Deep Text Social Media Analysis A Text Analytics Foundation

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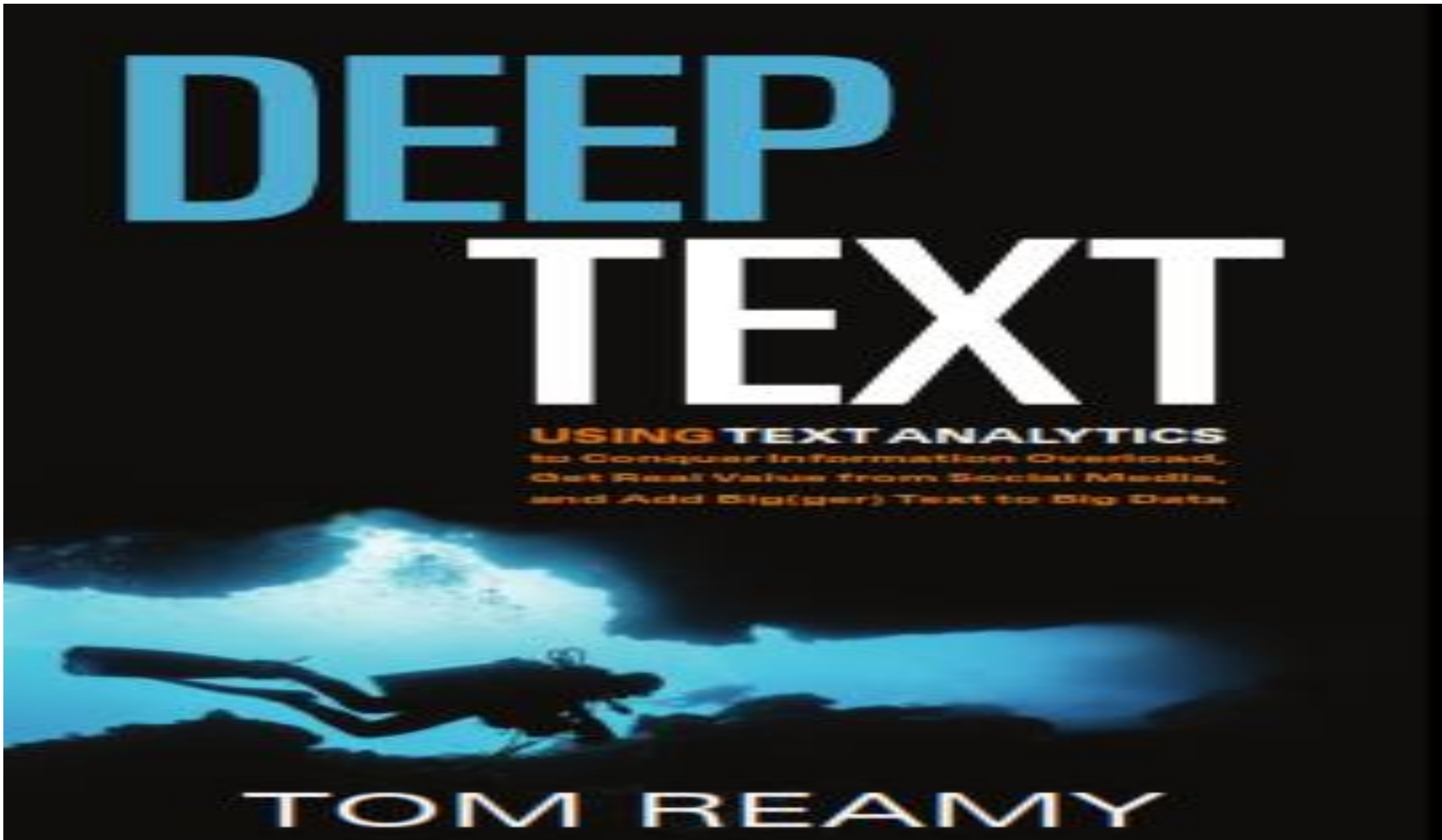
Author: Deep Text

Agenda

- Introduction
  - What is Deep Text Analytics – Definition & Elements
- Smart Social Media Analysis
- Key Concepts
  - Basic Level Categories and Expertise Analysis
- Development - Approaches
- Applications
- Getting Started with Text Analytics
- Questions / Discussions

A treasure trove of technical detail, likely to become a definitive source on text analytics – *Kirkus Reviews (available 30% off)*



Introduction:
Deep Text: The Book

- The only book on text analytics
- 5 sections, 3 chapters each
  - Text Analytics Basics
  - Getting Started in Text Analytics (Smart Start)
  - Text Analytics Development
  - Text Analytics Applications
  - ETA – Enterprise Text Analytics as a Platform
- A treasure trove of technical detail, likely to become a definitive source on text analytics. – Kirkus Reviews
- This book will give you all the answers and is the definitive book on the business possibilities of the technology**.** - Martin White

Introduction:
Deep Text: The Book – Who Am I?

- Professional student / independent consultant – all but 6 years
- History of Ideas to Programmer – AI (Only 2 years away)
- Games – Galactic Gladiators/Adventures – still available
- KAPS Group – 13 years, Network of consultants
  - Taxonomy to text analytics
  - Consulting, development – platform and applications
  - Strategy, Smart Start, Search, Smart Social Media
  - Partners – SAS, IBM, Synaptica, Expert System, Smartlogic, etc.
  - Clients: Genentech, Novartis, Northwestern Mutual Life, Financial Times, Hyatt, Home Depot, Harvard, British Parliament, Battelle, Amdocs, FDA, GAO, World Bank, Dept. of Transportation, etc.
- Presentations, Articles, White Papers – www.kapsgroup.com

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Introduction: What is Text Analytics?

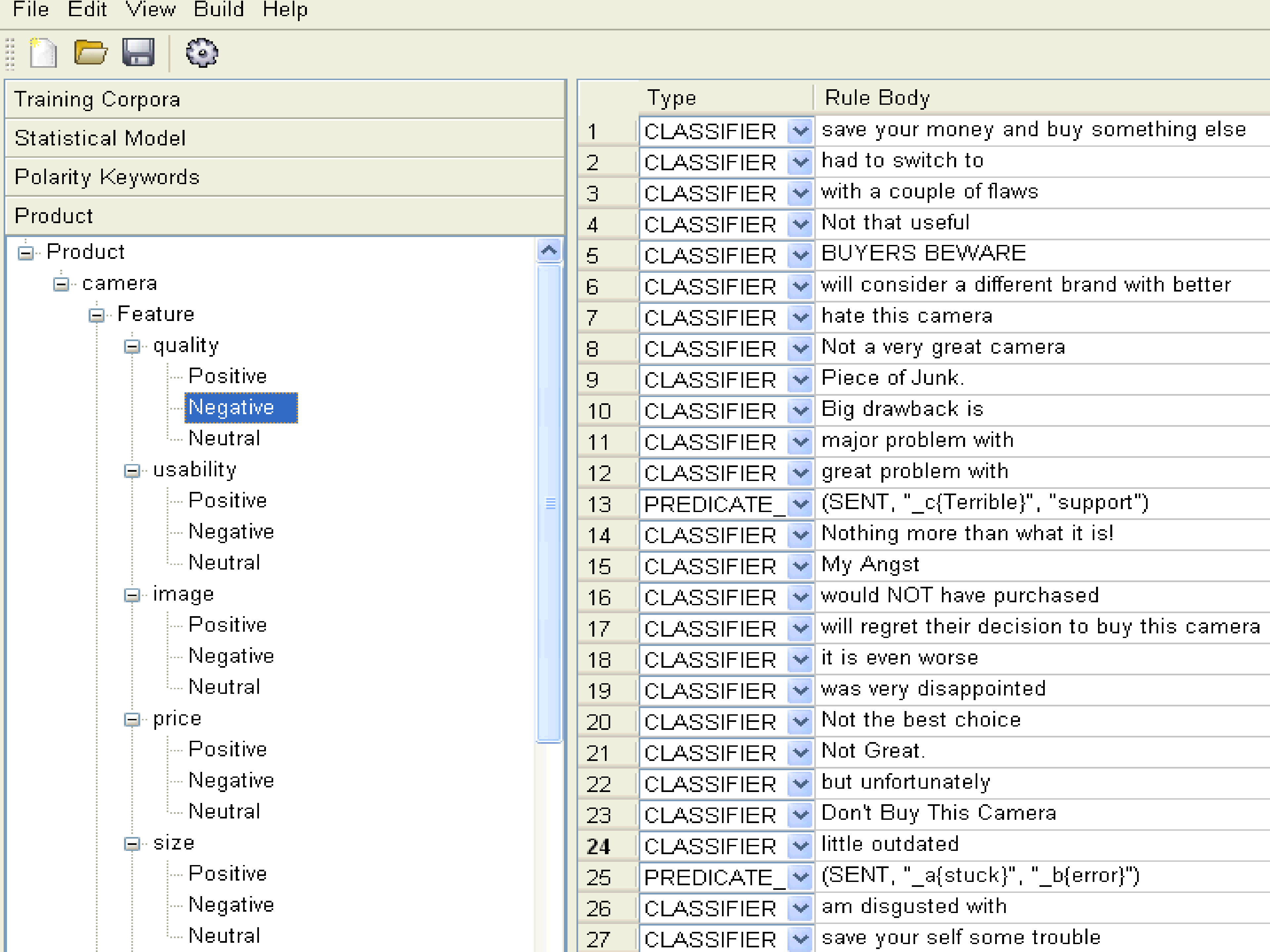
- Text analytics is the use of software and knowledge models to analyze and add structure to unstructured text.
- Text Mining – NLP, statistical, predictive, machine learning
  - Different skills, mind set, Math & data not language
- Annotation/Extraction – entities and facts – known and unknown, concepts, events - catalogs with variants, rule based
- Sentiment Analysis
  - Entities and sentiment words – statistics & rules
- Summarization
  - Dynamic – based on a search query term
  - Document – based on primary topics, position in document

Introduction:
What is Text Analytics?

- Auto-categorization = the brains of the outfit
  - Training sets – Bayesian, Vector space
  - Terms – literal strings, stemming, dictionary of related terms
  - Rules – simple – position in text (Title, body, url)
  - Boolean– Full search syntax – AND, OR, NOT
  - Advanced – DIST(#), ORDDIST#, PARAGRAPH, SENTENCE
- Auto-categorization = smart social media analysis

D1 Descriptive Terms

	A	B	C	D
1	#	Percentag	Freq	Descriptive Terms
2	1	34%	766	optimization
3	2	13%	298	+ driver, + device, + mechanism, + layout, + mobile device, + drive force, + lithography, + drive development, hard-drive, + multiprocessor, + fabrication, + parallel, performance analysis, + mobile phone, + hardware platform
4	3	7%	152	+ router, + technology, + memory, + mechanism, + component, hardware, + optimization
5	4	1%	15	dram, + memory, + hardware implementation, + router, hardware, + technology, + component
6	5	15%	344	+ mechanism, + memory, + hardware description language, + hardware optimization, + hardware parameter show, + component, + hardware component, hardware overhead, + keyboard, + hardware system, + drive, + parallel, hardware complexity, performance analysis
7	6	7%	156	+ microprocessor, + pipeline, + firmware, + hardware modification, + hardware trap, hardware-software, device reliability, hardware support, hardware, + hardware implementation, vlsi, + hardware platform, + drive, + drive architecture, + keyboard
8	7	11%	245	hardware, + hardware unit, + drive resource management issue, hardware availability, hardware development, hardware precision, + hardware basic, hardware design, + hardware resource, hardware acceleration, + hardware configuration
9	8	10%	217	+ component, + technology, + mechanism, + parallel, + optimization
10	9	4%	87	+ equipment, hardware cache due, + router, hardware, + memory, + device, + component, + technology, + mechanism, + optimization
11				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2 CLASSIFIER had to switch to
3 CLASSIFIER with a couple of flaws
4 CLASSIFIER Not that useful
5 CLASSIFIER BUYERS BEWARE
6 CLASSIFIER will consider a different brand with better
7 CLASSIFIER hate this camera
8 CLASSIFIER Not a very great camera
9 CLASSIFIER Piece of Junk.
10 CLASSIFIER Big drawback is
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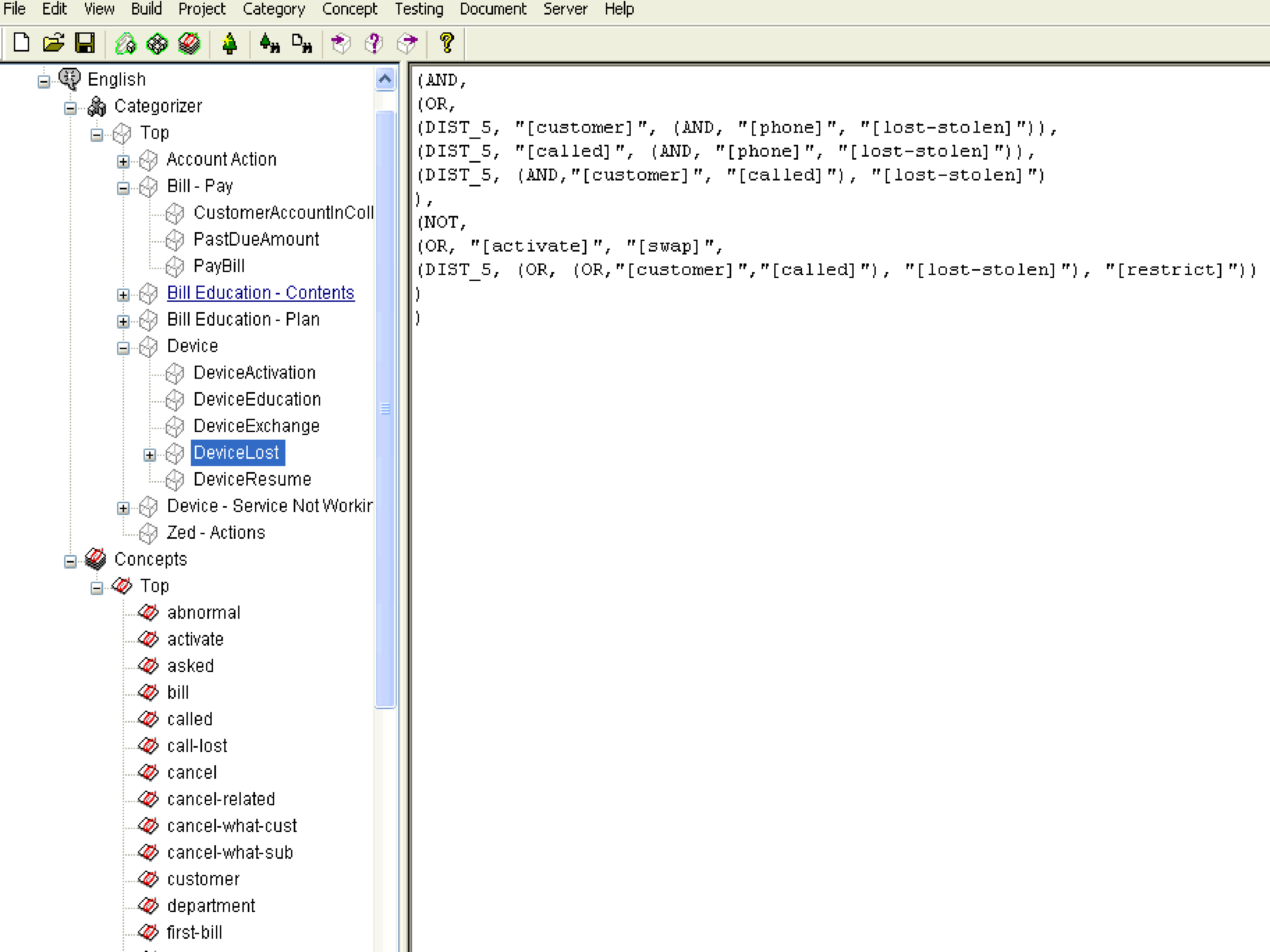
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(OR,
(DIST_5, "[customer]", (AND, "[phone]", "[lost-stolen]")),
(DIST_5, "[called]", (AND, "[phone]", "[lost-stolen]")),
(DIST_5, (AND,"[customer]", "[called]"), "[lost-stolen]")
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(OR, "[activate]", "[swap]",
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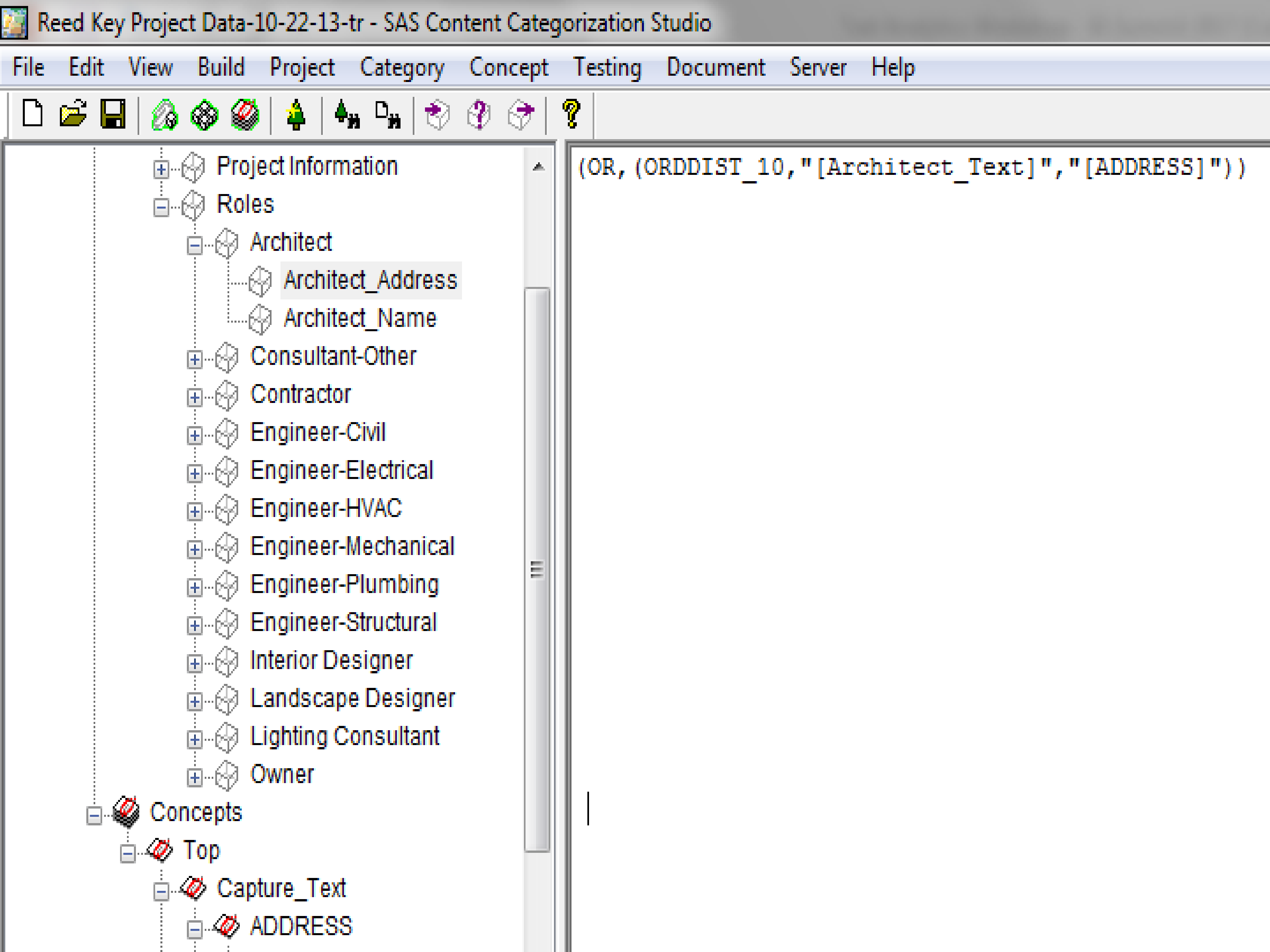
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Project Information
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Contractor
Engineer-Civil
Engineer-Electrical
Engineer-HVAC
Engineer-Mechanical
Engineer-Plumbing
Engineer-Structural
Interior Designer
Landscape Designer
Lighting Consultant
Owner
Concepts
Top
Capture_Text
ADDRESS
(OR,(ORDDIST_10,"[Architect_Text]","[ADDRESS]"))

Introduction: What is Text Analytics?

- History – Inxight - Moved TA from academic and NLP to enterprise - auto-categorization, entity extraction, and Search-Meta Data
- Shift to sentiment analysis - easier to do, obvious pay off
  - Backlash – Real business value?
- Current Market: 2016 – exceed $1 Bil for text analytics (10% of total Analytics)
- Growing 20% a year, search is 33% of total market
- Fragmented market place – full platform, social media, open source, taxonomy management, extraction & analytics, embedded in applications (BI, etc.), CM, Search
- No clear leader.

Smart Sentiment Analysis

Smart Sentiment Analysis
Sentiment & Categorization

- Beyond Good and Evil (positive and negative)
  - Taxonomy of Objects and Features to taxonomy of emotions
  - Addition of focus on behaviors – why someone calls a support center – and likely outcomes
- Emphasis on context around positive and negative words
  - Issue of sarcasm, slanguage – “Really great product”
  - Rhetorical reversals – “I was expecting to love it”
- Limited value of Positive and Negative
  - Degrees of intensity, complexity of emotions and documents
  - Granularity of Application – early categorization

Smart Sentiment Analysis
Sentiment & Categorization

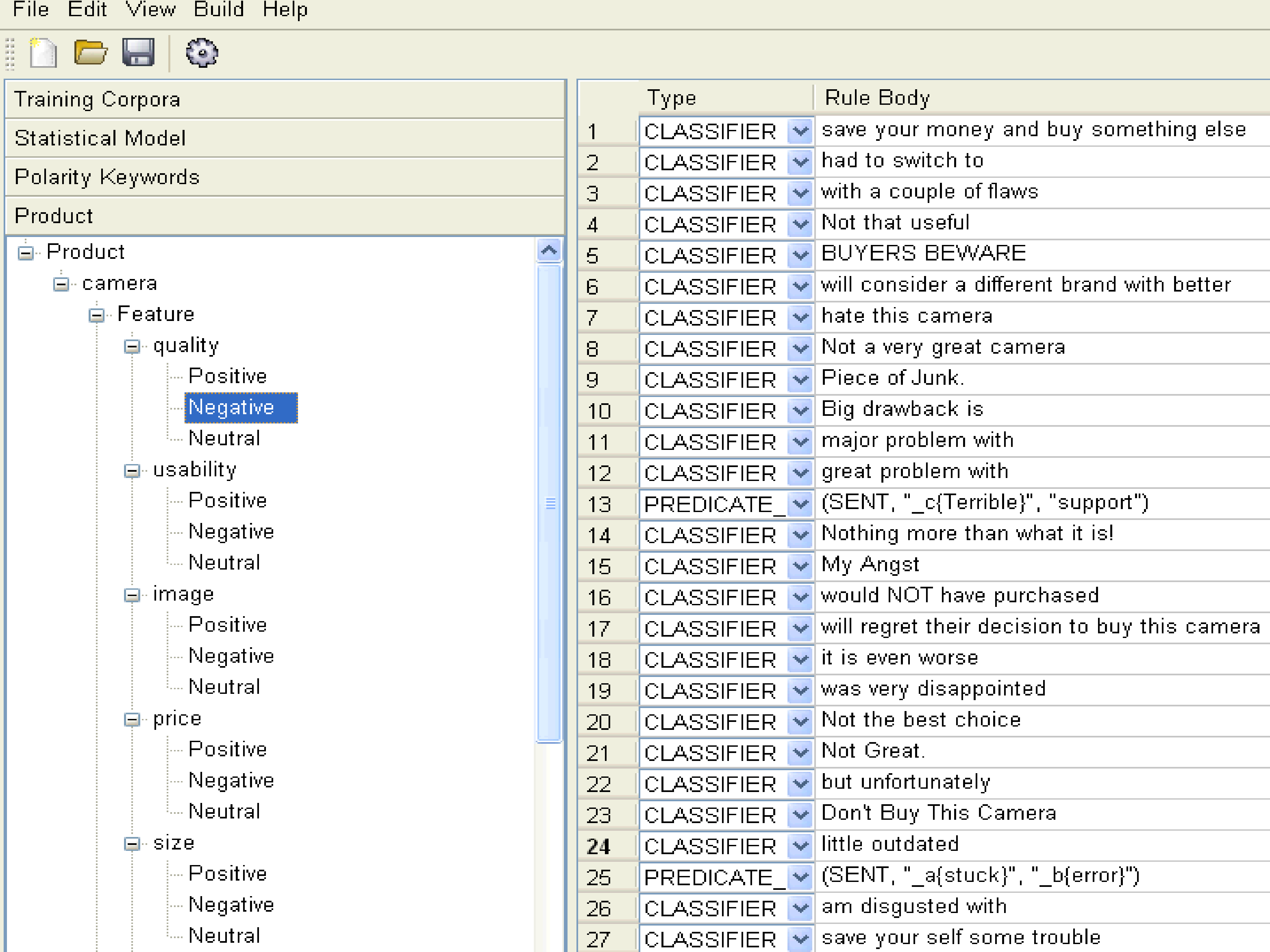
- Two flawed approaches: Lack of Accuracy, Depth
  - Statistical Signature of Bag of Words
  - Dictionary of positive & negative words
- Essential – need full categorization and concept extraction to do sentiment analysis well
- Categorization
  - Most basic to human cognition
  - Most difficult to do with software
- No single correct categorization
  - Women, Fire, and Dangerous Things

Smart Sentiment Analysis
Sentiment & Categorization

- Borges – Celestial Emporium of Benevolent Knowledge
  - Those that belong to the Emperor
  - Embalmed ones
  - Those that are trained
  - Suckling pigs
  - Mermaids
  - Fabulous ones
  - Stray dogs
  - Those that are included in this classification
  - Those that tremble as if they were mad
  - Innumerable ones
  - Other

Smart Sentiment Analysis
New Taxonomies

- New Taxonomies – Appraisal
  - Appraisal Groups – Adjective and modifiers – “not very good”
  - Four types – Attitude, Orientation, Graduation, Polarity
  - Supports more subtle distinctions than positive or negative
- Emotion taxonomies
  - Joy, Sadness, Fear, Anger, Surprise, Disgust
  - New Complex – pride, shame, embarrassment, love, awe
  - New situational/transient – confusion, concentration, skepticism
- Beyond Keywords
  - Analysis of phrases, multiple contexts – conditionals, oblique
  - Analysis of conversations – dynamic of exchange, private language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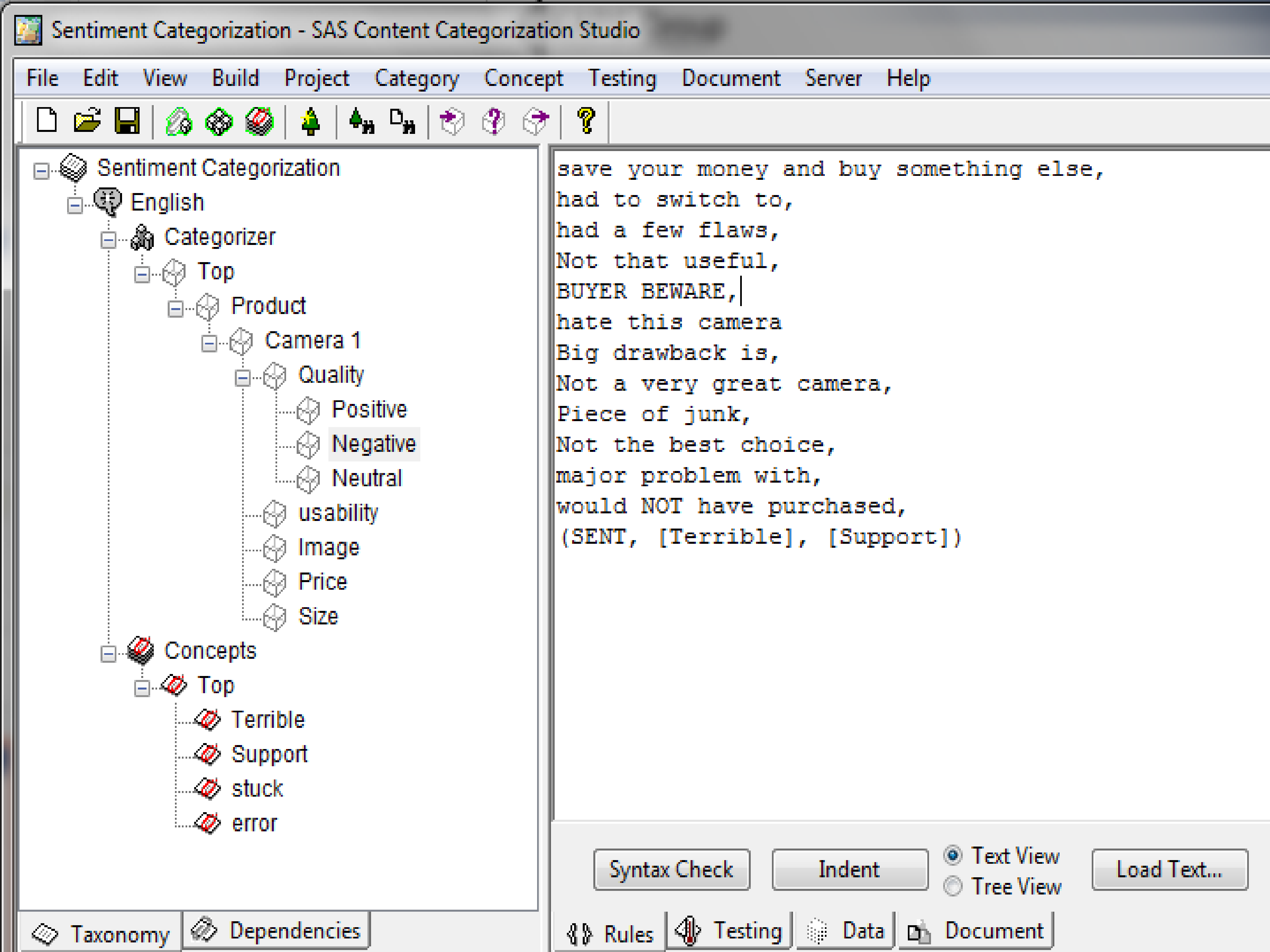
Sentiment Categorization - SAS Content Categorization Studio
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English
Categorizer
Top
Product
Camera 1
Quality
Positive
Negative
Neutral
usability
Image
Price
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Concepts
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Terrible
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major problem with,
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(SENT, [Terrible], [Support])
Syntax Check
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Text View
Tree View
Load Text...
Rules
Testing
Data
Document

Deep Text Social Media Analysis
Key Concepts

– Basic level categories
– Expertise

Deep Text Social Media Analysis
Basic Level Categories

- Mid-level in a taxonomy / hierarchy
- Levels: Superordinate – Basic – Subordinate
  - Mammal – Dog – Golden Retriever
  - Furniture – chair – kitchen chair
- Basic in 4 dimensions
  - Perception – overall perceived shape, single mental image, fast identification
  - Function – general motor program
  - Communication – shortest, most commonly used, neutral, first learned by children
  - Knowledge Organization – most attributes are stored at this level - Maximum distinctness and expressiveness

Deep Text Social Media Analysis
How recognize Basic level

- Cue Validity – probability that a particular object belongs to some category given that it has a particular feature (cue)
  - X has wings – bird
- Short words – noun phrase
- Kinds of attributes
  - Superordinate – functional (keeps you warm, sit on it)
  - Basic – Noun and adjectives – legs, belt loops, cloth
  - Subordinate – adjectives – blue, tall
- More complex for non-object domains
- Issue – what is basic level is context dependent

Deep Text Social Media Analysis
Other levels

- Subordinate – more informative but less distinctive
  - Basic shape and function with additional details
    - Ex – Chair – office chair, armchair
  - Convention – people name objects by their basic category label, unless extra information in subordinate is useful
- Superordinate – Less informative but more distinctive
  - All refer to varied collections – furniture
  - Often mass nouns, not count nouns
  - List abstract / functional properties
  - Very hard for children to learn

Deep Text Social Media Analysis
Basic Level Categories and Expertise

- Experts prefer lower, subordinate levels
  - Novice prefer higher, superordinate levels
  - General Populace prefers basic level
- Expertise Characterization for individuals, communities, documents, and sets of documents
- Experts chunk series of actions, ideas, etc.
  - Novice – high level only
  - Intermediate – steps in the series
  - Expert – special language – based on deep connections

Deep Text Social Media Analysis
Expertise Analysis: Analytical Techniques

- Corpus context dependent
  - Author748 – is general in scientific health care context, advanced in news health care context
- Need to generate overall expertise level for a corpus
- Develop expertise rules – similar to categorization rules
  - Use basic level for subject
  - Superordinate for general, subordinate for expert
- Also contextual rules
  - “Tests” is general, high level
  - “Predictive value of tests” is lower, more expert
  - Not counting “big words” – essay evaluation debacle

Deep Text Social Media Analysis Development

Deep Text Social Media Analysis Development: Deep Text vs. Deep Learning

- Two Schools – Language Rules vs. Math / Patterns
  - Depth & Intelligence vs. Speed & Power
  - Two systems in the brain – system 1 and 2
- Deep Learning
  - Neural Networks – from 1980’s, new = size and speed
  - Strongest in areas like image recognition, fact lookup
  - Weakest – concepts, subjects, deep language, metaphors, etc.
- Deep Text – Language, concepts, symbols
  - Categorization & Generalization – most basic to human cognition
    - Beyond Categorization – making everything else smarter
  - Rules = higher accuracy – 98% - Rules brittle?

- Boehringer Pilot One Drug Names Diseases
  - English
    - Categorizer
      - Top
        - Diseases
          - arthritis
          - Benign Prostatic Hyperplasia
          - Cancer
          - Deep Vein Thrombosis
          - HIV
          - Hypertension
          - Pulmonary Disease
        - Drug Names
          - afatinib

```
(OR,
_/article/title:"[arthritis]",

(AND, _/article/mesh:"[arthritis]",_/article/abstract:"[arthritis]"),

(MINOC_2, _/article/abstract:"[arthritis]"),

(START_500, (MINOC_2,"[arthritis]"))
)
```

Deep Text Social Media Analysis
Deep Text vs. Deep Learning

- Deep Learning is a Dead End - accuracy – 60-70%
  - Black Box – don't know how to improve except indirect manipulation of input – "We don't know how or why it works"
  - Domain Specific, tricks not deep understanding
  - No common sense and no strategy to get there
  - Major – loss of quality – who is training who?
  - Need millions of examples – not human-like learning
- AI should be AAI – Artificial Animal Intelligence – patterns not concepts
- Extra Benefits of a Deep Text Approach – Multiple InfoApps
- Future = Interpenetration of Opposites
  - Make Deep Learning smarter, add learning to Deep Text

Text Analytics Development: Categorization Process
Start with Taxonomy and Content

- Starter Taxonomy
  - If no taxonomy, develop (steal) initial high level
  - Library of semantic resources – templates, catalogs, data
- Analysis of taxonomy – suitable for categorization
  - Structure – not too flat, not too large, orthogonal categories
- Content Selection
  - Map of all anticipated content, Selection of training sets
- Start: taxonomy as initial categorization
- Term building – from content – basic set of terms that appear often / important to content
  - Auto-suggested and/or human generated
- Cycles: test set, recall, precision -> more content
- Rule templates, sectionize documents

Deep Text Social Media Analysis Development: Entity Extraction Process

- Entity Categories – from Knowledge Audit, K Map
- Find and Convert catalogs:
  - Organization – internal resources
  - People – corporate yellow pages, HR
  - Linked Data – more data, less control
  - Scripts to convert catalogs – programming resource
- Build initial rules – follow categorization process
  - Differences – scale, threshold – application dependent
  - Recall – Precision – balance set by application
  - Issue – disambiguation – Ford company, person, car
- Unknown entities – NLP rules – “cap cap said”

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Deep Text Social Media Analysis Applications

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Social Media Applications Characteristics

- Scale = Huge! 100's of Millions / Billions
- Poor Quality of the Text
- Conversations, not stand alone documents
  - Issues of co-reference, who is speaking
- Direct Business Value
  - Customers, competitors, fix products, new products
- New techniques beyond counting pos. & neg.
  - Context, intensity, new models of emotions
  - New conceptual models, models of users, communities

Deep Text Social Media Analysis
Expertise Analysis: Application areas

- Business & Customer intelligence
  - General – characterize people's expertise to add to evaluation of their comments
- Combine with VOC & sentiment analysis – finer evaluation – what are experts saying, what are novices saying
- Social Media - Community of Practice
  - Characterize the level of expertise in the community
- Expertise location
  - Generate automatic expertise characterization based on authored documents

Deep Text Social Media Analysis Enterprise Info Apps

- Focus on business value-new revenues not cost cutting
- Business Intelligence
  - Early identification of product issues
  - What are competitors doing
  - Integrate data and text
- Financial Services
  - Text analytics with predictive analytics – risk and fraud
  - Combine unstructured text (why) and structured transaction data (what)
  - Customer Relationship Management, Fraud Detection
  - Stock Market Prediction – Twitter, impact articles

Deep Text Social Media Analysis
Enterprise Info Apps

- eDiscovery,
  - Collect all documents about a particular situation (Search)
  - Reduce human effort, add intelligence to selection
  - Payoff is big – One firm with 1.6 M docs – saved $2M
- Text Analytics Assisted Review
  - Scan millions of documents for indications of revenue
- Enterprise Social Networks – growing
- Automatic Summaries
  - Extract key data – disambiguation, co-reference
  - Create story summaries – baseball game, finance

Social Media Applications
Voice of the Customer / Voter / Employee

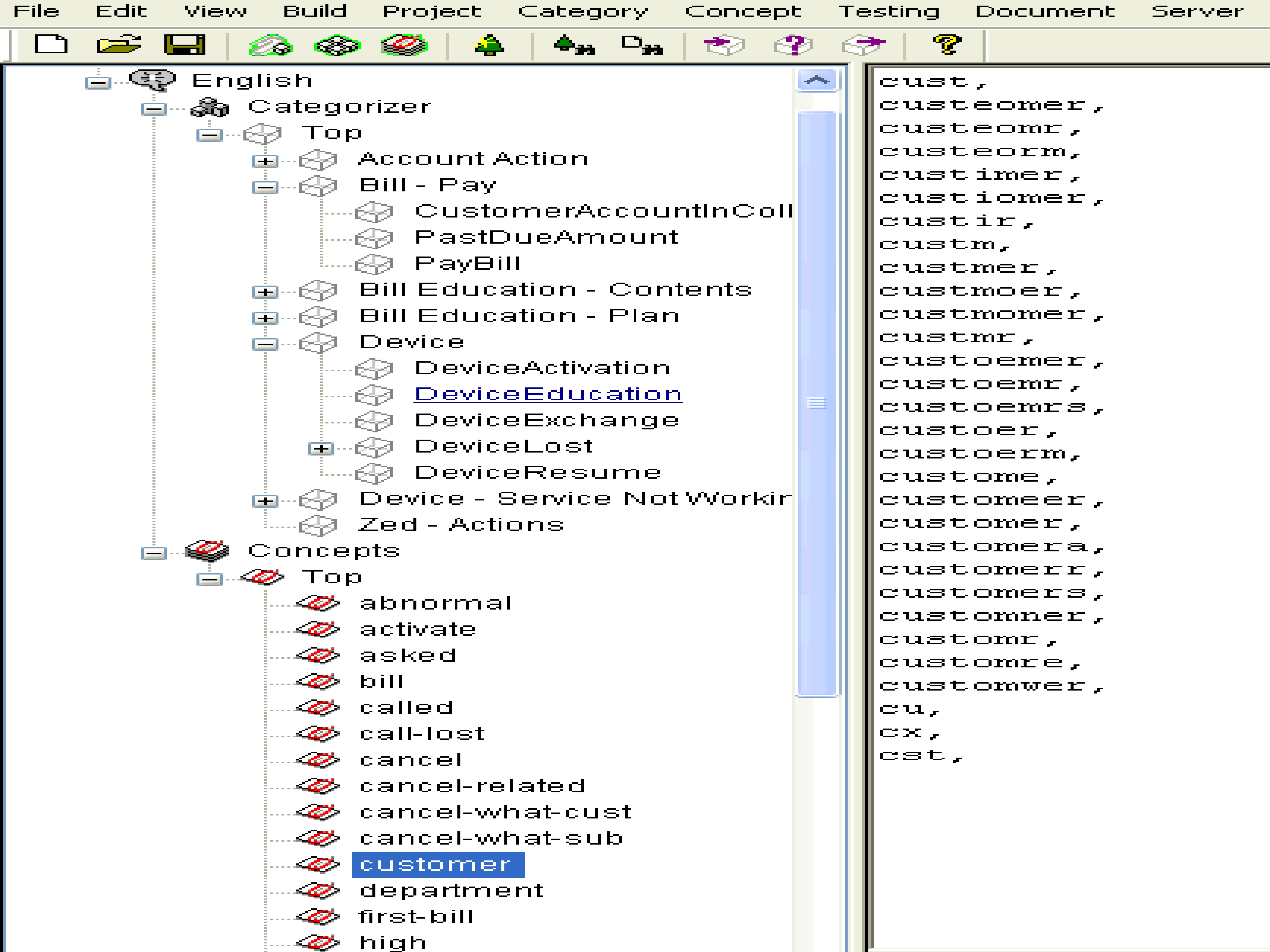
- Detection of a recurring problem categorized by subject, customer, client, product, parts, or by representative.
- Analytics to evaluate and track the effectiveness:
  - Representatives, policies, programs, actions
- Competitive intelligence – calls to switch from brand X to Y in a particular region – and why
- Subscriber mood before and after a call – and why
- Pattern matching of initial motivation to subsequent actions – optimize responses and develop proactive steps

New Applications in Social Media
Behavior Prediction – Telecom Customer Service

- Problem – distinguish customers likely to cancel from mere threats
- Analyze customer support notes
- General issues – creative spelling, second hand reports
- Develop categorization rules
  - First – distinguish cancellation calls – not simple
  - Second - distinguish cancel what – one line or all
  - Third – distinguish real threats

New Applications in Social Media
Behavior Prediction – Telecom Customer Service

- Basic Rule
  - (START_20, (AND,
  - (DIST_7,"[cancel]", "[cancel-what-cust]"),
  - (NOT,(DIST_10, "[cancel]", (OR, "[one-line]", "[restore]", “[if]”)))))
- Examples:
  - customer called to say he will **cancell** his **account** **if** the does not stop receiving a call from the ad agency.
  - cci and **is upset that he has the asl charge** and **wants it off** **or** her is going to **cancel** his act
- Combine sophisticated rules with sentiment statistical training and Predictive Analytics and behavior monitoring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DeviceEducation
DeviceExchange
DeviceLost
DeviceResume
Device - Service Not Workir
Zed - Actions
Concepts
Top
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activate
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bill
called
call-lost
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cancel-what-cust
cancel-what-sub
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Social Media Applications
Pronoun Analysis: Fraud Detection; Enron Emails

- Patterns of “Function” words reveal wide range of insights
- Function words = pronouns, articles, prepositions, conjunctions.
  - Used at a high rate, short and hard to detect, very social, processed in the brain differently than content words
- Areas: sex, age, power-status, personality – individuals and groups
- Lying / Fraud detection: Documents with lies have
  - Fewer and shorter words, fewer conjunctions, more positive emotion words
  - More use of “if, any, those, he, she, they, you”, less “I”
- Current research – 76% accuracy in some contexts

Deep Text Social Media Analysis
Getting Started with Text Analytics

- Text Analytics is weird, a bit academic, and not very practical
    - It involves language and thinking and really messy stuff
- On the other hand, it is really difficult to do right (Rocket Science)
- Organizations don't know what text analytics is and what it is for
- False Model – all you need is our software and your SME's
    - Categorization is not a skill that SME's have
- Companies get stuck – know the software but not how to really use it well, leads to abandoned projects
- Best way to start?
- Buy and read Deep Text, of course

Deep Text Social Media Analysis
Smart Start: Think Big, Start Small, Scale Fast

- Think Big: Strategic Vision
  - K Audit – content, people, technology, KOS
  - Establish Infrastructure – stabile foundation
  - Avoid expensive mistakes – dead end approach, technology, etc.
- Start Small: Pilot or POC
  - Immediate value and learn by doing
  - Easier to get management buy-in
- Scale Fast: multiple applications
  - Set of semantic resources and skill to implement
  - First project + 10%, subsequent projects – 50%

Deep Text Social Media Analysis
Smart Start Step One- Knowledge Audit

- Info Problems – what, how severe
- Formal Process – Knowledge Audit
  - Contextual & Information interviews, content analysis, surveys, focus groups, ethnographic studies, Text Mining
- Informal for smaller organizations, specific application
- Category modeling – Cognitive Science – how people think
  - Panda, Monkey, Banana
- Natural level categories mapped to communities, activities
- Strategic Vision – Text Analytics and Information/Knowledge Environment

Smart Start Step Two - Software Evaluation
Different Kind of software evaluation

- Traditional Software Evaluation - Start
  - Filter One- Ask Experts - reputation, research – Gartner, etc.
    - Market strength of vendor, platforms, etc.
    - Feature scorecard – minimum, must have, filter to top 6
  - Filter Two – Technology Filter – match to your overall scope and capabilities – Filter not a focus
  - Filter Three – In-Depth Demo – 3-6 vendors
- Reduce to 1-3 vendors
- Vendors have different strengths in multiple environments
  - Millions of short, badly typed documents, Library 200 page PDF, enterprise & public search

Smart Start Step Three – Proof of Concept / Pilot Project

- POC use cases – basic features needed for initial projects
- Design - Real life scenarios, categorization with your content
- Preparation:
  - Preliminary analysis of content and users information needs
    - Training & test sets of content, search terms & scenarios
  - Train taxonomist(s) on software(s)
  - Develop taxonomy if none available
- Four week POC – 2 rounds of develop, test, refine / Not OOB
- Need SME's as test evaluators – also to do an initial categorization of content
- Majority of time is on auto-categorization

Deep Text Social Media Analysis
POC and Early Development: Risks and Issues

- CTO Problem –This is not a regular software process
- Semantics is messy not just complex
  - 30% accuracy isn’t 30% done – could be 90%
- Variability of human categorization
- Categorization is iterative, not “the program works”
  - Need realistic budget and flexible project plan
- Anyone can do categorization
  - Librarians often overdo, SME’s often get lost (keywords)
- Meta-language issues – understanding the results
  - Need to educate IT and business in their language

Quick Start for Text Analytics
Proof of Concept -- Value of POC

- Selection of best product(s)
- Identification and development of infrastructure elements – taxonomies, metadata – standards and publishing process
- Training by doing –SME's learning categorization, Library/taxonomist learning business language
- Understand effort level for categorization, application
- Test suitability of existing taxonomies for range of applications
- Explore application issues – example – how accurate does categorization need to be for that application – 80-90%
- Develop resources – categorization taxonomies, entity extraction catalogs/rules

Deep Text Social Media Analysis Conclusions

- Deep text analytics adds depth and intelligence, context and categorization to social media analysis
- Deep text analytics Is an infrastructure platform technology – Enterprise & Social
- Needs a strategic vision
  - But also concrete and quick application to drive acceptance
- Future is
  - Deep Text and Deep Learning integration – modules
  - Text + Data, Language + Math, Social + Enterprise, psychology + cognitive science
  - Combination of sophisticated marketing and equally sophisticated text analytics

Questions?

Learn More:

- Taxonomy Boot Camp – 10/17-18-London
- Internet Librarian – 10/22-25-Monterey
- Taxonomy Boot Camp – 11/6-7 - DC
- Text Analytics Forum – 11/8-9 –DC

Resources

- Books
  - Deep Text: Using Text Analytics to Conquer Information Overload, Get Real Value from Social Media, and Add Big(ger) Text to Big Data
    - Tom Reamy
  - Women, Fire, and Dangerous Things
  - Don't Think of an Elephant
    - George Lakoff
  - Knowledge, Concepts, and Categories
    - Koen Lamberts and David Shanks
  - Thinking Fast and Slow
    - Daniel Kahneman
  - Any cognitive science book written after 2010

Resources

- Conferences – Web Sites
  - Text Analytics Forum - All aspects of text analytics
    - http://www.textanalyticsforum.com
  - Semtech
    - http://www.semanticweb.com
  - Dataversity Conferences
  - http://www.dataversity.net/
  - Sentiment Analysis Symposium
    - www.sentimentsymposium.com

KAPS Group
Knowledge Architecture Professional Services

Resources

- LinkedIn Groups:
  - Text Analytics
  - Text Analytics Forum
  - Taxonomy Community of Practice
  - Sentiment Analysis
  - Text and Social Analytics
  - Metadata Management
  - Semantic Technologies, Semantic Web
  - Association for Information Science & Technology