Estimating Summary Quality with Pairwise Preferences

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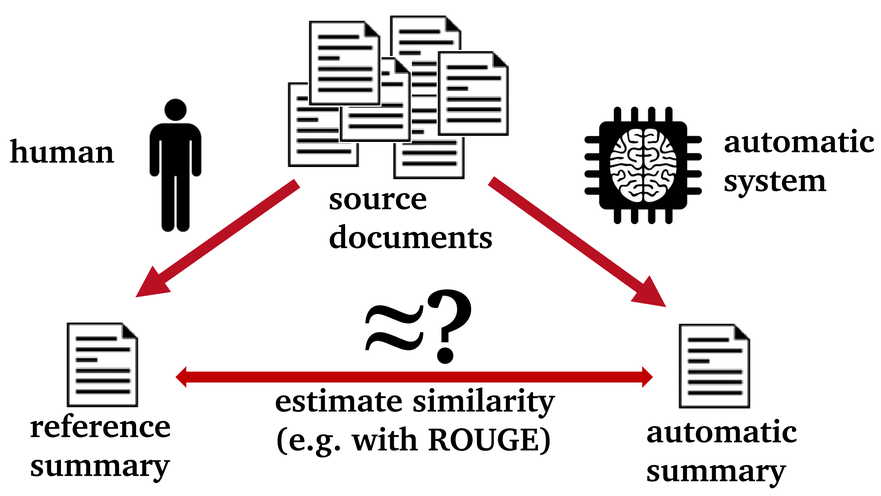
Traditional Automatic Evaluation



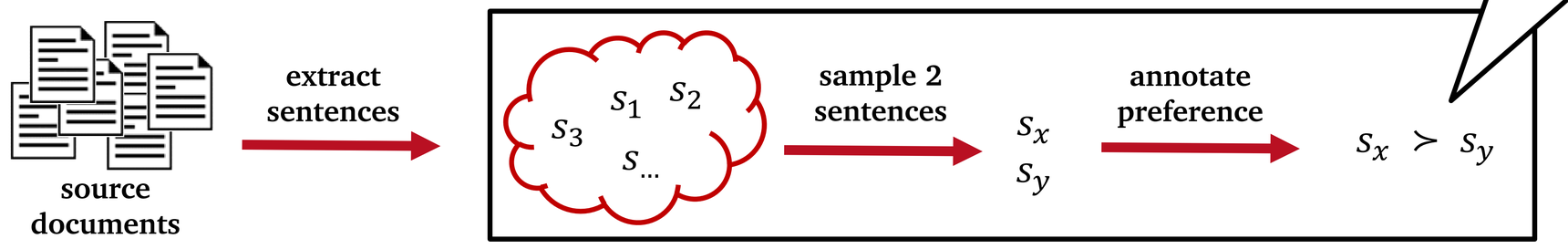
Problems:

1. creating reference summaries is time-consuming and complex → expensive
2. computing text similarities is a complex, unsolved problem → not reliable

Summary

- traditional evaluation methods use *references summaries* to estimate the quality of automatically generated summaries
- creating references summaries is *complex and expensive*
- we propose to use *simple pairwise preference labels* of individual sentences for evaluation
- our evaluation is *cheaper and more accurate* than the SOTA

Estimating Summary Quality with Pairwise Preferences



generated preferences are interpreted as games in which better sentences are more likely to win a game

$s_4 \succ s_6$
$s_2 \succ s_4$
$s_8 \succ s_5$
...

compute Bradley-Terry scores

$$p(s_x \succ s_y) = \frac{u(s_x)}{u(s_x)+u(s_y)}$$

$$v(\mathbf{S}) = \sum_{i}^{|\mathbf{S}|} w_i \cdot u(s_i)$$

S=summary to evaluate
s_i=i-th sentences in **S**

Automatically Generating Preferences

reference summaries are already available for standard datasets → reuse reference summaries to automatically create preference annotations for free

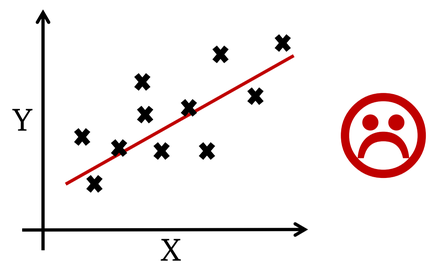
reference summary

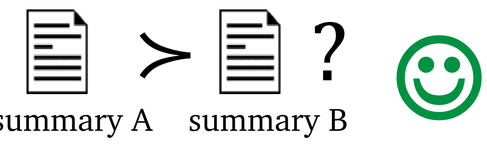
$$\hat{u}(s_i) = \max_{s \in \text{ref sum}} \text{sim}(s_i, s)$$

$s_x \succ s_y$

automatically generated preference label

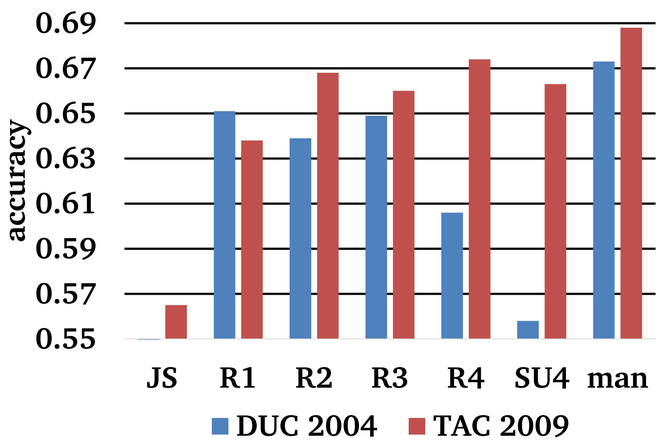
Evaluating Evaluation Methods





Prior work: Pearson correlation	Our work: Pairwise accuracy
interpretation difficult	clear interpretation
requires linear correlation	only necessary requirement
normal distr., interval scaling assumed	no additional assumptions
sensible to outliers	robust

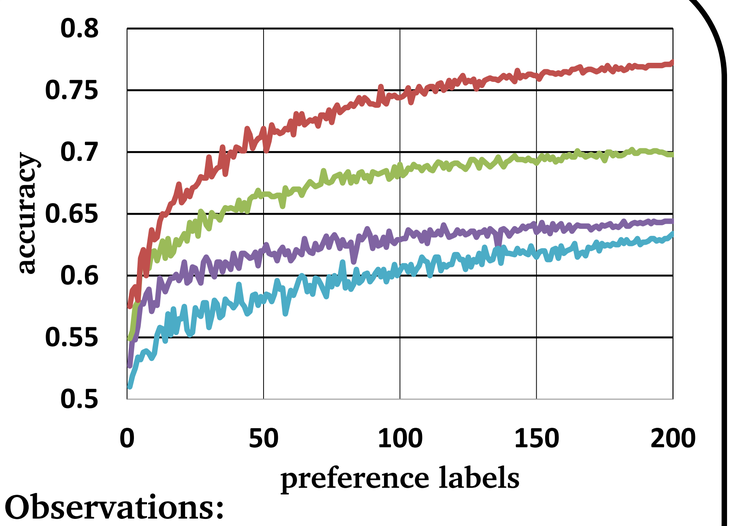
Using 200 Human Preferences



Observations:

- annotation effort: ~54 minutes per topic
- preference-based evaluation with human annotations outperforms JS and ROUGE

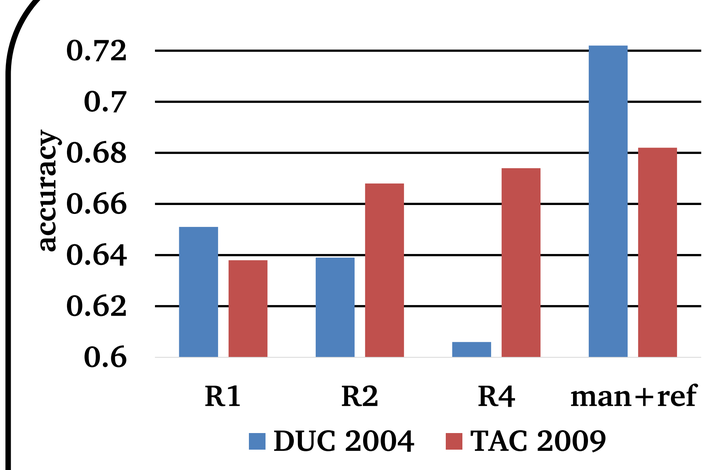
Training Convergence



Observations:

- different topics → different convergence
- not yet converged after 200 labels

Human+Automatic Preferences



Observation:

- using additional automatically generated labels can further improve accuracy

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