Institute for
Infocomm Research

CENTRE NATIONAL
DE LA RECHERCHE
SCIENTIFIQUE

Using Surface Syntactic Parser & Deviation from Randomness

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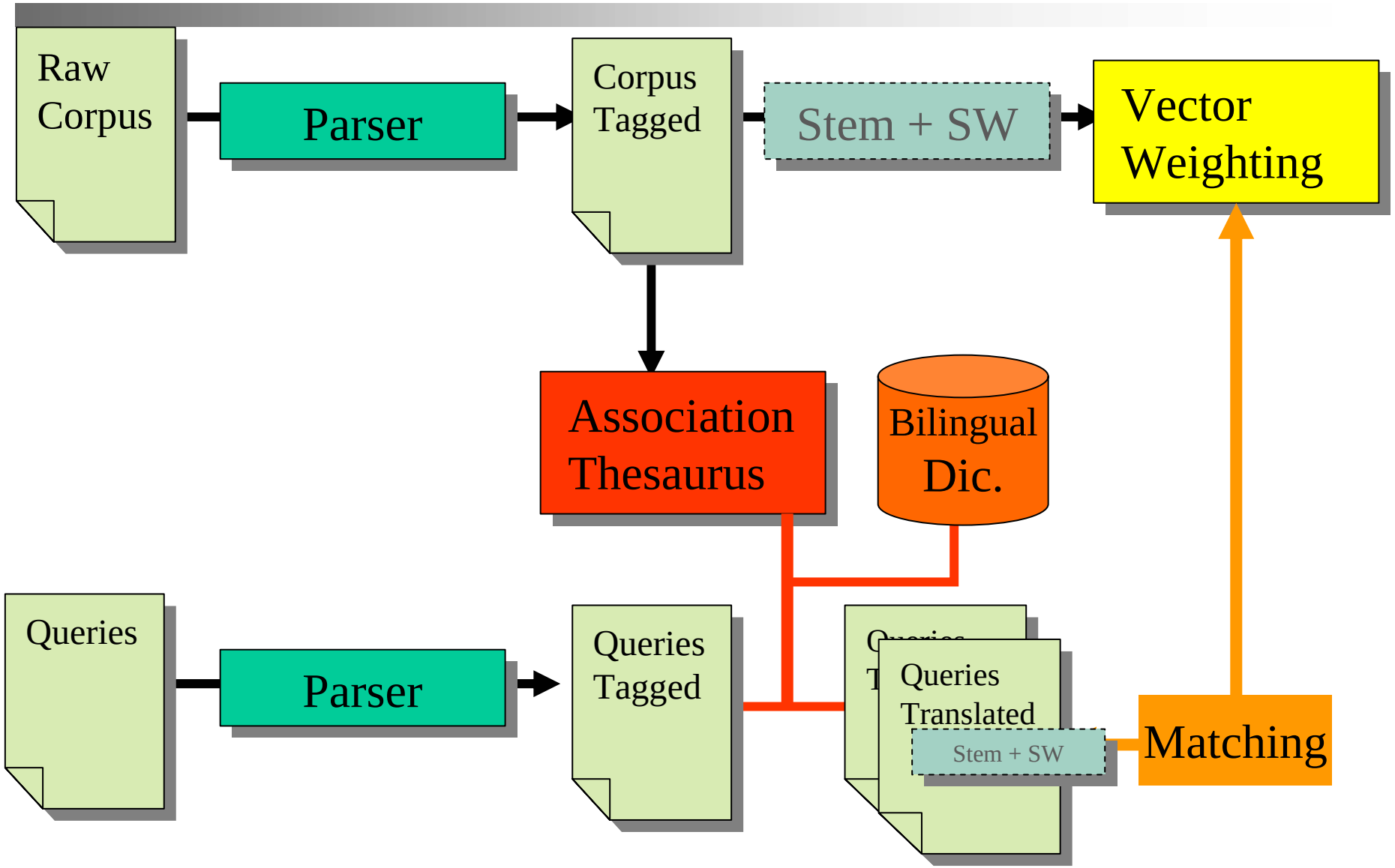
Outline

- Monolingual track
  - French, Russian, Finnish
  - Deviation from randomness
- Bilingual track
  - Bilingual Association Thesaurus for disambiguating Query Translation

Goal of Monolingual experiment

- Compare Deviation from randomness Weighting model,against some other
  - nnn, bnn, lnc, ntc, ltc, atn, dtn, Okapi
- Learn the best parameters
- Use surface syntactic parsing
  - For all documents and queries
  - Ensure correct linguistic stemming
  - Correct split of glued words
- A test for the XIOTA, XML IR systeem

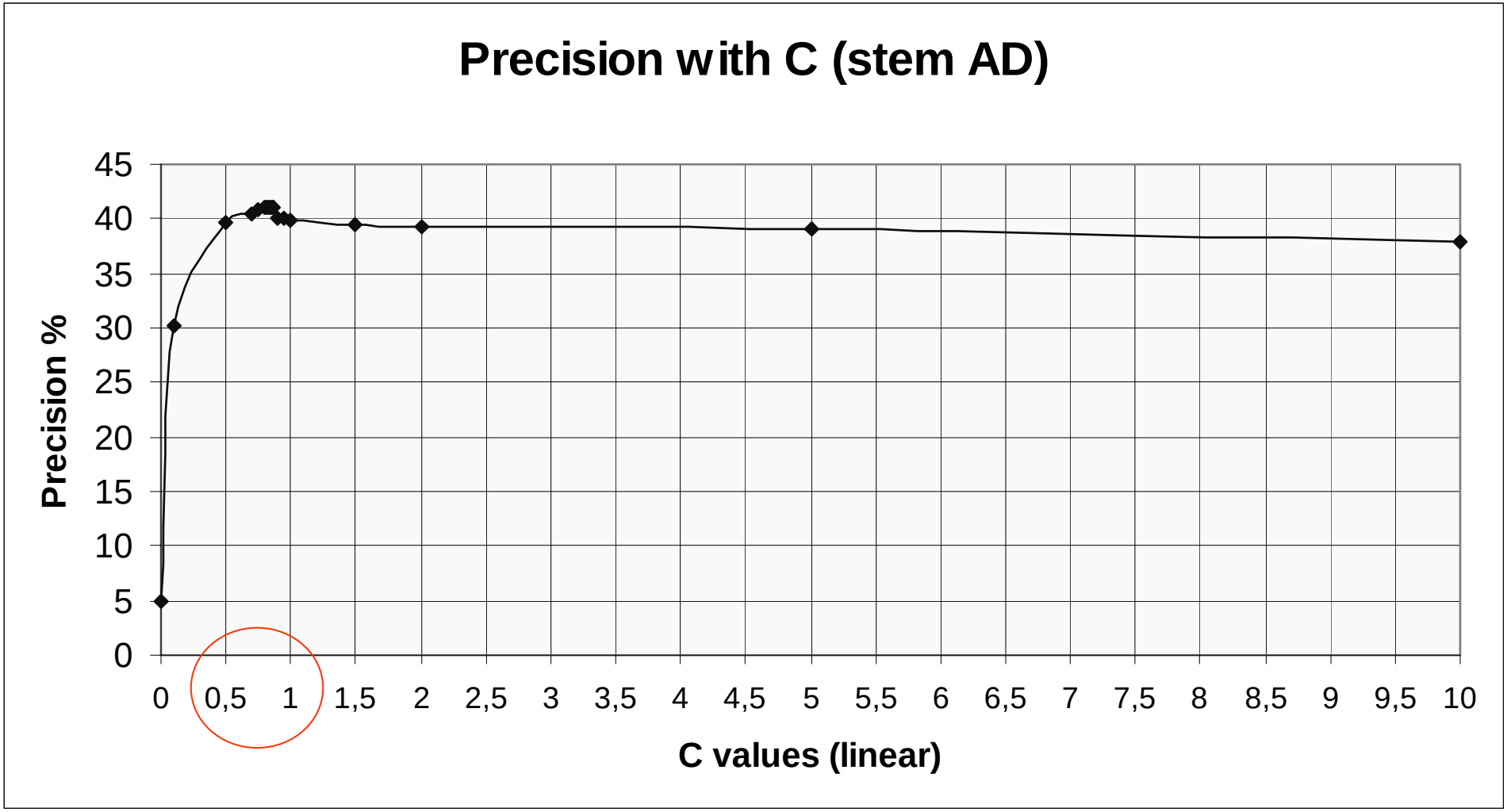
Global Schema of treatment



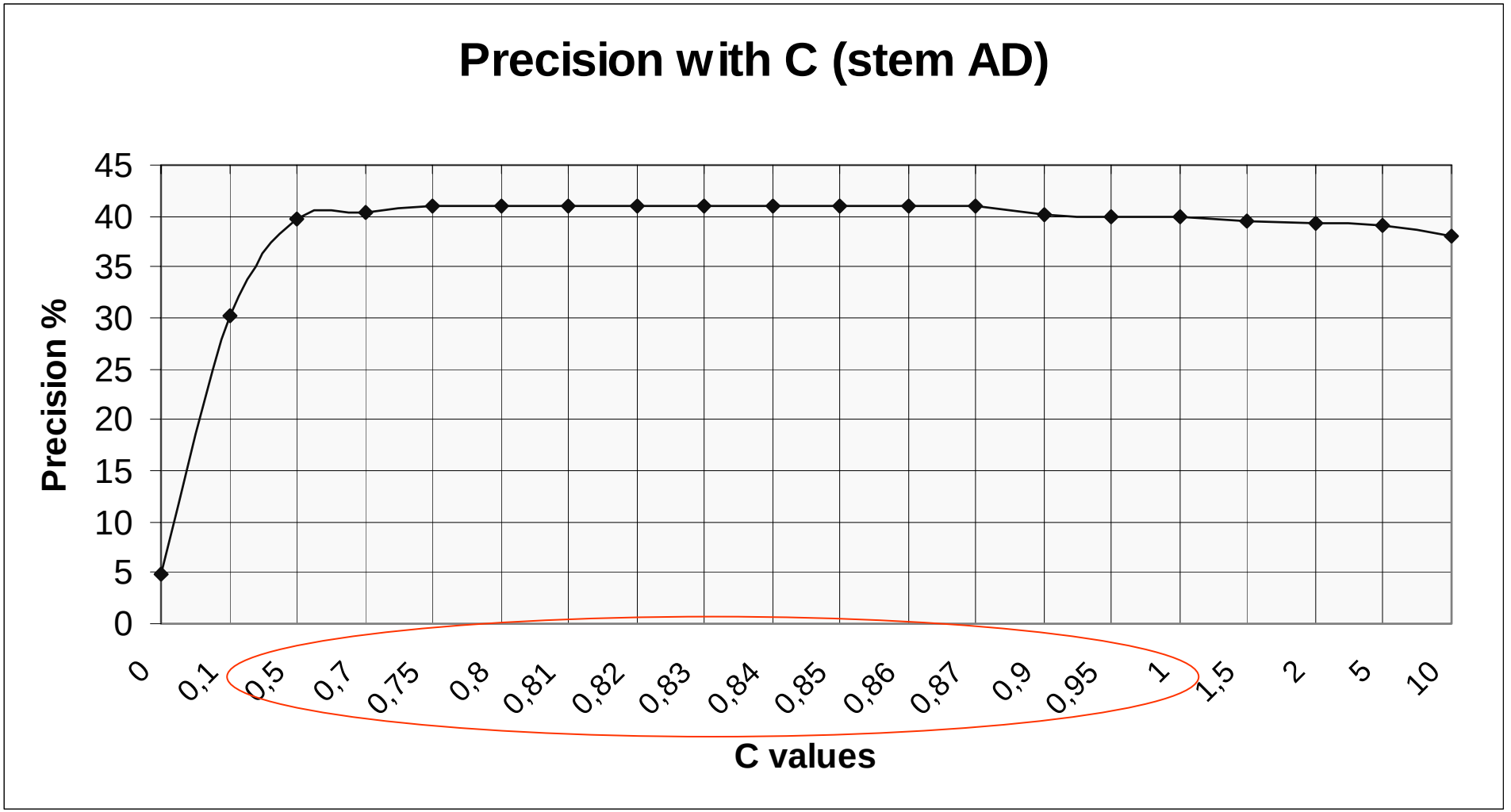
Deviation from Randomness

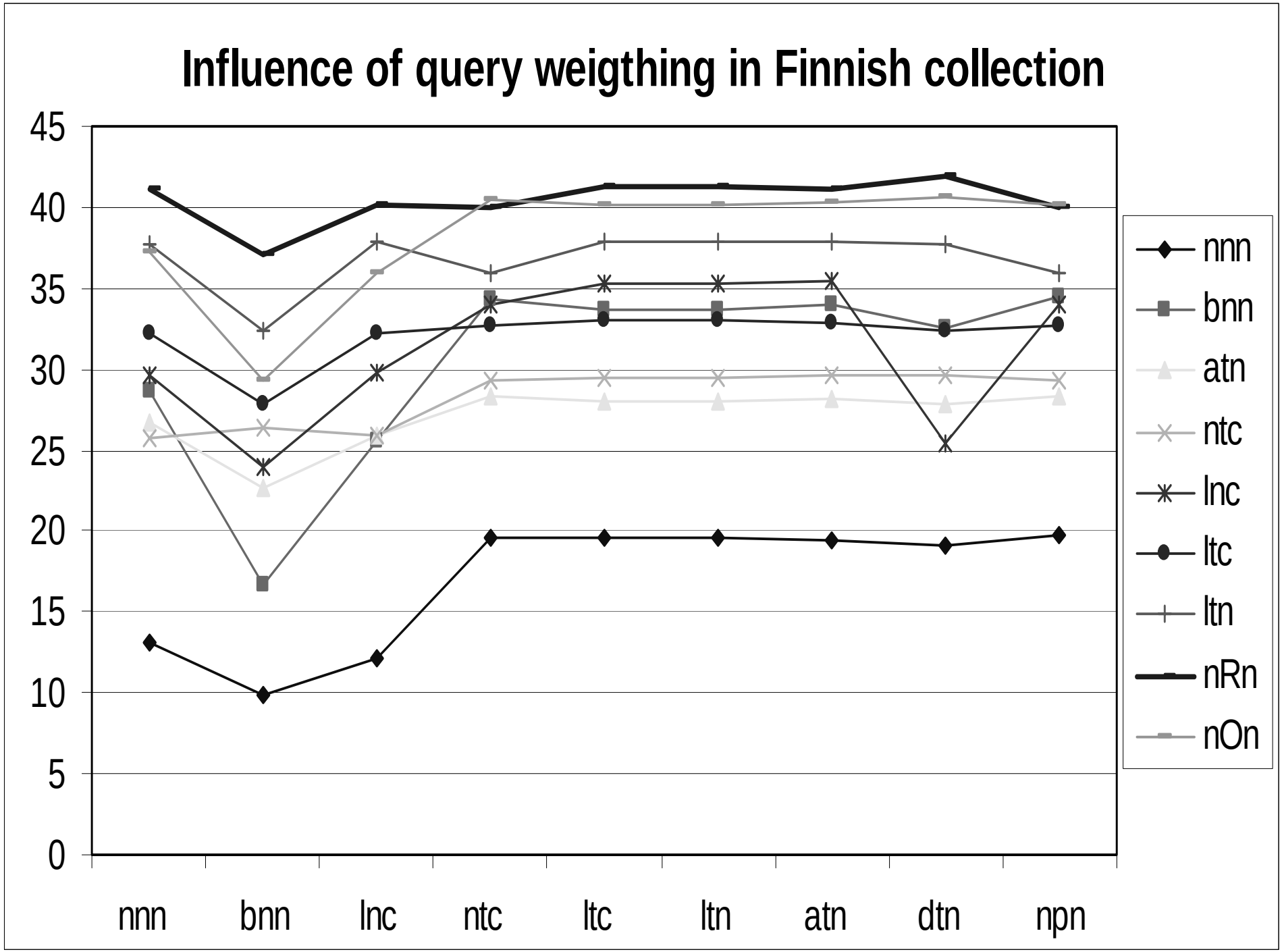
- Probabilistic model
- Compute the deviation of statistical repartition of term from a random distribution
- Formula take into account, corpus size and document size
- Only one constant c : weight normalization for the document length compared to the average length

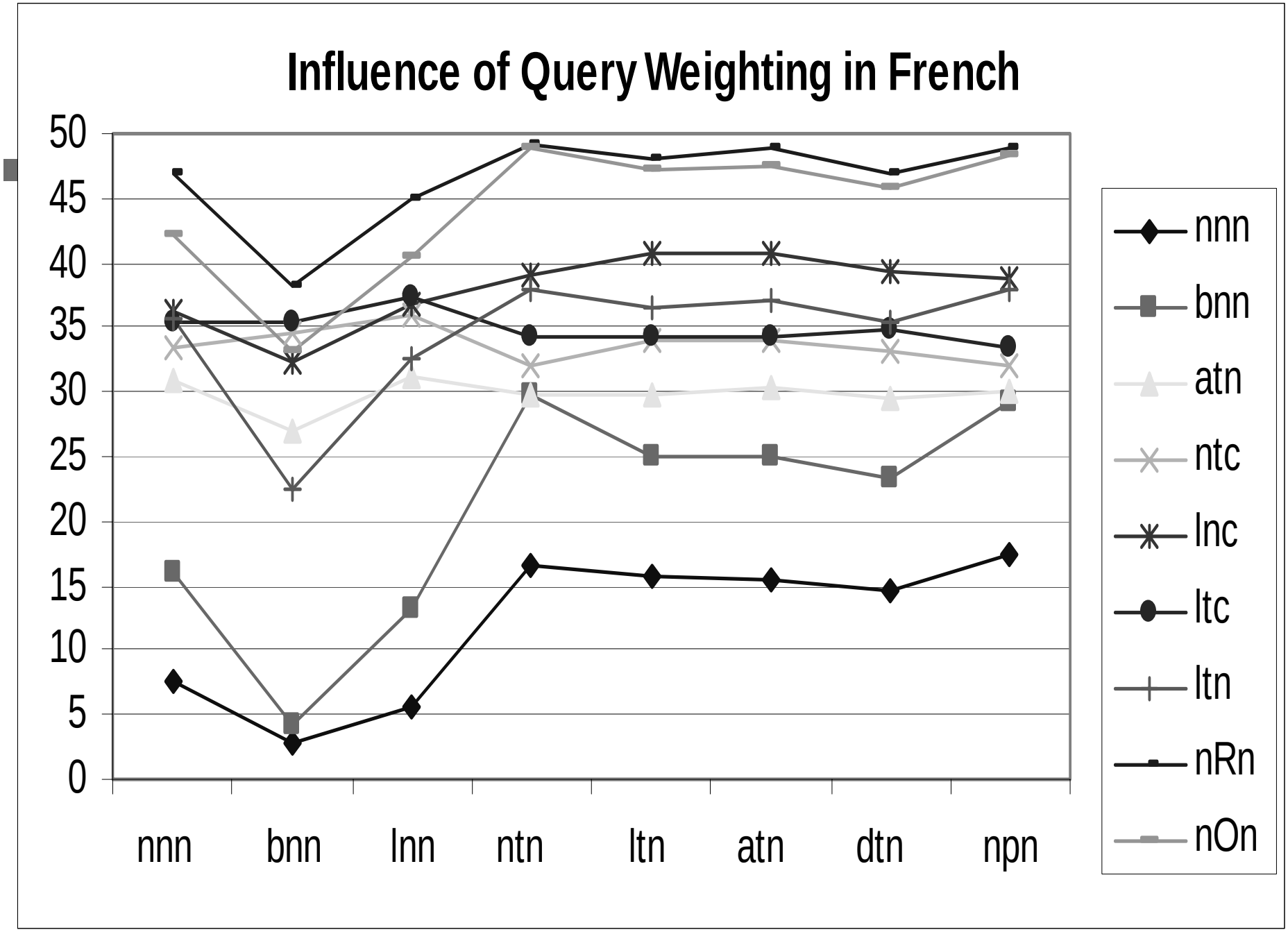
Influence of C Value in DFR



Influence of c in DFR




Influence of query weigthing in Finnish collection
45
40
35
30
25
20
15
10
5
0
nnn
bnn
lnc
ntc
ltc
ltn
atn
dtn
npn
nnn
bnn
atn
ntc
lnc
ltc
ltn
nRn
nOn

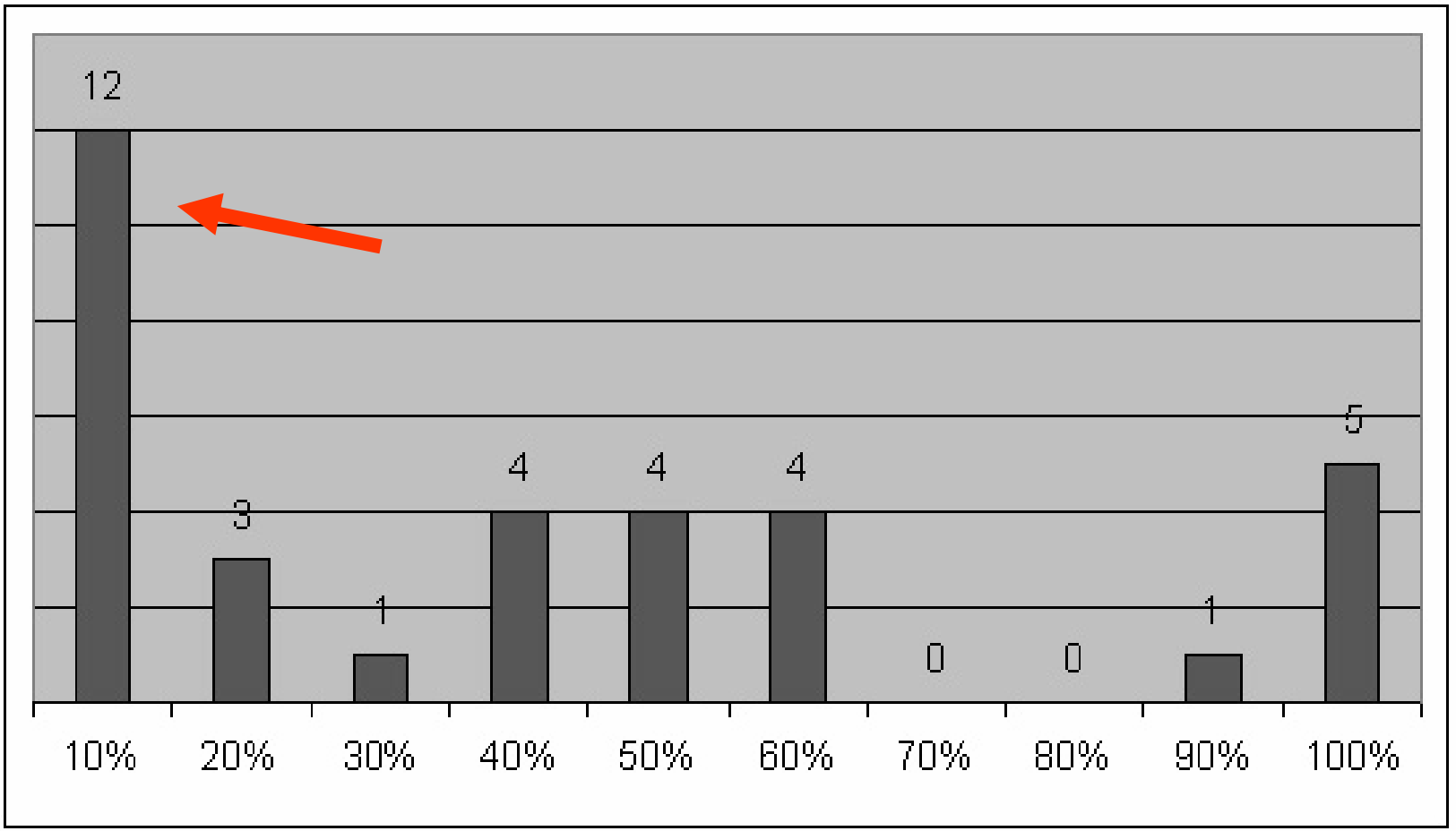

Influence of Query Weighting in French
50
45
40
35
30
25
20
15
10
5
0
nnn
bnn
lnn
ntn
ltn
atn
dtn
npn
nnn
bnn
atn
ntc
lnc
ltc
ltn
nRn
nOn

Comment on results

- Deviation from Randomness is very stable under query weighing, and is the best weighting on French and Finnish : we use it for 2004
- Good values of c between 0.6 and 1.0
- When using syntactic parsing
  - No need to a stop list : using grammatical categories
  - Stemming is done, with word splitting
- But these curves use classical stemming and stop list …(data from Savoy for Finnish)

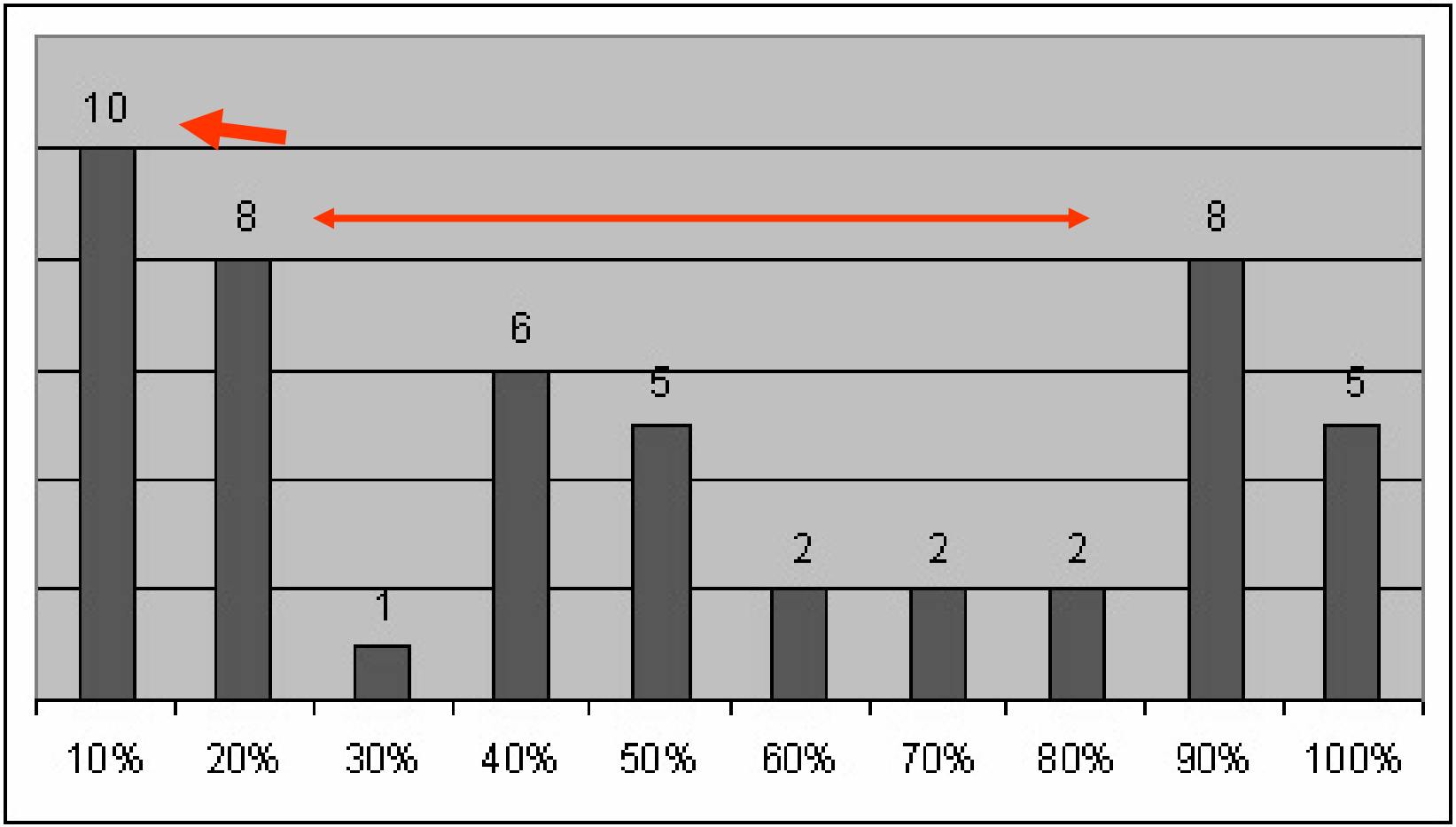
Results for 2004 Mono Lingual

Russian : 35%



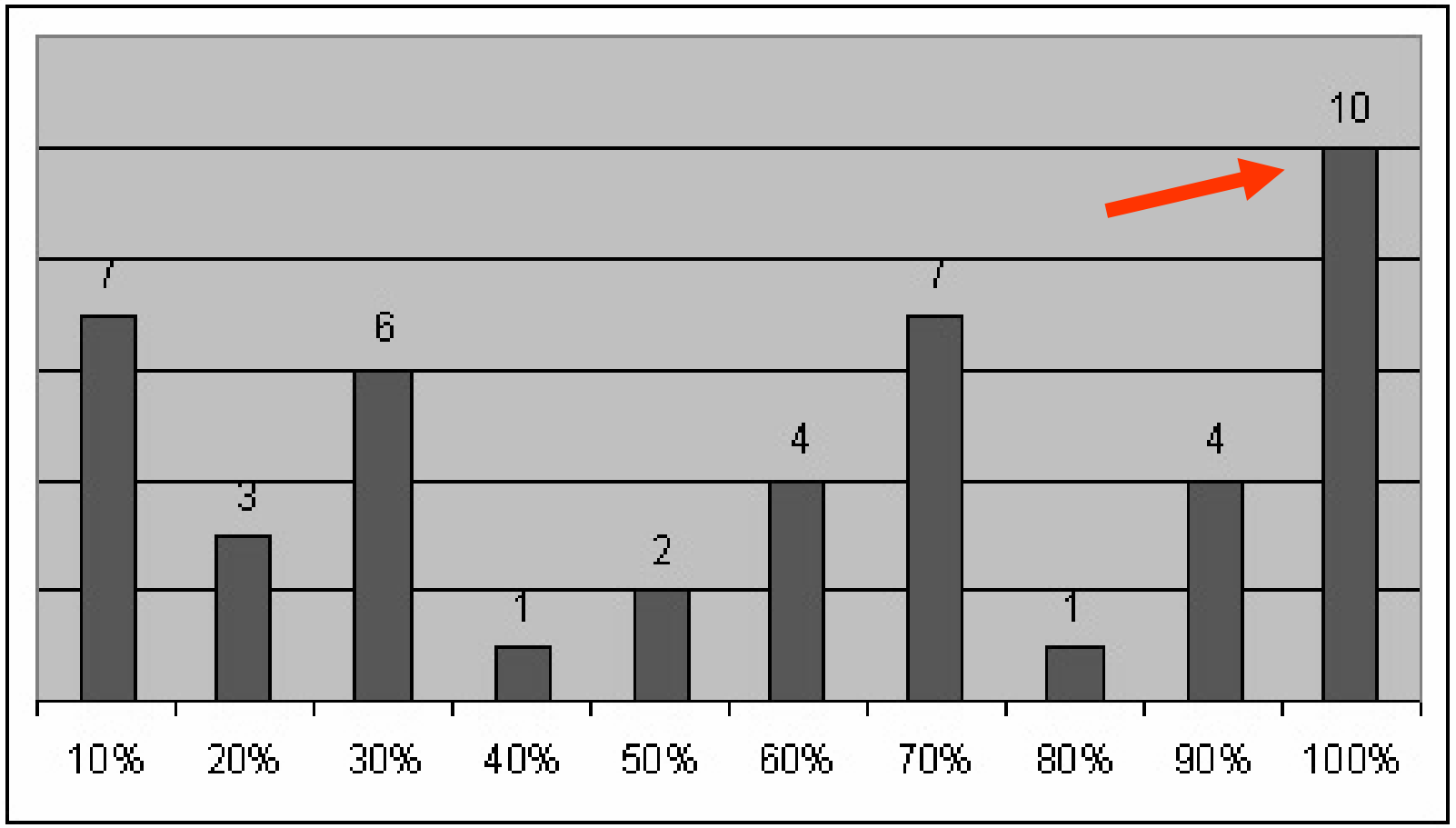
Results for 2004 Mono Lingual

French : 44 %



Results for 2004 Mono Lingual

Finnish : 53%



Comments on results

- Use of parsing for all 3 languages
- Best absolute results on Finnish
  - Results are better than our training in 2003
  - This is an agglutinative language, in our training we have not used the syntactic parsing
- Results in French are lower than our training
  - we have used both parsing and stemming + stop list to recover possible parsing errors
- There is still a lot on query under 10% of precision
  - We should examine closely why we cannot solve these queries : we probably need additional data like good thesaurus or dedicated knowledge base

Topic Translation

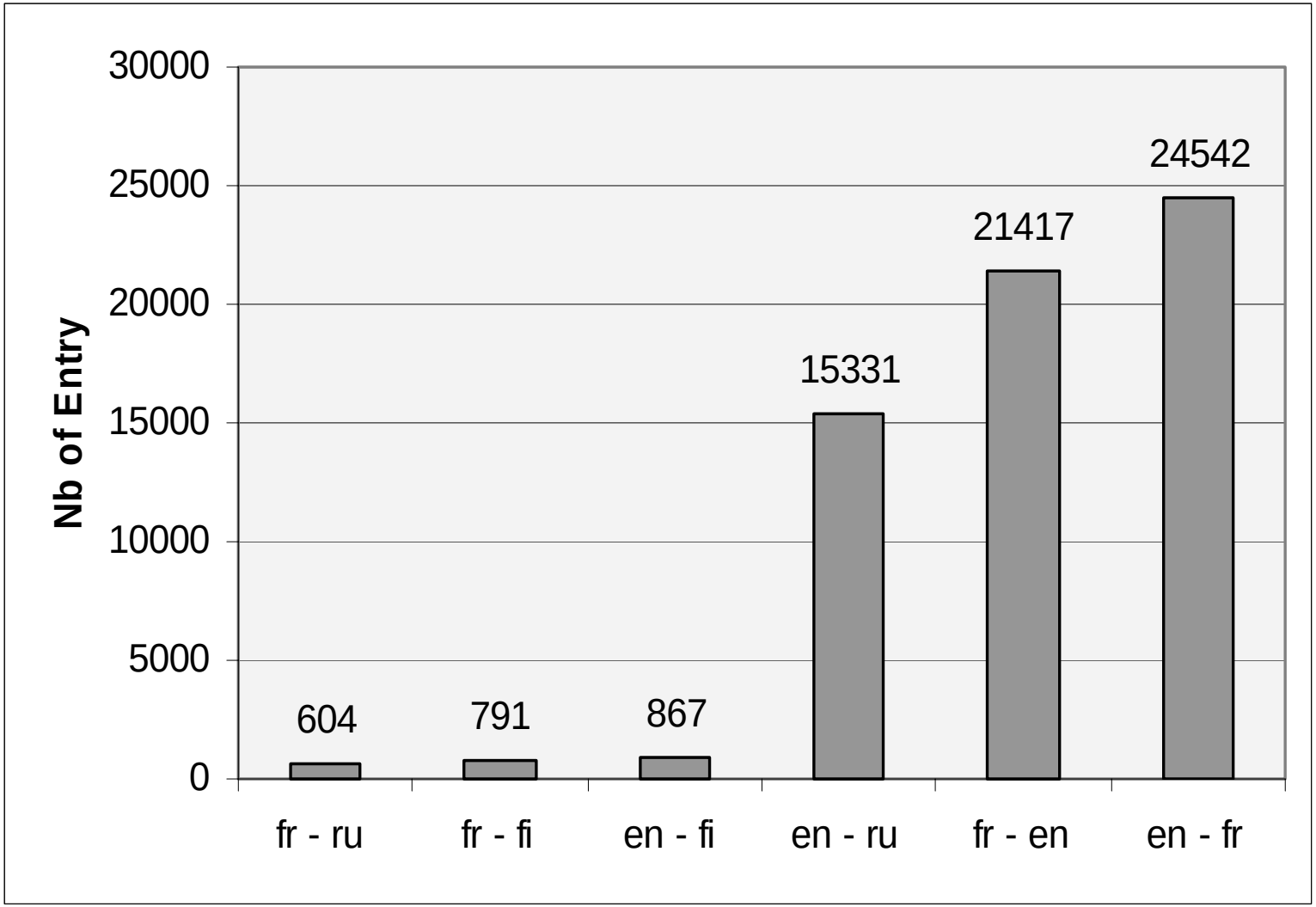
- Translation of query vectors
- Building bilingual dictionaries available at CLIPS and online
- French and English as topic language
- Russian and Finnish use Logos web site but only for terms in the topic
- All bilingual dictionary in the same XML file type

Multilingual Experiments

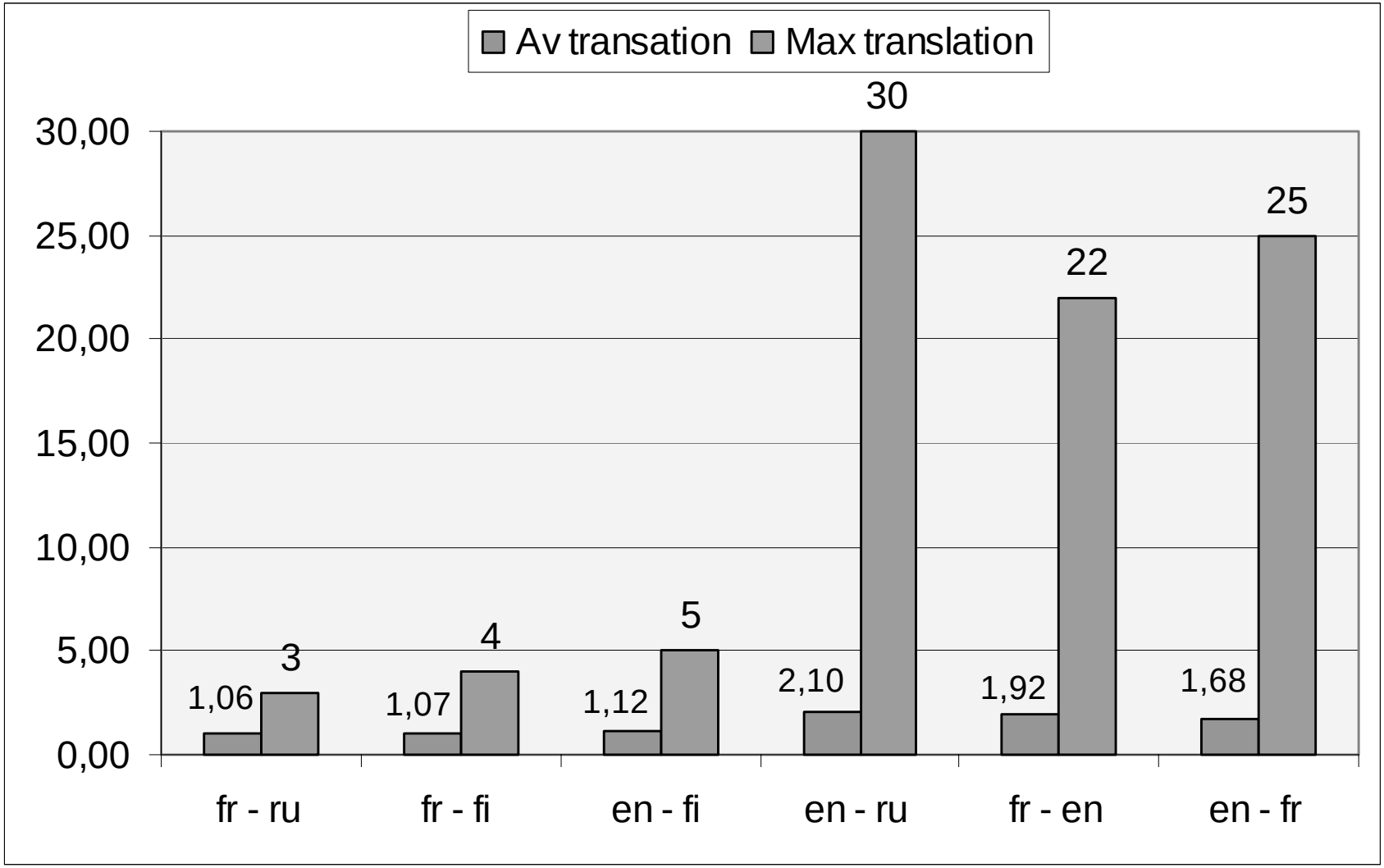
- Construction of the dictionaries

Dictionary	nb entries	avg nb trans	max nb trans
fr - en	21417	1.92417	22
fr - fi	791	1.06574	4
fr - ru	604	1.06126	3
en - fr	24542	1.67916	25
en - fi	867	1.11649	5
en - ru	15331	2.09901	30

Size of Bilingual Dictionaries



Translation per Entry



Topic Translation

- Substitute each terms by all available translation
- Divide the weight of each translation by the number of translation
- Selection of some better translation by filtering using an association thesaurus

Multilingual Experiments

- First experiment: simple translation

```
<vector id="C201" size="17">
<c id="at_least_one" w="1"/>
<c id="be" w="1"/>
<c id="cause" w="2"/>
<c id="document" w="1"/>
<c id="domestic" w="1"/>
<c id="fire" w="3"/>
<c id="general" w="1"/>
<c id="home" w="1"/>
<c id="house" w="1"/>
<c id="instance" w="1"/>
<c id="main" w="1"/>
<c id="mention" w="1"/>
<c id="private" w="1"/>
<c id="probable" w="1"/>
<c id="reference" w="1"/>
<c id="relevant" w="1"/>
<c id="specific" w="1"/>
</vector>
```

```
<vector id="C201" size="74">
<!-- Translation of id="fire" w="3" -->
<c id="allumer" w="3"/>
<c id="tir" w="3"/>
<c id="embraser" w="3"/>
<c id="feu" w="3"/>
<c id="tirer" w="3"/>
<c id="incendie" w="3"/>
<c id="limoger" w="3"/>
<!-- Translation of id="cause" w="2" -->
<c id="occasionner" w="2"/>
<c id="provoquer" w="2"/>
<c id="causer" w="2"/>
<c id="sujet" w="2"/>
<c id="procès_" w="2"/>
<c id="cause" w="2"/>
<c id="donner" w="2"/>
...
</vector>
```

Association Rules : meaning

- Support(X<=>Y) : the probability X and Y appears together in a transaction.
  - Used to eliminate rare or too frequent occurrences.
  - All supports get lower when nb of transaction raises : in practice we use absolute value in place of ratio
- Confidence(X=>Y) : the probability that Y appears knowing that X is in the transaction.
  - A probabilistic dependency from X to Y
  - Less dependent from the number of transactions
  - High values are preferred

Association Thesaurus

- Hypothesis : a document is a transaction, set of words forms a consistent set of information
- Production of a graph of terms
  - Link related to “some” semantic, no types
- Using syntactic parsing helps reduction of noise, meaningless relations
- For CLEF : confidence between 20% and 90%
- Possible Use of AT:

  2003 Monolingual Query expansion : add related terms

  2004 Bilingual Query precision : alignment of two thesaurus, choose the best translation

Multilingual Experiments

- Second experiment: weighted translation
  - Each translation is weighted
  - Using an association thesaurus
  - Idea: w -> t1, ... tn
    - Give a bonus to ti if it has a finite distance with other translations in an association thesaurus.
    - Hypothesis: if 2 words are close in context, their translations are close in context

Association Thesaurus & disambiguation

- Build one Association Thesaurus for each language using all documents
- Hypothesis :
  - the context of a term expresses its semantics
  - each arc of the thesaurus bears one of the meanings of the associated terms
- Thesaurus alignment
  - Associate each couple of term (A,B), in relation in the source thesaurus by a set of couples (X,Y) in the target thesaurus
  - Select (X,Y) with a minimal distance in target thesaurus
  - Meaning : when A is used with B, the X is the best translation of A and Y, of B

Multilingual Experiments

- Example:
  - Find some information about Tamil Tiger suicide bomb attacks or kamikaze **actions** in Sri Lanka.

```
<!-- Translation of id="action" w="1" -->
<c id="procès" w="0.16666666666667"/>
<c id="acte" w="0.16666666666667"/>
<c id="empire" w="0.16666666666667"/>
<c id="action" w="0.5"/>
<c id="plainte" w="0.16666666666667"/>
<c id="influence" w="0.16666666666667"/>
```

Multilingual Experiments

- But:
  - Results got worse !
- Because:
  - Quality of the dictionaries
  - Quality/Size of the thesaurii
    - Too few entries in the thesaurus (~4000 to ~9000)
  - Most of the time, selected transations are the most frequent translations but selection does not really depend on the context...
- However
  - Trowing out the thesaurii to directly take into account the context of translations may still be a good idea.

Results

- Drop mono-> bilingual
  - (Eng) Russian : 35% -> 11% , 4% with thesaurus ..
  - (Fr) Russian : 35% -> 6%, 5% with thesaurus
- Possible explanation
  - Division by the number of translation reduce importance of possible tool words
  - Raising weight of correct translation works on terms with many translation hence give more importance to words not really topic related

Conclusion

- Correct results on monolingual track
  - Effectiveness of syntactic parsing + DFR
- Bad results on bilingual track
  - Manual checking are good …
  - Not due to weighting (cf. monolingual)
  - Possible wrong re-weighting method
  - Not enough linguistic resources ?
  - Possible experimentation error
  - Wrong hypothesis on only one sense in corpus

What next ?

- Redo the experiment of parallel bilingual thesaurus
  - Understand what is wrong
  - Have better linguistic resources (but how ?)
- Better use of the output of the parser
  - Using noun phrase to enhance precision