

Advanced Data Structures

Course Project

Title: Multi-stage Matching for EDAI Guides Allocation using Gale-Shapley algorithm

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Group Members:

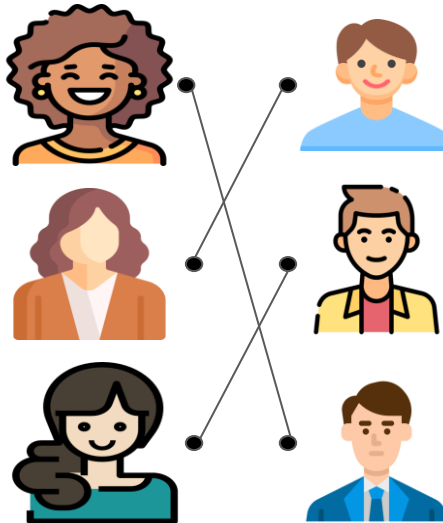
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Introduction

What do we mean by “**Matching**”?

- Generation of best possible pairs in a given scenario



Why are matchings so powerful?

- JoSAA
- Students to hostels
- Resource Allocation
- PG seat allocations
- Game Theory

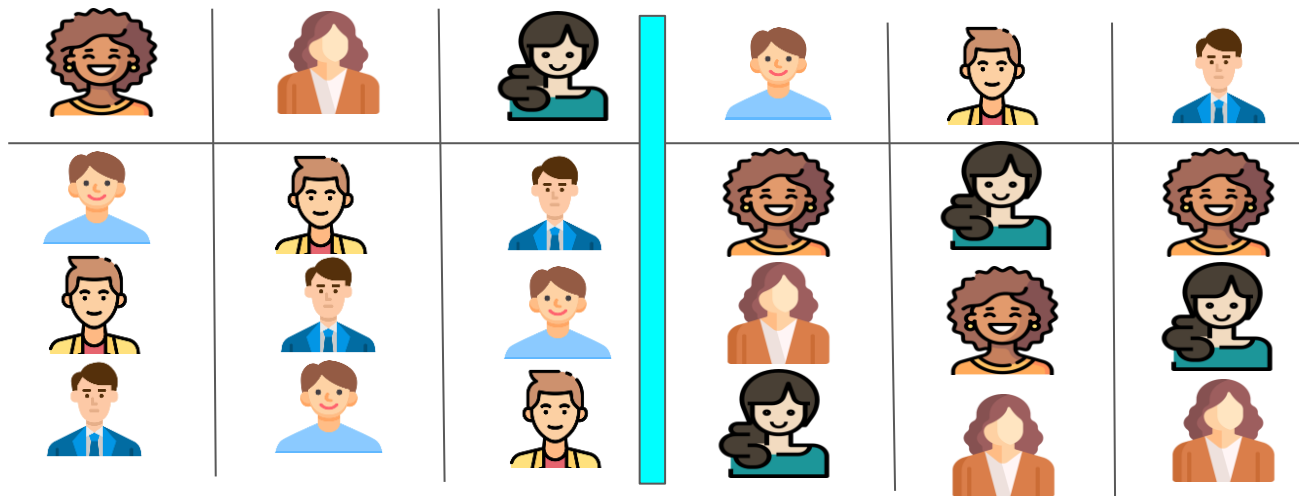


IIT BOMBAY



Setup of a Matching Problem

- Two separate sides (Bipartite)
- Each element of one side tries to match with some element of the other side
- Each element on one side gives preferences of the elements on the other side
- The matchings must be optimized in one or the other way



Problem Statement

To develop an optimal EDAI guide matching algorithm based on Gale-Shapley algorithm.



Objectives

- Each group should be allocated to guides such that there should be no such pairs of guides and groups that would both **prefer each other over their current matchings** making the matching **stable**.
- The algorithm should be **multi-staged** but all stages should be stable so that groups can make preferences to the guides in multiple rounds so that they get the best match.
- There should a **two way preference**.



Challenges

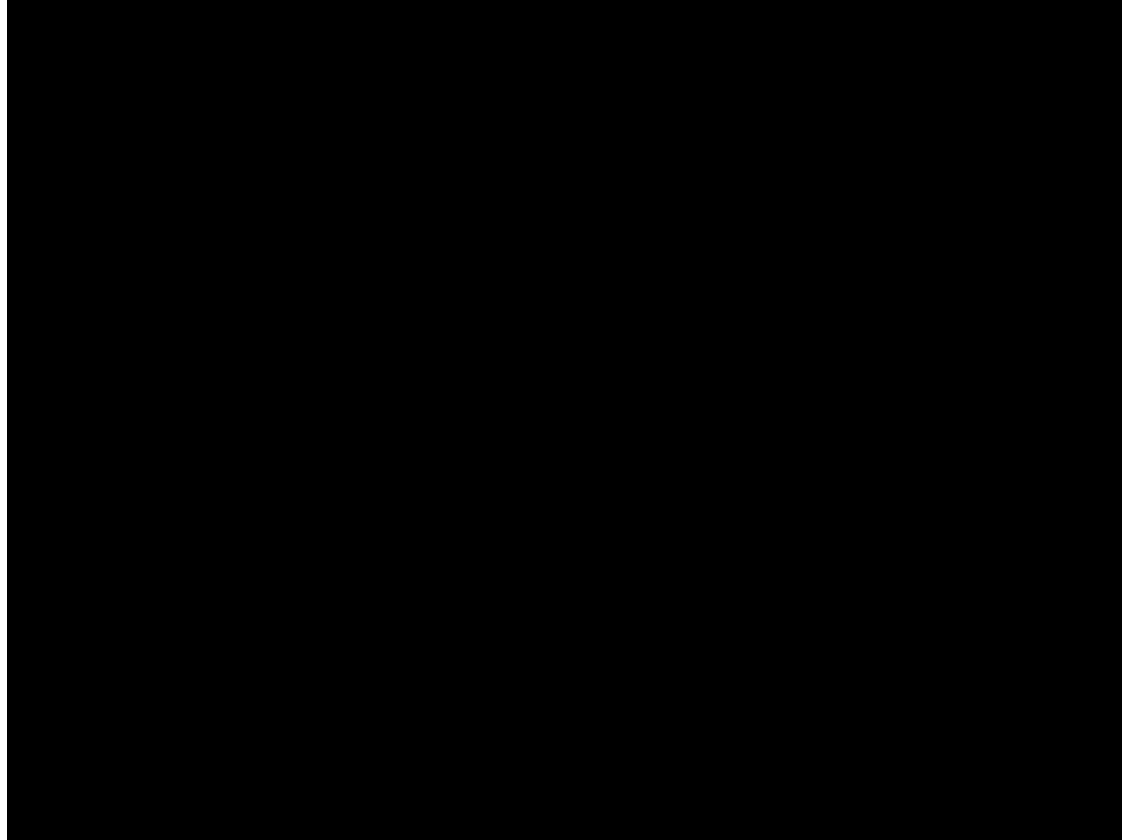
- Preferences of both sides matter
- No preference given
- Many to one matching
- Variable Capacity of Guides
- Conventional matchings not possible

Our Proposed Solution

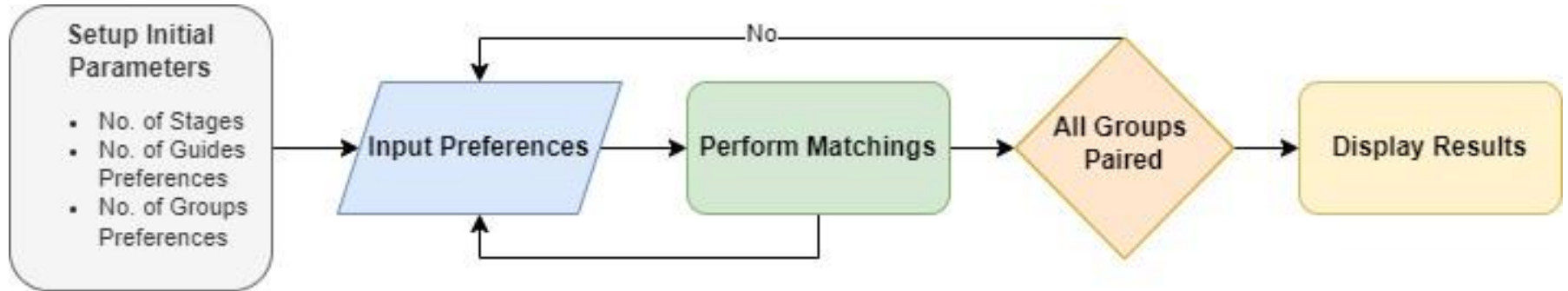
- Multi-staged approach
- For each stage, Gale- Shapley based matchings
- 'Capacity' for guides
- For last stage - take all preferences (complete graph)



Video Example & Explanation



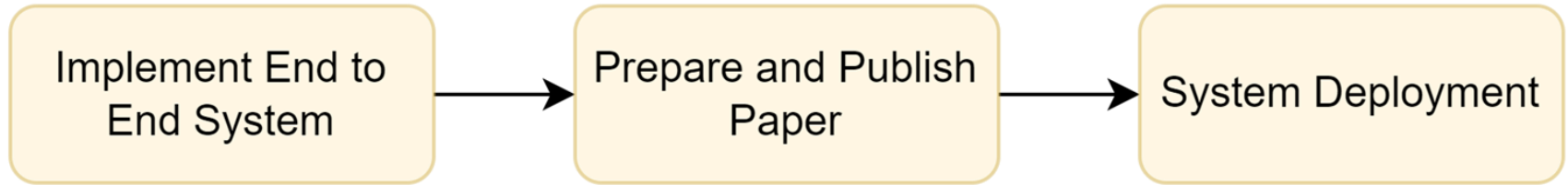
System Flow



Mathematical Proof of Concept



Roadmap



Comparison With Existing Solution

Existing Solution	Our Solution
Time Consuming	Efficient and Optimal
Manual Work	Automated Work
Preferences not matter	Preferences matter
Not standardized	Standardized

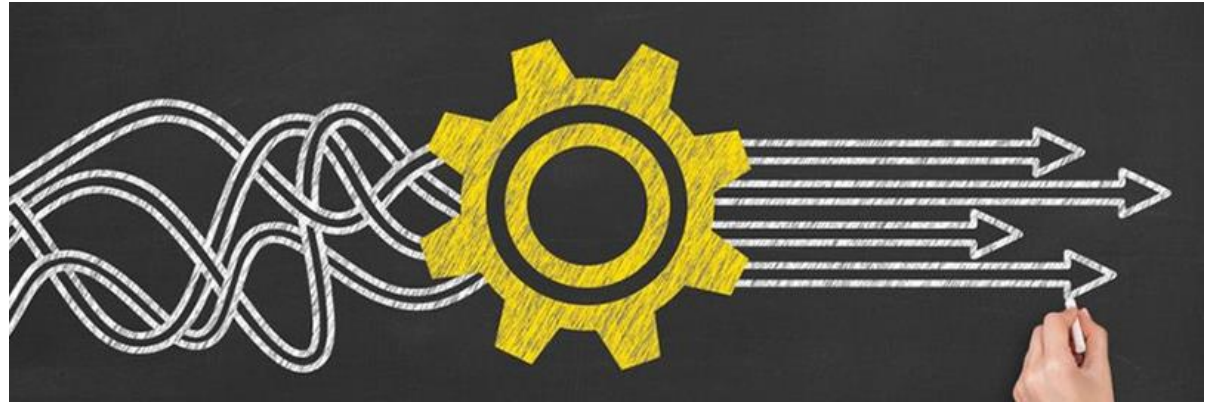
Conclusion

Efficient & Pragmatic Solution

Preferences Matter

Standardization of System

Novel Solution



THANK YOU!