

# Temporal Information retrieval

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# Agenda

- Introduction
- Characteristics of temporal data
- Types of temporal information
- Temporal expressions
- Recent Research work
- Case study : Learning Recurrent Event Queries for Web Search
- My interests
- Future work
- References

# Introduction

- What is Temporal Information retrieval?
- Why we need it?
- What is temporal data?
- From where temporal data can be extracted?

# Characteristics of temporal data

- Well defined
  - Assuming we know start point and end points relation between two temporal data can be identified easily
- Easy to normalize
  - Temporal data can be normalized with reference to specific semantics in specified format.
- Easy to cluster
  - Hierarchical clustering is possible using level(s) of granularity.

# Grouping temporal information

- Date
  - Exact Date
- Time
  - Exact Time
- Duration
  - Time period
- Set
  - Recurrence of event(s).

# Temporal Expressions

- Implicate
  - Single or multiples values of this data can be mapped to single
- Explicit
  - Date or time specified explicitly
- Relative
  - Time information in context with other Implicate or explicit expression(s)

# Recent research work

- Microblogging and real time search
- Temporal summaries
  - Provide snippet based results
- Temporal queries
  - Temporal constraint along with text query.

# Case Study : Learning Recurrent Event Queries for Web Search



# Problem

- Classifying queries as recurrent (REQ) and non recurrent(NON-REQ)
  - queries for event which occur at regular time interval
- Re-ranking documents based on temporal data

**EMNLP 2008** ☆  
The 2008 Conference on Empirical Methods on Natural Language Processing.  
[conferences.inf.ed.ac.uk/emnlp08/](http://conferences.inf.ed.ac.uk/emnlp08/) - Cached - Similar

**EMNLP 2009** ☆  
The 2009 Conference on Empirical Methods on Natural Language Processing.  
[conferences.inf.ed.ac.uk/emnlp09/](http://conferences.inf.ed.ac.uk/emnlp09/) - Cached - Similar

**SIGDAT (ACL Special Interest Group)** ☆  
2007 Joint Conference on Empirical Methods in Natural Language Processing and N  
Language Learning (EMNLP-CoNLL 2007) ...  
[www.cs.jhu.edu/~yarowsky/sigdat.html](http://www.cs.jhu.edu/~yarowsky/sigdat.html) - Cached - Similar

**EMNLP-CoNLL 2007 (EMNLP 2007 and CoNLL 2007)** ☆  
Aug 1, 2007 ... The 2007 Joint Meeting of the Conference on Empirical Methods in  
Language Processing (EMNLP) and the Conference on Natural Language ...  
[www.cs.jhu.edu/EMNLP-CoNLL-2007/](http://www.cs.jhu.edu/EMNLP-CoNLL-2007/) - Cached - Similar  
✚ Show more results from [www.cs.jhu.edu](http://www.cs.jhu.edu)

**HLT/EMNLP 2005** ☆  
In 2005, HLT (Human Language Technology Conference) and EMNLP (Conference on  
Empirical Methods in Natural Language Processing) will be a joint conference ...  
[www.aclweb.org/mirror/hlt-emnlp05/](http://www.aclweb.org/mirror/hlt-emnlp05/) - Cached - Similar

**EMNLP 2010: 2010 Conference on Empirical Methods in Natural ...** ☆  
EMNLP 2010: 2010 Conference on Empirical Methods in Natural Language Process  
Conference and Journal.  
[www.wikicfp.com/cfp/servlet/event.showcfp?eventid=9667...2](http://www.wikicfp.com/cfp/servlet/event.showcfp?eventid=9667...2) - Cached

**SIGNLL: Related Upcoming Events** ☆  
Mar 16, 2010 ... Paper submission deadline: unknown; EMNLP 2010 2010 Conferen  
Empirical Methods in Natural Language Processing, October or November 2010 ...  
[farrn.nl/signl/events/](http://farrn.nl/signl/events/) - Cached - Similar

**EMNLP 2006** ☆  
EMNLP is located with the other workshops linked to COLING-ACL 2006, in the Hay  
Campus of the University of Technology, Sydney (UTS) in rooms ...  
[nlp.stanford.edu/emnlp06/](http://nlp.stanford.edu/emnlp06/) - Cached - Similar

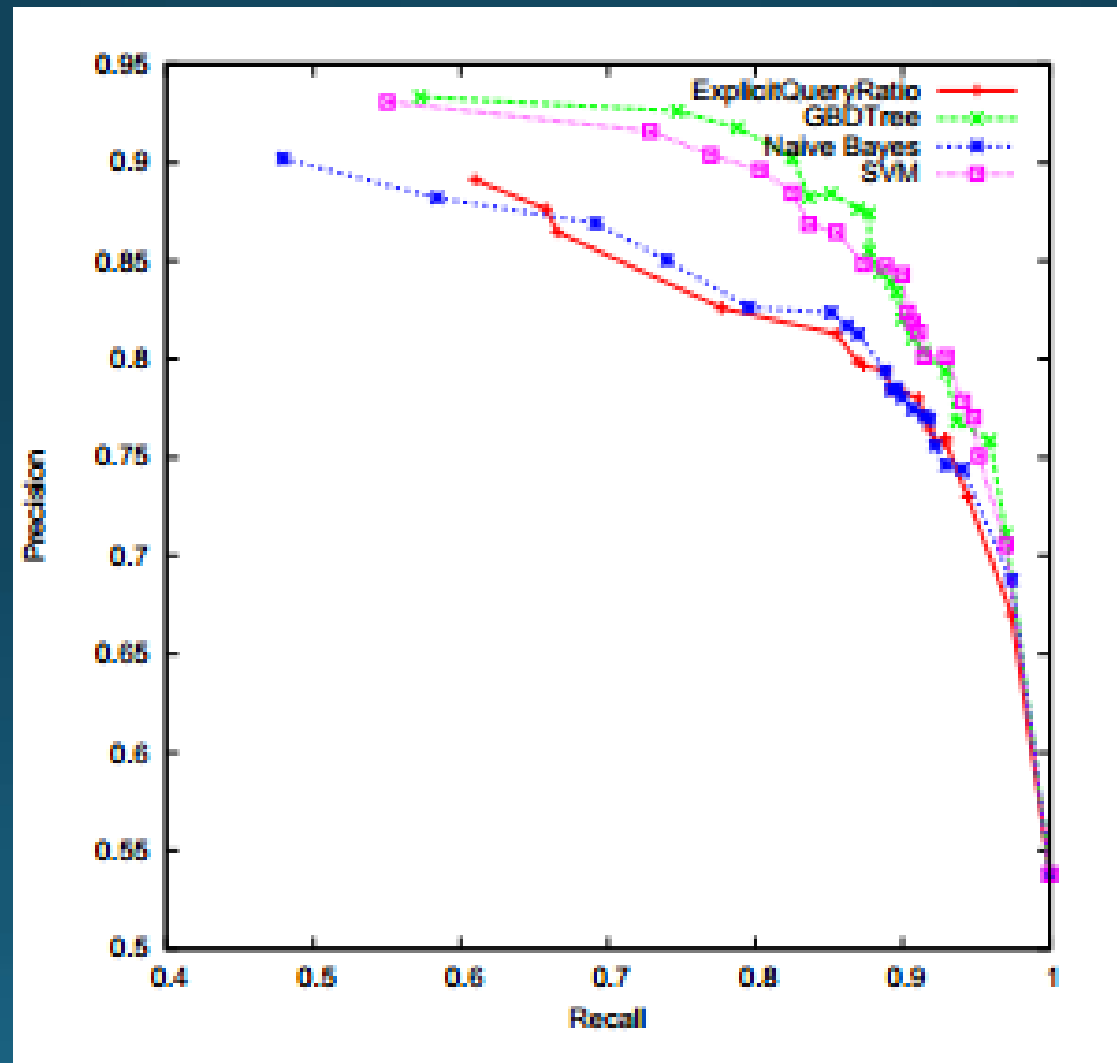
# Feature generation

- Extracting time
  - Used Implicate, explicit and no timestamp queries
- Query log analysis
  - Explicit query ratio
- Query reformation
- Click log analysis
- Search engine result set
- Time series analysis
- Recurrent event(s) term list

# Machine learning approach for Classification of queries

- Naive based method
  - This treats all features are independent
- SVM
- Gradient boosted decision tree algorithm

# ML evaluation



# Re-ranking documents

- Page score is boosted if query is REQ

- Ranking function

- $F(q,d) = R(q,d) + [e(d_o,d_n)+k]e^{\lambda\alpha(q)}$

Where  $R(q,d)$  base scoring function

$\lambda\alpha(q)$  is confidence score of REQ query

$[e(d_o,d_n)+k]e^\lambda$  is difference between oldest page and newest page

# Ranking evaluation

- Evaluation metrics :
- Discounted cumulative gain at rank k is:

$$DCG@k = \sum_{i=1}^k \frac{(2^{r(i)} - 1)}{\ln(1 + 1)}$$

- Where  $r(i)$  is relevance grade of  $i^{\text{th}}$  ranked document

bucket	#(query)	DCG@5			DCG@1		
		Organic	Our's	% over Organic	Organic	Ours	% over Organic
[0.0,0.1]	59	6.87	6.96	1.48(-2.3)	4.08	4.19	2.69(-1.07)
[0.1,0.2]	76	5.86	6.01	2.52(0.98)	2.88	2.91	1.14(1.69)
[0.2,0.3]	85	6.33	6.41	1.24(2.12)	3.7	3.7	0.0(0.8)
[0.3,0.4]	75	5.18	5.24	1.18(-0.7)	2.92	2.95	1.14(1.37)
[0.4,0.5]	78	4.96	4.82	-2.84(-1.35)	2.5	2.42	-3.06(0)
[0.5,0.6]	84	5.4	5.37	-0.45(-0.3)	2.82	2.85	1.05(-1.5)
[0.6,0.7]	78	4.78	5.19	8.42(3.64)	2.56	2.83	10.75(4.1)
[0.7,0.8]	80	4.45	4.60	3.41(3.19)	2.21	2.26	1.98(2.8)
[0.8,0.9]	78	4.81	4.96	3.15(4.79)	2.32	2.33	0.55(0.65)
[0.9,1.0]	107	5.08	5.50	<b>8.41*(4.41)</b>	2.64	3.09	<b>16.78*(1.36)</b>
[0.0,1.0]	800	5.33	5.47	<b>2.74*(2.17)</b>	2.83	2.93	<b>3.6*(1.26)</b>

Table 5: REQ learner improves search engine organic results. The numbers in the brackets are by Zhang's methods. Direct comparison with Zhang's method is valid only in the last line, using all queries. A sign "\*" indicates statistical significance (p-value<0.05)

# My interests

- Using machine learning approach to optimize index cache based on temporal query analysis
- Plotting Document improvements on timeline

# Future Work

- How to provide timeline?
- How to calculate lifespan of event?
- Detecting trending events



# References

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