee/co-conspirator
From: Competitor
-------------------------------
I think giving your notice in January is fine, that will give you time to collect what you promised. We need to keep this close to the vest until it goes public.
AH [5:36 PM]:
We have 3 left and V is taking those to UPS right now

ES [5:37 PM]:
Thank you!!

AH [5:37 PM]:
We are going to blow all of that money we made on a kick ass party

ES [5:37 PM]:
shhh.. quiet. no talkie about it yet

AH [5:37 PM]:
lol
internal plans for now
ES [9:50 AM]:
cable?
CV [9:50 AM]:
yes, so that helps. i never submit for it though. lol
ES [9:51 AM]:
lol, you want my company credit card number? we could autobill it :)
CV [9:52 AM]:
:) it's ok. i'll do it eventually.
i don't think any of us work here for the money
lol
ES [9:52 AM]:
let me know. i'm burning that thing up
Facets of Unstructured Data

- Network Relationship Mapping
- Emotional Tone Detection
- People Places and Events Extraction
- Digital Forensics
- AI-Based Concept Searching
- Topic Extraction

Evolution of topics, interactions, relationships, and emotions over time
Text is a Window to the Soul...

<table>
<thead>
<tr>
<th>Most Common Behavioral Red Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living beyond means</td>
</tr>
<tr>
<td>Financial problems</td>
</tr>
<tr>
<td>Wheeler-dealer attitude</td>
</tr>
<tr>
<td>Divorce / family problems</td>
</tr>
<tr>
<td>Addictions</td>
</tr>
<tr>
<td>Legal problems</td>
</tr>
<tr>
<td>Mental / emotional instability</td>
</tr>
<tr>
<td>Peer pressure</td>
</tr>
<tr>
<td>Family pressure</td>
</tr>
</tbody>
</table>
Topic Extraction

Evolution of topics, interactions, relationships, and emotions over time
Topic Maps and Themes

“Normal” Finance Department

Financial Statement Fraud

Ticketing Staff Email on Topic “Comps”
Tone Detection Case Study

- Evasiveness
- Vagueness
- Tension
- Nervousness
Tone Detection Case Study

Evasiveness
Vagueness
Tension,
Nervousness
Social Networks

Text Analytics

- Emotional Tone Detection
- Digital Forensics
- Topic Extraction
- Network Relationship Mapping
- People, Places, and Events Extraction
- AI-Based Concept Searching

Evolution of topics, interactions, relationships, and emotions over time
Relationship Networks

Carrie Fischer was in *Star Wars* with Harrison Ford who was in *The Fugitive* with Tommy Lee Jones who was in *Batman Forever* with Val Kilmer who was in *Heat* with Robert Dinero who was in *Sleepers* with Kevin Bacon
Relationship Analysis

[Network diagram with nodes labeled Shauna, Anthony, Brian, Todd, Don, Tom, Bryan, Cristina, Julia, Courtney, Jeff, Molly, Carol. Shauna is connected to all other nodes, Anthony is connected to all other nodes, and the network shows various connections between individuals.]
## Relationship Mapping

### Conflicts of interest in RFP process

<table>
<thead>
<tr>
<th>Date</th>
<th>To</th>
<th>From</th>
<th>Subject</th>
<th>Message Body</th>
<th>Named Entity Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/21/2013</td>
<td>Outside Influencer</td>
<td>City Employee</td>
<td>RFP</td>
<td>What are your thoughts on awarding the contract to Bob?</td>
<td>Bob</td>
</tr>
<tr>
<td>3/23/2013</td>
<td>Assistant</td>
<td>City Employee</td>
<td>Proposals</td>
<td>I've looked through the proposals, and think Bob and his company are the only logical choice. Outside Influencer agrees Tekco is the best choice.</td>
<td>Bob, Outside Influencer, Tekco</td>
</tr>
<tr>
<td>4/2/2013</td>
<td>Buddy</td>
<td>City Employee</td>
<td>Good News</td>
<td>Hey, we're going to steer this to Bob and Tekco, he's gonna need subs for the jobs - let Buddy2, Buddy3 and Buddy4 know so they can be ready to jump in.</td>
<td>Bob, Tekco, Buddy2, Buddy3, Buddy4</td>
</tr>
</tbody>
</table>
Relationship Mapping

Visualizing relationships
Other sources

Performance Eval
Barb needs to delegate more to her staff, a person in her position should not be posting entries, etc.

Performance Eval
She is unapproachable, often irritable when asked questions.

Hotline
Yes, I’d like to talk to someone about a lady named “Barb” in your collections department. I’m a lawyer in town and some of my clients have settled with her for cash only...

Email
Turnover in her dept. is high, she’s hard to deal with, I hate her.

Reply
Yeah, but write-offs are down, collections up since she came - hard to replace that. We can find staff anywhere.
Compressed air tanks are supposed to be strapped down, they are not on my shift. If one of those fell...

Bathrooms are a mess - floor has **** all over it. Why aren't they ever clean on my shift?

______ is pushing us too hard, we need our breaks. Things need to slow down or...

Routed to: Shift supervisor

Routed to: Housekeeping

Routed to: HR -> Plant Supervisor
Monitor internal dynamics

Emotion Alerts

- Staff to Staff
- Upper to Upper
- Upper to Middle

Network Analysis

Anger, tension, anxiety, nervousness
Vague, evasive, conspiratorial
Digital Forensics

- Emotional Tone Detection
- Network Relationship Mapping
- People Places and Events Extraction
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Evolution of topics, interactions, relationships, and emotions over time
Digital Forensics
Types of Evidence

- Recovery of deleted files
- Recovery of temporary files
- Reconstruction of events
- Evidence of “data harvesting”
- Previously connected devices
- Internet-based email ‘never stored’ on computer
- Social media history
- iPhone backups

Recommendation: “Shelve” hard drives and phones of departing key employees for one year.
Tools

- **Email**
  - Outlook built-in search
  - Lookeen (Lookeen.com)

- **Relationship Mapping**
  - NodeXL (http://www.smrfoundation.org/nodexl/)

- **General Search (All document types)**
  - Lookeen (Lookeen.com)
  - dtSearch (dtsearch.com)

- **Emotion/Sentiment**
  - Textblob (Python package)*

*Requires some programming skill*
Expanding the Risk “Detection Horizon”
Considerations

- Perception of spy state
- Not common IA data
- Need robust acceptable use policy
- Consult legal before beginning
Do what you can, with what you have, where you are.
Thank you!

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