

Enterprise Platform and
Integration Concepts

Master Project Summer Term 2015



Ask your Database:
Natural Language Processing using In-Memory Technology

Dr. Mariana Neves

April 10th, 2015

Question Answering in Biomedicine



What disease is mirtazapine predominantly used for?



NCBI Resources How To

PubMed.gov US National Library of Medicine National Institutes of Health

PubMed

PubMed.gov US National Library of Medicine National Institutes of Health

Advanced

Display Settings: Abstract Send to:

Pharmacopsychiatry. 2015 Jan 19. [Epub ahead of print]

Low Risk for Switch to Mania during Treatment with Sleep Promoting Antidepressants.

Results: [Wichniak A¹](#), [Jarkiewicz M¹](#), [Okruszek Ł²](#), [Wierzbicka A³](#), [Holka-Pokorska J¹](#), [Rybakowski JK⁴](#).

Author information

Abstract

Introduction: Sleep-promoting antidepressants are of interest because they are used not only as antidepressants, but also to promote sleep.

Methods: We reviewed case reports describing the switch to mania during treatment with trazodone, mirtazapine, or agomelatine. **Results:** Trazodone, mirtazapine, and agomelatine may induce manic symptoms. However, the risk of switching is related, first of all, to doses recommended for antidepressant treatment, administered without mood-stabilizer co-therapy. Low doses of these antidepressants, used for their hypnotic or sedative effects, were observed to cause mania only in patients with other risk factors for switching. There is no evidence for trazodone or mirtazapine and only sparse evidence for agomelatine, claiming that treatment with these antidepressants is related to an increased risk of switching to mania when administered in combination with a mood stabilizer. **Discussion:** These findings suggest that low doses of trazodone and mirtazapine are safe in bipolar disorder, and should still be considered important alternatives to hypnotics when long-term pharmacological treatment of insomnia is necessary. It seems that these antidepressants and agomelatine can also be used safely in antidepressant doses when combined with a mood stabilizer.

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PMID: 25599460 [PubMed - as supplied by publisher]

Related citations

Article types: Clinical Trial, Review, Customize ...

Text availability: Abstract, Free full text, Full text

PubMed Commons: Trending articles

Publication dates: 5 years, 10 years, Custom range...

Species: Humans, Other Animals

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Question Answering in Biomedicine



What disease is mirtazapine predominantly used for?

↓
major depression
↓

“The 10 most commonly prescribed antidepressant drugs (citalopram hydrobromide (selective serotonin reuptake inhibitor), fluoxetine hydrochloride (selective serotonin reuptake inhibitor), amitriptyline hydrochloride (tricyclic antidepressant), dosulepin hydrochloride (tricyclic antidepressant), paroxetine hydrochloride (selective serotonin reuptake inhibitor), venlafaxine hydrochloride (other), sertraline hydrochloride (selective serotonin reuptake inhibitor), mirtazapine (other), lofepramine (tricyclic antidepressant), and escitalopram (selective serotonin reuptake inhibitor)) comprised 93.6% (n=1) of all antidepressant prescriptions.” (PMID 21810886)

“mirtazapine will make it the first-choice drug in depressive patients with gastric ulcers.” (PMID 19034656)

“If antidepressants are used to treat insomnia, sedating ones should be preferred over activating agents such as serotonin reuptake inhibitors. In general, drugs lacking strong cholinergic activity should be preferred. Drugs blocking serotonin 5-HT_{2A} or 5-HT_{2C} receptors should be preferred over those whose sedative property is caused by histamine receptor blockade only. The dose should be as low as possible (e.g. as an initial dose: doxepin 25 mg, mirtazapine 15 mg, trazodone 50 mg, trimipramine 25 mg). Regarding the lack of substantial data allowing for evidence-based recommendations, we are facing a clear need for well designed, long-term, comparative studies to further define the role of antidepressants versus other agents in the management of insomnia.” (PMID 19016570)

State-of-the art



- Time taken:2990ms

Question: *

Related Questions

No related question!

You asked:What disease is mirtazapine predominantly used for

[mirtazapine]

- Serotonin-potentiating non-SSRIs, such as venlafaxine, nefazodone, trazodone and **mirtazapine**, have been evaluated in PTSD only in open-label and case studies..[\[Gregory:2004\]](#){Human,Guideline}

[predominantly]

- Bupropion (amfebutamone), a **predominantly** noradrenergic reuptake inhibitor, was ineffective in PTSD in an open-label study..[\[Gregory:2004\]](#){Human,Guideline}

[disorder]

- Post-traumatic stress **disorder** (PTSD) is a highly prevalent (7.8% lifetime rate) anxiety **disorder** with impairment in daily functioning, frequent suicidal behaviour and high rates of co-morbidity..[\[Gregory:2004\]](#){Human,Guideline}

[used]

- They should be avoided or **used** only short term because of potential depressogenic effects, and the possibility that they may promote or worsen PTSD..[\[Gregory:2004\]](#){Human,Guideline}

State-of-the art



• Time taken:2990ms

Question: *

What disease is mirtazapine predominantly used for

ask

Related Questions

No related question!

You asked:What disease is mirtazapine predominantly used for




Clustered Answers

Ranked Answers

Classified Answers

1. Post-traumatic stress **disorder** (PTSD) is a highly prevalent (7.8% lifetime rate) anxiety **disorder** with impairment in daily functioning, frequent suicidal behaviour and high rates of co-morbidity..[\[Gregory:2004\]](#){Human,Guideline}
2. Serotonin-potentiating non-SSRIs, such as venlafaxine, nefazodone, trazodone and **mirtazapine**, have been evaluated in PTSD only in open-label and case studies..[\[Gregory:2004\]](#){Human,Guideline}
3. Bupropion (amfebutamone), a **predominantly** noradrenergic reuptake inhibitor, was ineffective in PTSD in an open-label study..[\[Gregory:2004\]](#){Human,Guideline}
4. They should be avoided or **used** only short term because of potential depressogenic effects, and the possibility that they may promote or worsen PTSD..[\[Gregory:2004\]](#){Human,Guideline}

State-of-the art


●  EAGLi
○  PubMed

Your question was : *What disease is mirtazapine predominantly used for?*, **reformulated as** *diseas mirtazapin predominantli*


Possible answers are :


- **Anxiety (20 matches in 7 documents)**
- **Overdose (8 matches in 4 documents) ; Weight Gain (6/5)**
- **Nausea (4 matches in 3 documents) ; Sleep Apnea, Central (4/1) ; Sleep Initiation and Maintenance Disorders (3/3) ; Headache (3/2) ; Jaundice (3/1) ; Agranulocytosis (2/1) ; Dizziness (2/2) ; Serotonin Syndrome (2/1) ; Suicide, Attempted (2/1) ; Dyspepsia (2/2) ; Tremor (2/2) ; Liver Cirrhosis (2/1) ; Pain (2/1) ; Neurodegenerative Diseases (2/1) ; Accidental Falls (2/1) ; Dystonia (2/1) ; Dyskinesia, Drug-Induced (2/1) ; Back Pain (2/1) ; Chronic Disease (2/1) ; Constipation (1/1) ; Sweating (1/1) ; Respiratory Insufficiency (1/1) ; Vomiting (1/1) ; Movement Disorders (1/1) ; Seizures (1/1) ; Hypertension (1/1) ; Hypotension (1/1) ; Tachycardia (1/1) ; Incidental Findings (1/1) ; Blood Pressure (1/1) ; Neutropenia (1/1) ; Hyperphagia (1/1) ; Heart Rate (1/1) ; Eye Movements (1/1)**

ToxiCat on the selected articles (Beta) : 


 **Anxiety ▲**


Score



 **Mirtazapine: a review of its use in major depression.**
Holm K , Markham A
Drugs. 1999 Apr; 57(4): 607-31
Pmid : 10235695
 ... patients with moderate or severe depression, including those with baseline **anxiety** symptoms or sleep disturbance and the elderly ...

Score



 **Review of the results from clinical studies on the efficacy, safety and tolerability of mirtazapine for the treatment of patients with major depression.**
Barkin R , Fawcett J
J Affect Disord. 1998 Dec; 51(3): 267-85
Pmid : 10333982
 ... as first-line therapy in patients with major depression and symptoms of **anxiety**/agitation or anxiety/somatization or ...

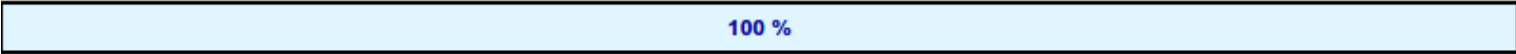
State-of-the art



What disease is mirtazapine predominantly used for?

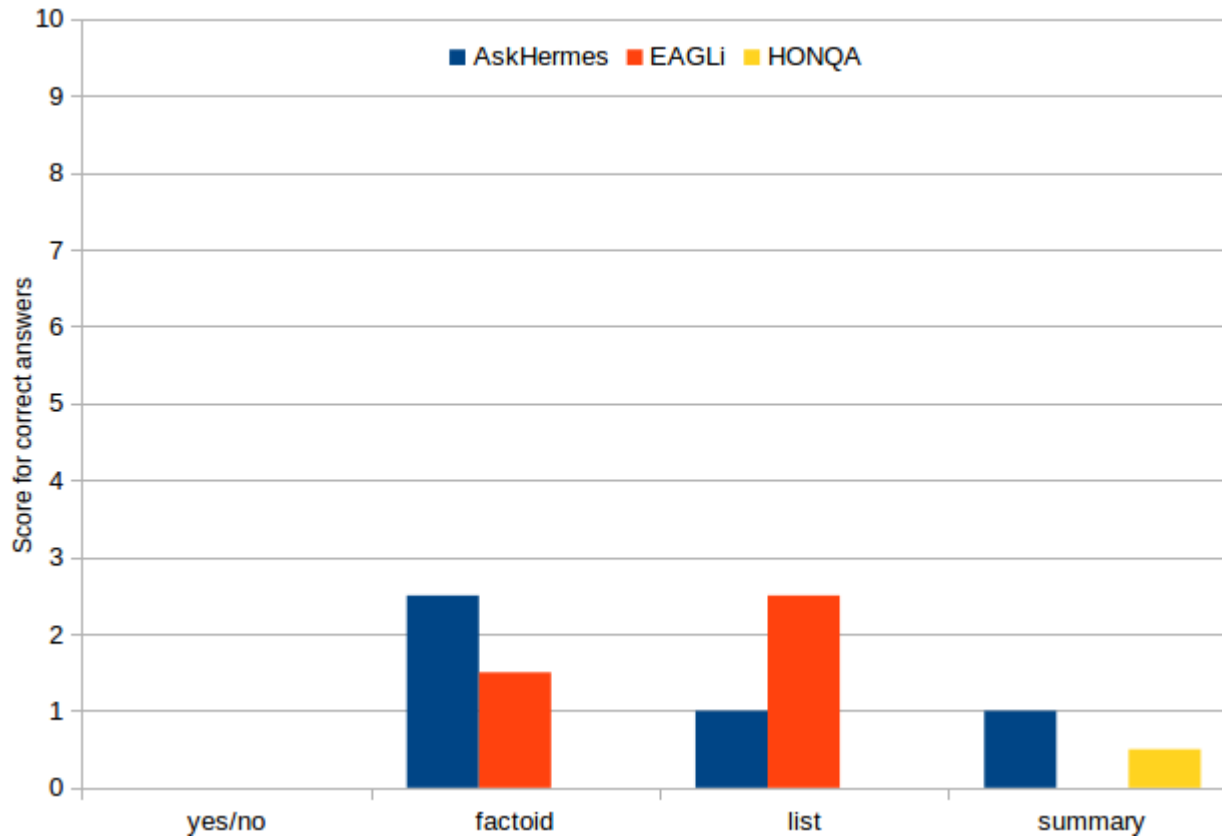
Ask

Advanced Search

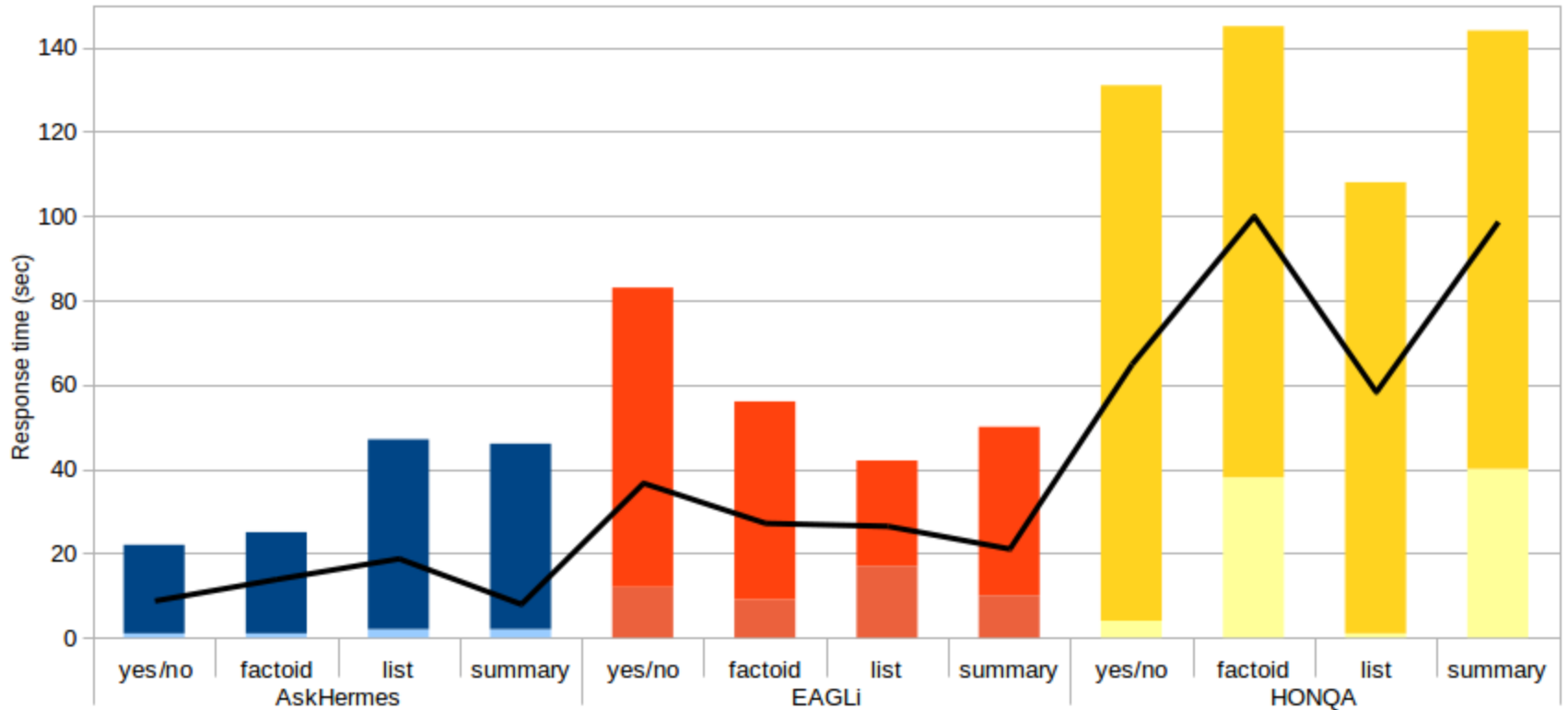


Answers:	Language:	Expected question type:	Expected medical type:	Rate answers: Is it appropriate or not ?	
43	English	factoid	treatment		
1: Answer from dailymed.nlm.nih.gov mirtazapine tablet				✓	✗
2: Answer from www.drugs.com continue taking mirtazapine.				✓	✗
3: Answer from www.drugs.com doctor may prescribe Mirtazapine for				✓	✗
4: Answer from dailymed.nlm.nih.gov • are allergic to mirtazapine or any of the ingredients in mirtazapine tablets.				✓	✗
5: Answer from www.drugs.com doctor has prescribed Mirtazapine for a				✓	✗
6: Answer from www.ncbi.nlm.nih.gov Mirtazapine for treatment of depression and comorbidities in Alzheimer disease.				✓	✗
7: Answer from www.drugs.com mirtazapine in your blood.				✓	✗
8: Answer from www.drugs.com mirtazapine tablet, film coated				✓	✗

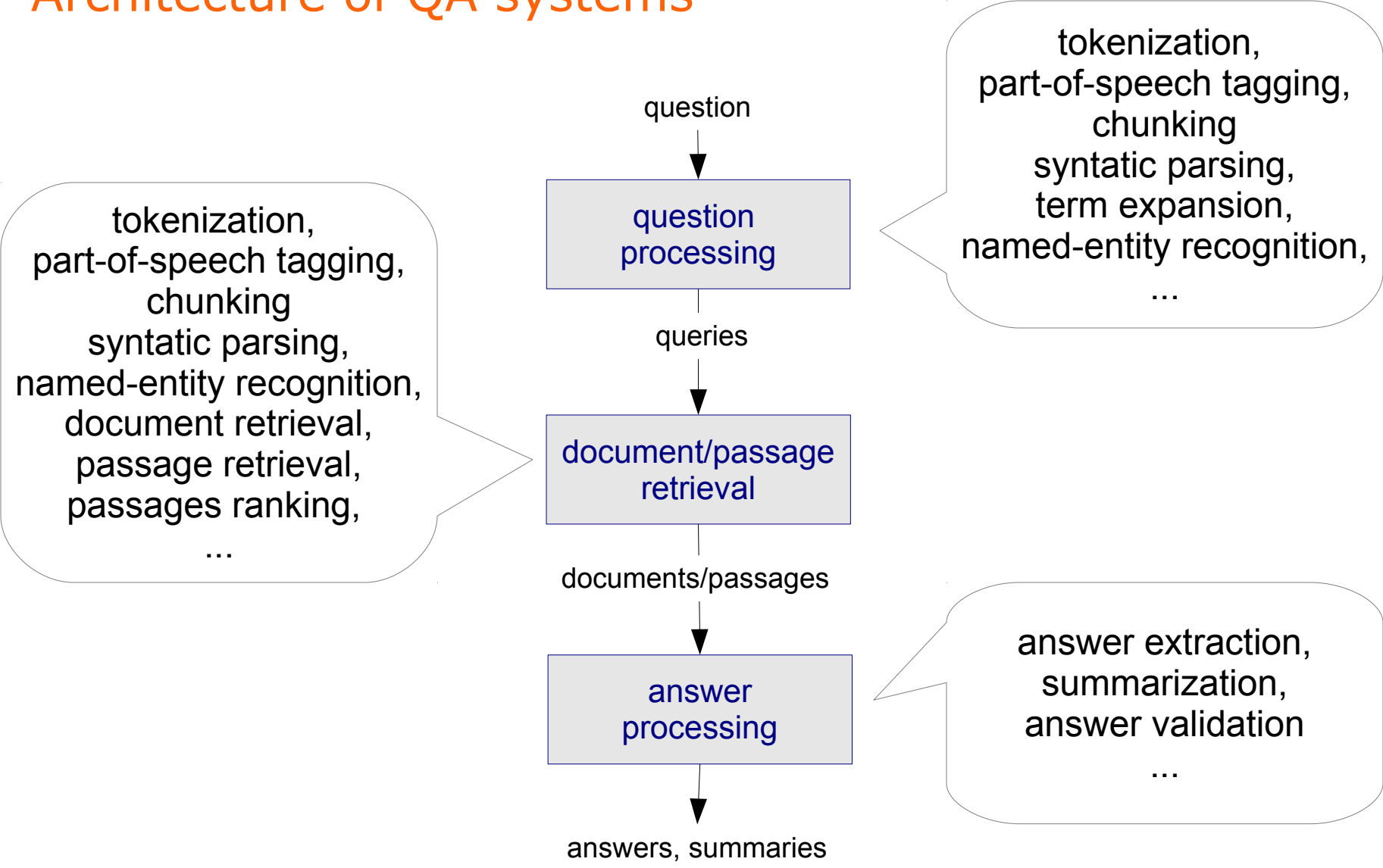
State-of-the art



State-of-the art

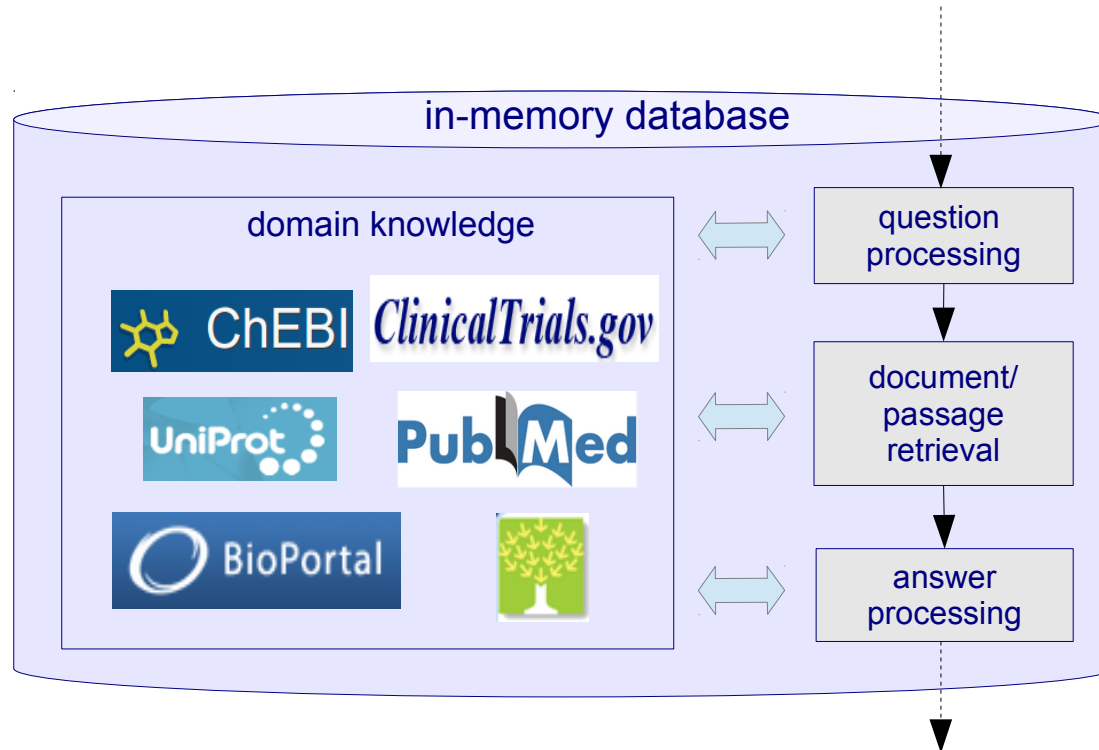


Architecture of QA systems



QA architecture in IMDB

What disease is mirtazapine predominantly used for?



Answer: “major depression”

Summary: “Mirtazapine is predominantly used in the treatment of major depression.”

Passages: “second-generation antidepressants (selective serotonin reuptake inhibitors, nefazodone, venlafaxine, and mirtazapine) in participants younger than 19 years with MDD, OCD, or non-OCD anxiety disorders.” (PMID 17440145)

NLP in SAP HANA

- Built-in features
 - Support to many languages
 - Document indexing
 - Fuzzy search
 - Sentence splitting, tokenization, part-of-speech tagging
 - Named entity recognition (dictionaries and/or rules)
 - Sentiments, negations(?), speculations(?)

Our QA prototype



A challenge on large-scale biomedical semantic indexing and question answering

System Name	Mean precision	Recall	F-Measure	MAP	GMAP
Current Submission	0.0195	0.1493	0.0323	0.0497	0.0010
HPI-S1	0.0097	0.0746	0.0163	0.0482	0.0004

System Name	Mean precision	Recall	F-Measure	MAP	GMAP	
Wishart-S2						
Wishart-S3	Current Submission	0.0219	0.1568	0.0356	0.0714	0.0009
Wishart-S1	Wishart-S3	0.0417	0.1268	0.0522	0.0574	0.0002
Top 100 Base	Wishart-S4	0.0417	0.1268	0.0522	0.0574	0.0002
Top 50 Basel	Wishart-S1	0.0501	0.1264	0.0516	0.0522	0.0002
	Wishart-S2	0.0501	0.1264	0.0516	0.0522	0.0002
	HPI-S2	0.0107	0.0857	0.0172	0.0517	0.0002
	Top 100 Baseline	0.0668	0.0789	0.0577	0.0486	0.0002
	Top 50 Baseline	0.0686	0.0777	0.0596	0.0480	0.0002

<https://sites.google.com/site/marianalaraneves/home/publications/supplementary-material-for-the-manuscript-in-memory-database-for-passage-retrieval-in-biomedical-question-answering>

Our QA prototype



A challenge on large-scale biomedical semantic indexing and question answering

```

"body": "Which extra thyroid tissues have thyrotropin (TSH) receptors?",
"concepts": [
  "http://www.nlm.nih.gov/cgi/mesh/2012/MB_cgi?field=uid&exact=Find+Exact+Term&term=D011989",
  "http://amigo.geneontology.org/cgi-bin/amigo/term_details?term=0004996",
  "http://www.biosemantics.org/jochem#4250044"
],
"documents": [
  "http://www.ncbi.nlm.nih.gov/pubmed/22517745",
  "http://www.ncbi.nlm.nih.gov/pubmed/22496347",
  "http://www.ncbi.nlm.nih.gov/pubmed/22399514",
  "http://www.ncbi.nlm.nih.gov/pubmed/22289392",
  "http://www.ncbi.nlm.nih.gov/pubmed/21956421"
],
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],
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"snippets": [
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    "offsetInEndSection": 1336,
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  },
  {
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    "endSection": "sections.0",
    "offsetInBeginSection": 552,
    "offsetInEndSection": 731,
    "text": "Previously, we found that CD34(+) progenitor cells, known as fibrocytes, express functional TSHR, infiltrate the orbit, and comprise a large subset of orbital fibroblasts in TAO. "
  }
]

```


question processing

Sentence splitting

What disease is mirtazapine predominantly used for?

Tokenization

What disease is mirtazapine predominantly used for

Part-of-speech tagging

What/WP disease/NN is/VBZ mirtazapine/NN predominantly/RB ...

Chunking

[What disease]_{NP} [is]_{VP} [mirtazapine]_{NP} [predominantly used]_{VP}

Entity recognition

mirtazapine/CHEMICAL_CHEBI:6950

Term expansion

disease [disorder; syndrome] mirtazapine [remeron] ...

Semantic role labeling

treat(agent:mirtazapine; theme:disease)

Expected answer

[DISEASE]

Question type

factoid

Query construction

disease [disorder; syndrome] AND mirtazapine [remeron] ...

document/passage
retrieval

mirtazapine will make it the first-choice drug in depressive patients with gastric ulcers.
METHODS: Antidepressant therapy with 15 to 45 mg/d of mirtazapine (n = 124) or 20 to 40 mg/d of paroxetine (n = 122)

Sentence splitting

Tokenization

METHODS : Antidepressant therapy with 15 to 45 mg / d of

Part-of-speech tagging

Patients/NNS 65/CD years/NNS or/CC older/JJR with/IN ...

Chunking

[patients 65 years]_{NP} or [older]_{ADJP} [with]_{PP} [major depression]_{NP}

Entity recognition

major depression/DISORDER_SNOMEDCT:370143000
mirtazapine/CHEMICAL_CHEBI:6950
gastric/FMA:Stomach

Semantic role labeling

treat (agent:mirtazapine; theme: depression)

Passage retrieval

METHODS: Antidepressant therapy with 15 to 45 mg/d of mirtazapine (n = 124) or 20 to 40 mg/d of paroxetine (n = 122)

Passages ranking

(0.8) METHODS: Antidepressant therapy with 15 to 45 mg/d of mirtazapine (n = 124) or 20 to 40 mg/d of paroxetine (n = 122)
(0.5) mirtazapine will make it the first-choice drug in depressive patients with gastric ulcers.

answer processing

Answer extraction

SRL-Question: treat(agent:mirtazapine; theme:disease)
 SRL-Passage: treat (agent:mirtazapine; theme: depression)
 Expected answer: [disease]
 NER: major depression/DISORDER_SNOMEDCT:370143000
 →→→ major depression

Summarization

- Mirtazapine will make it the first-choice drug in depressive patients with gastric ulcers.
 - METHODS: Antidepressant therapy with 15 to 45 mg/d of mirtazapine (n = 124) or 20 to 40 mg/d of paroxetine (n = 122)
 →→→ “Antidepressant therapy with mirtazapine will make it the first-choice drug in depressive patients”

Answer validation

- major depression
 - “Antidepressant therapy with mirtazapine will make it the first-choice drug in depressive patients”

Mirtazapine: a review of its use in major depression.

www.ncbi.nlm.nih.gov/pubmed/10235695

by KJ Holm - 1999 - Cited by 150 - Related articles

Mirtazapine: a review of its use in major depression. ... has predominantly been evaluated in the treatment of major depression. ... or severe depression, including those with baseline anxiety symptoms or sleep disturbance and the elderly.

Mirtazapine Uses, Dosage & Side Effects - Drugs.com

www.drugs.com › Drugs A to Z

Mirtazapine (Remeron) is an antidepressant used to treat major depressive disorder. Includes mirtazapine side effects, interactions and indications.

Master project „Ask your Database“

- Goals
 - Implement new NLP functionalities in SAP HANA database
 - Adapt current NLP features in SAP HANA to the biomedical domain
 - Participate in the development of a QA system for the biomedical domain
 - Evaluate the application on the BioASQ dataset

Master project „Ask your Database“

- Groups
 - Natural Language Processing in IMDB (3 students)
 - Question Answering for Biomedicine (6 students)

Group 1-NLP:

Natural Language Processing in IMDB

What disease is mirtazapine predominantly used for?

Tokenization

What disease is mirtazapine predominantly used for

Part-of-speech tagging

What/WP disease/NN is/VBZ mirtazapine/NN predominantly/RB ...

Chunking

[What disease]_{NP} [is]_{VP} [mirtazapine]_{NP} [predominantly used]_{VP}

Semantic role labeling

treat(agent:mirtazapine; theme:disease)

Group 1-NLP:

Natural Language Processing in IMDB

- Tokenization, Part-of-speech tagging, Chunking, Semantic role labeling
- Supervised learning (Support Vector Machines): Predictive Analysis Library (R, C++)
- Corpora: GENIA, TweetNLP, CoNLL-2000, CoNLL-2005, BioProp
- Integration into HANA full text indexing

Group 2 - QA:

Question Answering for Biomedicine

- QA-1: Question processing

What disease is mirtazapine predominantly used for?

Expected answer

[DISEASE]

Question type

factoid

Query construction

disease [disorder; syndrome] AND mirtazapine [remeron] ...

Group 2 - QA:

Question Answering for Biomedicine

- QA-1: Question processing
 - query construction, question type and target recognition
 - Output from the NLP group
 - SQL, stored procedures
 - Supervised learning (Support Vector Machines): Predictive Analysis Library (R, C++)
 - Corpus: BioASQ

Group 2 - QA:

Question Answering for Biomedicine

- QA-2: Named-entity recognition

What disease is mirtazapine predominantly used for?

Entity recognition

mirtazapine/CHEMICAL_CHEBI:6950

mirtazapine will make it the first-choice drug in depressive patients with gastric ulcers. METHODS: Antidepressant therapy with 15 to 45 mg/d of mirtazapine (n = 124) or 20 to 40 mg/d of paroxetine (n = 122)

Entity recognition

major depression/DISORDER_SNOMEDCT:370143000
 mirtazapine/CHEMICAL_CHEBI:6950
 gastric/FMA:Stomach

Group 2 - QA:

Question Answering for Biomedicine

- QA-2: Named-entity recognition
 - integration of various resources
 - HANA's built-in NER features
 - Corpus/evaluation: various + BioASQ

Group 2 - QA:

Question Answering for Biomedicine

- QA-3: Passage retrieval

Passage retrieval

METHODS: Antidepressant therapy with 15 to 45 mg/d of mirtazapine (n = 124) or 20 to 40 mg/d of paroxetine (n = 122)

Passages ranking

(0.8) METHODS: Antidepressant therapy with 15 to 45 mg/d of mirtazapine (n = 124) or 20 to 40 mg/d of paroxetine (n = 122)
(0.5) mirtazapine will make it the first-choice drug in depressive patients with gastric ulcers.

Group 2 - QA:

Question Answering for Biomedicine

- QA-3: Passage retrieval
 - Ranking passages/sentences
 - Calculate a score
 - PubMed indexed in Future SOC lab
 - Output from NLP and NER groups
 - SQL, stored procedures
 - Evaluation: BioASQ

Group 2 - QA:

Question Answering for Biomedicine

- QA-4: Answer processing

Answer extraction

SRL-Question: treat(agent:mirtazapine; theme:disease)

SRL-Passage: treat (agent:mirtazapine; theme: depression)

Expected answer: [disease]

NER: major depression/DISORDER_SNOMEDCT:370143000

→→→ major depression

Group 2 - QA:

Question Answering for Biomedicine

- QA-4: Answer processing
 - Answers for factoid/list/yes-no questions
 - Output from NER and NLP groups
 - SQL, stored procedures
 - Evaluation: BioASQ

Group 2 - QA:

Question Answering for Biomedicine

- QA-4: Answer processing
 - Answers for factoid/list/yes-no questions
 - Output from NER and NLP groups
 - SQL, stored procedures
 - Evaluation: BioASQ

Group 2 - QA:

Question Answering for Biomedicine

- QA-5: Summarization

Summarization

- Mirtazapine will make it the first-choice drug in depressive patients with gastric ulcers.

- METHODS: Antidepressant therapy with 15 to 45 mg/d of mirtazapine (n = 124) or 20 to 40 mg/d of paroxetine (n = 122)

→→→ “Antidepressant therapy with mirtazapine will make it the first-choice drug in depressive patients”

Group 2 - QA:

Question Answering for Biomedicine

- QA-5: Summarization
 - Answers for summary questions
 - SQL, stored procedures
 - Evaluation: BioASQ

Demo Web tool

- Input: question
- Output:
 - Answers (exact + summary)
 - Relevant passages (highlighted entities)
 - Feedback from users

Master project „Ask your Database“

- Grading
 - Report/paper: 40%
 - Commitment: 10%
 - Implementation: 50%

Master project „Ask your Database“

- Web page:
<https://hpi.de//plattner/teaching/summerterm2015/masterproject2015.html>
- Room: Campus D, E.0-1.2
- Mail with **3 top choices** to „mariana.neves@hpi.de“ until **Mon, April 13th**
- Meeting every 2 weeks (Mariana/Cindy)
- Mid-term presentation (June) and final presentation (July)

Master project „Ask your Database“

- Contact: Villa, HPI Campus II, room V1.02



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Dr. Matthias Uflacker

matthias.uflacker@hpi.de

Master project „Ask your Database“

- Mail with **3 top choices** to „mariana.neves@hpi.de“ until **Mon, April 13th**
 - NLP: Natural Language Processing in IMDB
 - QA-1: Question processing
 - QA-2: Named-entity recognition
 - QA-3: Passage retrieval
 - QA-4: Answer processing
 - QA-5: Summarization