Study on the Difference between Summary Peer Reviews and Abstracts of Scientific Papers

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Research Background

- **Functional components**\(^1\) - content of different semantic function helping to reveal the critical information of a paper. - the research purpose, the problem definition, methods, experiments, contributions...

- Clear function components can help reduce the burden of reading.

Abstracts:
- contain function components
- curse of knowledge

Summary Peer Reviews:
- have similar structure to abstracts
- a paper have no less than one review
- reviewers' comments provide a reference for readers to select right papers.
Related Work

- **Well-established norms** in scientific paper writing.
  - Introduction-Method-Results-Discussion (IMRD)[1]
  - Problem-Method-Results-Conclusion[2]
  - Goals-Method-Results[3]
  - Introduction-Method-Results-Conclusions[4]

- **Ontologies** have been put forward.
  - Function Unit Ontology (FUO) [5]

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Related Work

Peer reviews

- opinions of a paper
- PeerRead\(^1\): the first open dataset of review comments for academic research.
- Predict papers’ acceptance according to the sentimental of review texts.
  - sentimental of review texts\(^2\)
  - sentimental polarity of the reviews\(^3\)

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What will be discussed is the two questions:

- the difference on **functional components and readability** of abstracts and summary peer reviews;
- **the focus aspects** highlighted by summary peer reviews.
Research Process

STEP 1
- Function Type Definition

STEP 2
- Sentence Annotation
- Terminology Set Collecting

STEP 3
- Readability
  - Term Density
  - Sentence Length
- Focus Aspects
  - Type Ratio
Research Process

STEP 1

Function Type Definition

STEP 2

Sentence Annotation

Terminology Set Collecting

Readability

Focus Aspects

STEP 3

Term Density

Sentence Length

Type Ratio
### Research Process

<table>
<thead>
<tr>
<th>Function Type</th>
<th>Meaning</th>
<th>Pattern examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Background</strong></td>
<td>Background of theories and applications; existing studies; unsettled gaps; necessity and significance of the current study;</td>
<td>in order to (solve the problem) …; …remain unsolved; …not (completely) studied yet;</td>
</tr>
<tr>
<td><strong>Theme</strong></td>
<td>Research scope; research goal; definition to the concerned problem;</td>
<td>(this study/article/paper) propose/investigate/discuss/demonstrate …;</td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>Hypothesis; methods; experiments; theories and research perspectives;</td>
<td>Base on…proposed; First…Secondly…Last;(model/approach/method) be used/implemented…;</td>
</tr>
<tr>
<td><strong>Result</strong></td>
<td>Description and evaluation on the result, Hypothesis and methods;</td>
<td>(experiment/result/simulation/) show/demonstrate…; ...(provide/give) a reference to …;</td>
</tr>
<tr>
<td><strong>Contribution</strong></td>
<td>Contribution to the related theories or methods; Comparison with previous studies; insight obtained; future work;</td>
<td>The contribution (of this study/paper)…; (This study) improve…; The improvement (of this study/research) is…;</td>
</tr>
<tr>
<td><strong>Strength</strong></td>
<td>Claim the strength or highlights of the whole study and the current paper with summary description.</td>
<td>(idea/ concerned problem) new/novel/critical…; (experiment/data processing/research design) is firm/well;… is significant to sth;</td>
</tr>
</tbody>
</table>

### Table 1. The Definition of Function Types
Research Process

STEP 1
- Function Type Definition

STEP 2
- Sentence Annotation
- Terminology Set Collecting
- Readability
- Focus Aspects
- Term Density
- Sentence Length
- Type Ratio
Research Process

STEP 1
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- Type Ratio
• **Term density** reflects the average number of general terms or terminology appeared in sentences.

• **Sentence length** is the average number of character in the sentences of a function type.

• **Type proportion** shows the focused function of reviews and abstracts by the proportion of sentences of each function type.
Experiment

Dataset

(1) R & A

- 774 papers (2014-2019, JAPS)
- A: 4397 sentences in abstracts
- R: 2777 sentences in peer reviews

<table>
<thead>
<tr>
<th>Function types T</th>
<th># sentences</th>
<th>avgLen</th>
<th>T %</th>
</tr>
</thead>
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<tr>
<td></td>
<td>R</td>
<td>A</td>
<td>R</td>
</tr>
<tr>
<td>Background</td>
<td>124</td>
<td>532</td>
<td>39</td>
</tr>
<tr>
<td>Theme</td>
<td>638</td>
<td>504</td>
<td>30</td>
</tr>
<tr>
<td>Process</td>
<td>519</td>
<td>1011</td>
<td>30</td>
</tr>
<tr>
<td>Result</td>
<td>354</td>
<td>1724</td>
<td>47</td>
</tr>
<tr>
<td>Contribution</td>
<td>347</td>
<td>575</td>
<td>35</td>
</tr>
<tr>
<td>Strength</td>
<td>795</td>
<td>44</td>
<td>23</td>
</tr>
</tbody>
</table>

Table 2. Sentences of Different Types in Summary Peer Reviews and Abstracts
Experiment

Dataset

(1) R & A
• 774 papers (2014-2019, JAPS)
• A: 4397 sentences in abstracts
• R: 2777 sentences in peer reviews

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Experiment

Dataset

(2) Terminology set

- Collected from three sources
  - keywords
  - Academic Hotspots of Psychology[1]
  - Chinese Terms in Psychology[2]
- 8,354 terms in total.

Table 3. Term Density of Summary Peer Reviews and Abstracts

<table>
<thead>
<tr>
<th>Function types T</th>
<th>General terms</th>
<th>Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R</td>
<td>A</td>
</tr>
<tr>
<td>Background</td>
<td>10.4</td>
<td>12.1</td>
</tr>
<tr>
<td>Theme</td>
<td>9.0</td>
<td>10.3</td>
</tr>
<tr>
<td>Process</td>
<td>9.1</td>
<td>14.3</td>
</tr>
<tr>
<td>Result</td>
<td>13.8</td>
<td>19.3</td>
</tr>
<tr>
<td>Contribution</td>
<td>9.7</td>
<td>17.3</td>
</tr>
<tr>
<td>Strength</td>
<td>6.4</td>
<td>10.7</td>
</tr>
</tbody>
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Conclusion

- Peer reviews is another type of text to extract paper information.
- **Similar function types but different focus**
  - 6 types of function components in summary peer reviews and abstracts have been defined.
  - Summary peer reviews specially highlighted the strength of a study or a paper.
- **High readability**
  - Lower term density reduce the difficulty of reading.
THANKS & QUESTIONS!