Evaluation of Example Tools For Hairy Tasks

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Outline

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- Case study 1
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Motivation

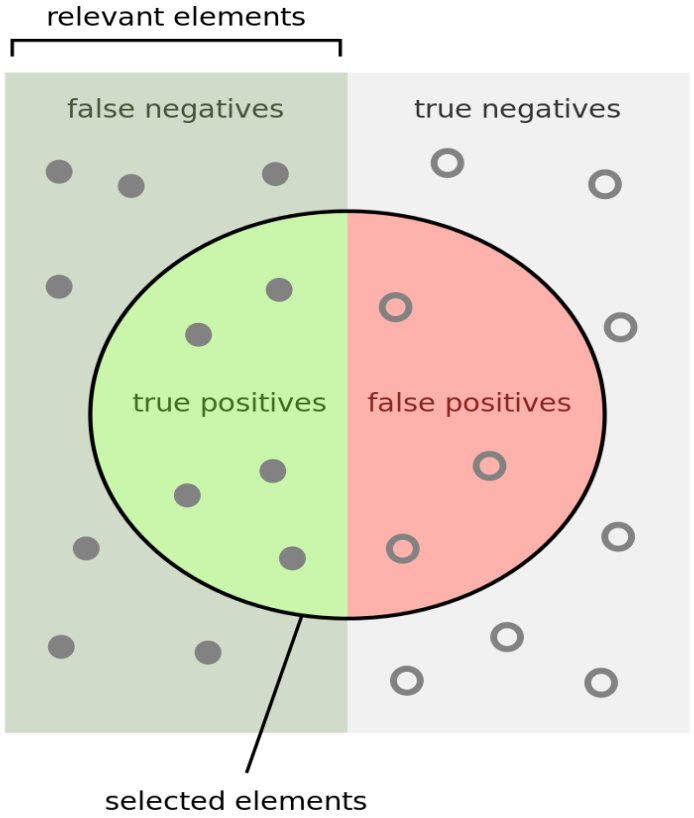
- In some scenarios, for some tasks, any tool with less than 100% recall is not helpful and the user may be better off doing the task entirely manually.
- The trade off between precision and recall may make it difficult to interpret the true result.
- Improper use of precision and recall may affect evaluation.
- Different tasks need different weight for F-measure

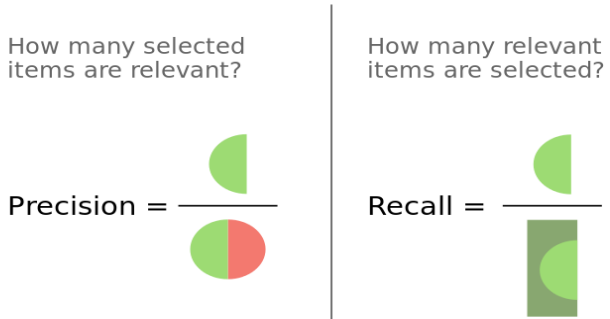
Introduction – Recall and Precision

- Recall (R) is the percentage of the correct answers that the tool returns
- Which is the percentage of the right stuff that is found.

$$R = \frac{|\, ret \cap cor \,|}{|\, cor \,|}$$

$$= \frac{|\, TP \,|}{|\, TP \,| + |\, FN \,|}$$





- Precision (P) is the percentage of the tool-returned answers that are correct.
- Precision is the percentage of the found stuff that is right

$$P = \frac{|\, ret \cap cor \,|}{|\, ret \,|}$$

$$= \frac{|\, TP \,|}{|\, FP \,| + |\, TP \,|}$$

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Introduction – F-Measure

- F-measure: harmonic mean of Precision and Recall

$$F_1 = \left(\frac{\text{recall}^{-1} + \text{precision}^{-1}}{2} \right)^{-1} = 2 \cdot \frac{\text{precision} \cdot \text{recall}}{\text{precision} + \text{recall}}.$$

- Weighted F-Measure: For situations in which R and P are not equally important.

$$F_\beta = (1 + \beta^2) \cdot \frac{\text{precision} \cdot \text{recall}}{(\beta^2 \cdot \text{precision}) + \text{recall}}.$$

β is the ratio by which it is desired to weight Recall more than Precision.

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Case Study 1:

- Using Tools to Assist Identification of Non-requirements in Requirements Specifications – A Controlled Experiment(Jonas Paul Winkler and Andreas Vogelsang)
  - Categorizing textual fragments into requirements and non-requirements.
  - In practice, this categorization is performed manually
  - Developed a tool to assist users in this task by providing warnings based on classification.
  - Performed a controlled experiment with two groups of students.
  - The results show that the application of an automated classification approach may provide benefits, given that the accuracy is high enough.

Case Study 1:

- Using Tools to Assist Identification of Non-requirements in Requirements Specifications – A Controlled Experiment(Jonas Paul Winkler and Andreas Vogelsang)
- Investigation of the effectiveness of automated tools for RE tasks
  - Their experiment supports that claim that the accuracy of the tool may have an effect on the observed performance.
  - A human working with the tool on the task should at least achieve better recall than a human working on the task entirely manually.
  - The experimental setup follows this idea by comparing tool-assisted and manual reviews.

Case Study 2:

- Evaluation of Techniques to Detect Wrong Interaction Based Trace Links(Paul Hubner and Barbara Paech)
  - Trace links are created and used continuously during the development
  - Support developers with an automatic trace link creation approach with high precision.
  - In their previous study we showed an interaction based trace link creation approach which is better than traditional IR based approaches. Performed a controlled experiment with two groups of students.
  - Performed the study within a student project.
  - Evaluated different techniques to identify relevant trace link candidates such as focus on edit interactions or thresholds for frequency and duration of trace link candidates.

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Conclusion

- Most RE and SE tasks involving NL documents are hairy tasks and need tools support.
- We may evaluate these tools with the different F-measure because the importance of recall and precision may be different for different tasks.
- We must to research and understand which measures are appropriate to evaluate any tool for the task.

THANK YOU!

QUESTIONS?