

# On Achieving **Fairness** and **Stability** in Many-to-One Matchings

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# Model

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**Many-to-One Matchings with Budgets:** match  $n$  students to  $m$  colleges

**Isometric utilities:**  $u_{s_i}(c_j) = u_{c_j}(s_i)$ .

**Global Rankings:**  $u_{s_i}(c_1) > u_{s_i}(c_2) > \dots > u_{s_i}(c_m)$  for all  $i \in [n]$  and  
 $u_{c_j}(s_1) > u_{c_j}(s_2) > \dots > u_{c_j}(s_n)$  for all  $j \in [m]$

**Stability:** No blocking pair

**Leximin optimal:** Maximize utility of worst agent, then second worst etc

Problem Statement: **Find leximin optimal stable matching**

# Results

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- **Envy and Stability don't mix:**
  - EF1 and stable matching need not exist
- Finding leximin optimal stable matching over isometric utilities is **NP-Hard**
  - Reduction from balanced partition problem
- Global rankings give structure over stable matchings
  - Stable  $\Leftrightarrow$  matching according to rank
- **$O(mn)$  time algorithm** finds leximin optimal stable matching over ranked isometric utilities.
- **Extends to more general valuations**