

# Reducing Uncertainty in Resource Selection

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# Outline

- 1 Background
- 2 Measuring Uncertainty
- 3 Reducing Uncertainty
  - General Idea
  - Perturbation Methods
  - Experimental Results

Google

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Any time - All results - Clear

### Apple Store - Amsterdam

[www.apple.com/nl/retail/amsterdam/](http://www.apple.com/nl/retail/amsterdam/) - Translate this page

Apple Store **Amsterdam** store hours, contact information, and weekly calendar of events. ... **Amsterdam** 3 Apple Store, **Amsterdam** 4 Apple Store, **Amsterdam** 5 Apple ... In de Apple Store kun je met de Apple Store-app op je **iPhone** accessoires ...

Genius Bar - Winkelen - Zakelijk - Persoonlijke configuratie

### iPhone 5: Super Glued to Ground in Amsterdam ... - YouTube



[www.youtube.com/watch?v=aRIOM3y4yG4](http://www.youtube.com/watch?v=aRIOM3y4yG4) -

Sep 21, 2012 - Uploaded by iPhoneNL

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28 september 2012 om 08:00 uur 's ochtends en er

staat een rij van het Leidseplein tot Momo bij Park ...

### Images for iPhone 5s amsterdam

Report images

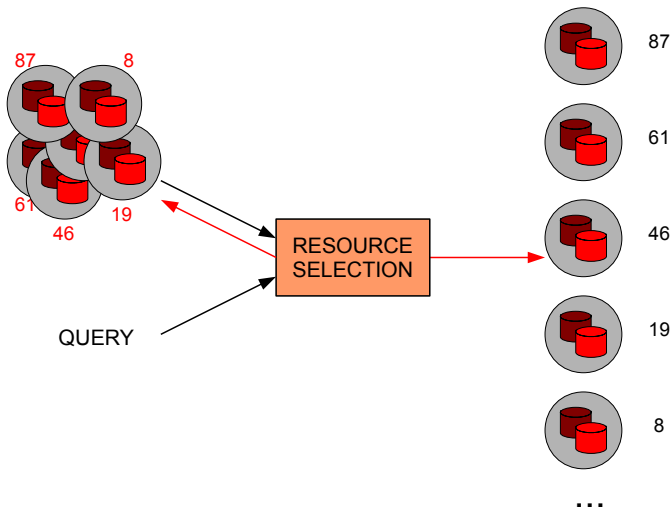


More images for iPhone 5s amsterdam

## Resource Selection

Given a user's query and a set of resources, resource selection is concerned with identifying and ranking relevant resources for the query

# Resource Selection



# Uncertainty in Resource Selection

- ① Measure uncertainty
- ② Reduce uncertainty

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## Measures of Uncertainty

- $< Init$
- $RI(Q) = (n_+ - n_-)/|Q|$
- $R-Loss$
- $Var(AP) = E(AP - E(AP))^2 = E(AP - MAP)^2$



## Experimental Setup

- TREC GOV2: crawl of .gov in 2004, 25 million web pages
- Splits
  - gov2.1000 – domain split
  - gov2.30 – topical split

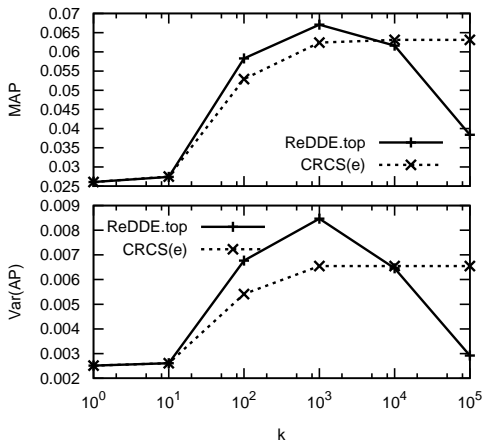


Figure : Gov2.1000

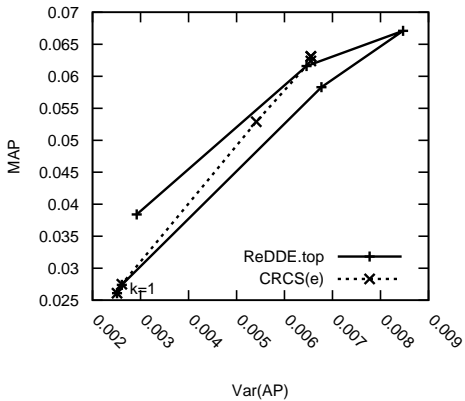


Figure : Gov2.1000

## Results

- CRCS(e): no value of  $k$  with both high performance and low uncertainty
- ReDDE.top: lower uncertainty is possible for the same level of performance

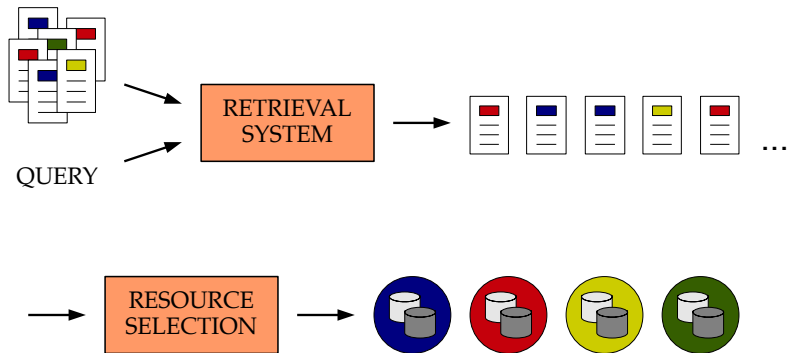
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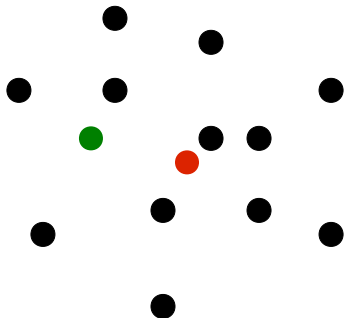
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## Small-Document Resource Selection

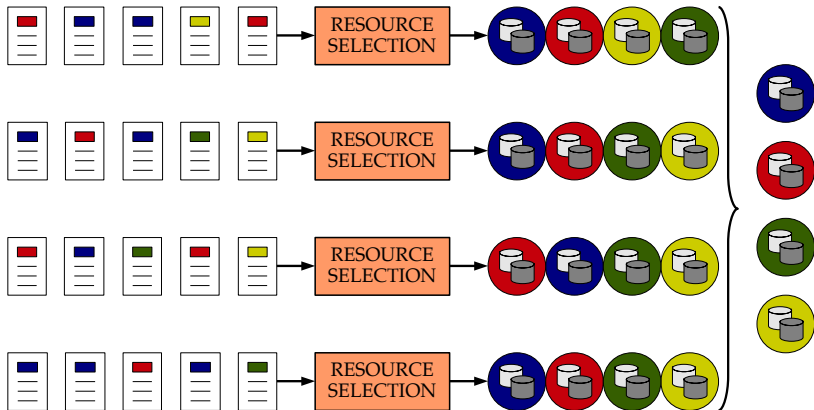


## Exploring the Space of Source Rankings

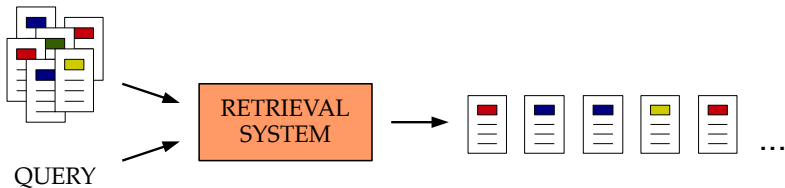




# Using Multiple Document Rankings



# Obtaining Multiple Documents Rankings



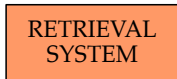
# Components to Perturb



sample of documents

QUERY

user's query



retrieval system



document ranking

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## Query Perturbation

### QUERY

- The weight of each query term is decreased one term at a time.
- This results in  $L + 1$  perturbations, where  $L$  is the query length.

# Retrieval System Perturbation



RETRIEVAL  
SYSTEM

- Ten different retrieval functions are used.
- The parameters of each function *could* also be changed in order to obtain more perturbations.

# Document Ranking Perturbation



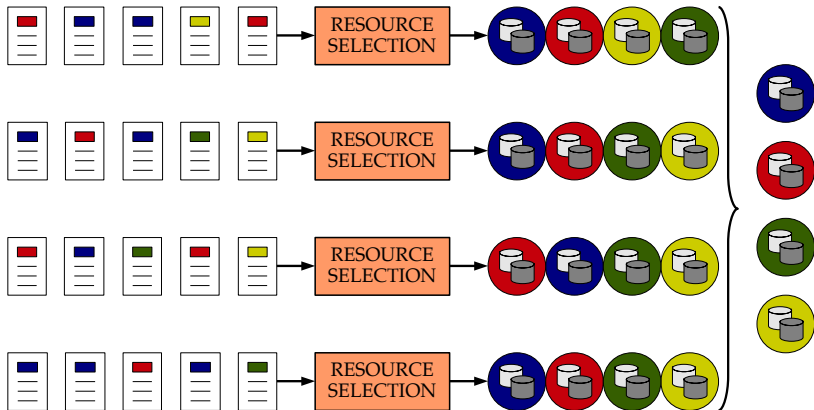
- Sample with replacement  $n$  documents from the original ranking.
- The sampling is weighed by document relevance scores.
- The process is repeated 100 times (converges after about 50 iterations).

# Perturbation Methods

- 1 Query perturbation
- 2 Retrieval system perturbation
- 3 Document ranking perturbation



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## ReDDE.top

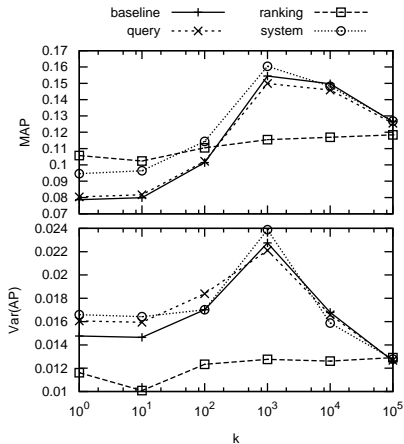


Figure : ReDDE.top, gov2.30

## ReDDE.top

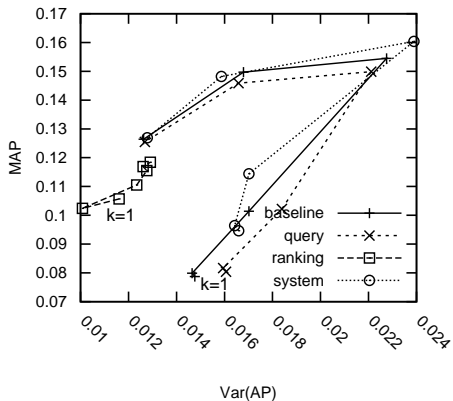


Figure : ReDDE.top, gov2.30

## CRCS(e)

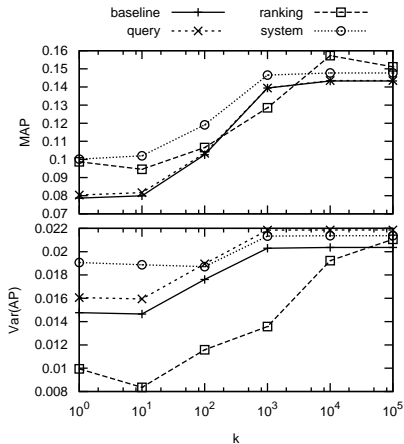


Figure : CRCS(e), gov2.30

## CRCS(e)

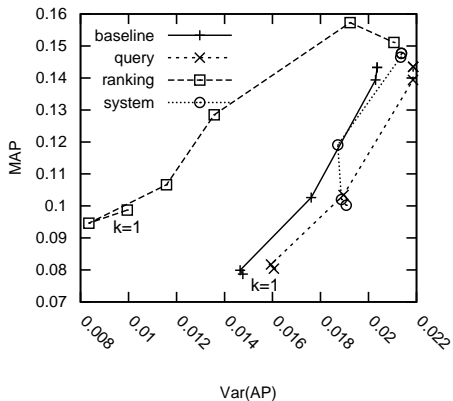


Figure : CRCS(e), gov2.30

# Results

- *Retrieval system perturbation* improves performance while having the same or lower uncertainty, or reduces uncertainty for the same level of performance
- *Query perturbation* usually performs worse than the baseline while having the same uncertainty, or achieves the same performance but increases uncertainty
- *Ranking perturbation*
  - ReDDE.top: mixed results
  - CRCS(e): improves performance/decreases uncertainty

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# Answers