

COMP318

Ontologies and Semantic Web

Ontology Alignment

- Part 4

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Alignment evaluation

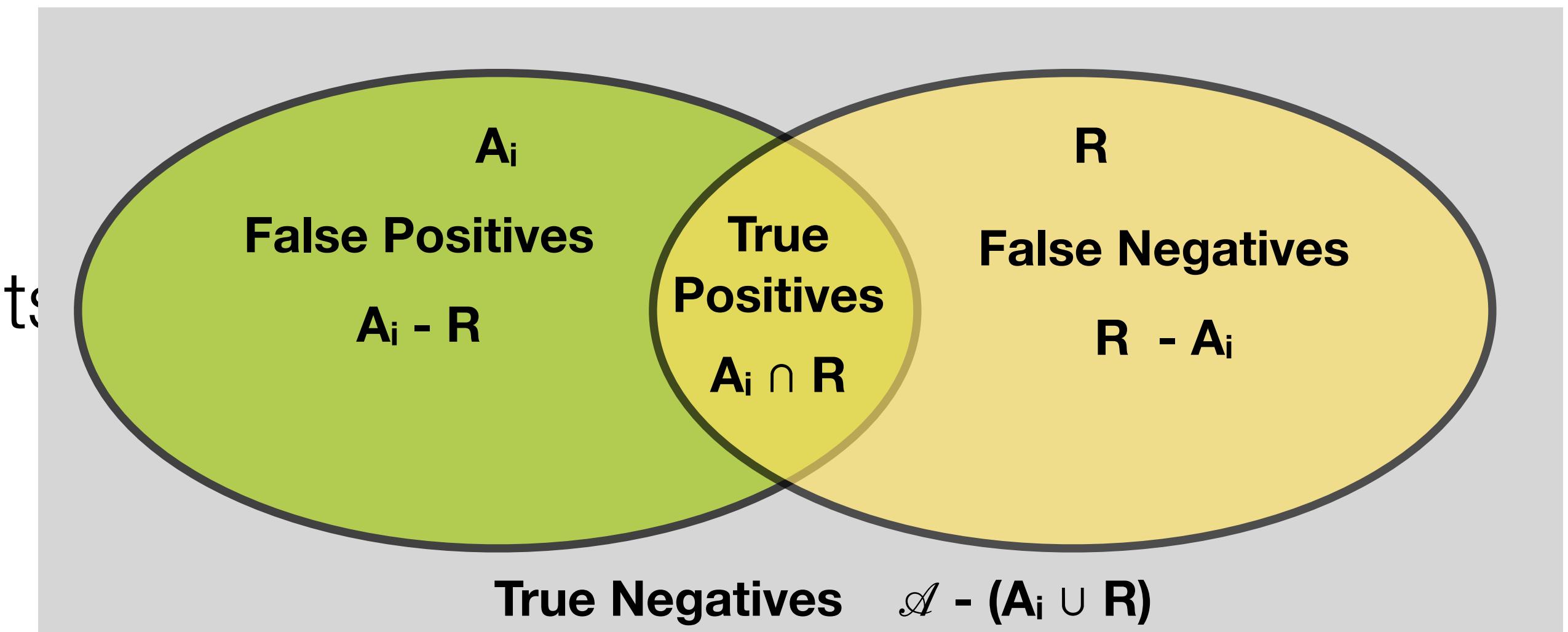
- Three types of alignment evaluation approaches:
 - Competence benchmarks: allow users to measure the extent of competence (and performance) of a particular system with regard to a set of well defined tasks
 - Usually, tasks are designed to isolate particular characteristics
 - E.g. set of tests designed
 - Comparative evaluation: compare the results of various systems or several versions of the same system on a common task.
 - The rules and the evaluation criteria MUST be clearly specified
 - Blind or nearly blind tests
 - Application-specific evaluation: compare the results of various systems wrt the output of a particular application instead of considering the alignments in isolation
 - Usually, tasks are designed to isolate particular characteristics

OAEI

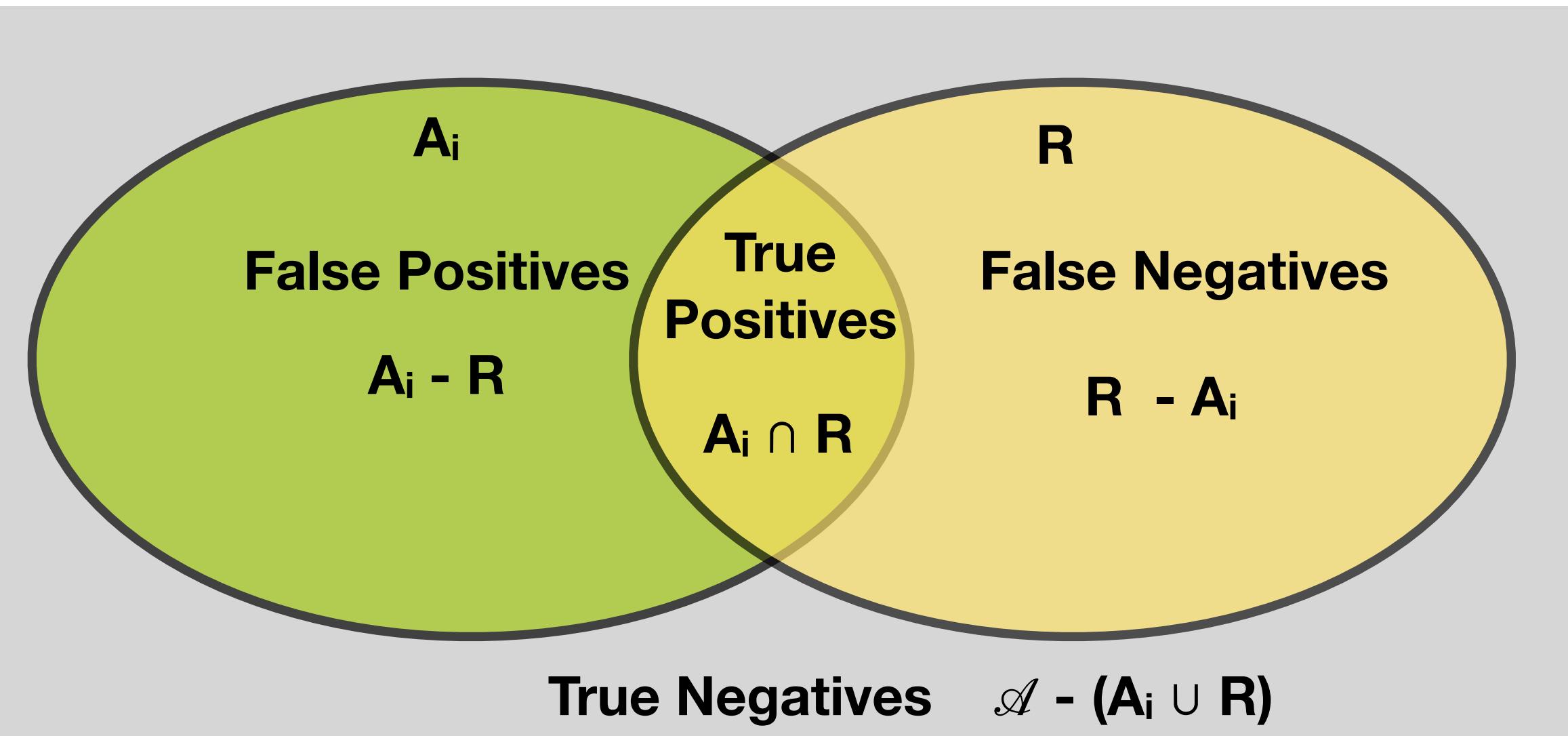
- Ontology Alignment Evaluation Initiative defines a set of benchmark dataset to be used to evaluate ontology alignment approaches.
- Annual challenge, started in 2004
- Its aims are
 - *assessing strengths and weaknesses of alignment/matching systems;*
 - *comparing performance of techniques*
 - *increase communication among algorithm developers;*
 - *improve evaluation techniques*
 - *helping improving the work on ontology alignment/matching*

Compliance Measures: Precision and Recall

- Compliance measures evaluate the degree of compliance of a system with regard to some standard
 - typically a reference alignment $\textcolor{orange}{R}$ defined as part of the OAEI benchmark
- Given:
 - the set of all possible alignments \mathcal{A}
 - an alignment to assess $A_i \in \mathcal{A}$
 - and a reference alignment $\textcolor{orange}{R}$



Compliance Measures: Precision and Recall



Precision

$$\text{Prec}(A_i, R) = \frac{|A_i \cap R|}{|A_i|}$$

Recall

$$\text{Rec}(A_i, R) = \frac{|A_i \cap R|}{|R|}$$

F-measure

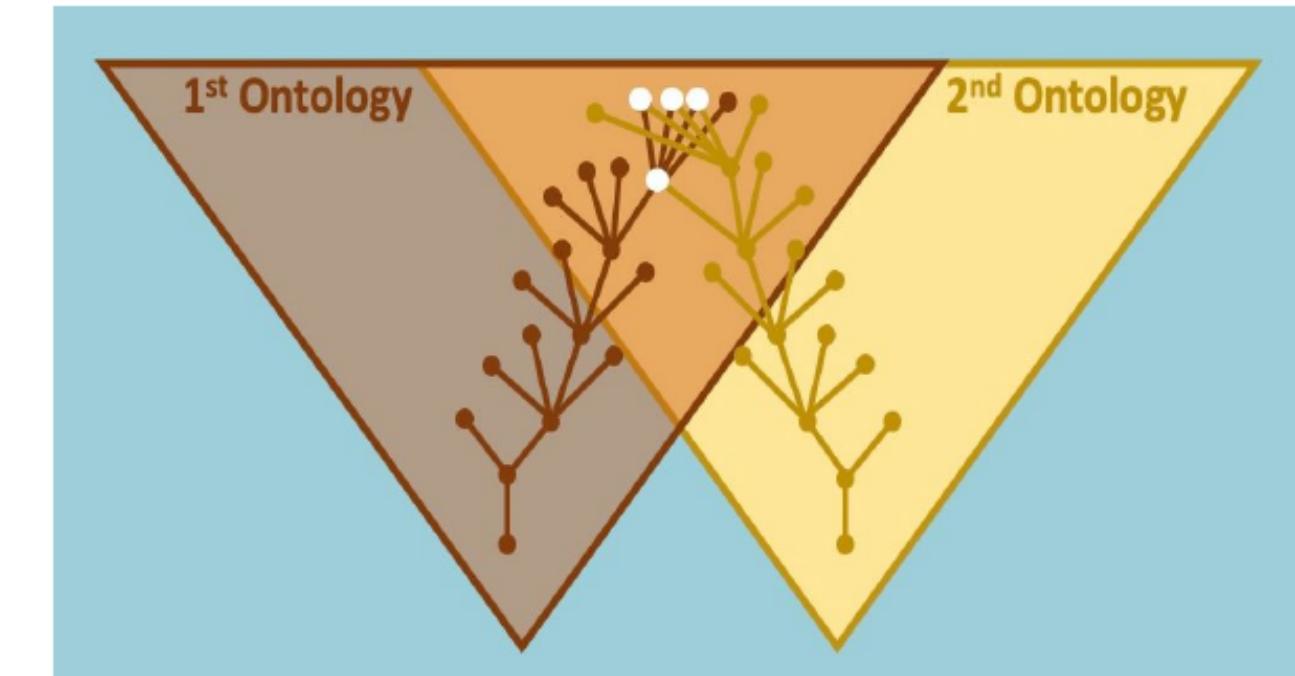
$$F_{\text{measure}}(A_i, R) = 2 \times \frac{\text{Prec}(A_i, R) \times \text{Rec}(A_i, R)}{\text{Prec}(A_i, R) + \text{Rec}(A_i, R)}$$

Precision, recall, F-measure

- **Precision:** fraction of relevant correspondences ($|A_i \cap R|$) amongst all the correspondences generated ($|A_i|$)
- **Recall:** fraction of relevant correspondences produced by an alignment system ($|A_i \cap R|$) over the total number of relevant correspondences
 - those in the reference alignment
- **F-measure:** is the harmonic mean of precision and recall
 - score reaches its best value at 1 (perfect precision and recall) and worst at 0.
- Time performance can be used as an additional criteria
- Precision and recall should not be considered in isolation,
 - as considering just one out of precision and recall can lead to extreme but unhelpful solutions.
 - A system that returns every correspondence indiscriminately has 100% recall;
 - **Recall without precision will provide too many results.**
 - A system that returns only a single correct correspondence is 100% precise.
 - **However, only precision will limit the number of results (e.g. finding only one of the possible correct results will yield a precision of 100%).**

Application of alignment laboratory analytics

- Pistoia Alliance (Ontologies Mapping project)
 - Not-for-profit alliance of life science companies, vendors, publishers, and academics.
 - Motivation: better integration, understanding and analysis of data – Interest in Semantic Web technologies and ontology alignment.



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Current funders, partners & collaborators

Summary

- The need of knowledge integration and sharing
 - support for interoperability
- Ontology alignment
 - Definition
 - Techniques
 - Evaluation metrics
- Acknowledgement
 - Jerome Euzenat
 - Ernesto Jimenez Ruiz
 - Ontology Alignment Evaluation Initiative (OAEI)

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End Ontology Alignment - Part 4

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