Accelerating Science: A Grand Challenge for AI

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Allen Institute for Artificial Intelligence

18 November, 2016

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Allen Institute for AI (AI2)

Founded by Paul Allen in 2014
Now 70 people and growing

AI for the Common Good

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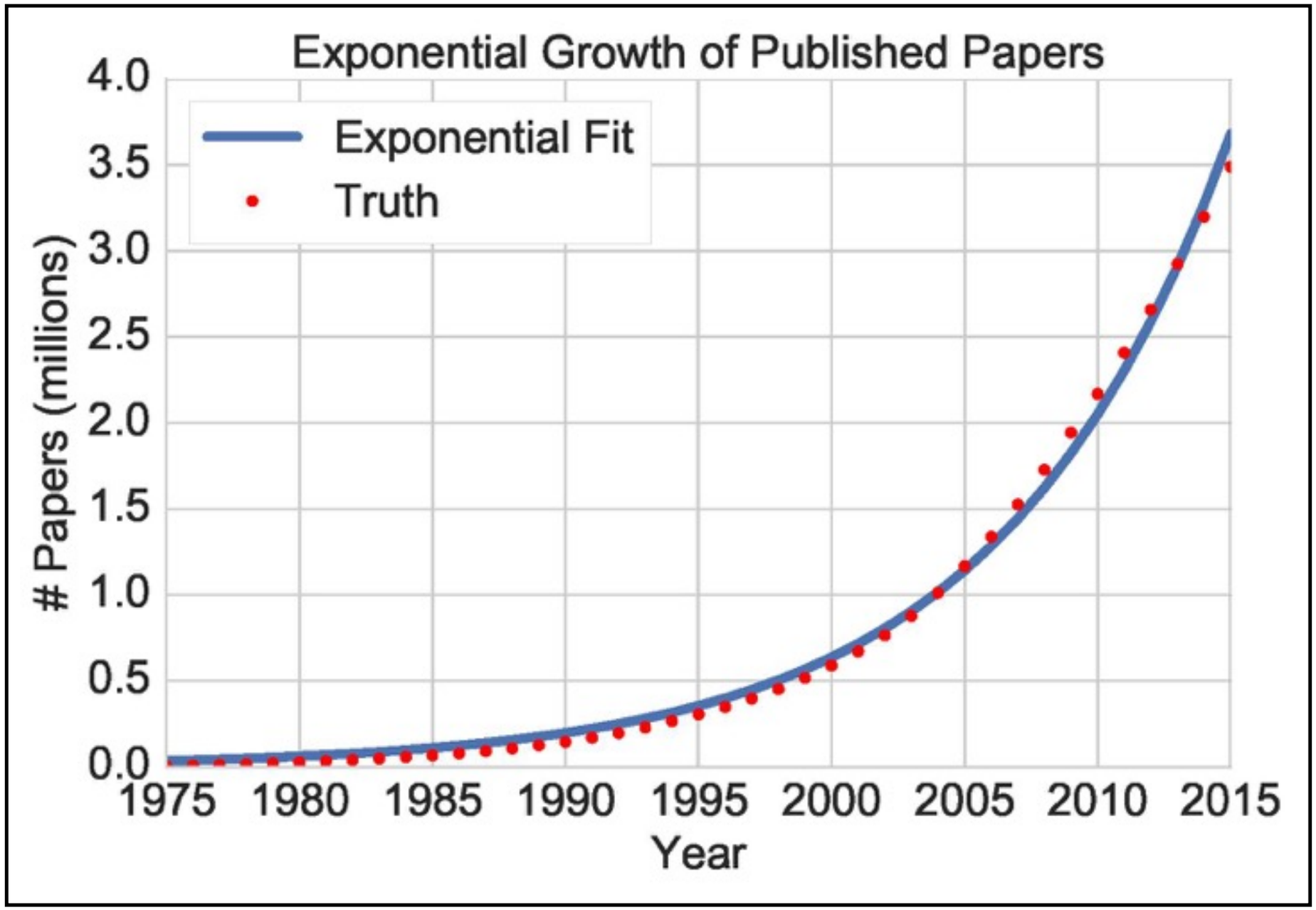
Moore's Law of Scientific Publication

The number of scientific papers has doubled every nine years since World War II



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Google deep learning

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Since 2016
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Sort by relevance
Sort by date

include patents
include citations

Learning in science: A comparison of **deep** and surface approaches
C Chin, DE Brown - Journal of research in science teaching, 2000 - Wiley Online Library
Abstract The purpose of this study was to explore in greater depth what has been called by previous researchers, a **deep** versus surface approach to **learning** science. Six Grade 8 students judged as typically using **learning** approaches ranging from **deep** to surface were ...
Cited by 397 Related articles All 5 versions Cite Save

Why does unsupervised pre-training help **deep learning**?
D Erhan, Y Bengio, A Courville, PA Manzagol... - ... of Machine **Learning** ..., 2010 - jmlr.org
Abstract Much recent research has been devoted to **learning** algorithms for **deep** architectures such as **Deep** Belief Networks and stacks of auto-encoder variants, with impressive results obtained in several areas, mostly on vision and language data sets. ...
Cited by 722 Related articles All 27 versions Cite Save

[PDF] Multimodal **deep learning**
J Ngiam, A Khosla, M Kim, J Nam... - ... machine **learning** (..., 2011 - machinelearning.wustl.edu
Abstract **Deep** networks have been successfully applied to unsupervised feature **learning** for single modalities (eg, text, images or audio). In this work, we propose a novel application of **deep** networks to learn features over multiple modalities. We present a series of tasks for ...
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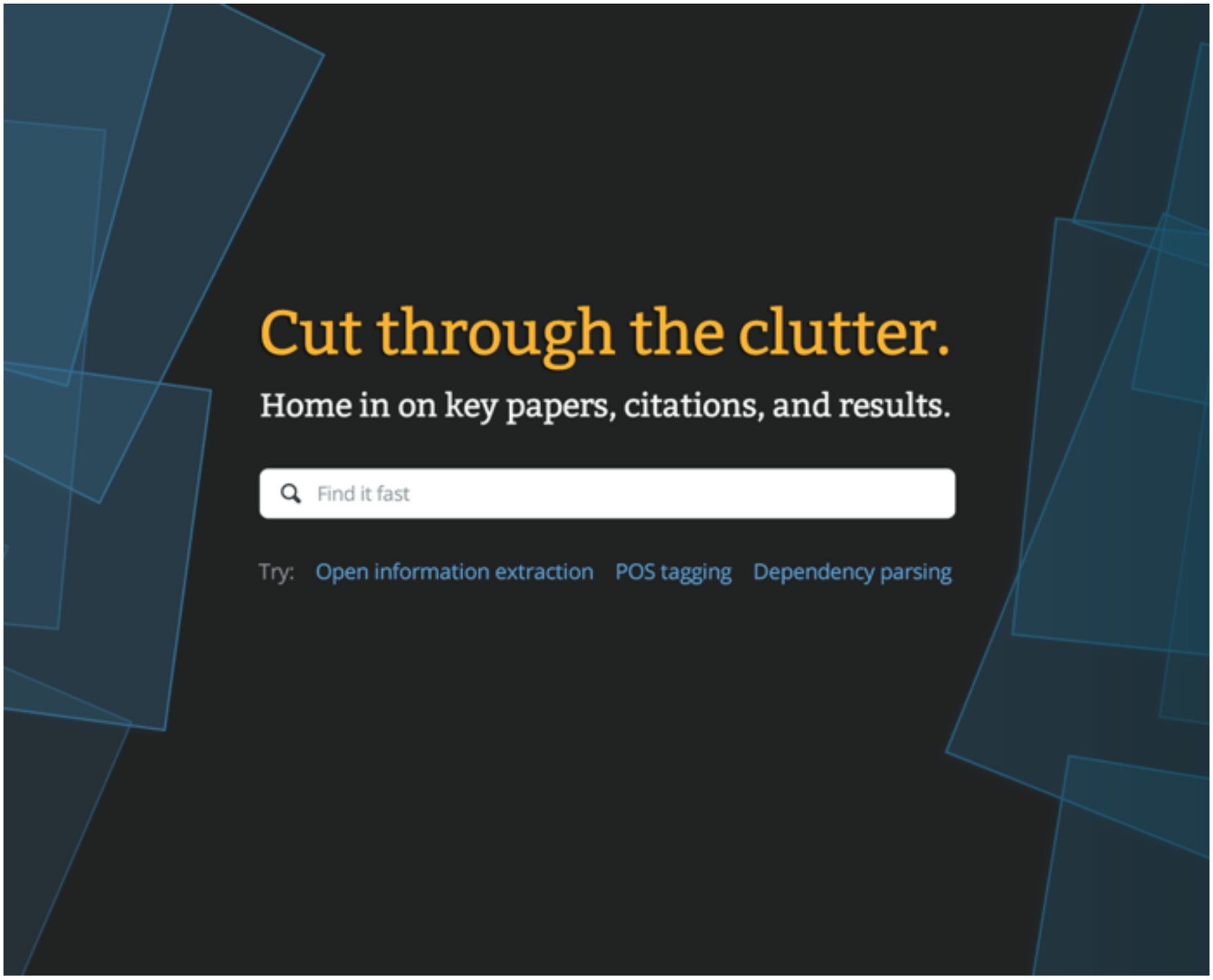
Information Overload

Challenge: Researchers are swamped; Virtually impossible to read all papers

Opportunity: Leverage AI to combat information overload

Semantic Scholar (S2)



Computer Science and (recently) Neuroscience research articles

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Semantic Scholar

Demo

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Faceted Search

Semantic Scholar

deep learning

SIGN IN

Filter Results:

Field of Study

Publication Year

1980 2017

Author

Key Phrase

- CNN (1,562)
- DNN (81)
- Deep Learning (87)
- ANN (7)
- RBM (10)
- Regularization (13)
- Autoencoder (8)
- Deep Neural Network (8)
- MNIST (20)
- Supervised (5)

Publication Venue

Data Set Used

Page 1

Sort by: Relevance

INSIGHT-1 at SemEval-2016 Task 5: **Deep Learning** for Multilingual Aspect-based Sentiment Analysis

Trending

Sebastian Ruder, Parsa Ghaffari, John G. Breslin · SemEval@NAACL-HLT · 2016

This paper describes our **deep learning**-based approach to multilingual aspect-based sentiment analysis as part of Se-mEval 2016 Task 5. We use a convo-lutional neural network (CNN) for both aspect extraction and aspect-based sentiment analysis. We cast aspect extraction as a multi-label classification problem , outputting probabilities over aspects... (More)

Mentioned in **18 tweets**:

CS CL **arXiv CS-CL**
@arxiv_cscl

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NSIGHT-1 at SemEval-2016 Task 5: Deep Learning for Multilingual Aspect-based Sentiment Analysis
arxiv.org/abs/1609.02748
11:40 AM - 12 Sep 2016
1 2

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Deep learning.

Yann LeCun, Yoshua Bengio, Geoffrey E. Hinton · Nature · 2015

Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics. **Deep**... (More)

16 View On PubMed Related Publications View Slides More...

Deep Learning in Neural Networks: An Overview

Jürgen Schmidhuber · Neural Networks · 2015

In recent years, **deep** artificial neural networks (including recurrent ones) have won numerous contests in pattern recognition and machine **learning**. This historical survey compactly summarizes relevant work, much of it from the previous millennium. Shallow and **Deep** Learners are distinguished by the depth of their credit assignment paths, which are chains of... (More)

5 232 View PDF Related Publications More...

Faceted Search

Semantic Scholar

Songbird Basal Ganglia

SIGN IN

Filter Results:

- Field of Study
- Publication Year
- Publication Type
- Author
- Key Phrase
- Publication Venue
- Brain Region
- Cell Type
- Method
- Organism
  - Zebra Finch (616)
  - Human (29)
  - Non-human primate (25)
  - Rat (24)
  - Mouse (14)
  - Zebra Fish (10)
  - Drosophila (5)
  - C. elegans (2)
  - Cat (2)

Page 1

Sort by: Relevance

Incomplete and Inaccurate Vocal Imitation after Knockdown of FoxP2 in **Songbird Basal Ganglia** Nucleus Area X

Sebastian Haesler, Christelle Rochefort, Benjamin Georgi, Pawel Licznerski, Pavel Osten, Constance Scharff · PLoS biology · 2007

The gene encoding the forkhead box transcription factor, FOXP2, is essential for developing the full articulatory power of human language. Mutations of FOXP2 cause developmental verbal dyspraxia (DVD), a speech and language disorder that compromises the fluent production of words and the correct use and comprehension of grammar. FOXP2 patients have… (More)

62 | View PDF | Related Publications | More...

Organization of the **songbird basal ganglia**, including area X.

Abigail L Person, Samuel D Gale, Michael A Farries, David J Perkel · The Journal of comparative neurology · 2008

Area X is a **songbird basal ganglia** nucleus that is required for vocal learning. Both Area X and its immediate surround, the medial striatum (MSt), contain cells displaying either striatal or pallidal characteristics. We used pathway-tracing techniques to compare directly the targets of Area X and MSt with those of the lateral striatum (LSt) and globus… (More)

1 | View On PubMed | Related Publications | More...

Automatically extracted using statistical models

Vocal learning in songbirds requires a **basal ganglia** circuit termed the anterior forebrain pathway (AFP). The AFP is not required for song production, and its role in song learning is not well understood. Like the mammalian striatum, the striatal component of the AFP, Area X, receives dense dopaminergic innervation from the midbrain. Since dopamine (DA)… (More)

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Vocal Experimentation in the Juvenile **Songbird** Requires a **Basal Ganglia** Circuit

Bence P Ölveczky, Aaron S Andalman, Michale S Fee · PLoS biology · 2005

Songbirds learn their songs by trial-and-error experimentation, producing highly variable vocal output as juveniles. By comparing their own sounds to the song of a tutor, young songbirds gradually converge to a stable song that can be a remarkably good copy of the tutor song. Here we show that vocal variability in the learning **songbird** is induced by a… (More)

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Extracted Key Elements

Semantic Scholar

Deep Learning

< Back to results for **Deep Learning**

Share

Domain Adaptation for Large-Scale Sentiment Classification: A Deep Learning Approach

Xavier Glorot, Antoine Bordes, Yoshua Bengio · ICML · 2011

View PDF | Cite | Save

Abstract

The exponential increase in the availability of online reviews and recommendations makes sentiment classification an interesting topic in academic and industrial research. Reviews can span so many different domains that it is difficult to gather annotated training data for all of them. Hence, this paper studies the problem of domain adaptation for sentiment classifiers, hereby a system is trained on labeled reviews from one source domain but is meant to be deployed on another. We propose a deep learning approach which learns to extract a meaningful representation for each review in an unsuper-vised fashion. Sentiment classifiers trained with this high-level feature representation clearly outperform state-of-the-art methods on a benchmark composed of reviews of 4 types of Amazon products. Furthermore, this method scales well and allowed us to successfully perform domain adaptation on a larger industrial-strength dataset of 22 domains.

Extracted Key Phrases

Non-linearity | SDA | Encoder | NLP | Autoencoder

5 Figures and Tables

Table 1

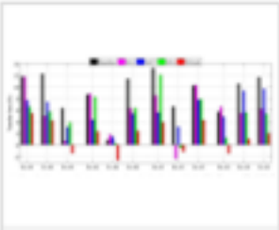

Figure 1

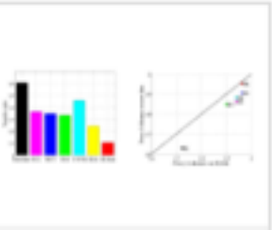

Figure 2

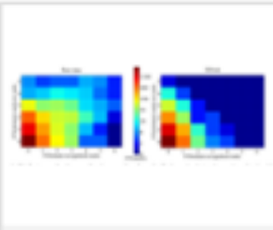

Figure 3

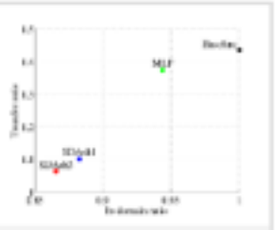

Figure 4

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Staying up-to-date

Cornell University Library

arXiv.org > cs

Computer Science

Authors and titles for recent submissions, skipping first 205

- Thu, 17 Nov 2016
- Wed, 16 Nov 2016
- Tue, 15 Nov 2016
- Mon, 14 Nov 2016
- Fri, 11 Nov 2016

[total of 516 entries: 1-25 | ... | 131-155 | 156-180 | 181-205 | **206-230** | 231-255 | 256-280 | 281-305 | ... | 506-516]
[showing 25 entries per page: fewer | more | all]

Tue, 15 Nov 2016 (showing first 25 of 158 entries)

[206] arXiv:1611.04581 [pdf, other]

How to scale distributed deep learning?

Peter H. Jin, Qiaochu Yuan, Forrest Iandola, Kurt Keutzer

Comments: Extended version of paper accepted at ML Sys 2016 (at NIPS 2016)

Subjects: **Learning (cs.LG)**

Staying up-to-date

- Idea: Daily feed of most relevant papers
- Research Challenges:
  - Identify topics in a documents
  - Model user's topic preference
  - Rank by relevance

Deeper Understanding of a Document


Conditional Random Field Autoencoders
for Unsupervised Structured Prediction

Waleed Ammar Chris Dyer Noah A. Smith

Abstract

1 Introduction

Autoencoders

CRF autoencoders

CRF

POS Induction

Unsupervised structured prediction

CoNLL 2007

Entity Extraction

Deeper Understanding of a Document


Conditional Random Field Autoencoders for Unsupervised Structured Prediction

Waleed Ammar Chris Dyer Noah A. Smith

Abstract

1 Introduction

Autoencoders

CRF autoencoders

CRF

POS Induction

Unsupervised structured prediction

CoNLL 2007

Method

Task

Dataset

Type Identification

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Deeper Understanding of a Document

Conditional Random Field Autoencoders
for Unsupervised Structured Prediction

Autoencoders

subclass of

CRF autoencoders

CRF

uses

addresses

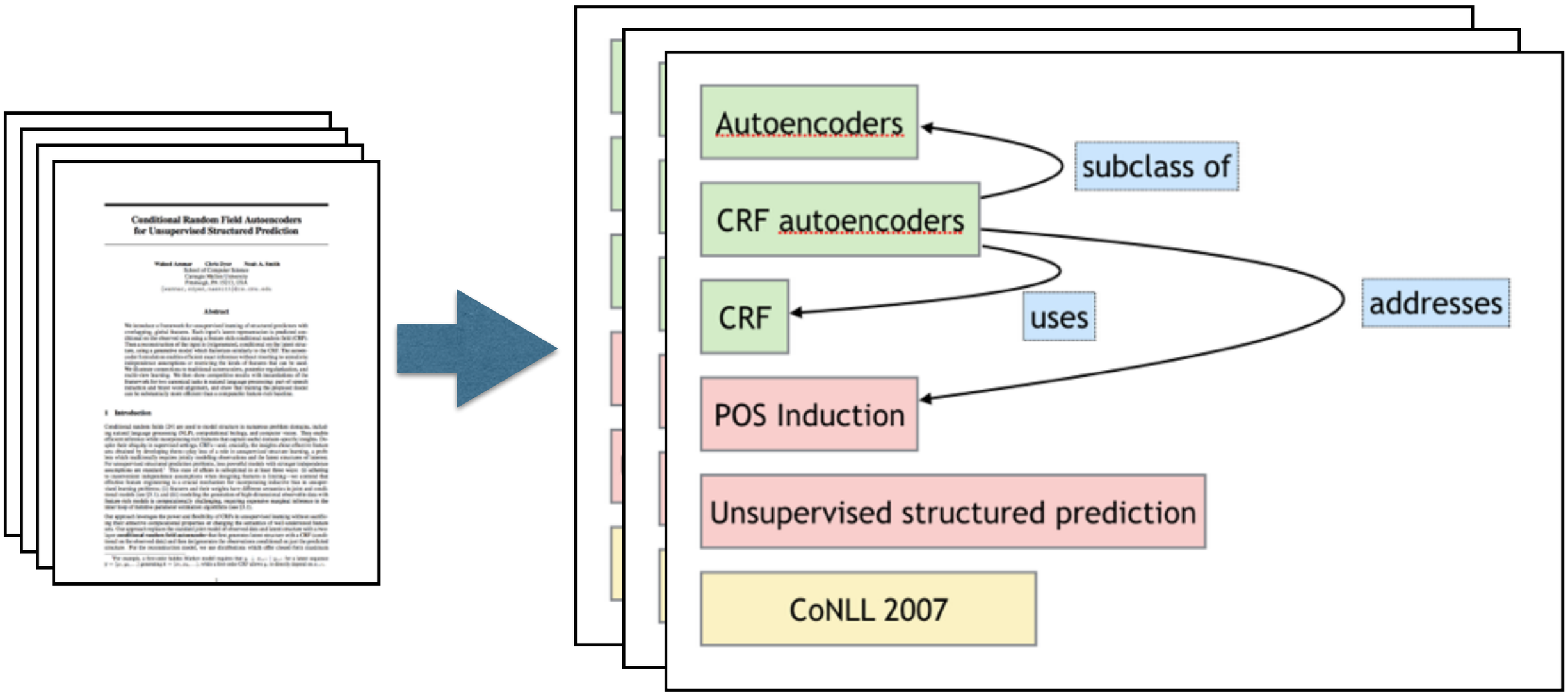
POS Induction

Unsupervised structured prediction

CoNLL 2007

Relation Extraction

Deeper Understanding of the Literature



Literature Graph

Citeomatic: Who should I cite?

- Disseminating Research by Writing papers
- Comprehensive review of related work is challenging

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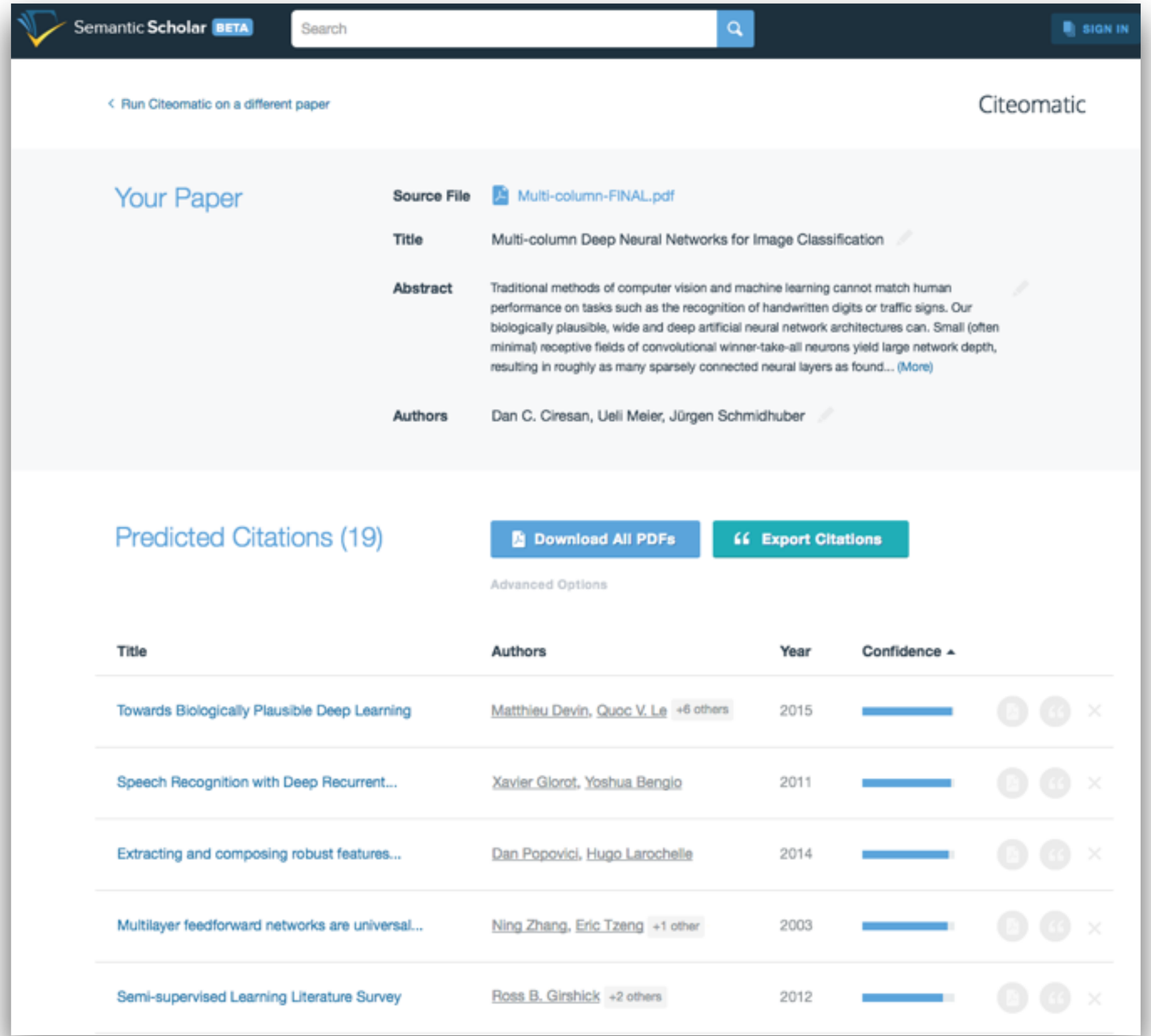
Citeomatic: A brief overview

- Input:
  - The title and abstract of a query paper
- Output:
  - A list of related work, that should be reviewed, ordered by confidence

Citeomatic



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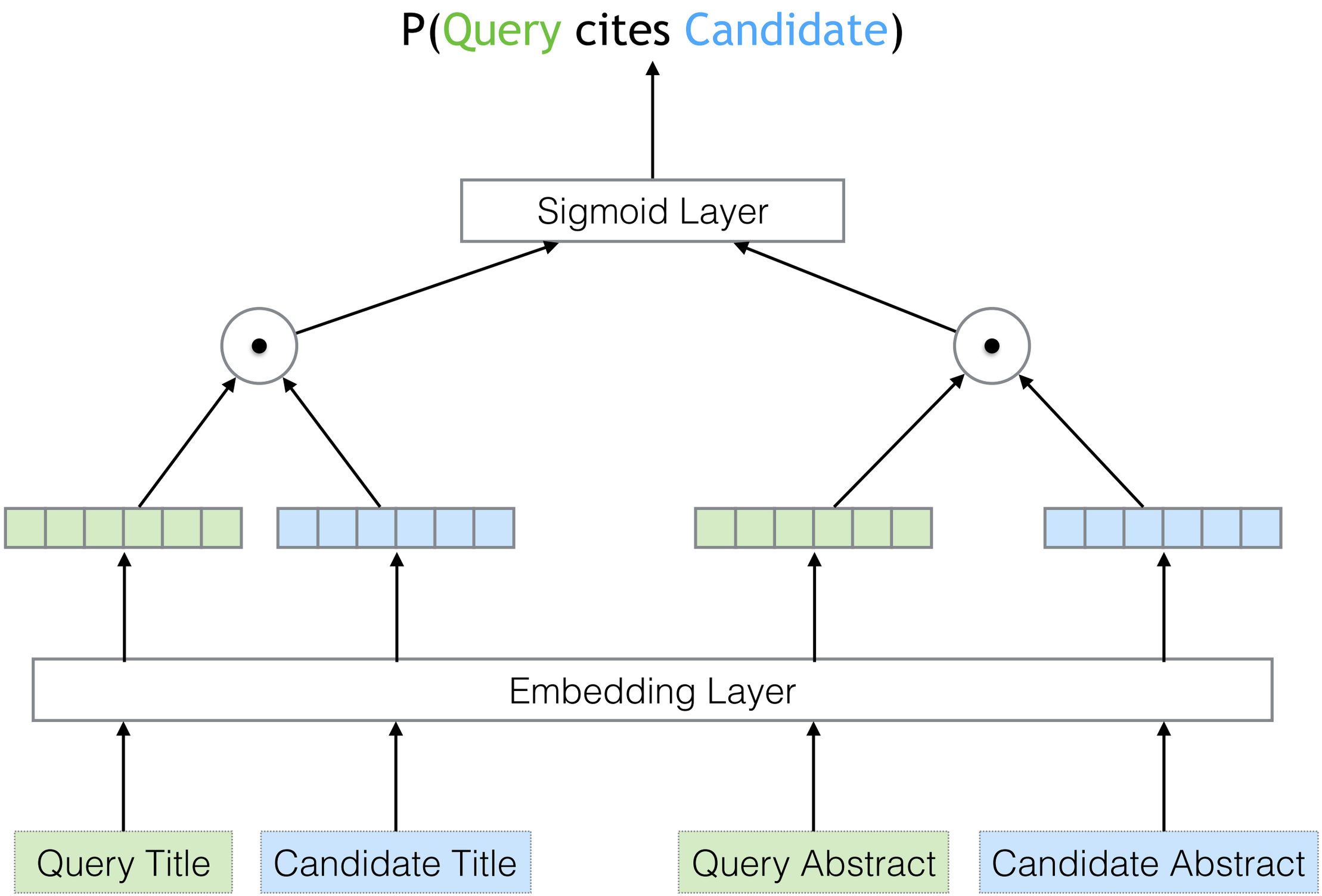
Citeomatic: Network Architecture



Summary

Feature / Idea	Addresses Information Overload in	Research Challenges
Faceted Search	Finding Relevant Documents	Search
Automatically extracted important elements	Reading Relevant Documents	Information Extraction (IE)
Daily Feed	Staying Up-to-date	Recommendation
Literature Graph	Understanding and Relating to existing Knowledge	NER, KB Construction etc.
Citeomatic	Writing and Publishing	Document Similarity

Directions of Future Work

- Hypothesis Generation
  - *Method X has been found to be effective for task Y. Task Y and Z are related. Maybe X can be applied to Z*
- What's at my knowledge-frontier?
  - *I know about X and Y, what should I know next?*
- Topic dependencies
  - *I want to learn X, what are its pre-requisites?*

Conclusion

"No human could possibly read the entirety of medical literature, personal health records, and case file histories that might inform a doctor's professional opinion when trying to save a cancer patient's life. But a machine can."

- fortune.com on Nov 2, 2016

Scientific Research is facing tremendous Information Overload

Advances in AI, ML and NLP can help !

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Thank You!

Please visit: semanticscholar.org

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