4-2010

Semantics-Empowered Text Exploration for Knowledge Discovery

Delroy H. Cameron

Wright State University - Main Campus, cameron.20@wright.edu

Pablo N. Mendes

Wright State University - Main Campus

Amit P. Sheth

Wright State University - Main Campus, amit@sc.edu

Victor Chan

Follow this and additional works at: <https://corescholar.libraries.wright.edu/knoesis>

Part of the [Bioinformatics Commons](#), [Communication Technology and New Media Commons](#), [Databases and Information Systems Commons](#), [OS and Networks Commons](#), and the [Science and Technology Studies Commons](#)

Repository Citation

Cameron, D. H., Mendes, P. N., Sheth, A. P., & Chan, V. (2010). Semantics-Empowered Text Exploration for Knowledge Discovery. .

<https://corescholar.libraries.wright.edu/knoesis/552>

This Presentation is brought to you for free and open access by the The Ohio Center of Excellence in Knowledge-Enabled Computing (Kno.e.sis) at CORE Scholar. It has been accepted for inclusion in Kno.e.sis Publications by an authorized administrator of CORE Scholar. For more information, please contact library-corescholar@wright.edu.

kno.€.sis

COLLECTING THE DOTS | CONNECTING THE DOTS

Semantics-Empowered Text Exploration for Knowledge Discovery

Delroy Cameron, Pablo N. Mendes, Amit P. Sheth

Knowledge Enabled Information and Services Science Center (Kno.e.sis)
Department of Computer Science and Engineering
Wright State University
Dayton, OH

Victor Chan

Division of Biosciences and Performance
Human Effectiveness Directorate
Air Force Research Lab (AFRL)
Wright-Patterson Air Force Base
Dayton, OH

- ❑ Background
- ❑ Paradigm Shift
- ❑ Demo
- ❑ Architecture
- ❑ Experimental Results
- ❑ Future Work
- ❑ Conclusion

- IR Systems - Interaction Paradigm
  - Manually seek information
  - Hyperlinked Documents
  - Document-Centric Model

- Basis - Interaction Paradigm
  - Keyword Search
  - Document Browsing

■ Interaction Sequence

1. Assemble Keywords and Search
2. Document Selection
3. Document Inspection
4. Aggregation/Organization

Information Need

What is the role of
Magnesium in relation
to **Migraine**?

- Home
- Migraine Blog
- Search
- Cause of migraine
- Home remedies
- Herbs for headache
- Migraine symptoms
- Headache types
- Migraine Quiz
- Fight nausea
- Migraine and food
- Migraine meds
- Prevent migraine
- Migraine triggers
- Child migraines
- Headache & weather
- Hormonal headache
- Silent migraine

So just what is the magnesium migraines connection?

Researchers have been investigating the magnesium migraines connection because of magnesium's role in stabilizing blood vessels walls. Magnesium is also an important mineral when it comes to helping you get to sleep. Regular sleeping patterns are also very important to migraine sufferers. Magnesium also helps in protein synthesis, and keeps your bones strong and helps maintain normal nerve and muscle function.

It was first suggested that a deficiency in magnesium could cause

[Migraine Cure for Women](#)
There Is An Easy & Effective Cure 100% Money
Back Guarantee
[Migraine-Headaches-Information.com](#)

[I Defeated My Migraines](#) ⚡
I Finally Discovered Something That Relieves My
Migraine Pain
[www.MagnesiumDirect.com](#)

[TMJ Treatment Center](#)
John Mitakides, DDS, Fellow, Am Academy of
Craniocervical Pain
[www.djohndds.net](#)

[Sokolove Law-Official Site](#)
Experienced serious side effects from

headaches over 70 years
ago. It makes sense,
because a lot of the things
that cause the body to
run short of magnesium
also either trigger
migraines or lower your
resistance. For example
alcohol, stress, and
menstruation. Today we
know that about half of the
people who get migraines
are also short of a certain
type of magnesium (serum

0 of about 4,460,000 for **magnesium migraine**. (0.41 seconds)

Sponsored Links

[Headache or Migraine?](#)
Answer a Few Simple Questions to
Help Determine if it's a **Migraine**.
[MigrainePrescriptionTreatment.com](#)

[Magnesium - 66% off](#)
Citrate, Malate & Other Forms. 35 -
1440mg - Top Brands - Save today!
[www.vitacost.com/Magnesium](#)
[Show products from Vitacost.com](#)

[New Migraine Solution](#)
Study Shows 80% Get **Migraine** Relief
Revolutionary New **Magnesium** Spray
[www.MagnesiumDirect.com](#)
[Google Checkout](#)

[Ancient Magnesium Oil](#)
#1 Dr. Recommended Transdermal
Magnesium Oil in the World
[www.ancient-minerals.com](#)
Ohio

[Magnesium Migraine](#)
Buy **magnesium migraine** at Amazon!
Qualified orders over \$25 ship free

headaches over 70 years
ago. It makes sense,
because a lot of the things
that cause the body to
run short of magnesium
also either trigger
migraines or lower your
resistance. For example
alcohol, stress, and
menstruation. Today we
know that about half of the
people who get migraines
are also short of a certain
type of magnesium (serum

LIMITATIONS

Query: Father of the Web
Answer: Sir Tim Berners-Lee

■ Query Reformulations

- Impatient users
- Recognition over Recall

■ Constrained navigation

- Hyperlink dependent - apriori

■ Fuzzy User Interests

- Haiti Earthquake – Recovery, Relief, Political Climate, Crime

■ Ineffective for Exploratory Search

- Search-and-Sift

- Users are *information seekers*
Information is embedded in *documents*
  - A priori hyperlink dependent
- Semantic Web Standards
  - Entity Identification (Semantic Annotations)
  - Relationship and Triple Identification
  - Explore documents/information via relationships

- Search Hit > Annotated Hit

- Bag of annotated words/phrases
- Annotated phrase is known entity
- Entity is Subject/Object of Triple

Contextual Navigation
(relationships as context)

- Navigation driven by relationships

- Entity[Document] → Relationship → Entity[Document]

CONTRIBUTIONS

1. Novel Information Exploration Paradigm
  - *Data-Centric Model*
2. Demonstrate use of background knowledge
  - Named Entities, Relationships
3. Prototype Implementation
  - Semantic annotations for navigation
4. Aggregation Utilities
  - Saving, bookmarking, publishing etc

Keyword Search Triple Search

magnesium

Search

Medline+UMLS (Browse PubMed Abstracts i.e. medline using UMLS schema)

Enter a search query (e.g. batman begins) then click Search

WORKBENCH

Early adaptation of renal magnesium reabsorption in response to magnesium restriction.

dietary **magnesium** restriction with hypomagnesemia is normally associated with diminished urinary **magnesium** excretion. young rats were pair fed control **magnesium** diets (0.05% mgso4) and **magnesium**-restricted diets (less than 0.01% mg), and tubular **magnesium** reabsorption was assessed to determine the importance of filtered load (plasma **magnesium** concentration (0.61 +/- 0.02 mmol/L) over 20 h on low-magnesium diets without a change in plasma concentration (0.61 +/- 0.02 mmol/L). micropuncture studies demonstrated that cellular adaptation occurred within the loop of henle. after 20 h of magnesium restriction, there was a 50% decrease in fractional **magnesium** reabsorption. the presence of cellular adaptation of **magnesium** transport. urinary **magnesium** excretion decreased from 17.2 +/- 2.7 to 5.9 +/- 1.2% over 20 h on low-magnesium diets without a change in plasma concentration (0.61 +/- 0.02 mmol/L). is rapid (within 5 h), specific (without effect on sodium and calcium), and sensitive (without change in plasma concentration). transport occurs with **magnesium**-deficient diets, and alterations in filtered **magnesium** and plasma **magnesium** are not necessary for **magnesium** conservation. all with an associated further decrease in fractional **magnesium** excretion. accordingly, cellular adaptation of **magnesium** reabsorption is not necessary for **magnesium** conservation.

http://www.ncbi.nlm.nih.gov/sites/entrez?cmd=Retrieve&db=pubmed&dopt=AbstractPlus&list_uids=260111

Magnesium metabolism and deficiency.

magnesium is a prominent intracellular cation required for the function of hundreds of enzymes. **magnesium deficiency** may present with neuromuscular hyperexcitability, hypocalcemia, and hypoparathyroidism. **magnesium deficiency** is usually made by a low-serum **magnesium** concentration, although the normal range is given for long-term repletion. hospitalized patients and is usually secondary to renal or intestinal **magnesium** loss. clinically, **magnesium** appears to improve survival in patients with myocardial infarction. the diagnosis of **magnesium** states. in acutely ill patients, **magnesium** is usually give parenterally; oral **magnesium** may be given for long-term repletion.

http://www.ncbi.nlm.nih.gov/sites/entrez?cmd=Retrieve&db=pubmed&dopt=AbstractPlus&list_uids=12134652

Plasma ionized magnesium concentration following cardiopulmonary bypass

we performed a retrospective study to analyze plasma ionized magnesium concentration following cardiopulmonary bypass. cardioplegia containing 16 mmol/L-1 of magnesium ion mg/ml. magnesium supplement is thought to be essential for patients receiving cardiopulmonary bypass. use of ionized magnesium concentration associated with frequent abnormal ecg sign was found in a patient with normal ranges without postoperative magnesium loading. use of cardioplegia containing magnesium or adequate

http://www.ncbi.nlm.nih.gov/sites/entrez?cmd=Retrieve&db=pubmed&dopt=AbstractPlus&list_uids=12134652 - 5/5K

Study of several parameters of magnesium metabolism in spontaneously hypertensive rats

we have compared a few parameters of magnesium metabolism in spontaneously hypertensive (shr) and wistar kyoto rats (wky). the results show a decrease of plasma magnesium and urinary magnesium. there is no difference in fecal magnesium and balance of magnesium. these results have raised a question as to the importance of changes in magnesium metabolism in the mechanism of hypertension.

http://www.ncbi.nlm.nih.gov/sites/entrez?cmd=Retrieve&db=pubmed&dopt=AbstractPlus&list_uids=3834253 - 391K

Context Menu

EntityID: C0024467

More results about **magnesium**

Explore relations: ▶

Relation	List of Entities	File name
isa	Calcium Channel Blockers	15537251
		8402763
		10695366
		8969683
		1619909
		102969186
		9061722
		2675378
		16199915
		8689266

Effect of prolonged nifedipine or captopril therapy on lymphocyte magnesium and potassium levels in hypertension.

magnesium > isa > Calcium Channel Blockers

The effect of prolonged treatment with calcium channel blockers on potassium and magnesium stores is uncertain. We measured lymphocyte and serum magnesium and potassium in 28 patients treated for hypertension for 6 months with nifedipine or captopril. There was no difference in serum or lymphocyte concentrations in the two groups compared to 45 healthy, normotensive controls. These results suggest that intracellular cation levels are maintained with prolonged therapy with calcium channel blockers.

ARCHITECTURE

Figure 1: System Components and Architecture

- Spotter Module

<abstract>

Dietary magnesium restriction
hypomagnesemia is normal
diminished urinary magnesium

</abstract>

UMLS Controlled Vocabulary	
Entity Label	PubMed ID
Magnesium	C0024467
Magnesium Deficiency	C0024473

|
Dietary
↑

EntityID:

restriction with hypomagnesemia

This process is called
Spotting and uses a
Trie data structure.

■ Document Corpus

- Medline
- Lucene Index - 19 million abstracts Aug 2009.
- REST Endpoint: <http://knoesis1.wright.edu/IndexWrapper>
- XML Response (or JSON)
- Keyword queries, Document IDs

■ Background Knowledge

- UMLS (Unified Medical Language System)
  - 5,232 entities and 16,540 triples
- HPCO (Human Performance & Cognition Ontology)
  - 15,742 entities and 22,298 triples

EVALUATION

Evaluation Metrics	Search User Interfaces		
	Semantic Browser	PubMed	Yahoo
Interface Design	"Dr. Swanson found a link between magnesium and migraine by manually examining the titles of abstracts of scientific literature. Use the semantic browser (http://knoesis.wright.edu/trellis), PubMed (http://www.ncbi.nlm.nih.gov/sites/entrez) and Yahoo search (http://yahoo.com/) to find this link. Fill in our evaluation form upon completion."		
Useful Feature			
Motivation to Use			
Information Needs			
Effectiveness of Search			
Required Cognitive Load	1.00	0.60	0.64
Overall Satisfaction	1.00	0.62	0.78

- Rank Feature on [1-5] scale
- Normalized Relative Aggregated Scores

CONCLUSION

- Novel Information Exploration Paradigm
- Semantic Browser support Contextual Navigation
- Identify Named Entities and Relationships
- Provide Semantic Annotations
- Utilities for Aggregation
- Semantic Trails to Knowledge Discovery

- Formal Model for Paradigm Shift
- Improved Spotter
  - Additional Vocabularies, Context, Rule Based
- Relationship Ranking
- Document Re-ranking
- Trail Logs Analysis

People

- Cartic Ramakrishnan
- Bilal Gonen, Aditya Dhoke
- Wesley Workman, Rodrigo Gama, Guilherme de Napoli

Air Force Research Lab

Human Effectiveness Directorate
Wright-Patterson Air Force Base

National Science Foundation Award

SemDis: Discovering Complex Relationships in the Semantic Web.
No. 071441 Wright State University
No. IIS-0325464 to University of Georgia

QUESTIONS

- **Semantic Web** – is an **extension of the current web** in which **data** is expressed in a **common vocabulary** making such that the data becomes **machine processable**.
- **Ontology** – is a specification of concepts and relationships between them.
- **Triple** - a ternary relation containing an entity pair and a relationship that expresses the link between them i.e. **subject-predicate-object**
- **Entity/Concept** – an instance of a thing
- **URI** – a unique identifier for any resource/entity/thing on the web
- **LOD** - a semantic web initiative to provide a repository of semantically connected datasets