

Theoretical and Empirical results in Strategyproof Conference Review

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Abstract

Strategyproofness describes the ability of a reviewer to change the rankings of their own paper.
A review process is *group unanimous* if when all reviewers rank a partition of papers over another partition, then the papers of the first set are ranked above the latter.
Certain conflict graphs cannot admit a simultaneously strategyproof and group unanimous review process.

Motivation

Many peer review conferences are still susceptible to strategies due to its reviewers (i.e. not strategyproof).
Determining properties of strategyproofness gives insight into necessary conditions for the review graphs.

Result 1

A review graph G with n reviewers and n papers where $n \geq 4$ and each reviewer i reviews papers $i, i+1$ cannot admit a review process that is both strategyproof and group unanimous.

Proof

Consider the following review profiles:

$$P_1 \succ_1 P_2 \succ_2 P_3 \dots \succ_{n-1} P_n \text{ and } P_1 \succ_n P_n$$

$$P_1 \prec_1 P_2 \succ_2 P_3 \succ_3 P_4 \dots \succ_{n-1} P_n \text{ and } P_n \succ_n P_n$$

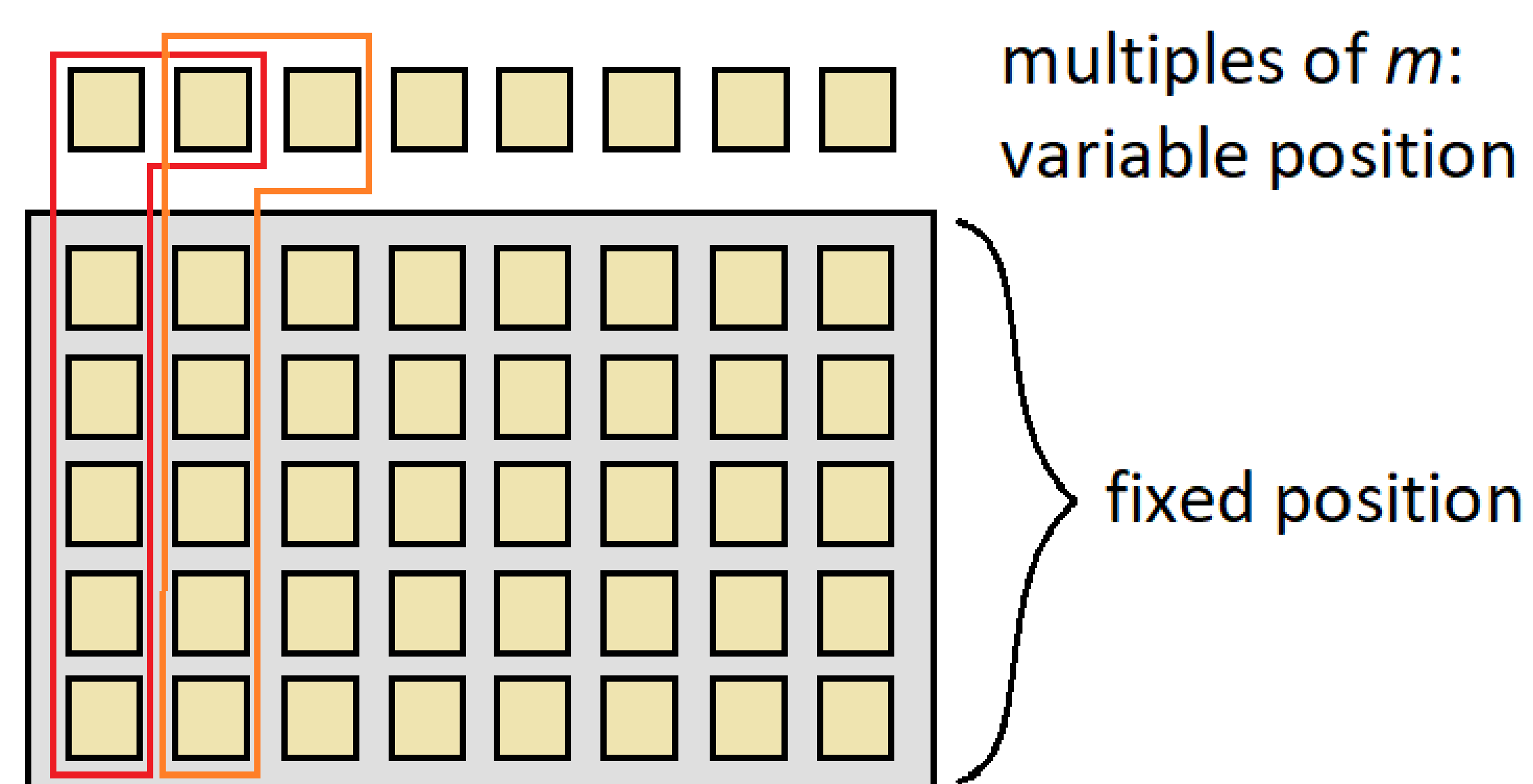
$$P_1 \prec_1 P_2 \succ_2 P_3 \succ_3 P_4 \dots \succ_{n-1} P_n \text{ and } P_n \prec_n P_n$$

Result 2

For any positive integer $m+1$ and n a multiple of m and $n \geq 4m$, a review graph G with n reviewers and n papers where each reviewer i reviews $m+1$ papers starting from paper i cannot admit a review process that is both strategyproof and group unanimous.

Proof

When each reviewer reviews $m+1$ many papers, then each reviewer i uniquely reviews papers i and $i+m$.
Consider a review profile that fixes papers multiples of m over papers not multiples of m . Among these profiles, fix an ordering on papers not multiples of m .
We are left with profiles that only alter the rankings of papers multiples of m .



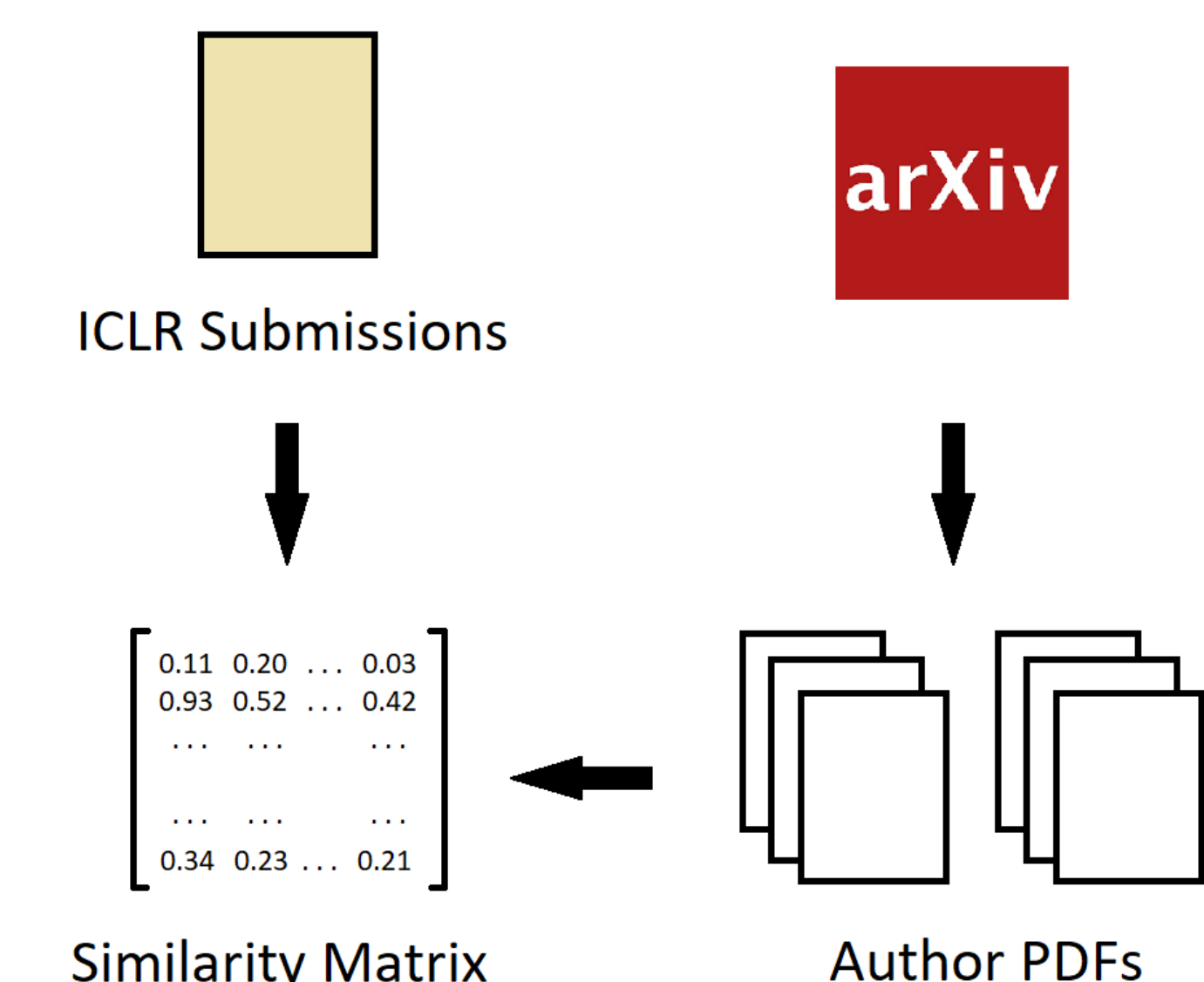
By taking only the papers that are multiples of m , this then reduces to the premise in result 1. Since this does not admit a strategyproof and group unanimous review process, then the original review graph also cannot admit a strategyproof and group unanimous review process.

Background

TPMS maximizes reviewer/paper similarity in a peer review conference setting.
Compatibility between strategyproofness and TPMS is difficult to analyze, since the implementation of TPMS is closed source.

Project

We generated a reviewer list and paper list from ICLR 2018 submissions data and constructed the associated similarity matrix for this conference.



Future Plans

- Use dataset to empirically quantify effect of strategyproofing on similarity scores.
- Discuss and qualify limitations of dataset
- Extend dataset for other conferences with public submissions.

Code and dataset can be found at:
<https://github.com/KeiraZhao/PeerReview>