CSRA: The C3SR Reviewer Assignment System

Motivation
Peer review is crucial for scientific achievement. The conventional reviewer assignment process for academic conferences is now challenged by the fast-growing number of paper submissions (Fig 1): while timely review for all submissions is necessary, manual reviewer assignment is extremely labor-intensive due to the following reasons.
- **Time-consuming**: To judge the expertise of a reviewer on a specific submission, one often needs to learn the reviewer’s research from his/her publication records.
- **Not scalable**: #judgments = reviewers x submissions
- **Optimization difficulty**: The assigning process is often an optimization problem with thousands of variables which also considers reviewer’s load and linguistic quality.
- **Limited diversity**: For a small reviewer pool, limited support is available to cover the diversity of topics in new submissions which is growing rapidly.

Existing Solutions
- **LDA based models**: Mechanism: probability distribution over topics
  - State-of-the-art examples: [2,3], TPMS[4],
  - Limitation: fail to capture lexical level similarity
- **LSI based models**: Mechanism: identifying occurrence patterns of words in documents
  - Limitation: rely on lexical overlap to measure document similarity
- **TFIDF based models**: Mechanism: words weighting based on their importance
  - Limitation: constrained to word-level comparison in similarity evaluation

Automated Reviewer Assignment
To address those issues, we propose to automate the process via modern natural language processing (NLP) and optimization techniques. Specifically, we expect to automatically
- judge the expertise level of each reviewer to each submission, by embedding all the submissions and the reviewers within the same semantic space
- assign a required number of expert reviewers to each submission by formulating the assignment process as an optimization problem, which can also
  - avoid conflicts of interests
  - balance the load of different reviewers

Conclusions
- This task heavily relies on extracting relevant keywords
- Use of embeddings instead of tokens is proven to be a robust way for this task to overcome vocabulary mismatch between submissions and reviewers
- The proposed common topic modeling shows a strong empirical performance over baselines

References
[1] (Online) ed2019spriodical.hull.ups.edu/1Pyp=156

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