Experience and Conclusions from the CESTA Evaluation Project

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Outline

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Introduction

CESTA:

- **Two Evaluation campaigns of machine translation systems**
- **13 different systems**
- **Arabic-to-French and English-to-French directions**
- **Observe the behaviour of well-known metrics for those directions**
- **Experiment with new metrics**
- **Conduct a meta-evaluation**

More information: *Assessing Human and Automated Quality Judgments in the French MT Evaluation Campaign CESTA (Hamon, Hartley, Popescu-Belis, Choukri)* ➔ MT Summit XI

Automatic metrics used within CESTA

Automatic metrics used

Widely-used and well-known metrics:

- **BLEU: *Bilingual Evaluation Understudy* (Papineni et al., 2001)**
  - **Weighted average of common n-grams between the hypothesis and the references**
  - **Needs 1..n references (CESTA=4)**
  - **Good reliability in previous experiments**
- **NIST: (Doddington, 2002)**
  - **Like BLEU but considers information gain and length penalty**
  - **Needs 1..n references (CESTA=4)**
  - **Outperforms BLEU in previous experiments**

Automatic metrics used

- **WNM: *Weighted N-gram Metric* (Babych & Hartley, 2004)**
  - **Combines BLEU with weight of statistical salience**
  - **Needs 1 reference (CESTA=1 to 4) and a statistical corpus**
  - **Outperforms BLEU and NIST in previous experiments**

Automatic metrics used

Experimental metrics:

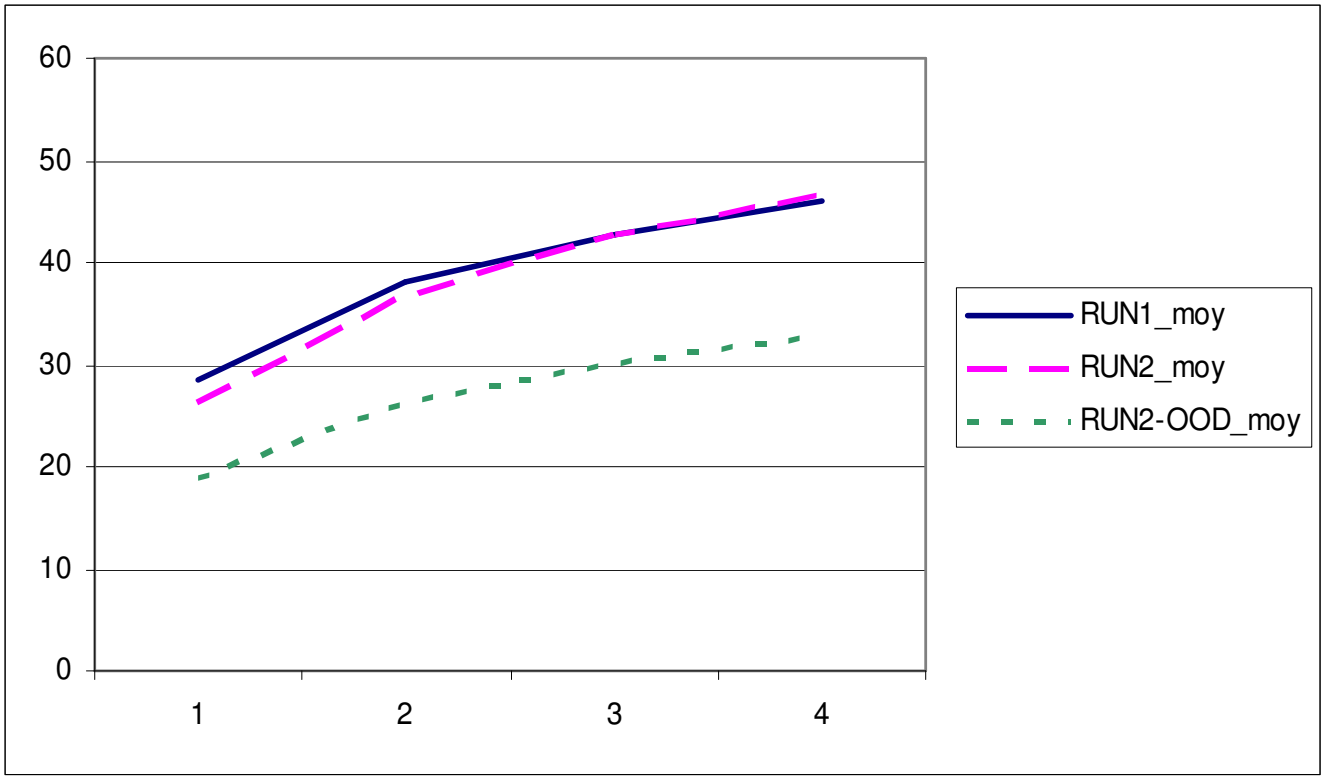
- **X-Score (Rajman & Hartley, 2001)**
  - **Analysis of the grammaticality of the hypothesis. The morpho-syntactical distribution is compared with a reference corpus fluency-annotated**
  - **Needs a fluency-annotated corpus**
- **D-Score (Rajman & Hartley, 2001)**
  - **Analysis of the preservation of the semantic content between the source and the hypothesis. The semantic vector model of the hypothesis is compared with a reference**
  - **Needs a parallel corpus**

CESTA experience

CESTA experience – BLEU / NIST

- NIST correlation slightly better than BLEU correlation
- But it is « easier » to understand BLEU (scale 0-100) than NIST (no scale)
- BLEU and NIST correlations not as good as expected

Amount of reference translations (BLEU)



CESTA experience – WNM

- **Adaptation to the NIST format for CESTA**
- **Much better correlation than BLEU / NIST**
- **Correlation dependant on the references**

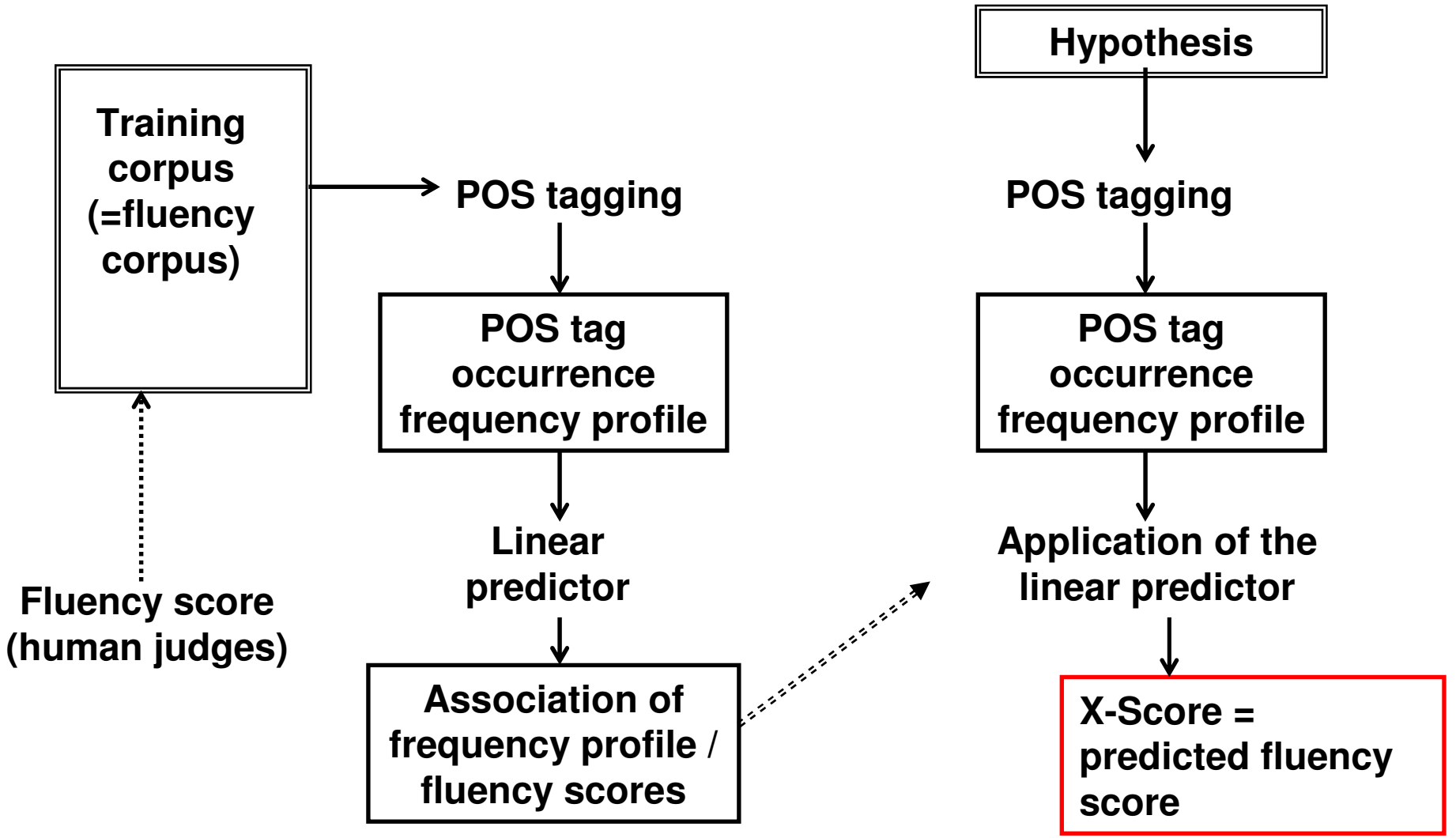
2nd run En→Fr	Ref-1	Ref-2	Ref-3	Ref-4	*Comb.*
Fluency	83.19	86.16	96.73	83.94	*85.58*
Adequacy	94.23	94.86	87.78	94.16	*95.11*

→Needs reference combination as BLEU does? ('mWNM')

CESTA experience – X-Score

- Only the translation is considered for the metric
- The translation is characterized by the occurrence frequency profile of syntactic features (POS tags in our case)
- The frequency profiles are used to train a linear predictor for the fluency score
- Two stages:
  - Learning phase: production of the grammaticality model (i.e. computation of the coefficients of the linear predictor)
  - Evaluation phase: computation of the scores

CESTA experience – X-Score



CESTA experience – X-Score

– Not correlated

➔ Reconsidering the problema

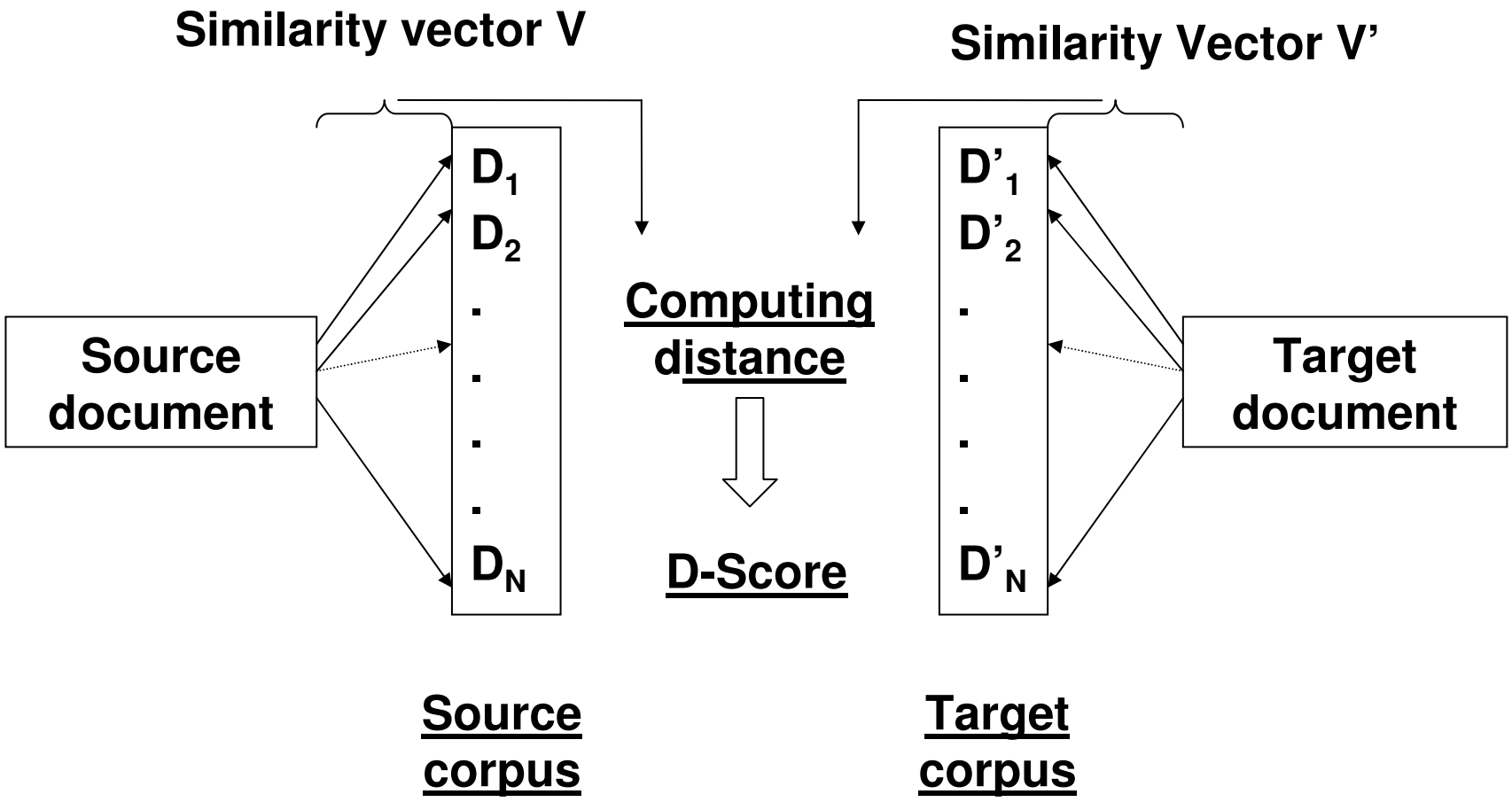
– Several issues are raised:

- Tagger dependant
- Weights are too high and favour some tags →a solution is to compute the ratio of tags
- Word ordering →needs to use n-grams, but very time consuming (CESTA : 35 tags, 1,156 bi-grams, 1M ratio, resulting a 1B entry matrix!)
- Selection of tags
- …

CESTA experience – D-Score

- Hypothesis: source and target languages have the same semantic vector. Similarity comparison between documents
- Use of a large parallel corpus
- Two stages:
  - Learning phase:
    - For the whole corpus, computing of the relative term-frequency vectors in document
    - For each document, computing the relative document-frequency vectors in terms
    - Each parallel document has a position in its language vector space
  - Evaluation phase: Computing of similarities with each document of the corpus, for source and target documents

CESTA experience – D-Score



CESTA experience – D-Score

– Correlations are inconsistent

– Need to be studied in depth (ongoing)

➔ Maybe reconsidering the problem?

– A lot of parameters (filtering, which tags, tagger, etc.)

Open issues & conclusions

Open issues & conclusions

- Reliability of BLEU / NIST, WNM corresponds to literature
- For BLEU, NIST, WNM, fluency correlations slightly higher than adequacy correlations ; except on a specific domain (vocabulary)
- Bad correlations for X-Score, D-Score
- Experimental metrics not ready yet
- Task / domain dependant

Open issues & conclusions

- Do we need so many metrics?
- BLEU, NIST, WNM, etc.:
  - Obtain similar same correlations most of the time
  - Give the same analysis: are the hypothesis words present in the references? In correct order?
- other metrics, but computing other things? (that do not rely with n-grams…)

Open issues & conclusions

- **Costs (money and time) for CESTA:**
  - **BLEU / NIST / WNM = reference translations**
    - **~ 4 * 2,000€ (cannot be reduced)**
    - **~ 2/3 weeks (not easy to reduce)**
  - **X-Score = reference corpus**
    - **~ 38 * 30€ (could be reduced)**
    - **~ 3/4 weeks (could be reduced)**
  - **D-Score = parallel corpus**
    - **~ 0 (already available), but very large cost**
  - **Human = judges**
    - **~ 100 * 30€ (for the first campaign)**
    - **~ 3/4 weeks**

Open issues & conclusions

– **Is it really cheaper to use automatic metrics instead of human evaluation?**
  - **for a single campaign → not really**
  - **for systems →yes?**
  - **data evolve quickly…**
  - **less data also allows to know systems' quality**