



Query Performance Prediction for Microblog Search

A Preliminary Study

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SoMeRA'14 Workshop in conjunction with SIGIR'14

Why?

sigir awards



 **Daniel Tunkelang** @dtunkelang · May 3
 @IR_oldie Yes, but only one of them can win best paper. cf. sigir.org/general-inform...

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 **dog (gauh!)** @khaitoy · 6 Jul 2013
 便利まとめだ (今まで知らなかった...) / "Best paper awards for WWW, SIGIR, CIKM, AAAI, CHI, KDD, SIGMOD, ICML, VLDB, IJCAI" htn.to/bUSJkz

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 **isi2013** @isi2013 · 30 Aug 2012
 Norbert Fuhr von der ACM mit dem Salton-Preis 2012 ausgezeichnet (höchster Preis im Information Retrieval) sigir.org/awards/awards.... #glueckwunsch

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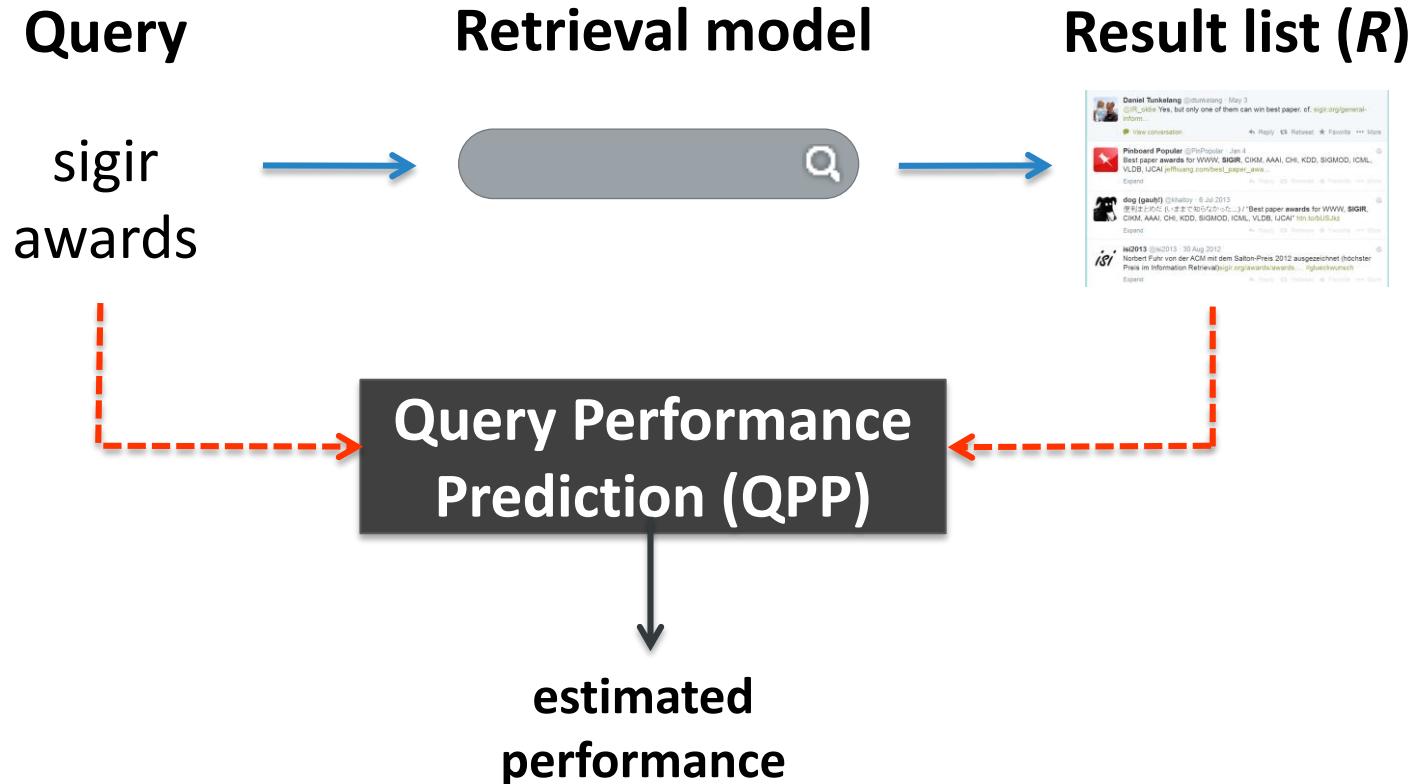
Expectation
 high quality
 results

Reality
 Some
 queries are
difficult



Poor results

What's QPP?



QPP in Microblog Search?

- QPP is not a new problem

RQ1: How well the existing state-of-the-art predictors perform in the context of *microblog search*?

- Microblog search is *different*

RQ2: Will the predictors performance be consistent across different retrieval models, specifically *temporal ones*?

Setup of the Study ...

Overview

- Examine *frequently-used* predictors for *tweets search*
- 2 types of **predictors**:
 - **Content-based**: consider terms in tweets and queries
 - **Temporal**: also consider time factor
- 2 types of **retrieval models**:
 - **Content-based**
e.g. Query Likelihood
 - **Temporal**
e.g. Time-based Exponential Priors

QP Predictors

Content-based predictors

- Standard deviation (σ)
 - Normalized Standard Deviation (**NSD**)
 - Normalized Query Commitment (**NQC**)
- KL-divergence
 - Clarity (**CLR**)
- Information Gain
 - Weighted information gain (**WIG**)

Post-retrieval

QP Predictors

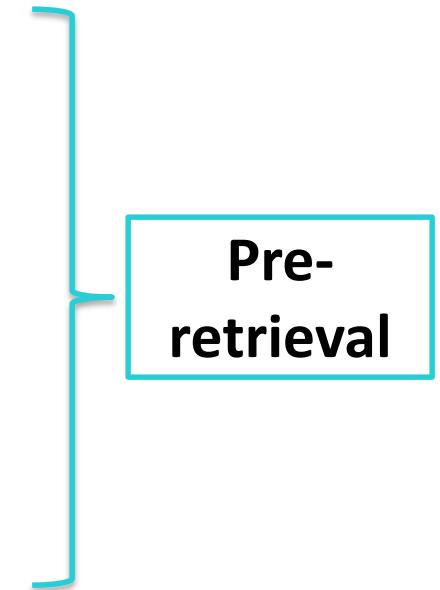
- Inverse document frequency (IDF)

SumIDF, MaxIDF, AvgIDF, ...

- Collection-query similarity (SCQ)

SumSCQ, MaxSCQ, AvgSCQ, ...

- Simplified clarity score (SCS)



QP Predictors

Temporal predictor

- **KL-divergence**
Temporal Clarity (*t*-CLR)

← Post-retrieval

Retrieval Models

Content-based

- **Query Likelihood (QL)**

$$P(D|Q) \propto P(Q|D) \cdot P(D)$$

Temporal

- **QL with temporal prior (t -EXP)**

$$P(D|Q) \propto P(Q|D) \cdot \underbrace{r \cdot e^{-r \cdot t_d}}$$

- **Temporal relevance modeling (t -QRM)**

$$P(w|Q) = \sum_{t \in T} P(w|t, Q) P(t|Q)$$

$$P(w|t, Q) = \sum_{D \in t} P(w|D) P(D|t, Q)$$

Evaluation

Setup

Datasets

	Tweets2011	Tweets2013
<i>Source</i>	TREC'11-12	TREC'13
<i>Tweets</i>	~16M	~243M
<i>Queries</i>	108	60
<i>Time span</i>	~2 weeks	~2 months

Evaluating retrieval

Evaluation measure: Average precision (AP)

Setup

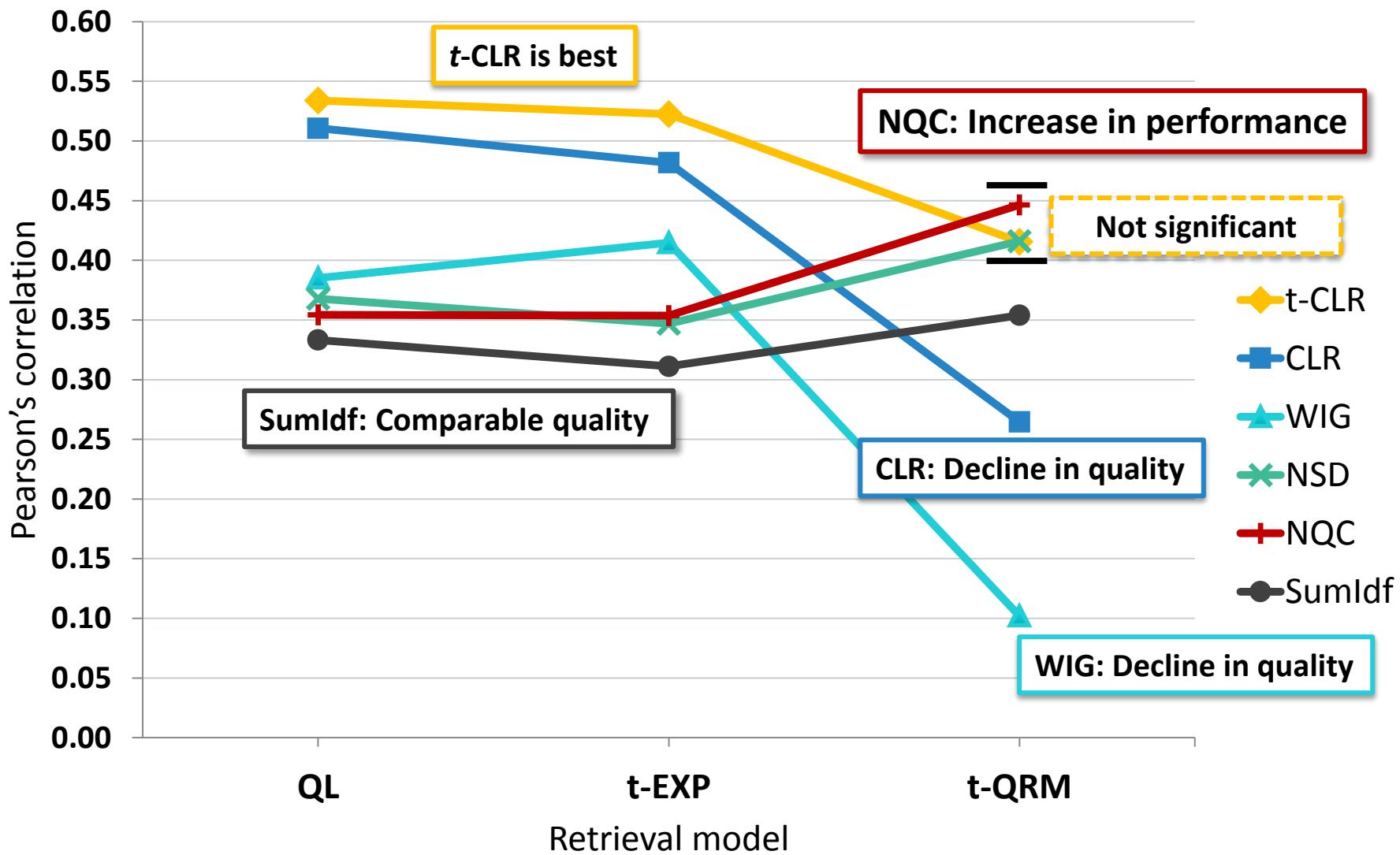
Evaluating prediction

- *Correlation* between *predicted AP* & *actual AP*.
- Linear correlation: Pearson's r
- Rank correlation: Kendall's- τ

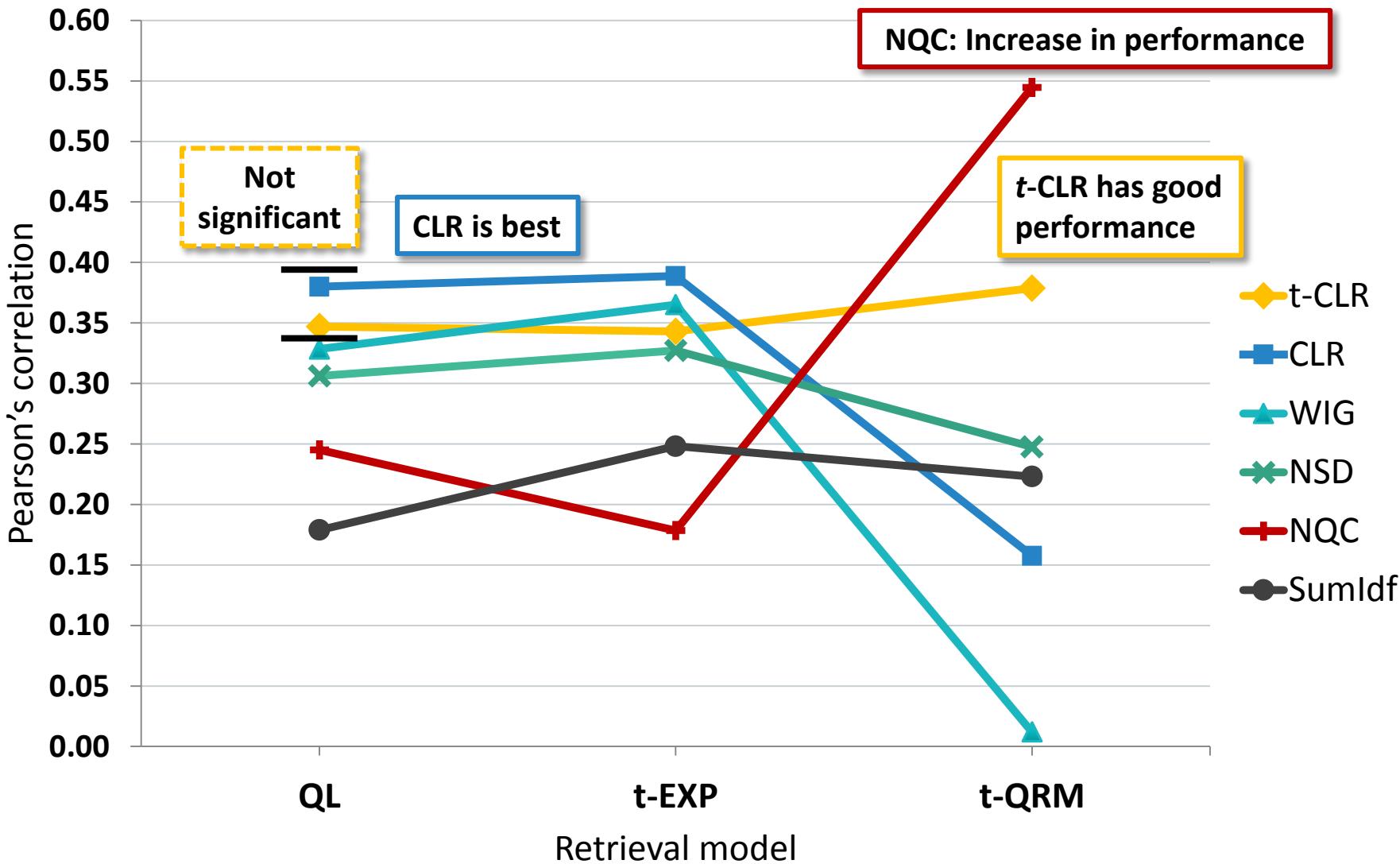
Training/Testing

- 75% of queries for parameter tuning
- Repeat and average with 120 trials

Results (Tweets2011)



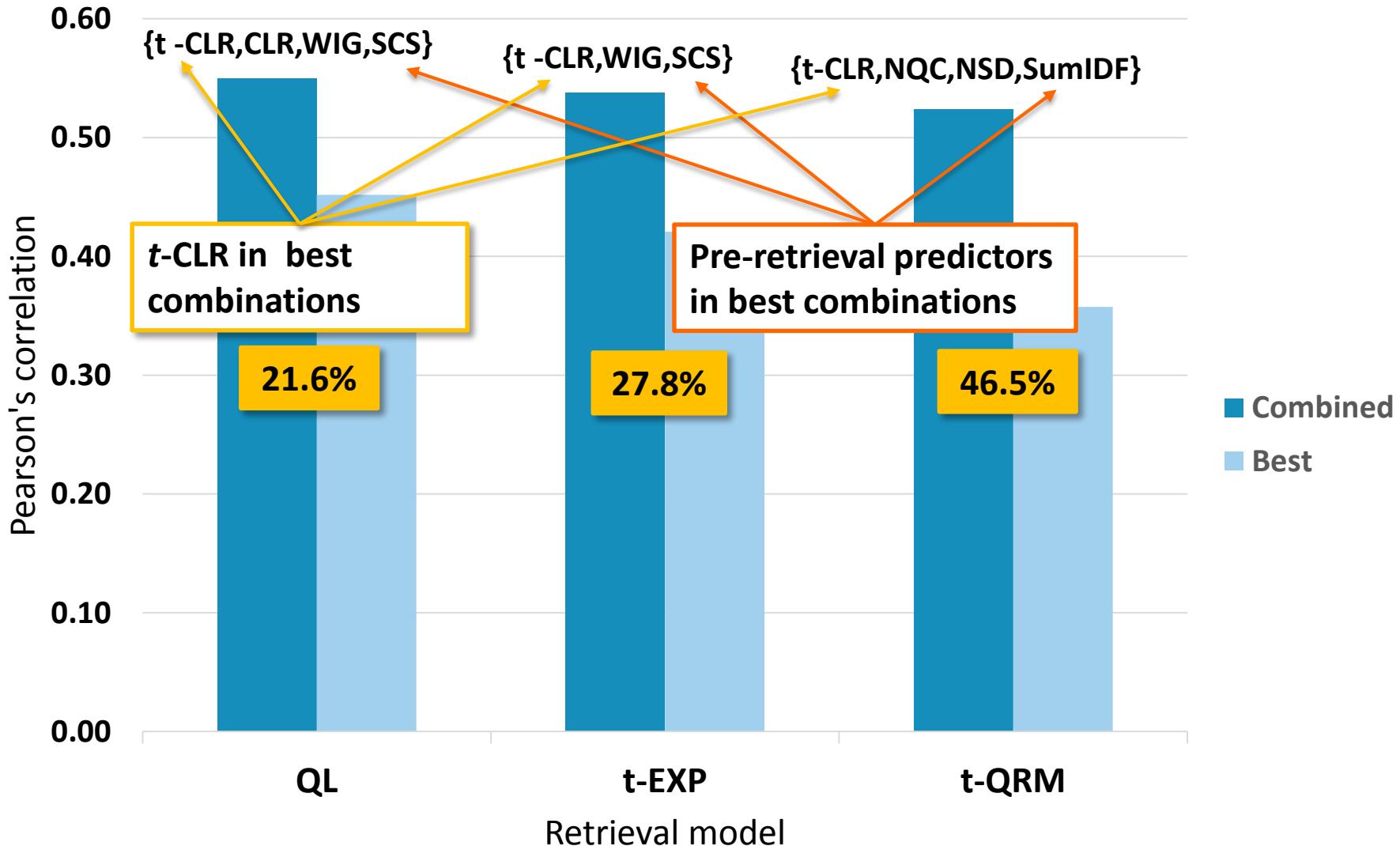
Results (Tweets2013)



Combining Predictors

- Using linear regression
- Feature selection to find best predictors combination
- Only over Tweet2011
- 40% of queries for parameter tuning
- Train & test combined model by cross-validation with 60% of queries.

Combining Predictors (Tweets2011)



Summary

- First comprehensive study focusing on testing QPP in microblog search with different retrieval models.
- Temporal predictors might be more suitable for microblog search.
- Combining predictors improved prediction quality.
- Some pre-retrieval predictors are showing promising results.

Future Work

- *Experiment* with more **temporal predictors & retrieval models**
- *Develop* new...
 - **Temporal** predictors
 - Predictors considering **tweet-specific** features
- *Use* QPP in ...
 - **Selective** query expansion
 - **Dynamic** query expansion



Thank You ☺

