Empirical Machine Translation and its Evaluation

EAMT Best Thesis Award 2008

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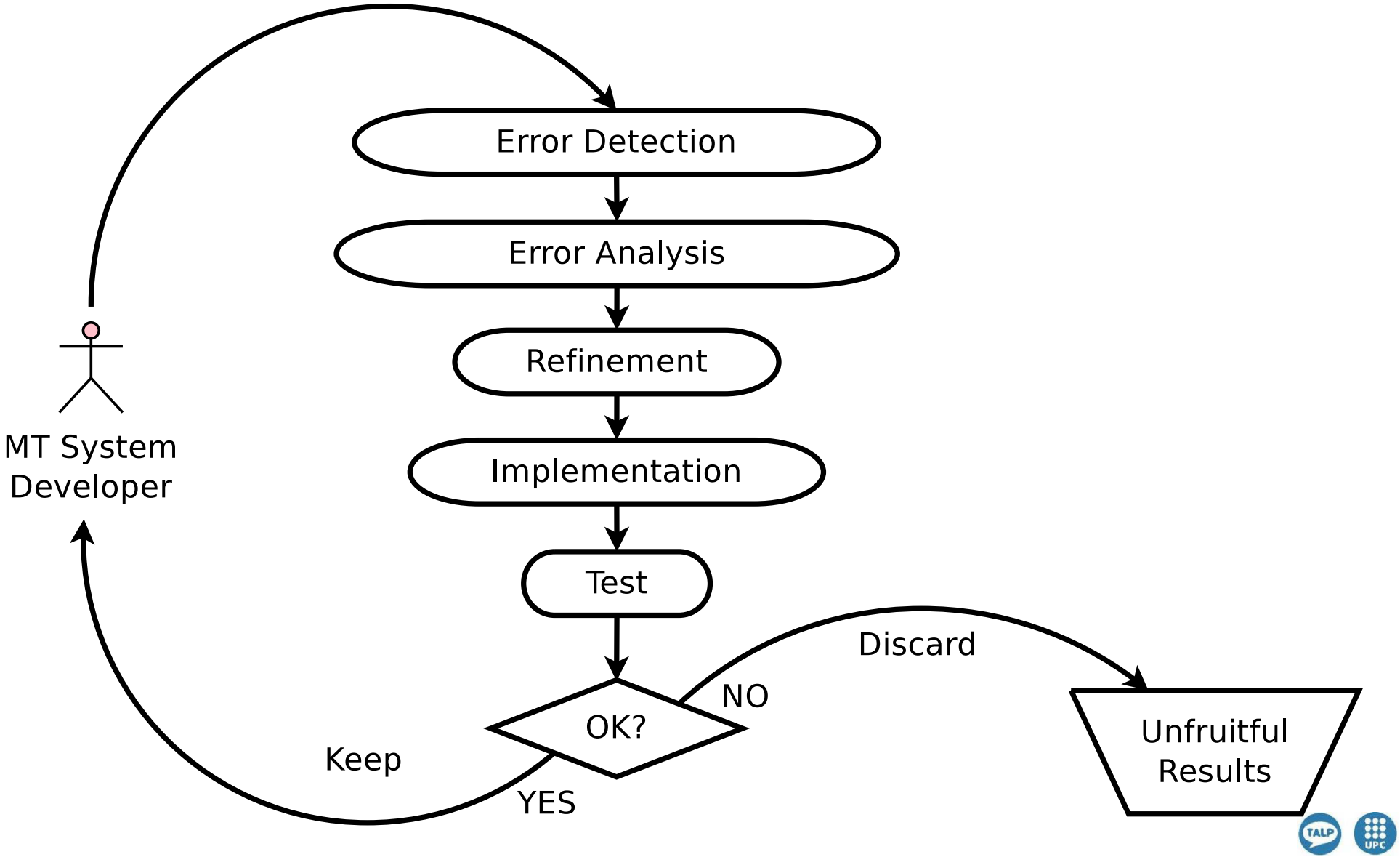
(Advisor, Lluís Màrquez)

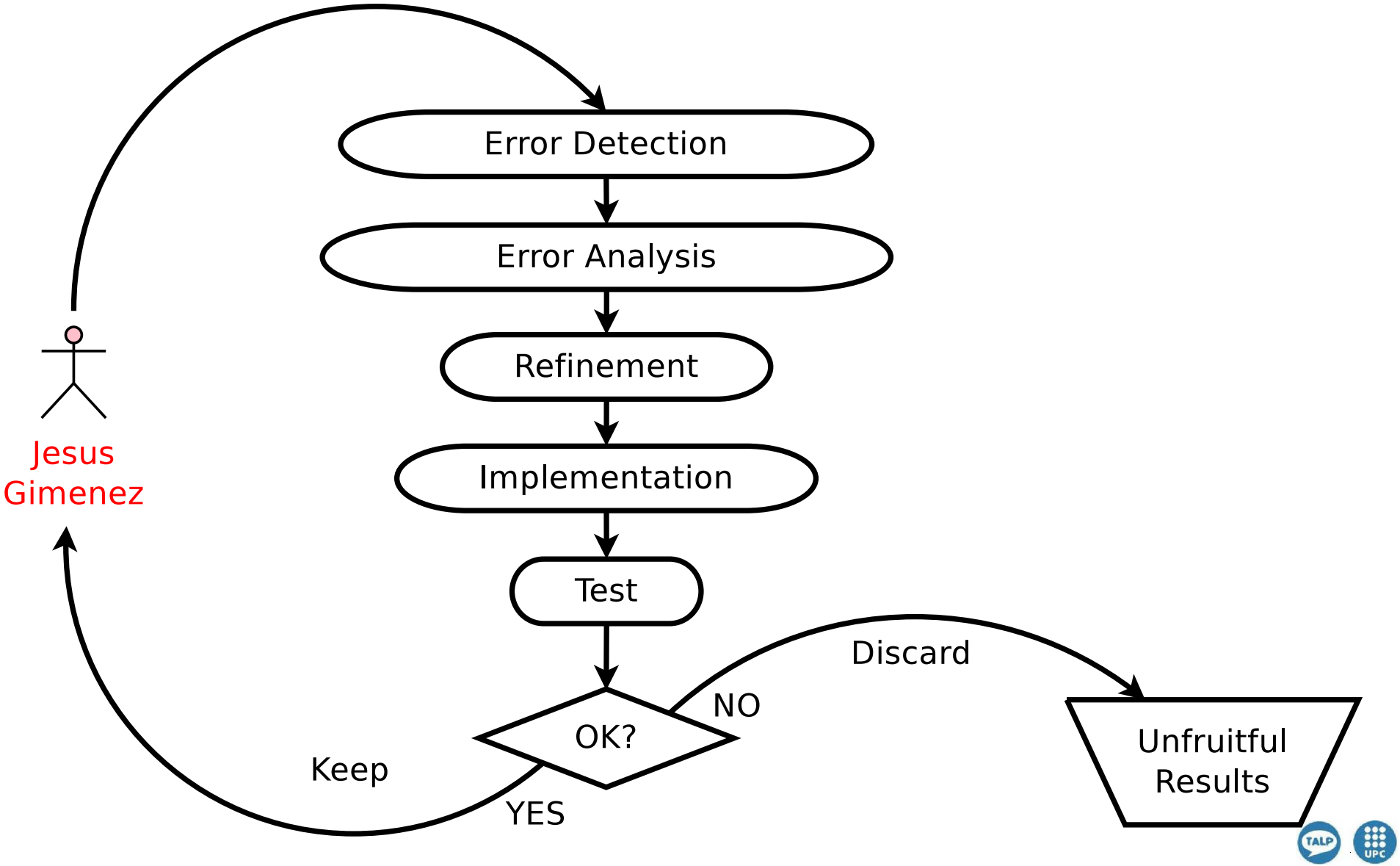
Universitat Politècnica de Catalunya

May 28, 2010

Empirical Machine Translation



Empirical Machine Translation



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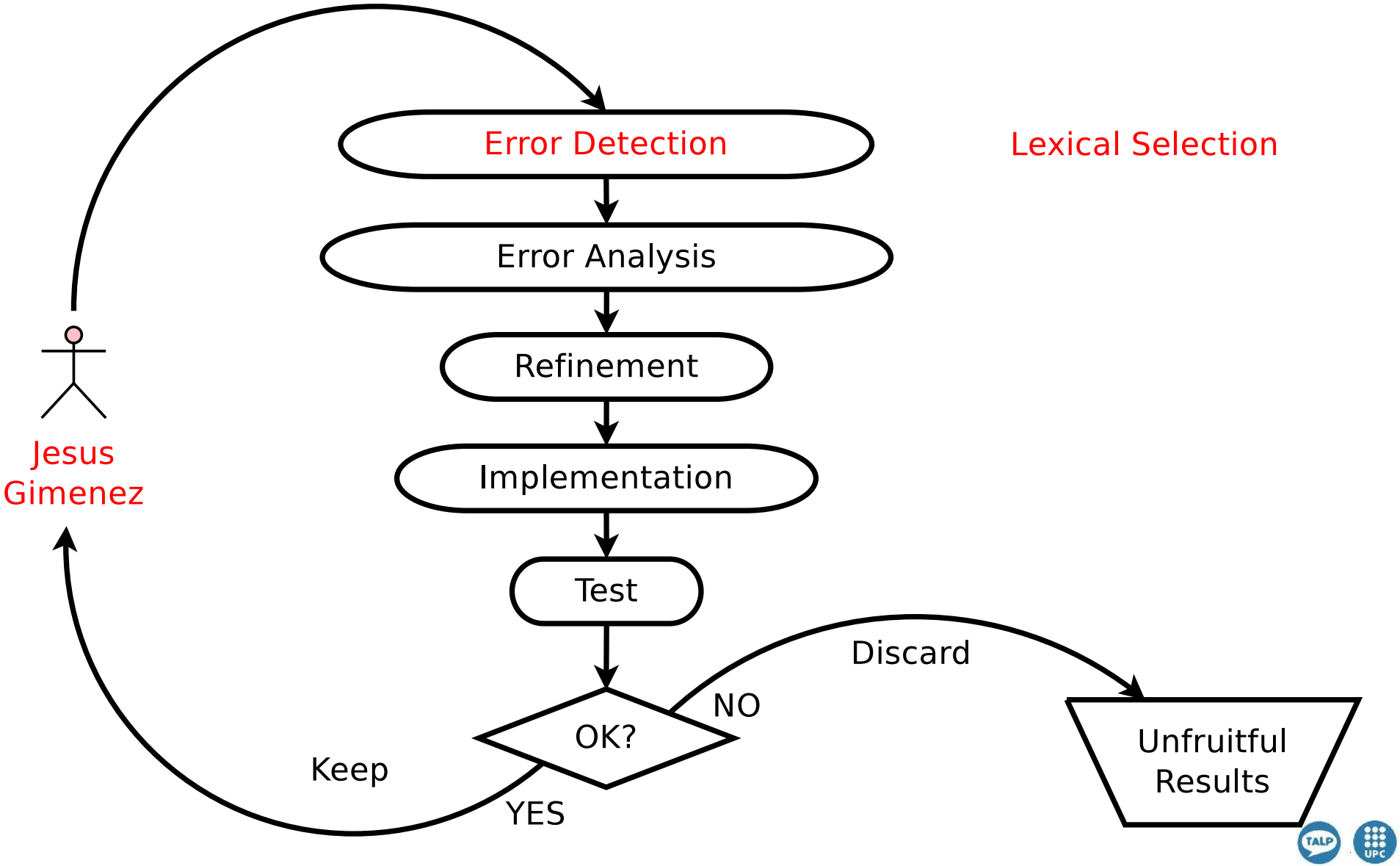

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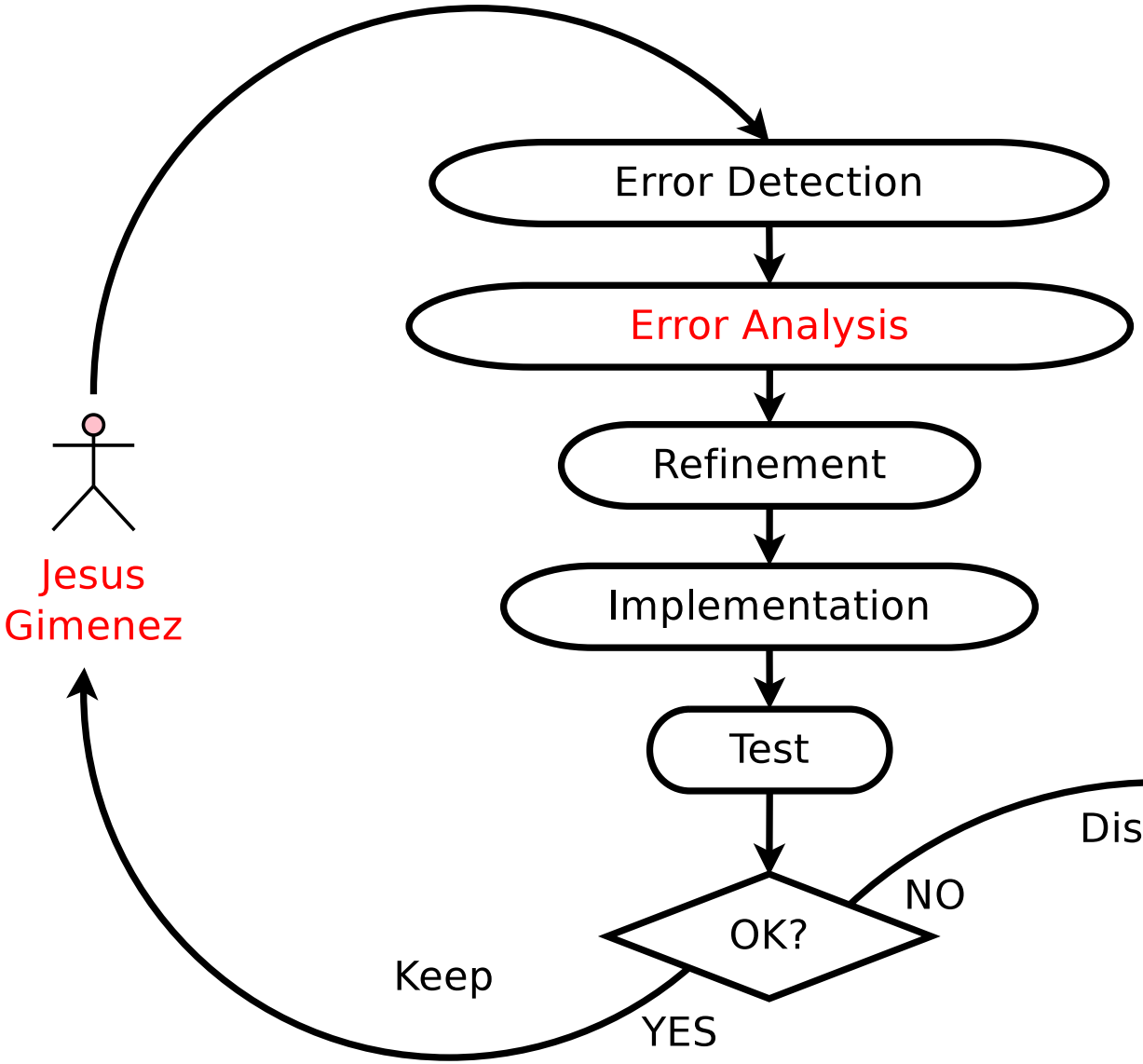
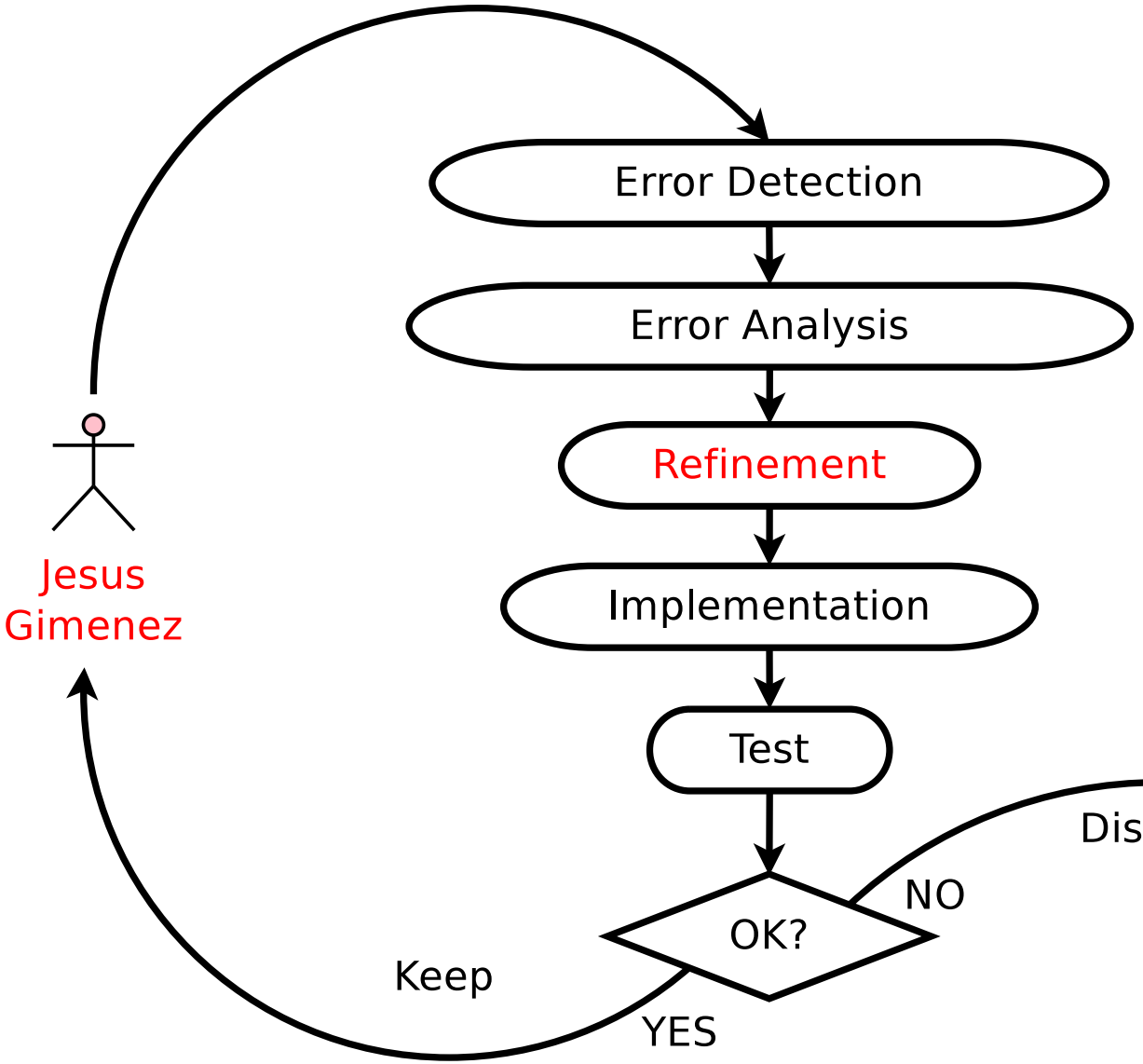


No explicit use of linguistic information
+
Source context is not fully exploited

Empirical Machine Translation



Incorporation of
linguistic knowledge
+
Discriminative Learning

Discriminative Phrase Translation

vs. *"A brilliant play by Lionel Messi that produced a wonderful goal"*

→ *"Una brillante jugada de Lionel Messi que resultó en un bello gol"*

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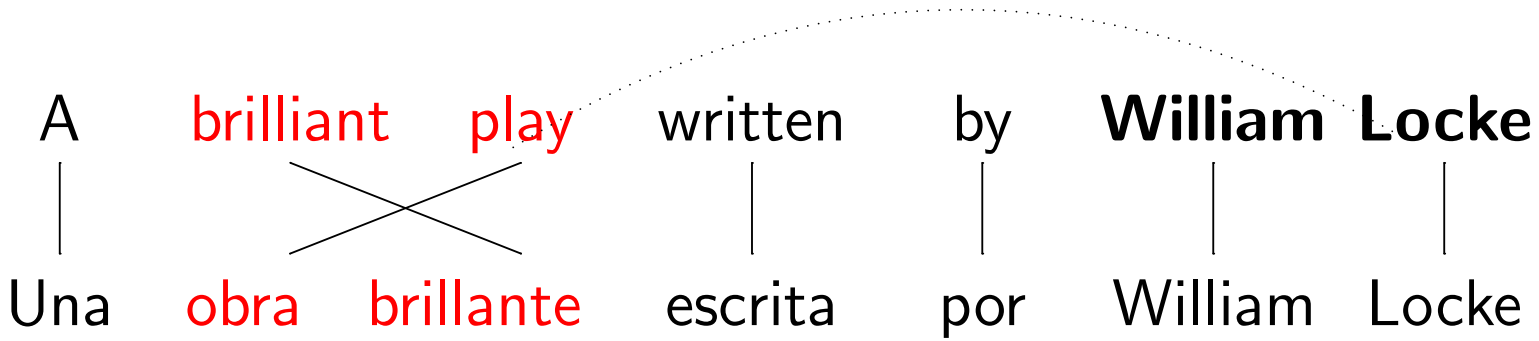

vs. *"A brilliant play by* **Lionel Messi** *that produced a wonderful goal"*

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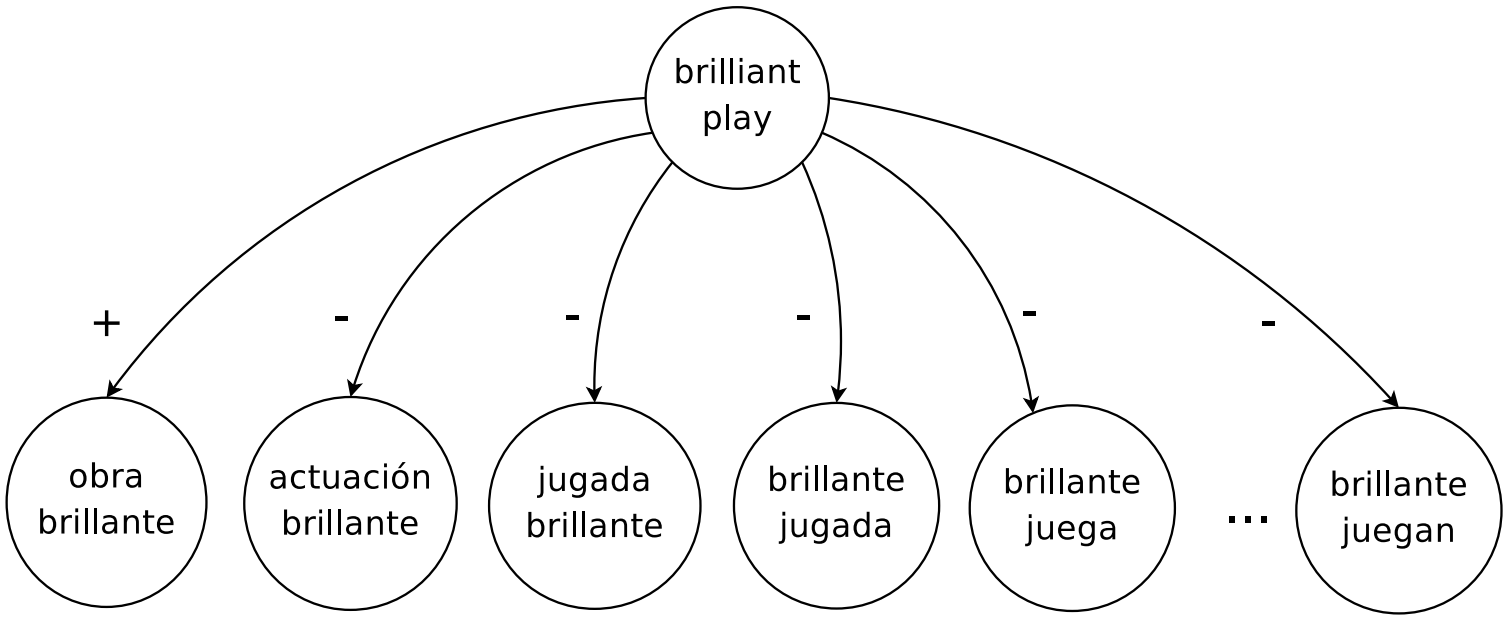
Discriminative Phrase Translation

Idea

- Use discriminative Machine Learning techniques in SMT to estimate $P(e_i|f_j)$, actually, $P(e_i|f_j, context\_f_j)$
- Translation modeling is addressed as a classification problem



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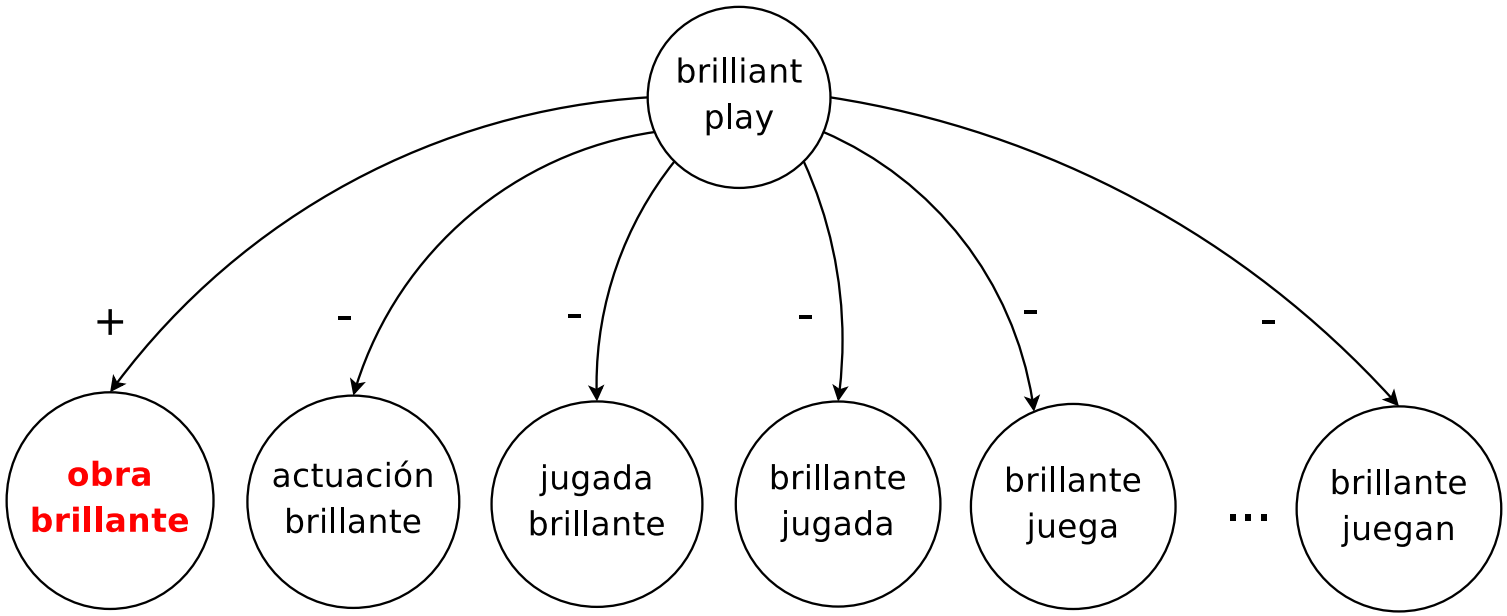

Contributions

1. Discriminative Phrase Selection for SMT
   - Shallow-syntactic features
     - word, lemma, parts of speech, chunking
     - local / global context

   → Improved translation quality

2. Domain Dependence in SMT
   - Parliament proceedings → Dictionary definitions
   - Adaptation based on:
     - EuroWordNet
     - out-of-domain data
     - a small amount of in-domain data

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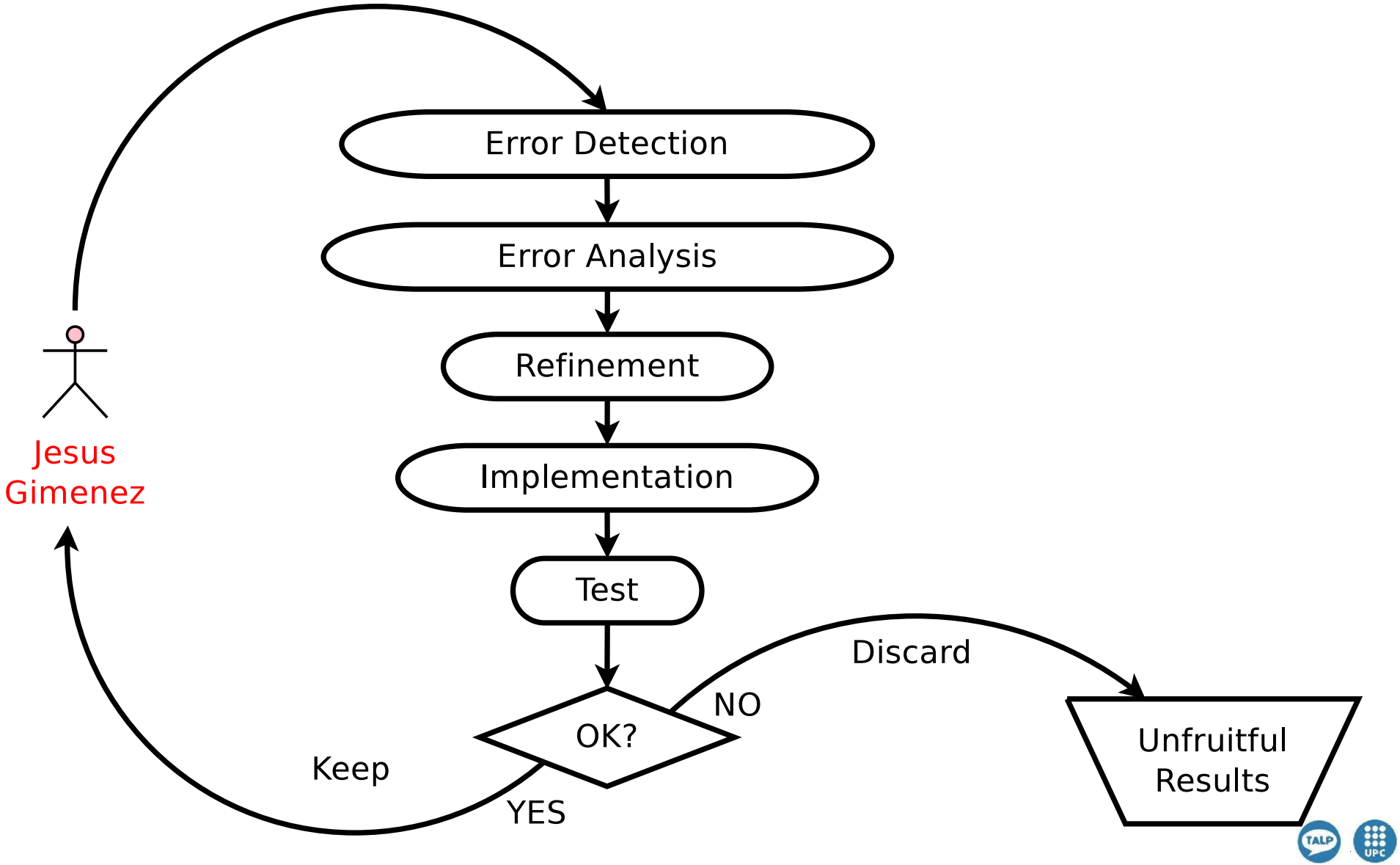

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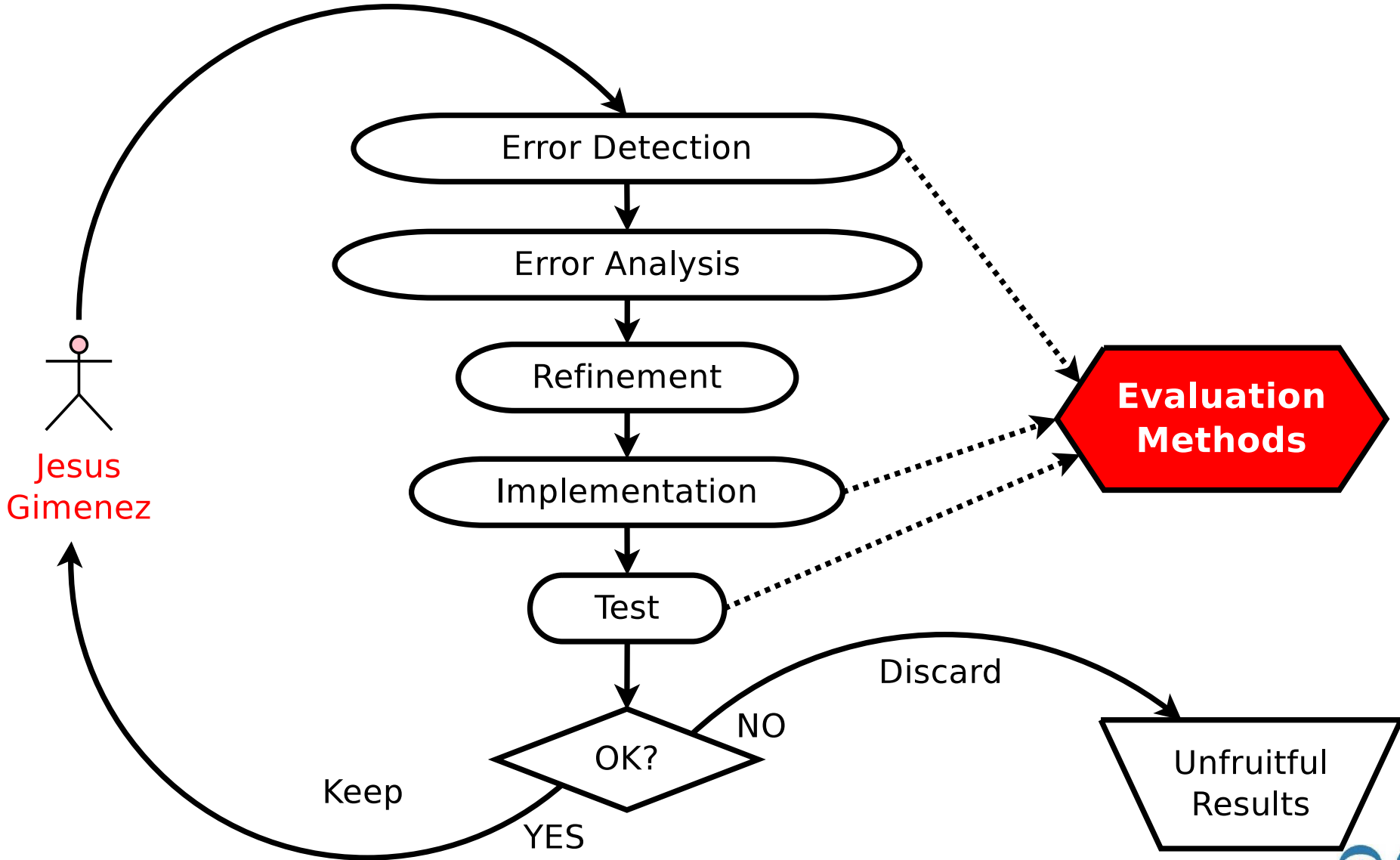

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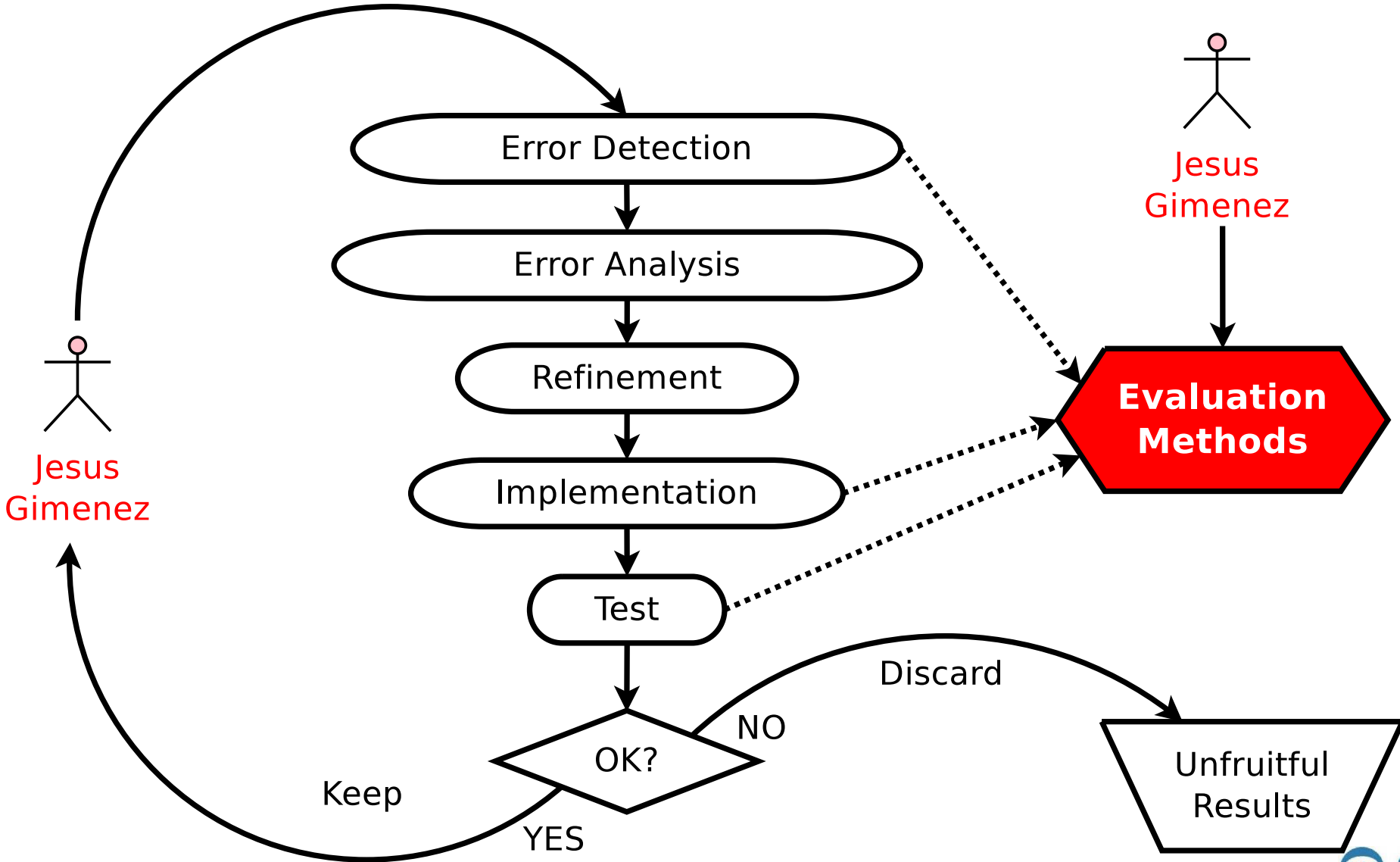

Limits of Lexical Similarity

Candidate Translation	On Tuesday several missiles and mortar shells fell in southern Israel , but there were no casualties .
Reference Translation	Several Qassam rockets and mortar shells fell today, Tuesday , in southern Israel without causing any casualties .

Only one 4-gram in common!

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Linguistic Features for Automatic MT Evaluation

Idea

- Define similarity measures based on deeper linguistic information
  - Compare linguistic structures and their lexical realizations
- Linguistic levels
  - Syntax
    - Parts-of-speech
    - Base phrase chunks
    - Phrase constituents
    - Dependency relationships
  - Semantics
    - Named entities
    - Semantic roles
    - Discourse representations

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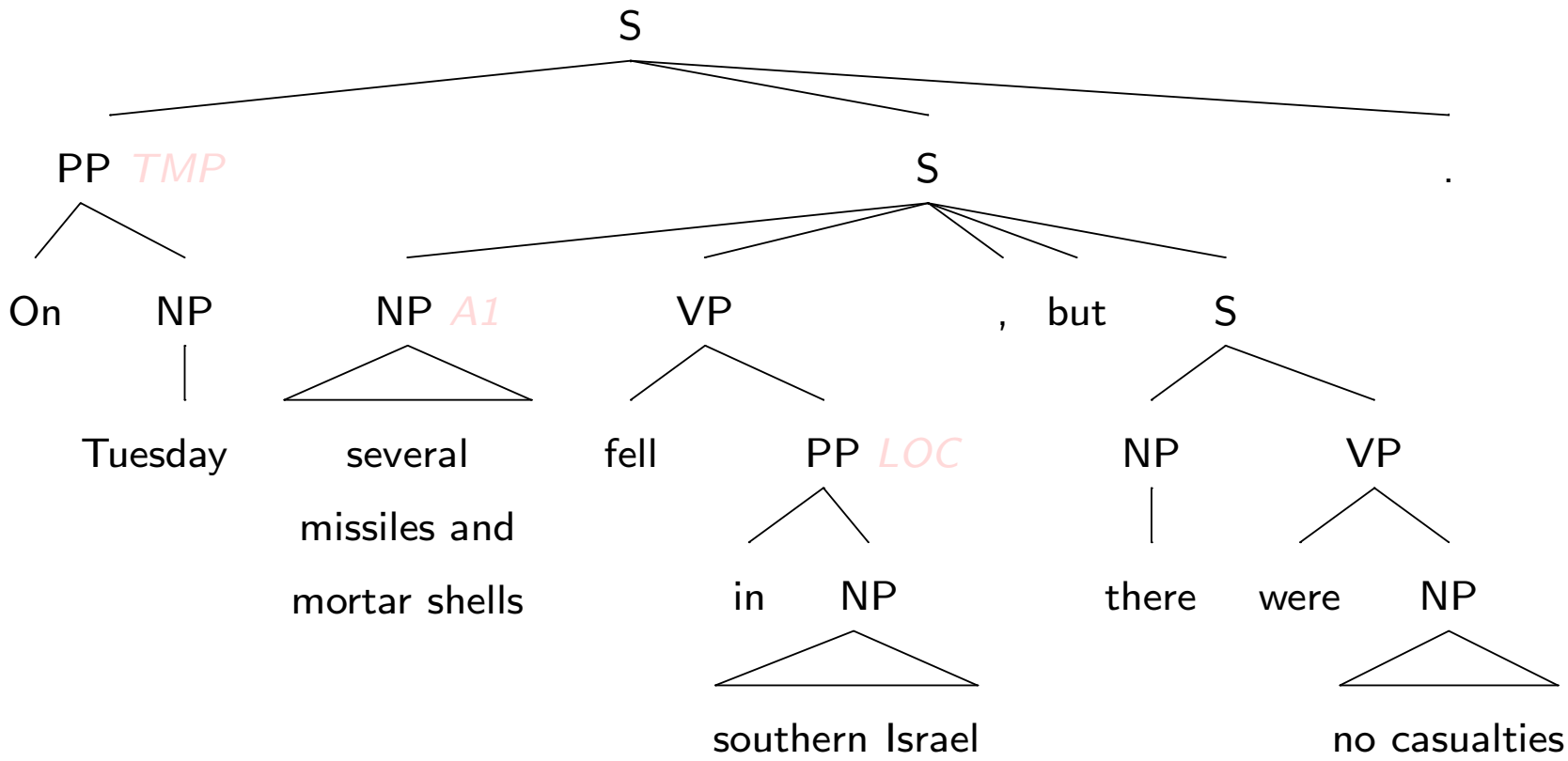

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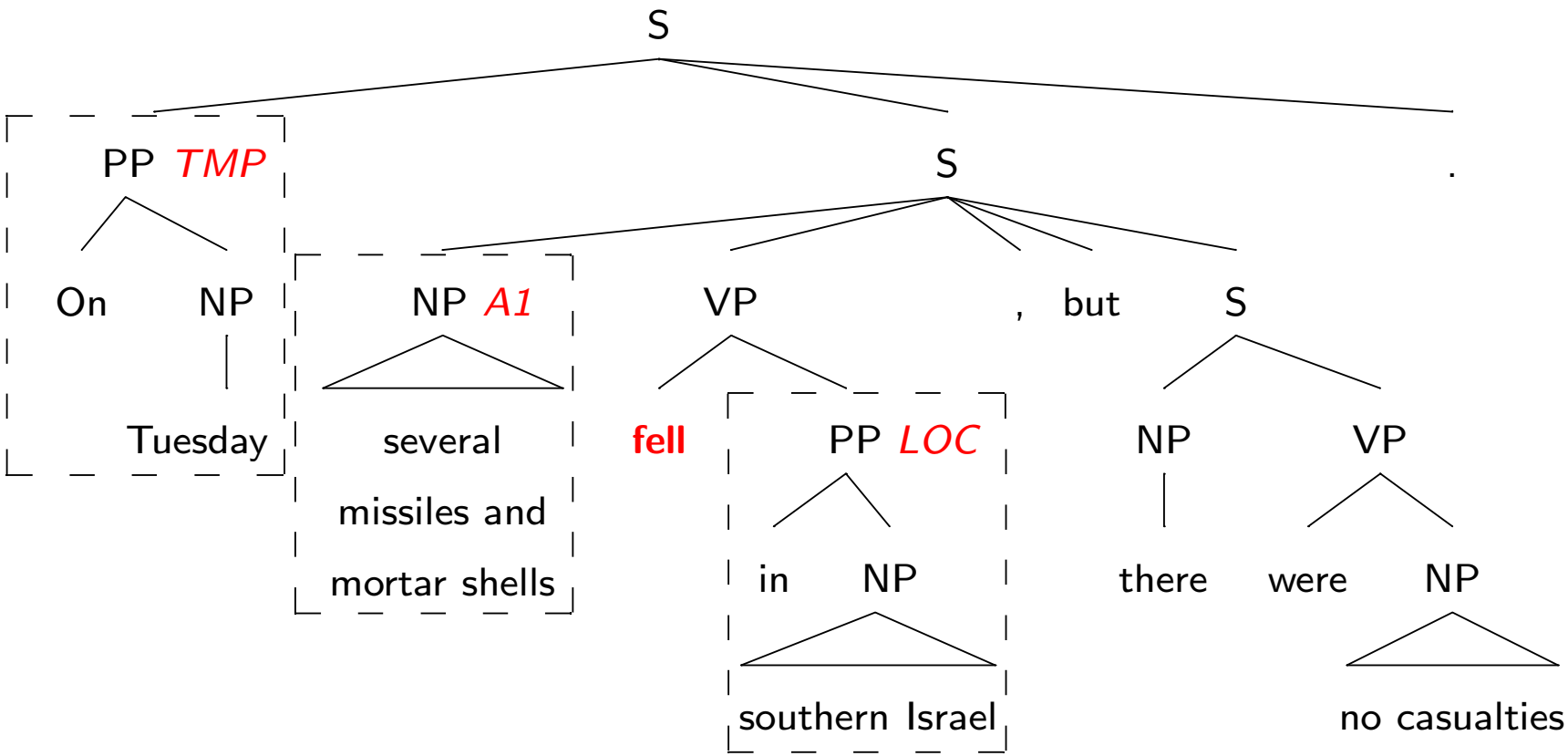

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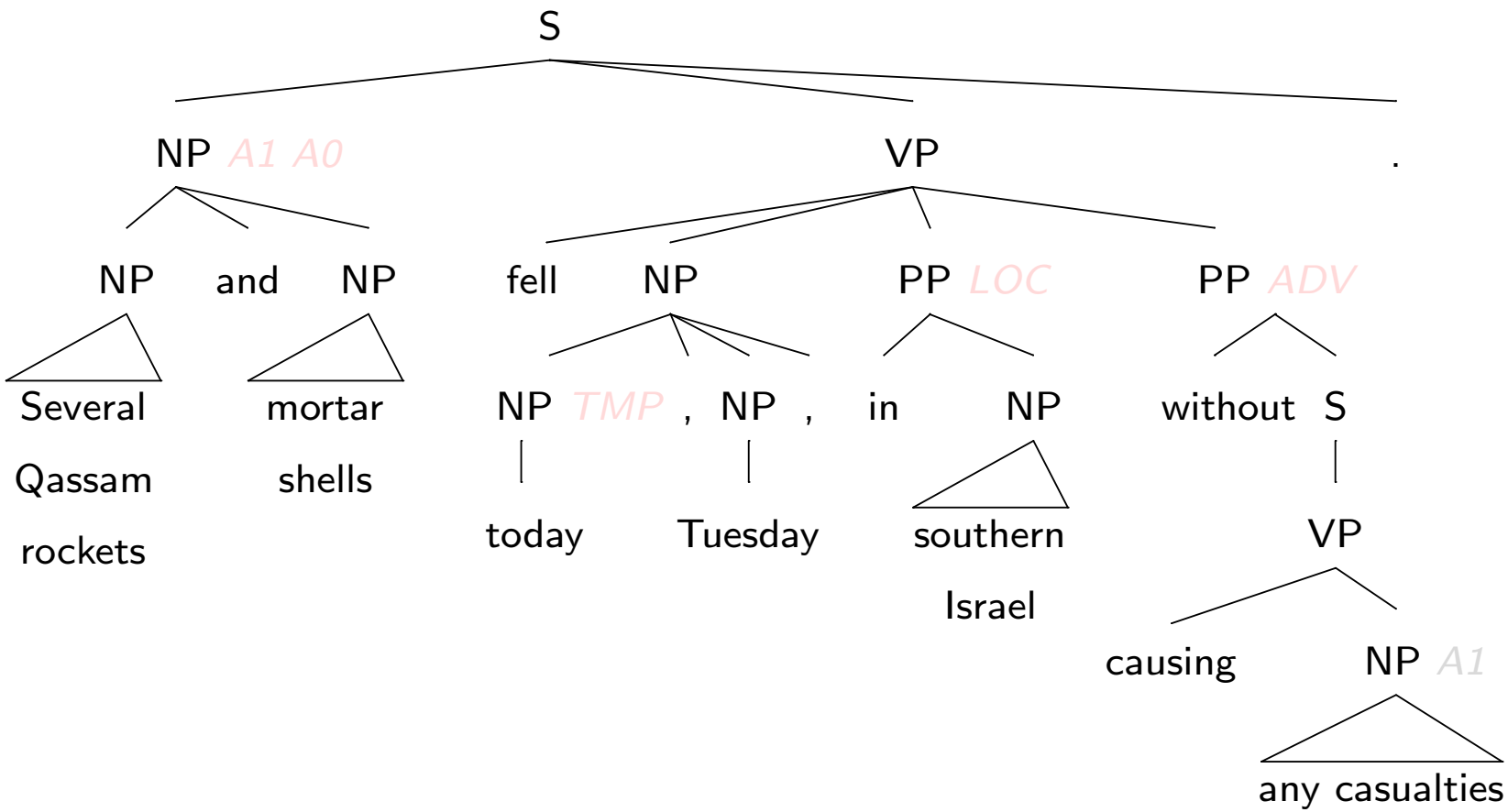

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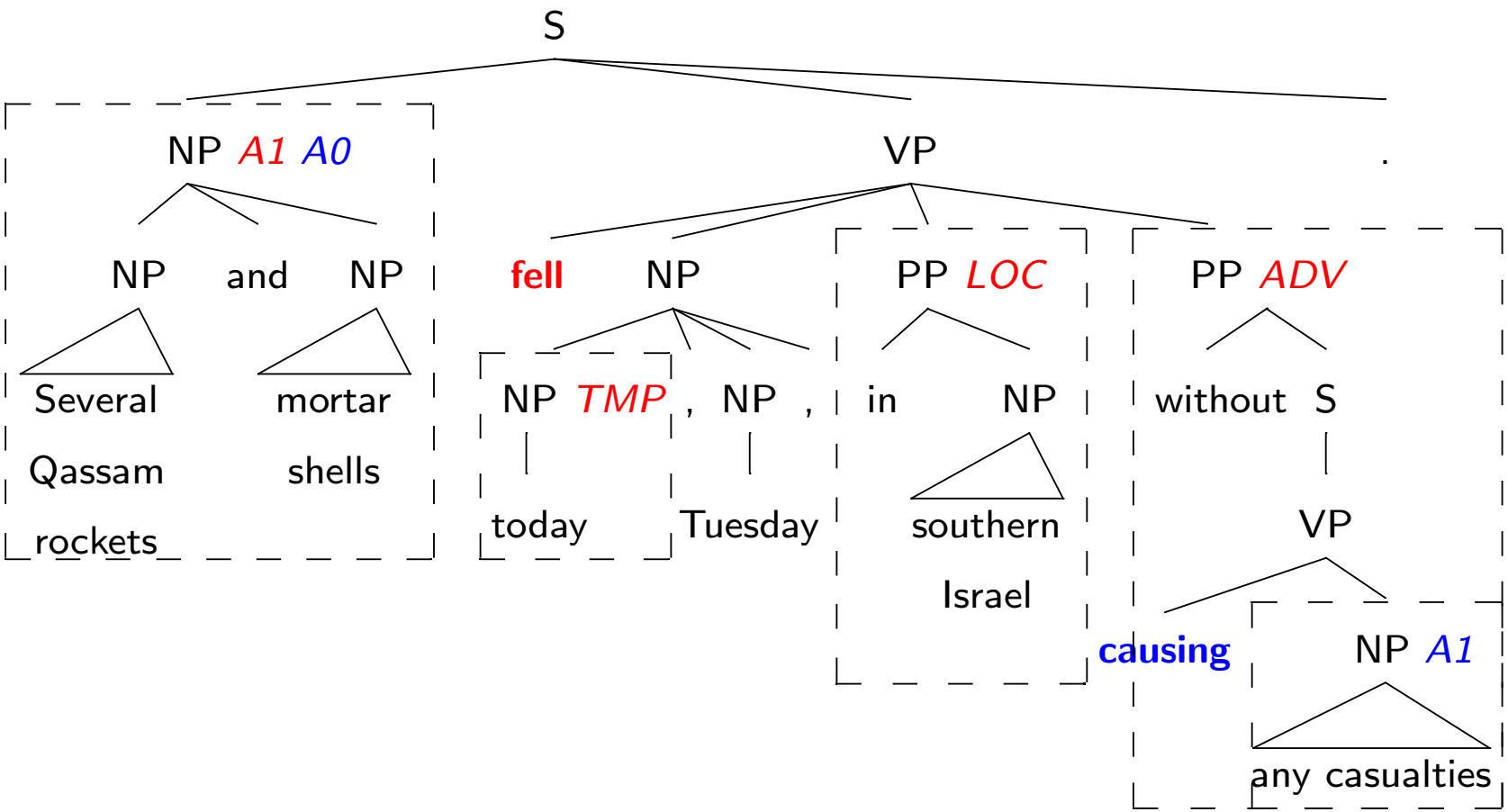

Contributions

1. Linguistic measures provide more reliable rankings when the systems under evaluation are based on different paradigms (statistical vs. rule-based, fully-automatic vs. human-aided)
2. Linguistic measures have proven effective in shared tasks (WMT 2007-2009) both at the system and sentence levels
3. Some linguistic measures suffer a substantial quality decrease at the sentence level (due to parsing errors!)
4. Lexical and Linguistic measures are complementary
   $\longrightarrow$ suitable for being combined!

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