

Ubiquiti: Software for Data Analytics & Diagnostics

Applications in Healthcare



About Ubiquiti

Ubiquiti provides analytics, diagnostics and search software with customized domain-specific ontologies to help utilize domain-knowledge in a novel approach.

Both structured and unstructured data are handled (eg, narrative text with its semantics) – and Ubiquiti has a proven and strong track-record in delivering solutions.

Overview of Ubiquiti Inc.

■ Solutions: Data analysis software & associated services

- Encoding, data mining, reporting, alerting, forecasting, and diagnostics
- Organizes and analyzes both structured and unstructured information in the context of domain-specific ontologies, with unique approach to text encoding & analysis
- Modular – easily integrates with other software

■ Major Industries: Transportation and Healthcare

- Strong track record in transportation industry (automotive, fleets, aviation)
- Now expanding into healthcare (payers, providers, pharmaceuticals)

■ Corporate Background: Successful and growing

- Operational since 2000, with offices in the US and overseas
- Privately-held, self-funded, profitable
- Enthusiastic customer references

Examples with Healthcare Ontologies

- Finding Previously Unknown but Useful Patterns in Data
(eg, Mining of “Adverse Event Reports” for Pharma/FDA)
- Automating Flagging of Known Issues in Data
(eg, Alerts for Claims Overpayments for Payers)
- Analytics, including text, on Patient Charts/EMRs
(eg, Encoding, Outcomes Analysis etc. for Providers)
- Enabling Technologies: Ontologies & Text Analytics
- More Possibilities...1: Data-Driven Diagnostics
- More Possibilities...2: Generalized Models & Search

Examples ...1: For Pharma-related Industry

- Surveillance applications, eg, for adverse events from pharmaceutical use; monitoring of epidemics; clustering, categorization, search, mining of clinical trial reports
- (Sub)sequence analyses & mining data for bio-informatics
- Group documents concerning compounds (eg, proteins), ailments (eg, 'flu) into functional, structural, ... ontologies
- Handling large quantities of sales, marketing, feedback information very rapidly
- Customized text technologies for pharmaceutical-specific issues, opportunities and problems

An AERS Data Record

Used one calendar quarter of Adverse Events Reporting System (AERS) data publicly available from FDA

Ubiquiti RADAR for FDA Drug Testing - Standard View

File Tools Database Window Help

Powered by Ubiquiti

View: Standard Mining Alerts

Notifications FDA_Data_All.csv

	OEM Code	ISR	L Case	I F Code	Foll Sequence	Image	Event Date	Manufacture...	FDA Date	Report Code	Manufacturer Number	Manufacturer Sender
1	10	0	0	I_F_COD	FOLL_SEQ	IMAGE	EVENT_DT	MFR_DT	FDA_DT	REPT_COD	MFR_NUM	MFR_SNDR
2	10	0	0	I_F_COD	FOLL_SEQ	IMAGE	EVENT_DT	MFR_DT	FDA_DT	REPT_COD	MFR_NUM	MFR_SNDR
3	10	5700584	6872520	I		5700584-7	Mar 17, 2008		Apr 09, 2008	DIR		
4	10	5700584	6872520	I		5700584-7	Mar 17, 2008		Apr 09, 2008	DIR		
5	10	5700584	6872520	I		5700584-7	Mar 17, 2008		Apr 09, 2008	DIR		
6	10	5701501	6817974	I		5701501-6	Jan 01, 2008	Mar 20, 2008	Apr 07, 2008	EXP	530#6#2008-00011	SCHWARZ PHARMA DEUTSCHLAND GMBH

405043 records, 1 selected

FDA Adverse Effect Reporting System (AERS) Report

AERS Report Information

ISR: 5701501
L Case: 6817974
Image: 5701501-6
Follow Up Sequence:
Report Date: Apr 2, 2008
Dechallenge Code: D - Does Not Apply
Rechallenge Code: D - Does Not Apply
Report Code: EXP - Expedited (15-Day)
Report Source Code #1: FGN - Foreign
Report Source Code #2: OTH - Other
Report Source Code #3:

Drug User Information

Age: 83 YR
Weight:
Gender: M - Male
Identity Confidential:
Reporter Country: GERMANY
Reporter Occupation: MD - Physician

Drug Information

Administration Route: TRANSDERMAL
Drug #1 Name: NEURO-PATCH-DOSE (ROTIGOTINE)
Drug #2 Name:
Drug #3 Name:
Drug Name Source: 2 - Verbatim Name Used
Drug Role Code: PS - Primary Suspect Drug
Drug Mfg. Number: 530#6#2008-00011
Manufacturer Name: SCHWARZ PHARMA DEUTSCHLAND GM.
Expiration Date:
Manufacture Date: Mar 20, 2008
FDA Date: Apr 7, 2008

Drug Usage Information

Event Date: Jan 1, 2008
Drug Start Date: Oct 23, 2007
Drug End Date: Oct 25, 2007
Outcome Code #1: DE - Death
Outcome Code #2: HO - Hospitalization - Initial or Prolonged
Outcome Code #3:
Death Date:
Duration of Use:

MedDRA Terms

PT - Use for: PARKINSON'S DISEASE
PT - Symptom #1: PNEUMONIA
PT - Symptom #2:
PT - Symptom #3:

Dosage Verbatim Information

2 MG/24H (2 MG/24H 1 IN 1 DAY (S)) TRANSDERMAL, 4 MG/24H (4 MG/24H 1 IN 1 DAY (S)) TRANSDERMAL

Generated by Ubiquiti

Zoom In Zoom Out 125% Fit Width Fit Height

Console
Viewing Records: FDA_Data_All.csv

Navigator

TOP 7

- Mining Results
- FDA_Data_All.csv (405043, Apr 17 2009)
- Date Information (405041)
- Demographic Information (404520)
- Drug Information (405041)
 - Drug Administration Route (211855)
 - Drug Dosage Verbatim (129417)
 - Drug Name (380212)
 - A-B (62262)
 - ASPIRIN (4636)
 - BYETTA (4385)
 - AVONEX (2904)
 - ACETAMINOPHEN (2357)
 - AVANDIA (1900)
 - AVELOX (1693)
 - ACETYLSALICYLIC ACID SRT (1640)
 - C-D (53974)
 - S-T (49973)
 - M-N (43915)
 - O-P (39458)
 - K-L (31853)
 - E-F (31302)
 - Drug Name Source (405040)
 - Drug Role Code (405041)
 - Duration Concepts (31524)
 - Manufacturer Name (389481)
 - Patient Outcome Code (330775)
 - Preferred Term (MedDRA) - 'Use For' Indication (202574)
 - D (54468)
 - DRUG (38882)
 - DIABETES (7735)
 - TYPE 2 DIABETES MELLITUS (4939)
 - DIABETES MELLITUS (2867)
 - TYPE 1 DIABETES MELLITUS (267)
 - IDIABETIC NEUROPATHY (60)
 - IDIABETIC FOOT (54)
 - DIABETES INSIPIDUS (36)
 - DIABETES MELLITUS INADEQUATE CONTROL (14)
 - DEPRESSION (4903)
 - DEMENTIA (448)
 - DISORDER (100)

Group Sets (FDA_Data_All.csv)

No Group Sets

Information

Name: FDA_Data_All.csv
Created: Apr 17, 2009, 2:05 PM
Count: 405,043 records

Ready

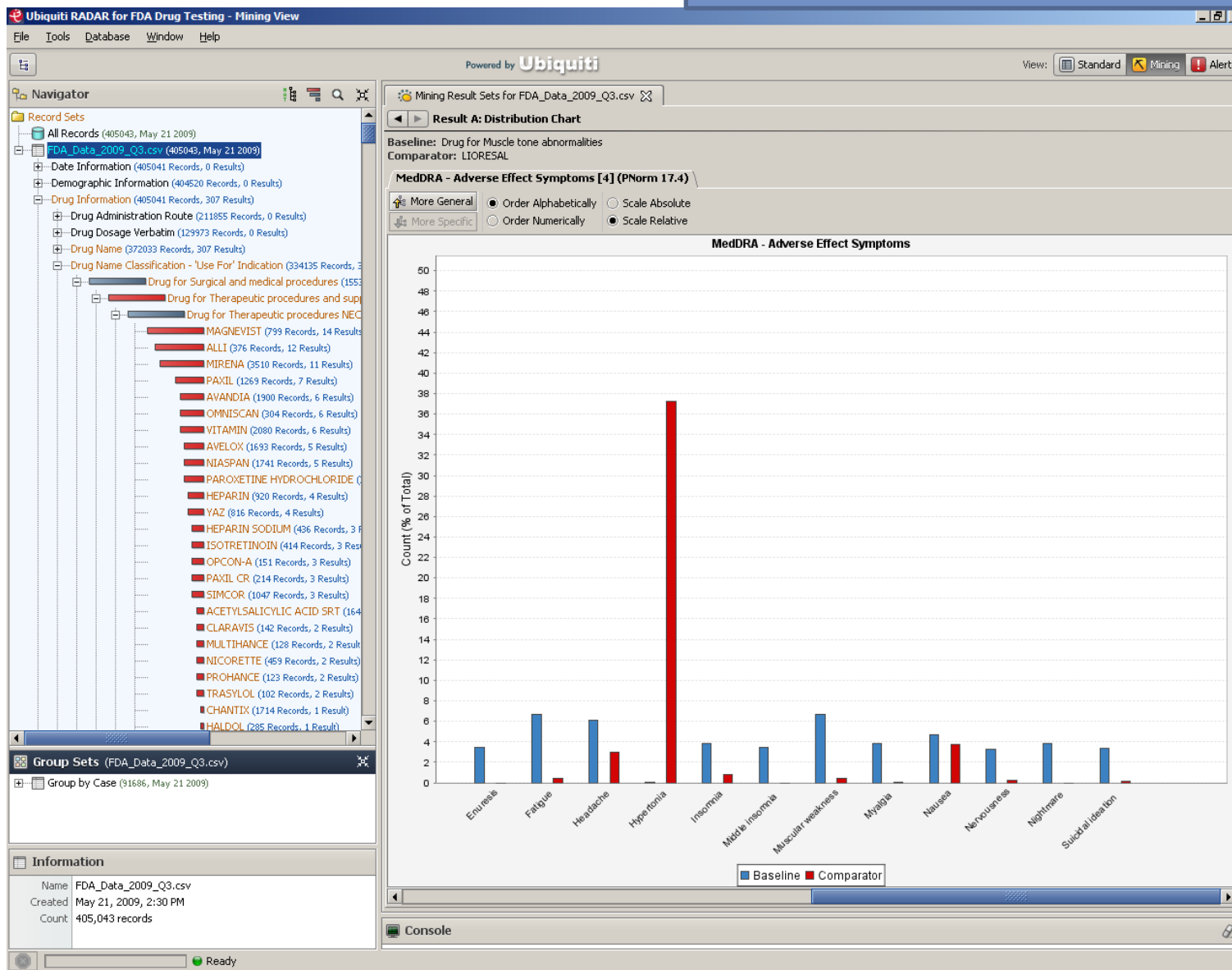
Validation of Findings

Using publicly available Internet sources:

- Drug AVANDIA: Lawsuit for causing Mycardial Infarction
- Drug BYETTA: Several sources indicate Nausea side-effect
- Drug ZOMETA: Lawsuit for causing Osteonecrosis
- Drug LIORESAL: Several sources indicate the side-effects

“Distribution Difference”

Distribution difference results seen in more detail



Automated Mining ...

Analytics can be “operationalized” via sophisticated automated alerts

Ubiquiti RADAR for FDA Drug Testing - Alerts View

File Tools Database Window Help

Powered by Ubiquiti

View: Standard Mining Alerts

Alerts for FDA_Data_2009_Q3.csv

FDA_Data_2009_Q3.csv: Adverse Symptom Alert (All Cases)

Adverse Symptom Alert
The Count distribution over MedDRA - Adverse Effect Symptoms [4] has a PNorm Difference Greater Than 10 for any combination of Drug Name Classification - 'Use For' Indication [3] and Drug Name Classification - 'Use For' Indication [4] where a specific Drug Name Classification - 'Use For' Indication [4] is excluded from a specific Drug Name Classification - 'Use For' Indication [3]

15 Cases. 15 Unacknowledged Cases.

Acknowledge... Unacknowledge... Clear All Sort... Export to CSV...

1.	(LIORESAL), (Drug for Muscle tone abnormalities) - Count distribution PNorm difference is 17.396	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge
2.	(MIRENA), (Drug for Therapeutic procedures NEC) - Count distribution PNorm difference is 15.507	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge
3.	(BYETTA), (Drug for Diabetes mellitus (incl subtypes)) - Count distribution PNorm difference is 13.949	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge
4.	(MIRENA), (Drug for Contraceptive methods female) - Count distribution PNorm difference is 13.295	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge
5.	(NIASPAN), (Drug for Therapeutic procedures NEC) - Count distribution PNorm difference is 12.717	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge
6.	(AVANDIA), (Drug for Diabetes mellitus (incl subtypes)) - Count distribution PNorm difference is 12.572	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge
7.	(AVANDIA), (Drug for Therapeutic procedures NEC) - Count distribution PNorm difference is 12.502	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge
8.	(LIORESAL), (Drug for Neuromuscular disorders NEC) - Count distribution PNorm difference is 11.443	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge
9.	(NIASPAN), (Drug for Cholesterol analyses) - Count distribution PNorm difference is 11.336	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge
10.	(XYREM), (Drug for Muscle tone abnormalities) - Count distribution PNorm difference is 10.824	May 22, 2009 08:57 AM	View Evidence Save Records Acknowledge

50 cases per page

Console

Information

Name: FDA_Data_2009_Q3.csv
Created: May 21, 2009, 2:30 PM
Count: 405,043 records

Ready

Unexpected Increases

Another example of operationalized analytics

Ubiquti RADAR for FDA Drug Testing - Alerts View

File Tools Database Window Help

Powered by Ubiquti

View: Standard Mining Alerts

Alerts for FDA_Data_All.csv

FDA_Data_All.csv: Reports Increase (All Cases)

Reports Increase
 Count for Drug Name [2] is 3 or more standard deviations above the moving average for the last 3 Report Date [2] intervals
 924 Cases, 924 Unacknowledged Cases. (displaying 1-50)

Acknowledge... Unacknowledge... Clear All Sort... Export to CSV...

1.	REMICADE - Count is 2568.054 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
2.	AVONEX - Count is 1070 standard deviations above the average in 2008-05	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
3.	DIANEAL - Count is 844 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
4.	ENBRELE - Count is 738.431 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
5.	IMITREX - Count is 574.464 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
6.	GLIMEPIRIDE - Count is 319.852 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
7.	MAGNEVIST - Count is 314 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
8.	LEVOXYL - Count is 294.812 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
9.	ROZEREM - Count is 278 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
10.	TAXOTERE - Count is 263.849 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
11.	TRUVADA - Count is 252.302 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records Acknowledge
12.	MIRTAZAPINE - Count is 247.106 standard deviations above the average in 2008-07	May 19, 2009 06:38 PM	View Evidence Save Records

50 cases per page Page: 1 of 19: 1 - 50

Console

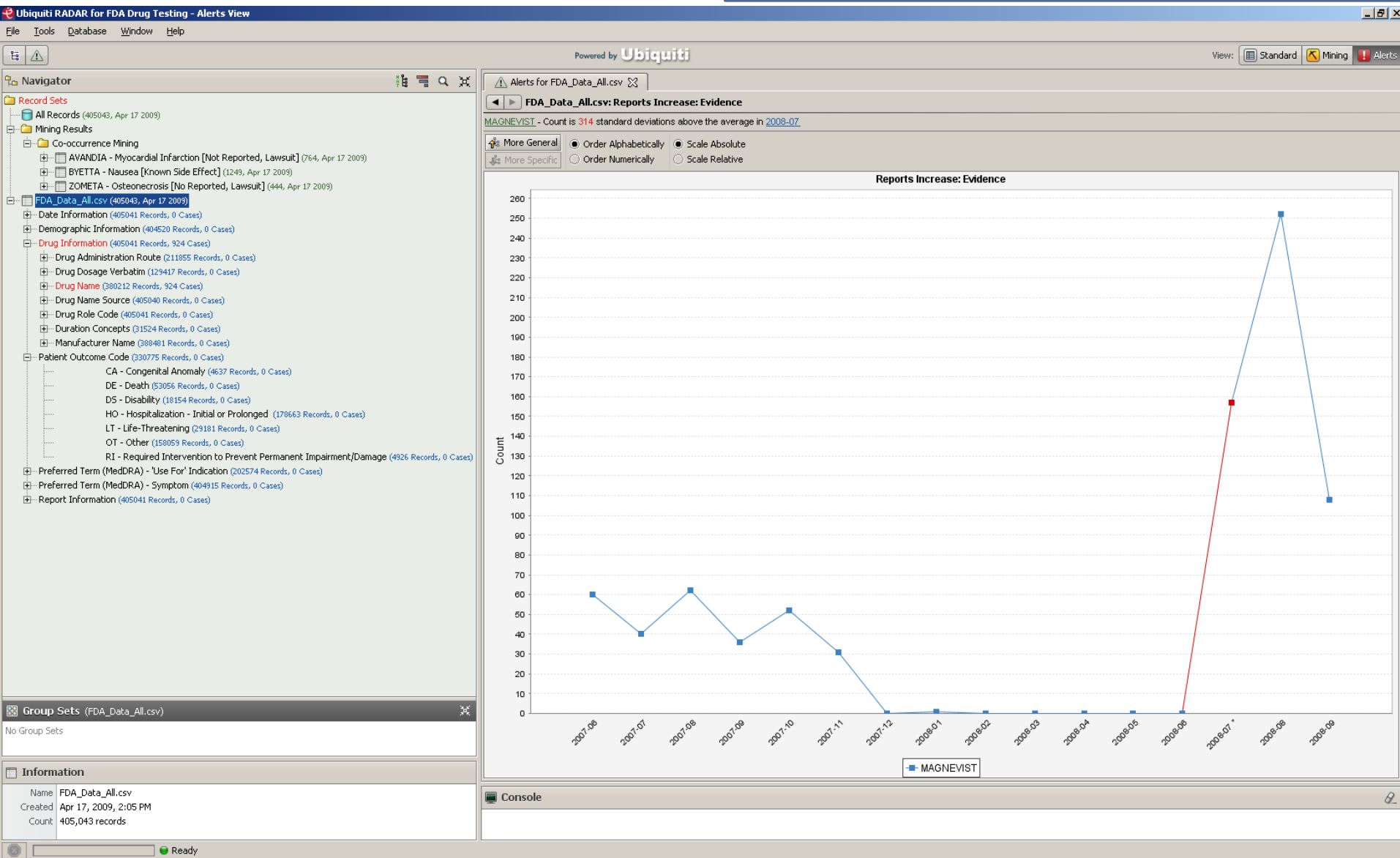
Information

Name FDA_Data_All.csv
 Created Apr 17, 2009, 2:05 PM
 Count 405,043 records

Ready

Detail on the Increase

Detail on operationalized analytics

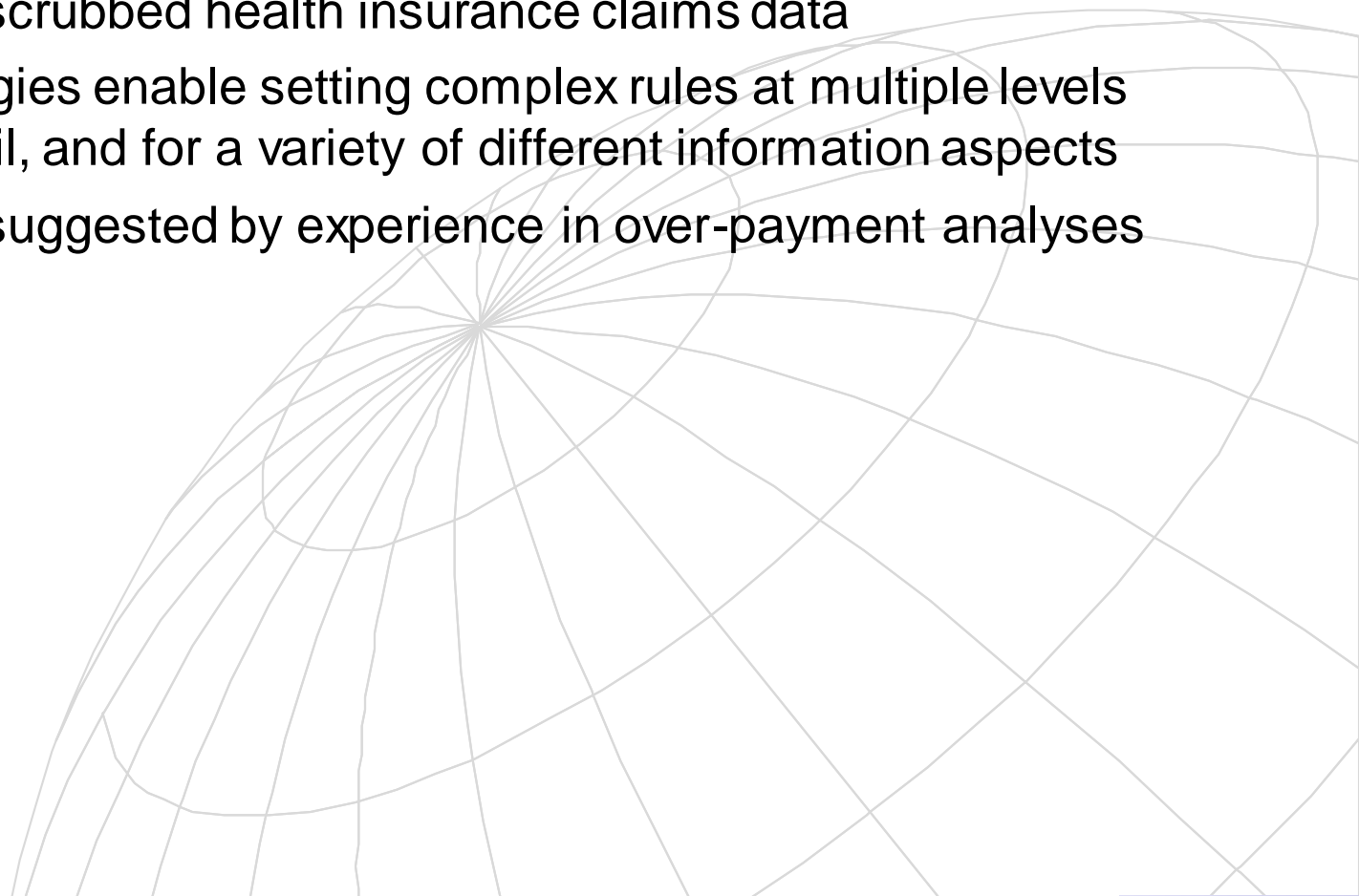


Specific Examples for Payers & Providers

- Automated audit of codes assigned for patient charts based on the transcribed dictations. (Payer side)
- (Semi-)automated assignment of standard codes for patient charts with transcribed dictations. (Provider side)
- Potentially creating a (semi-)automated clearing-house to replace current Provider-Payer revenue cycle.
- Process (i.e., cluster/categorize/search/mine/link) medical literature
- Analyses & mining of extracted data for research
- Eg, see more in *UTHSC_Talk_Abstract* (presented at School of Health Information Sciences, Univ. Texas)

Examples ...2: for Payers

- For auditing payments by Payers
- Using scrubbed health insurance claims data
- Ontologies enable setting complex rules at multiple levels of detail, and for a variety of different information aspects
- Rules suggested by experience in over-payment analyses



Setting Complex Rules with Ontology Grouping

The screenshot displays the Ubiquiti RADAR interface for configuring a group type. The main window is titled "Powered by Ubiquiti" and shows a "Group Type Definitions" panel with a "Group Type Properties" configuration for "PC-TC Correspondence".

Group Type Properties:

- Name: PC-TC Correspondence
- Definition: Field: Member ID (Empty Field Not Allowed) and Field: Date of Service From (Empty Field Not Allowed) and Field: Date of Service Thru (Empty Field Not Allowed)
- Record Filter: Concept: Procedure Code: 992* (is present)
- Group Filter: Concept: Revenue Code: 0510 - General Classifi (Value Type: Count, Relation: Is Greater, Value: 0)

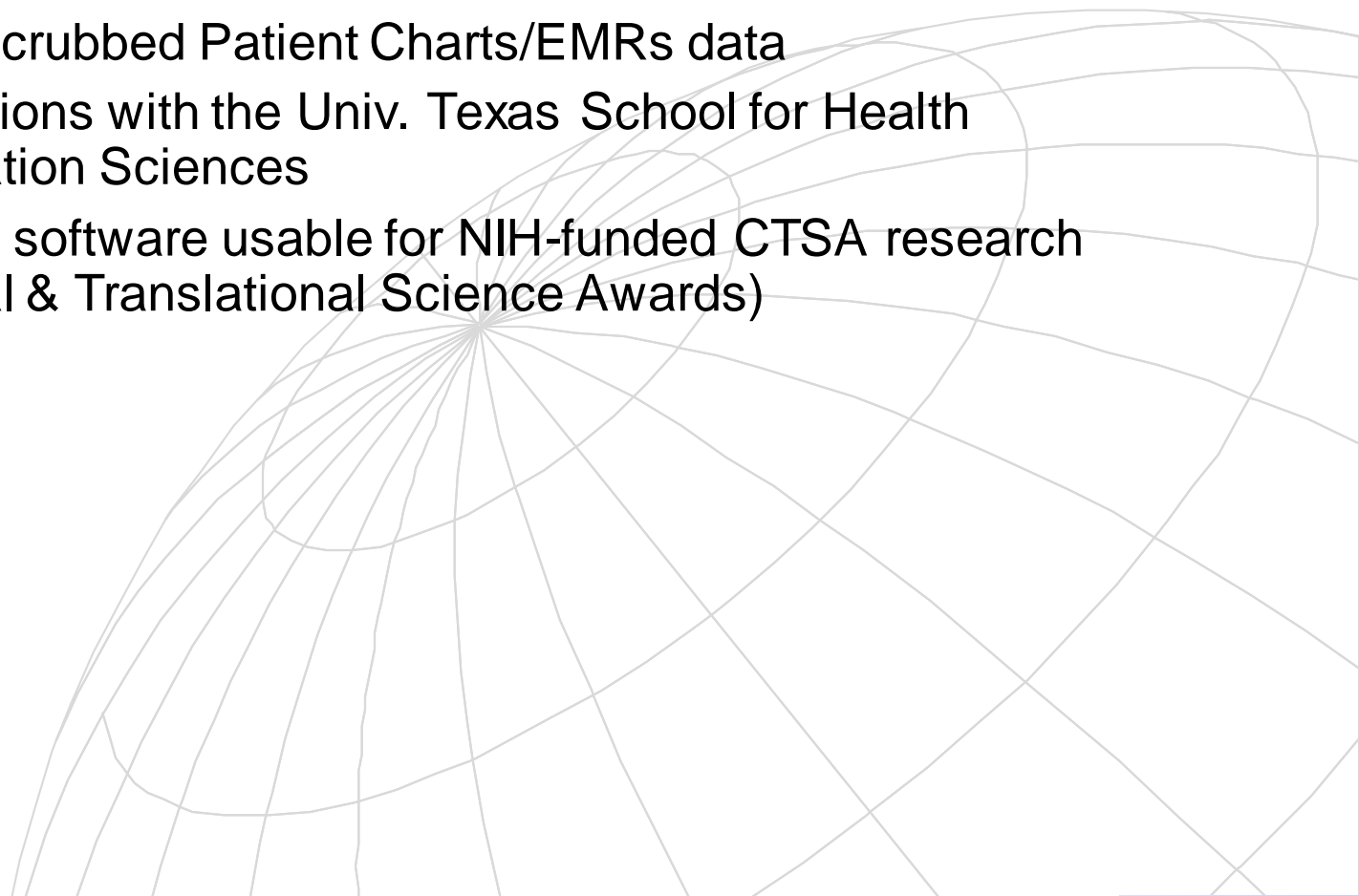
A "Group Filter Clause" dialog is open, showing a search for "dyspnea". The "Matching Concepts" section lists two results:

- Diagnosis Code: 786.09 - OTHER DYSPNEA AND RESPIRATORY ABNORMALITIES
- Diagnosis Code: 786.0 - DYSPNEA AND RESPIRATORY ABNORMALITIES

The "Group Sets" panel at the bottom left shows a list of 66 groups, including "CCI Flag", "Duplicate Claim", "Excessive Billing Amount", and "J-Code Profiling".

Examples ...3: for Providers

- To assess Outcomes, Quality Metrics, Under-charges etc. by Providers
- Using scrubbed Patient Charts/EMRs data
- Interactions with the Univ. Texas School for Health Information Sciences
- Ubiquiti software usable for NIH-funded CTSA research (Clinical & Translational Science Awards)



Example from Anonymized Patient Record

Subjective: This is a 31-year-old female with a history of asthma, allergic rhinitis, and learning disability who presents today with cough. Five days ago she developed a headache with sinus congestion and postnasal drip. This progressed to persistent cough that has been productive of a yellowish sputum over the last day. The patient also feels like she has chest congestion. She denies any wheezing or shortness of breath. She has not had any fever, chills, night sweats, ear ache, nausea, vomiting, or diarrhea. She initially had a mild sore throat which has resolved. The patient is currently on Flovent and albuterol MDI two puffs q.d. for her asthma and Allegra and Nasonex for her allergies.

Objective: General: The patient was in no apparent distress. Vitals: Blood pressure 90/60, temperature 99.0. HEENT: No frontal or maxillary sinus tenderness. Nasal mucosa slightly erythematous with no cobblestoning or string sign. Sinuses transilluminated bilaterally. Tympanic membranes Joyce gray bilaterally. Oropharynx with mild erythema and no exudates. Neck supple with no lymphadenopathy. Lungs: Good air exchange bilaterally. No wheezes, rales, or rhonchi bilaterally.

Assessment and Plan: This is a 31-year-old female with symptoms consistent with viral bronchitis. The patient was given reassurance and advised to take Nyquil over-the-counter for her nighttime cough. The patient was also given a prescription for Tessalon Perles if her cough persists. Given the patient's history of asthma, she was instructed to take her albuterol MDI every eight hours for the next few days. The patient also has a history of seizure disorder and is requesting a renewal of a prescription for phenobarbital. She was given a one-month refill and a referral to Neurology. The patient had been seeing a neurologist in the past but had stopped secondary to changing insurance. The patient is to follow up if her symptoms persist or worsen in the next week. James F Zettel, M.D. Irene, M.D. Resident Physician //Electronically signed by Fel M.D.

Example Auto-Coded in Ubiquiti Software

The screenshot displays the Ubiquiti Document Analysis System interface. At the top, there is a menu bar (File, Tools, Window, Help) and a toolbar. A left-hand pane shows a 'Navigator' with a tree view of document sets, including 'AnonymizedAsthma.csv (1173, Jan-06-2004)'. The main window contains a table with columns: Row #, Report Id, Patient Id, Patient Name, Case Number, and Physician Comment. Row 38 is highlighted, showing patient 'Crump, Jane Jane' with case number '500315113ATS'. Below the table, a detailed view of the selected record is shown, including fields for Patient Name, Case Number, and Physician Comment. The Physician Comment field contains a large block of text with several words highlighted in yellow, indicating auto-coding. To the right of this text, a list of ICD-9 codes is displayed, with '493.9 Asthma, unspecified' selected. At the bottom, there is a 'Console' pane showing search results and a status bar indicating 'Ready'.

Row #	Report Id	Patient Id	Patient Name	Case Number	Physician Comment
32	140101116	13138593	Reickert, Doris	000538836HOM	Chief Complaint: Increasing difficulty breathing. History of Present Illness: The patient is a 29-year-old femal...
33	116000	14277211	Pearlman, Stephanie	000026415ATS	Subjective: 41 year-old woman here for follow-up of her hypothyroidism. She states that she is feeling a little...
34	128814	10347899	Cooke, Robin	000032484ATS	This is a pleasant female, who comes in with a two week history of cough which is nonproductive associated wi...
35	129285	15569586	Crowley, Gina	000032711ATS	Subjective: Mrs. Crowley was here two days ago with a one day history of sore throat, cough, headache, ge...
36	140130110	15741342	Nostrant, Patricia Laura	712192232WSL	HISTORY OF PRESENT ILLNESS: Patricia is a pleasant 31-year-old female who comes in complaining of a coupl...
37	133143	13877005	Mehrad, Victor	000034483ATS	This is a 40 year-old white male, who complains of a right hand and wrist discomfort for approximately the last ...
38	140136548	15244424	Crump, Jane Jane	500315113ATS	Subjective: This is a 31-year-old female with a history of asthma, allergic rhinitis, and learning disability who pr...
39	139878	10347899	Cooke, Robin	000037637ATS	Robin Cooke is a 51 year-old female, who I had treated about a year ago with bronchitis. At that time I had to...
40	141382	10905251	Lawrence, Janis	000038367ATS	Subjective: This is a 27 year-old, obese, white female here for follow-up. The patient needs second hepatitis ...
41	140146474	13116925	Khan, Muhammad E	500317117ATS	History of Present Illness: This is a 52-year-old male who is here to address several concerns today. 1. Asthma...

Patient Name
Crump, Jane Jane

Case Number
500315113ATS

Physician Comment
Subjective: This is a 31-year-old female with a history of **asthma**, **allergic** rhinitis, and learning disability who presents today with cough. Five days ago she developed a headache with sinus congestion and postnasal drip. This progressed to persistent cough that has been productive of a yellowish sputum over the last day. The patient also feels like she has chest congestion. She denies any wheezing or shortness of breath. She has not had any fever, chills, night sweats, ear ache, nausea, vomiting, or diarrhea. She initially had a mild sore throat which has resolved. The patient is currently on Flovent and albuterol MDI two puffs q.d. for her **asthma** and Allegra and Nasonex for her allergies. Objective: General: The patient was in no apparent distress. Vitals: Blood pressure 90/60, temperature 99.0. HEENT: No frontal or maxillary sinus tenderness. Nasal mucosa slightly erythematous with no cobblestoning or string sign. Sinuses transilluminated bilaterally. Tympanic membranes Joyce gray bilaterally. Oropharynx with mild erythema and no exudates. Neck supple with no lymphadenopathy. Lungs: Good air exchange bilaterally. No wheezes, rales, or rhonchi bilaterally. Assessment and Plan. This is a 31-year-old female with symptoms consistent with **viral bronchitis**. The patient was given reassurance and advised to take Nyquil over-the-counter for her nighttime cough. The patient was also given a prescription for Tessalon Perles if her cough persists. Given the patient's history of **asthma**, she was instructed to take her albuterol MDI every eight hours for the next few days. The patient also has a history of seizure disorder and is requesting a renewal of a prescription for phenobarbital. She was given a one-month refill and a referral to Neurology. The patient had been seeing a neurologist in the past but had stopped secondary to changing insurance. The patient is to follow up if her symptoms persist or worsen in the next week. James F Zettel, M.D. Irene, M.D. Resident Physician
/Electronically signed by Fel M. D.

ICD-9 Codes:
490 Bronchitis, not specified as acute or chronic
493 Asthma
493.0 Extrinsic asthma
493.9 Asthma, unspecified
786.05 Shortness of breath
786.2 Cough
786.4 Abnormal sputum

File: AnonymizedAsthma.csv
Created on: Jan 06, 2004
1173 Documents

Viewing Documents: Search Results on AnonymizedAsthma.csv
Viewing Documents: AnonymizedAsthma.csv

Console Log

Ready

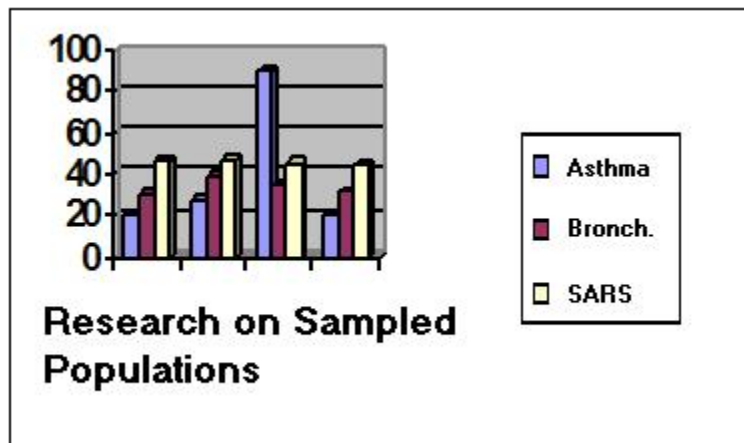
Auto-Assign Standard Reimbursement Codes

Automated Coding:

Confidence

■ 490 Bronchitis, not acute/chronic	95 %
■ 493 Asthma	95 %
■ 493.0 Extrinsic Asthma	93 %
■ 493.9 Asthma, unspecified	85 %
■ 786.5 Shortness of Breath	95 %
■ 786.2 Cough	90%
■ 786.4 Abnormal sputum	92%

- ✓ “Automate” the Revenue Cycle
- ✓ Identify “Top 10” cost issues
- ✓ Reduce unpaid claims
- ✓ Reduce turnaround times
- ✓ Identify co-occurring issues
- ✓ Detect emerging problems
- ✓ Understand patient needs
- ✓ Identify geographical issues



CUT COSTS, IMPROVE CARE ...!

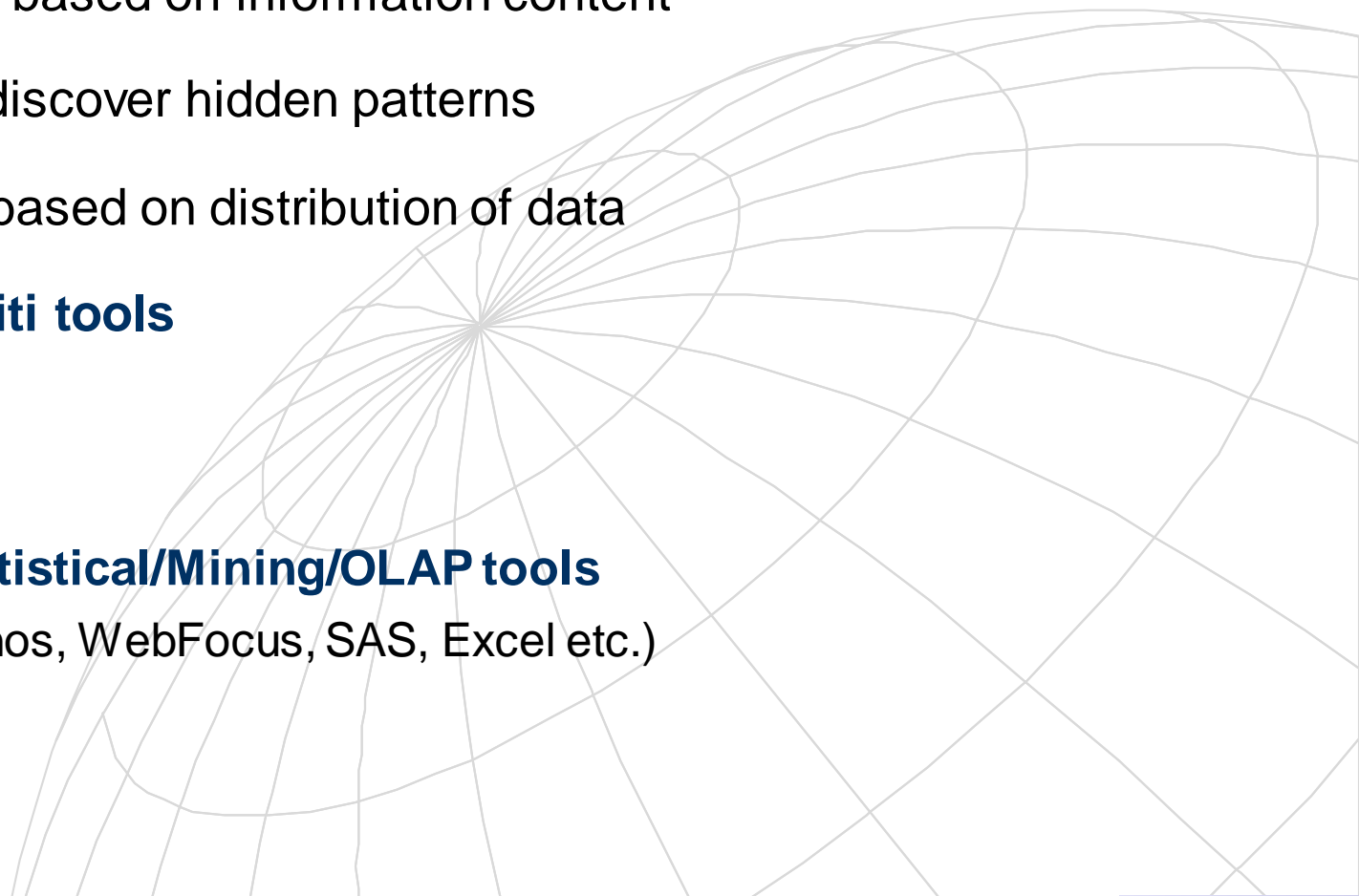
Potential Data Analyses

- **Searching** based on content in data
- **Clustering** based on information content
- **Mining** to discover hidden patterns
- **Statistics** based on distribution of data
- Use **Ubiquiti tools**

and/or

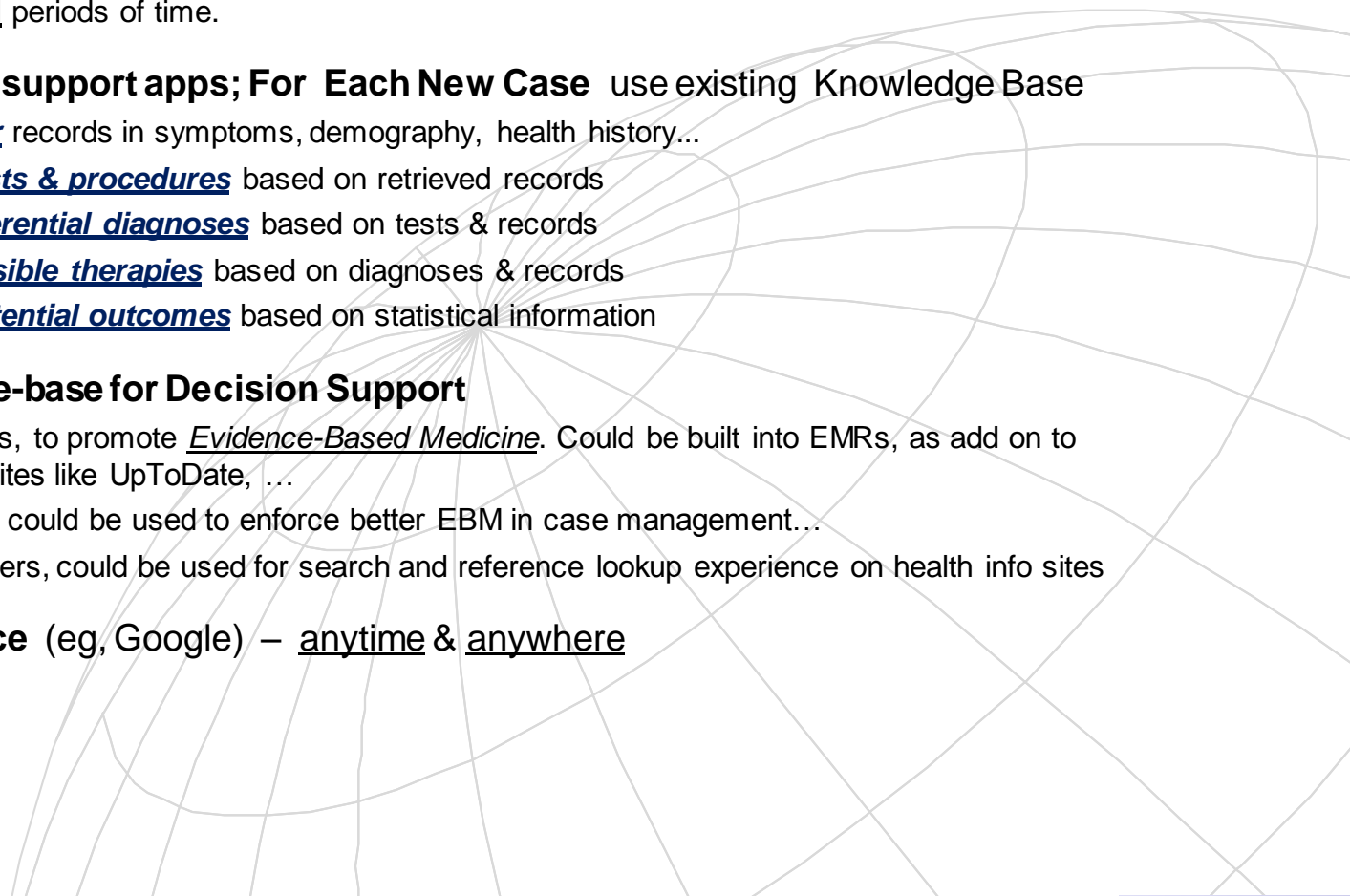
Other Statistical/Mining/OLAP tools

(e.g., Cognos, WebFocus, SAS, Excel etc.)



More Possibilities ...1: Diagnostics

- **EMRs, Outcomes, Claims** data forms Knowledge Base
 - Captures **all** medical professionals' experiences.
 - Captures **all** geographical regions.
 - Captures **all** periods of time.
- **Build decision support apps; For Each New Case** use existing Knowledge Base
 - Find similar records in symptoms, demography, health history...
 - Suggest tests & procedures based on retrieved records
 - Report differential diagnoses based on tests & records
 - Report possible therapies based on diagnoses & records
 - Indicate potential outcomes based on statistical information
- **Use knowledge-base for Decision Support**
 - For providers, to promote Evidence-Based Medicine. Could be built into EMRs, as add on to online info sites like UpToDate, ...
 - For payers, could be used to enforce better EBM in case management...
 - For consumers, could be used for search and reference lookup experience on health info sites
- **Simple interface** (eg, Google) – anytime & anywhere



Diagnostics Illustrated

Ubiquiti Doctor Assist
File Help

Ubiquiti DOC Assist

SSN or Description
38 year Caucasian Female

Symptoms
Breathing trouble upon exercise

[Advanced Search](#)

Diseases

Click on a disease to view medications & procedures

- Diseases of Respiratory System (865)
- COPD and Allied Conditions (494)
- Non-specific (92)
- Extrinsic Allergic Alveolitis (78)
- Bagassosis (38)
- Suberosis (15)
- Due to *Aspergillus clavatus* (15)
- Due to *Cryptostroma corticale* (3)
- "Ventilation" Pneumonitis (3)
- Allergic Alveolitis (2)
- Sequoiosis (1)
- Hypersensitivity pneumonitis (1)
- Asthma (57)
- Exercise Induced Asthma (35)
- Asthmatic Bronchitis (11)
- Allergic NOS Asthma (9)
- COPD (2)
- Bronchiectasis (29)
- Fusiform Bronchiectasis (22)
- Bronchiectasis with Acute exacerbation (4)
- Bronchiectasis without Acute exacerbation (1)
- Bronchiolectasis (1)

Procedures/Medications: Code 044-002-001: Exercise Induced Asthma

Click on an item to view more details

- Beta-2-agonist Bronchodilator (18)
- Cromolyn (8)
- leukotriene inhibitor (5)
- Chest P.T. (4)

Beta-2-agonist Bronchodilator
18 Cases

- [View Case Records](#)
- [View Case Procedures](#)

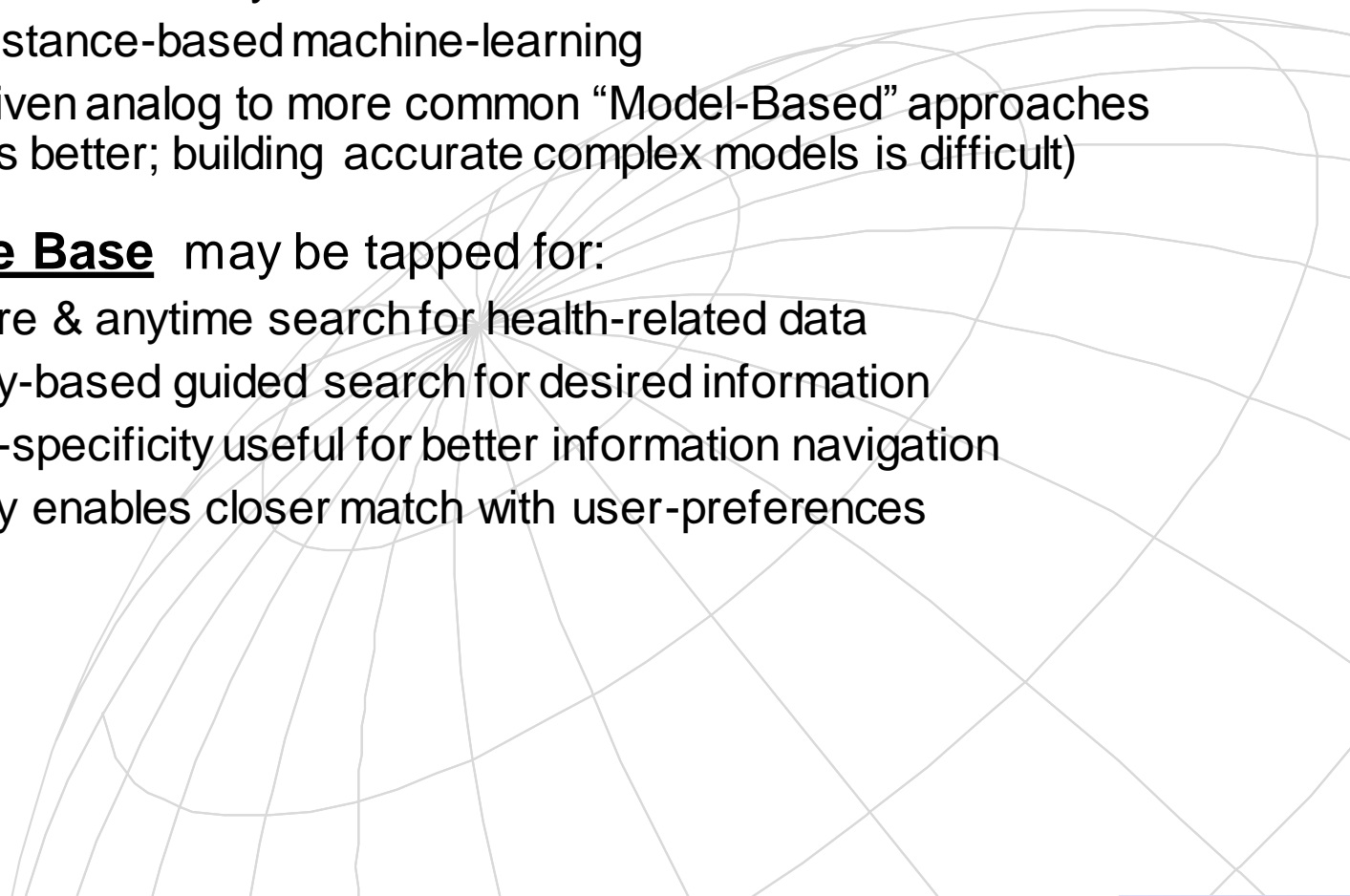


● Ready



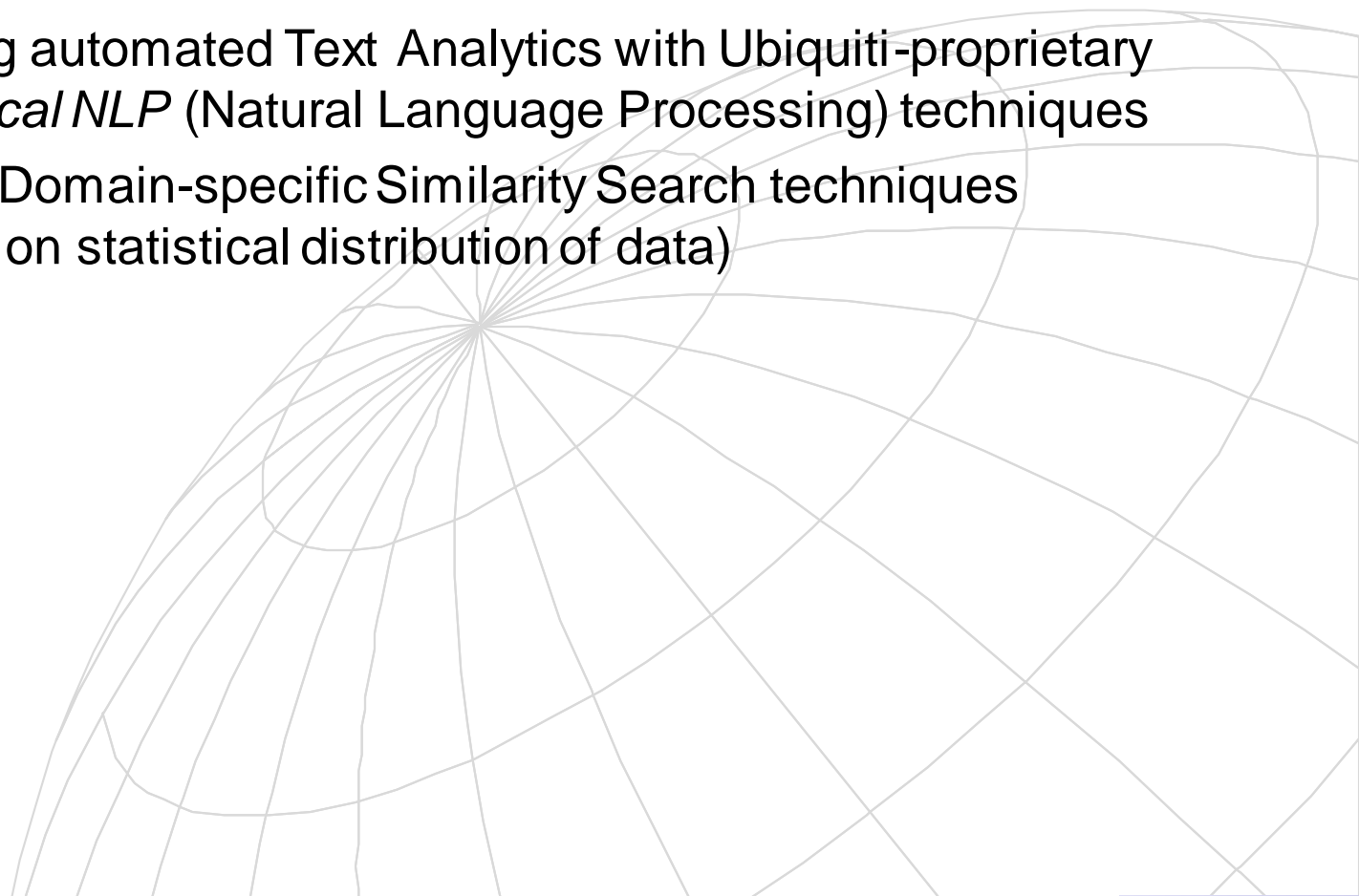
More Possibilities ...2: Generalizations & Search

- **EMRs, Outcomes, Claims** Knowledge Base for:
 - Generalized similarity-search
 - Using instance-based machine-learning
 - Data-driven analog to more common “Model-Based” approaches (perhaps better; building accurate complex models is difficult)
- **Knowledge Base** may be tapped for:
 - Anywhere & anytime search for health-related data
 - Ontology-based guided search for desired information
 - Domain-specificity useful for better information navigation
 - Ontology enables closer match with user-preferences



Outline of Key Differentiating Technologies

- Using Ontologies as an integral part of Analytics
- Utilizing automated Text Analytics with Ubiquiti-proprietary *Statistical NLP* (Natural Language Processing) techniques
- Use of Domain-specific Similarity Search techniques (based on statistical distribution of data)



Ubiquiti Ontology Creating/Maintaining software

Ontology Editor - Snomed [Concept Editor View]

File Tools View Help

Ontology Tree

- [-] Date Information 2855
- [-] Geographic Location 14
- [-] I2B2 Concepts 41607
- [-] Inferred ICD-9 Codes 41592
- [-] Patient Information 418
- [-] SNOMED CT Concept (SNOMED RT+CTV3) 138875005
 - [-] Body structure (body structure) 123037004
 - [-] Clinical finding (finding) 404684003
 - [X] Additional symptom, signs and abnormal clinical and laboratory findings class...
 - [-] Adverse incident outcome categories (finding) 405533003
 - [-] Clinical history and observation findings (finding) 250171008
 - [X] Other specified symptoms and signs involving circulatory and respiratory
 - [X] Other specified symptoms and signs involving nervous and musculoskele...
 - [-] Anesthetic finding (finding) 250763003
 - [-] Cardiac rhythm AND/OR rate finding (finding) 106066004
 - [-] Child health observations (finding) 281037003
 - [-] Communication, speech and language finding (finding) 284530008
 - [-] **Contraception (finding) 13197004**
 - [-] Barrier contraception metho...
 - [-] Contraception failure (findin...
 - [-] Deficient knowledge of famil...
 - [-] Depot contraception (finding)...
 - [-] Dissatisfaction with contrace...
 - [-] Emergency contraception (f...
 - [-] Fear of reaction regardin...
 - [-] Inconsistent use of contrace...
 - [-] Intrauterine contraception (...)
 - [-] Natural contraception (findin...
 - [-] Oral contraception (finding)...
 - [-] Postcoital contraception (fin...
 - [-] Postcoital douche method of...
 - [-] Sheath contraception (findin...
 - [-] Spermicidal contraception (f...
 - [-] Subcutaneous contraceptive impla...
 - [-] Temperature method of contrace...
 - [-] Total abstinence (finding) 56257004

▼ Concept Properties

CID: 13197004
Name: Contraception (finding)

Words	Values	Relationships	D-O-M	Rules	Ancestry
Concept From		Type			Concept To
Clinical history and observation findin...		Specialization 2			Contraception (finding) 13197004
Contraception (finding) 13197004		Specialization 2			Barrier contraception method (finding)...
Contraception (finding) 13197004		Specialization 2			Contraception failure (finding) 102...
Contraception (finding) 13197004		Specialization 2			Deficient knowledge of family planning...
Contraception (finding) 13197004		Specialization 2			Depot contraception (finding) 2684...
Contraception (finding) 13197004		Specialization 2			Dissatisfaction with contraception met...
Contraception (finding) 13197004		Specialization 2			Emergency contraception (finding) ..
Contraception (finding) 13197004		Specialization 2			Fear of reaction regarding family plan...
Contraception (finding) 13197004		Specialization 2			Inconsistent use of contraception met...
Contraception (finding) 13197004		Specialization 2			Intrauterine contraception (finding) ..
Contraception (finding) 13197004		Specialization 2			Natural contraception (finding) 225...
Contraception (finding) 13197004		Specialization 2			Oral contraception (finding) 5935008
Contraception (finding) 13197004		Specialization 2			Postcoital contraception (finding) 2...
Contraception (finding) 13197004		Specialization 2			Postcoital douche method of contrace...
Contraception (finding) 13197004		Specialization 2			Sheath contraception (finding) 268...
Contraception (finding) 13197004		Specialization 2			Spermicidal contraception (finding) ..
Contraception (finding) 13197004		Specialization 2			Subcutaneous contraceptive implant (...)
Contraception (finding) 13197004		Specialization 2			Temperature method of contraceptio...
Contraception (finding) 13197004		Specialization 2			Total abstinence (finding) 56257004
Contraception (finding) 13197004		Specialization 2			Transdermal contraception (finding)
Contraception (finding) 13197004		Specialization 2			Vaginal contraception (finding) 896...

Context Menu:

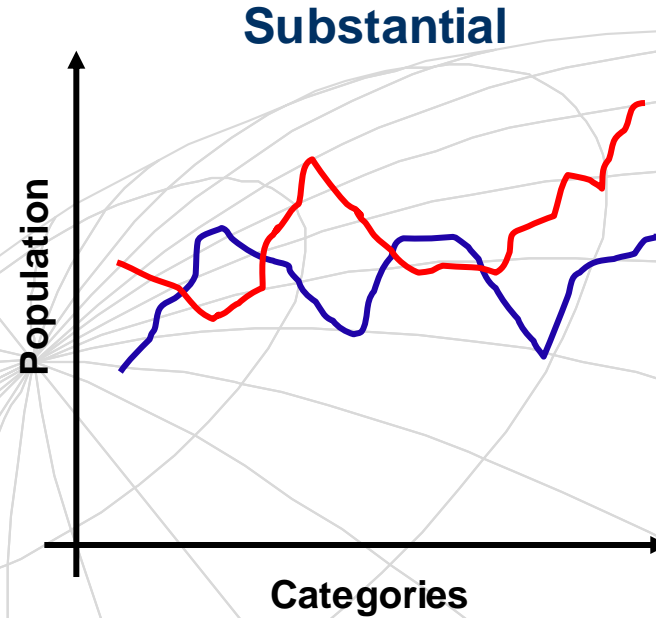
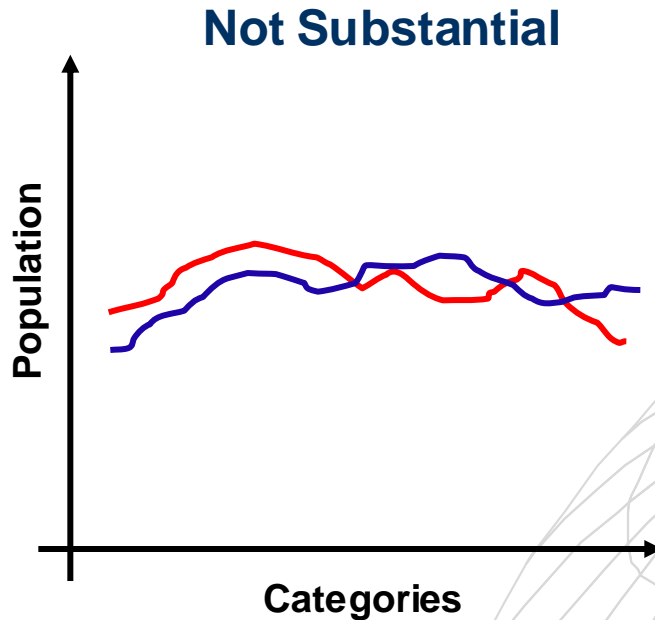
- [-] Add New Concept as Child of "Contraception (finding)"... Ctrl-N
- [-] Add Existing Concepts as Children... Ctrl+Shift-N
- [-] Copy "Contraception (finding)" to... Ctrl+Shift-C
- [-] Move "Contraception (finding)" to... Ctrl+Shift-X
- [-] Detach "Contraception (finding)" from Parent Node Ctrl-D
- [-] Rename "Contraception (finding)"... F2
- [-] Delete "Contraception (finding)" Delete
- [-] Copy "Contraception (finding)" to Clipboard Ctrl-C
- [-] Import/Export
- [-] Replicate "Contraception (finding)"...
- [-] Ancestry

Activity Log

Buttons: New... Edit... Delete



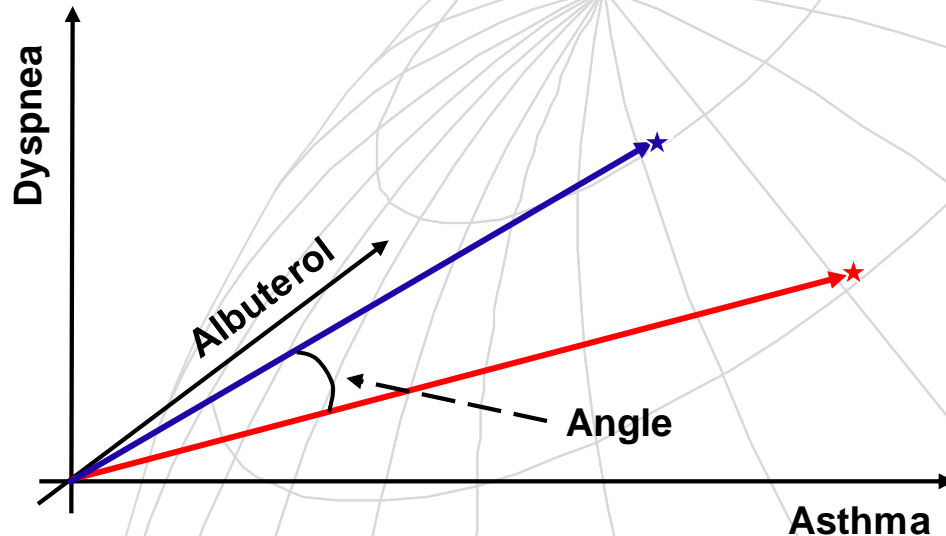
“Substantial” Distribution Differences



Difference measured by K-L or P norms; empirically assessed.

Similarity-based Search: Individual Records ...1

- **Basic Idea:** Find records “**similar**” to a given record. (E.g., with Google-bar, select some text & invoke Google search).
- **Usual approaches** – based on “vector” of words or “tokens”. Similarity based on angle between vectors. Not too effective (e.g., since co-located words do have relationships).



Similarity-based Search: Individual Records ...2

- **Ontology-based approach** – based on “ontology-maps” and similarity between them. Use concepts (instead of words), dispense with artificial orthogonality, leverage the ontology. But more complex and compute-intensive.

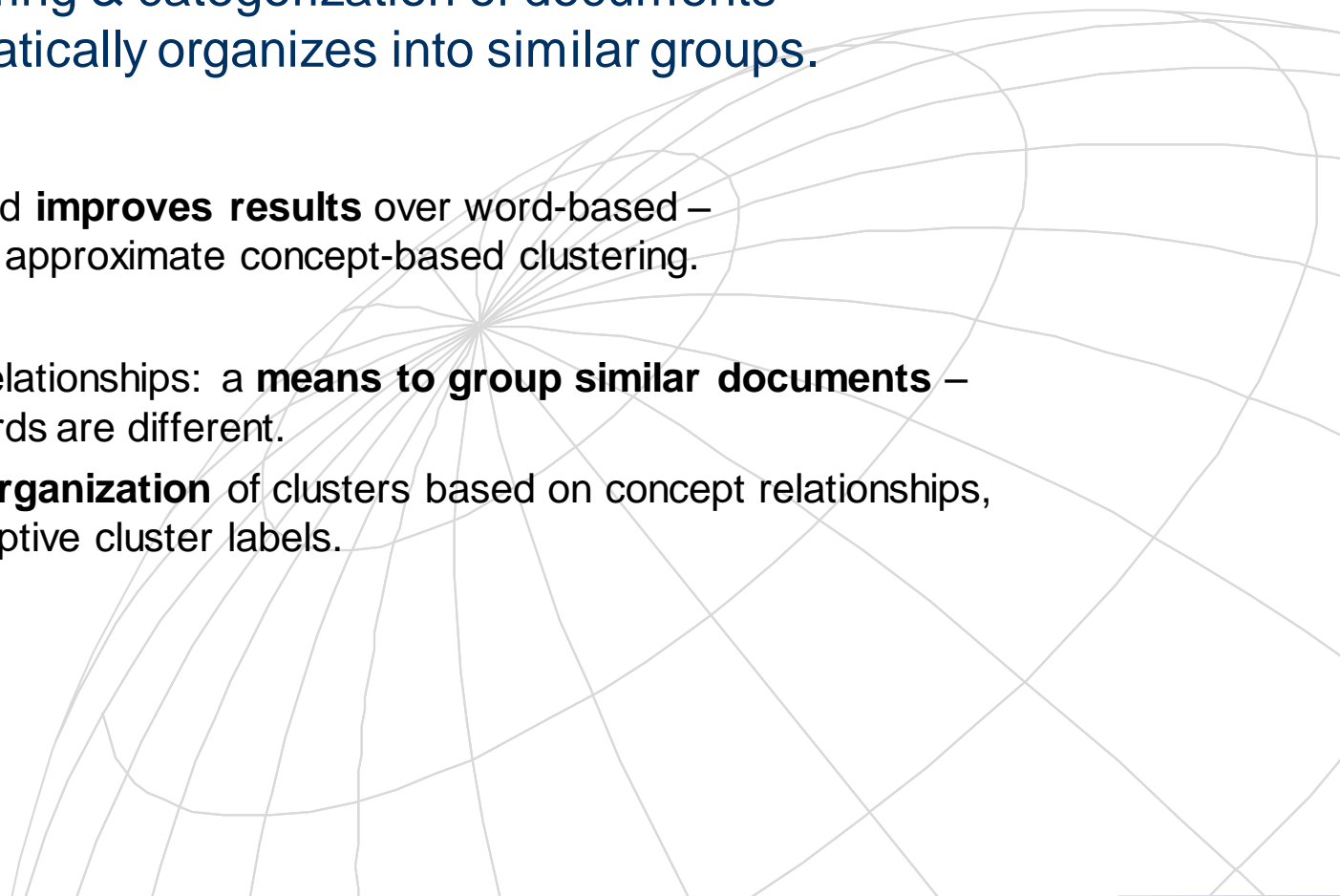
vs.

Concept-Based Clustering/Categorization

Clustering & categorization of documents automatically organizes into similar groups.

Concept-based **improves results** over word-based – the latter only approximate concept-based clustering.

- Concept-relationships: a **means to group similar documents** – even if words are different.
- **Intuitive organization** of clusters based on concept relationships, with descriptive cluster labels.



Concept-Based Search

User-specifies **words *and/or* concepts** for search.

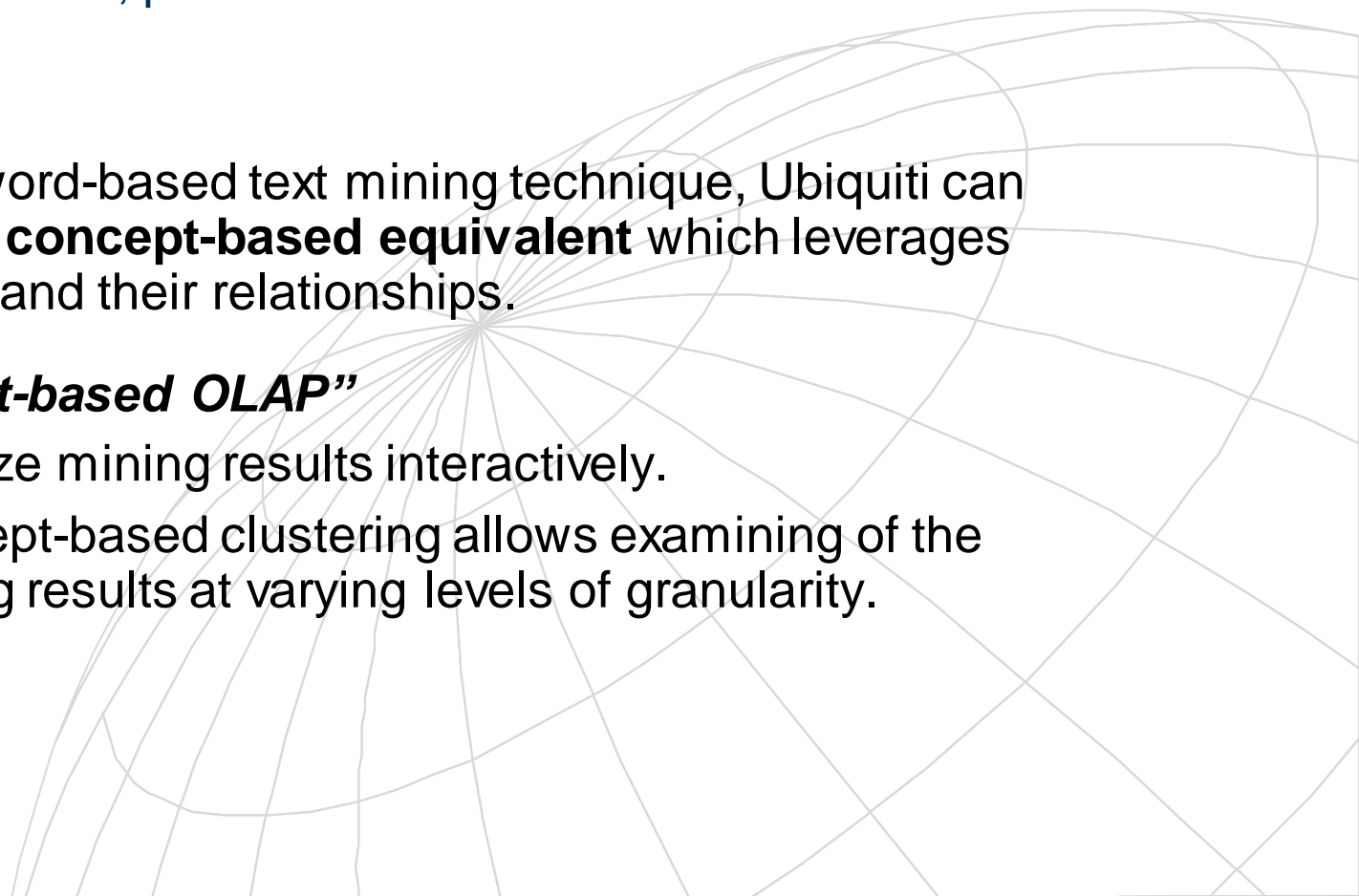
Filtering / ranking based on words ***and*** concepts.

- **Special criteria easily added** where desired.
- Automatically achieve
 - **word disambiguation**
 - **specialization of concepts**
 - **filtering and ranking**
- Metadata modification is easy; also, **changes reflected immediately** in the results.

Concept-Based Text “Mining”

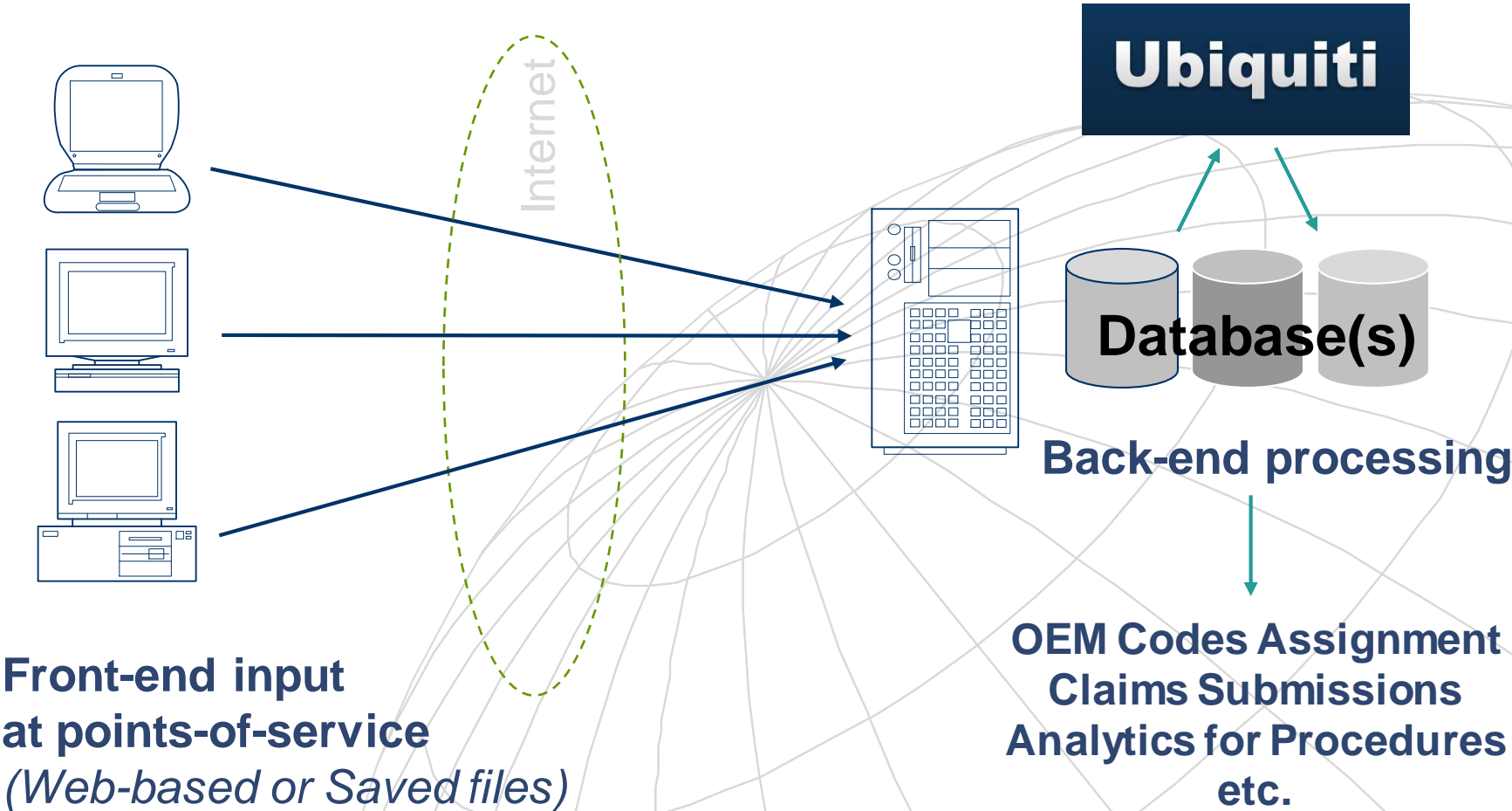
Finding trends, patterns and outliers in text documents.

- For any word-based text mining technique, Ubiquiti can provide a **concept-based equivalent** which leverages concepts and their relationships.
- **“Concept-based OLAP”**
 - Analyze mining results interactively.
 - Concept-based clustering allows examining of the mining results at varying levels of granularity.



Infrastructure Architecture

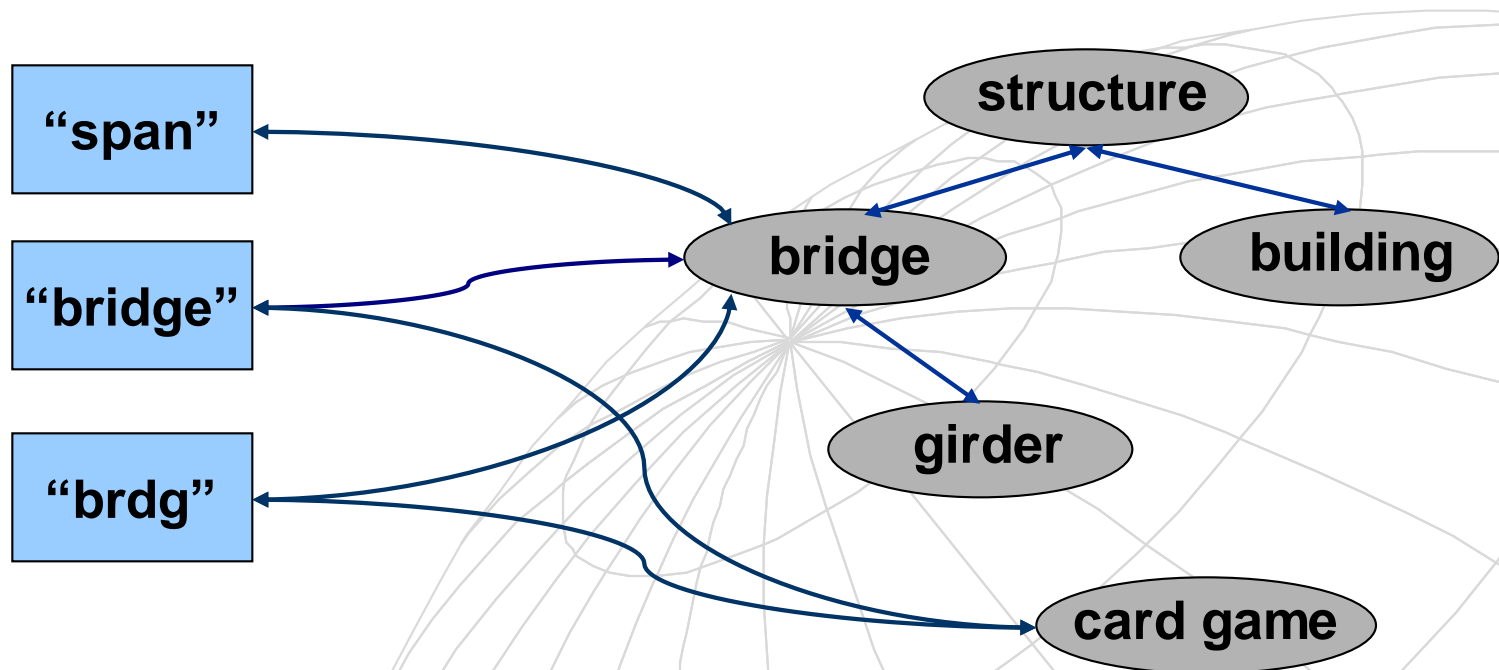
(No need for change!)



Enabling Technology for Text

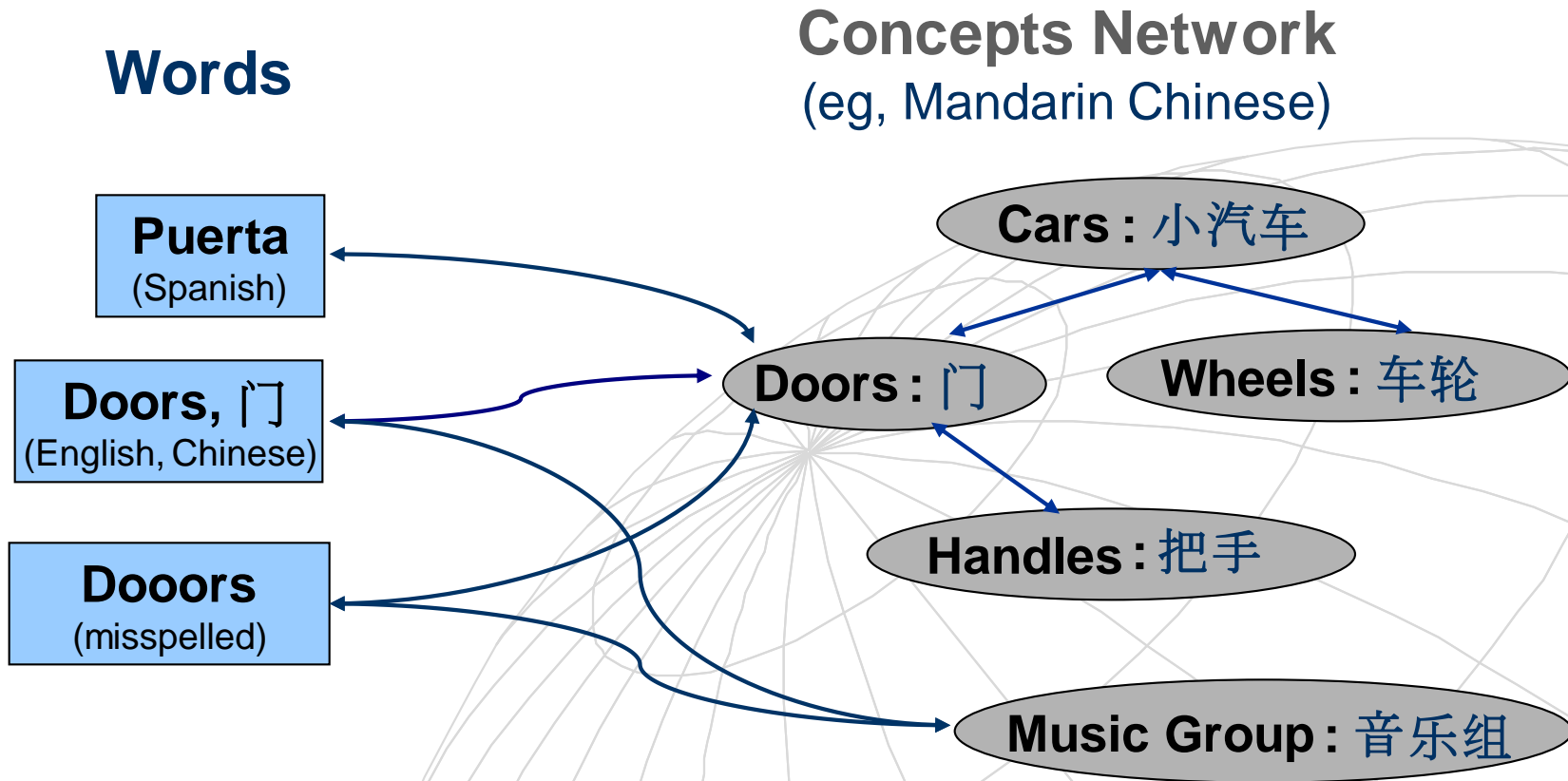
Words

Concepts Network



High Accuracy, Language Independent

Technology for Non-English Languages



Ubiquiti is used in the Americas, Europe, China, Australia

Thanks for your Interest. Contact Ubiquiti for more details.



Decision Support with Text

Web: www.ubiquiti.com
Email: info@ubiquiti.com
Phone: (734) 997-8800
Fax: (413) 622-3123

Ubiquiti Inc.
303 Detroit Street
Suite 202
Ann Arbor, MI 48104

