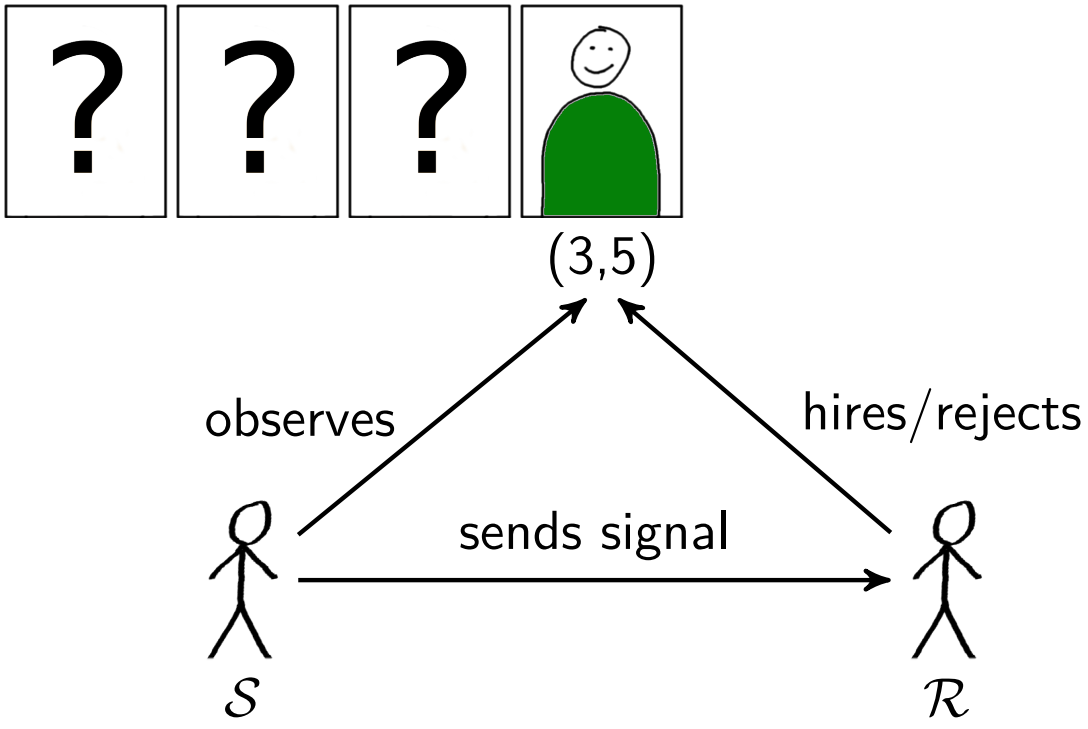
The Secretary Recommendation Problem

Niklas Hahn, Martin Hoefer, Rann Smorodinsky

n candidates, arriving one-by-one in uniform random order



Candidate i provides (a-priori unknown) nonnegative utilities (r_i, s_i) to $\mathcal{R}$ and $\mathcal{S}$. $\mathcal{R}$ can hire at most one candidate. $\mathcal{S}$ and $\mathcal{R}$ maximize their respective expected utility from the hired candidate

Main Question

How can $\mathcal{S}$ effectively **exploit the informational advantage** over $\mathcal{R}$? How much value is lost for $\mathcal{S}$ because of **online arrival and departure** of choice options?

Objective of the paper

$\rightarrow$ Mechanisms that optimize the utility for $\mathcal{S}$ under persuasiveness-constraints for $\mathcal{R}$, i.e., that $\mathcal{R}$ wants to follow

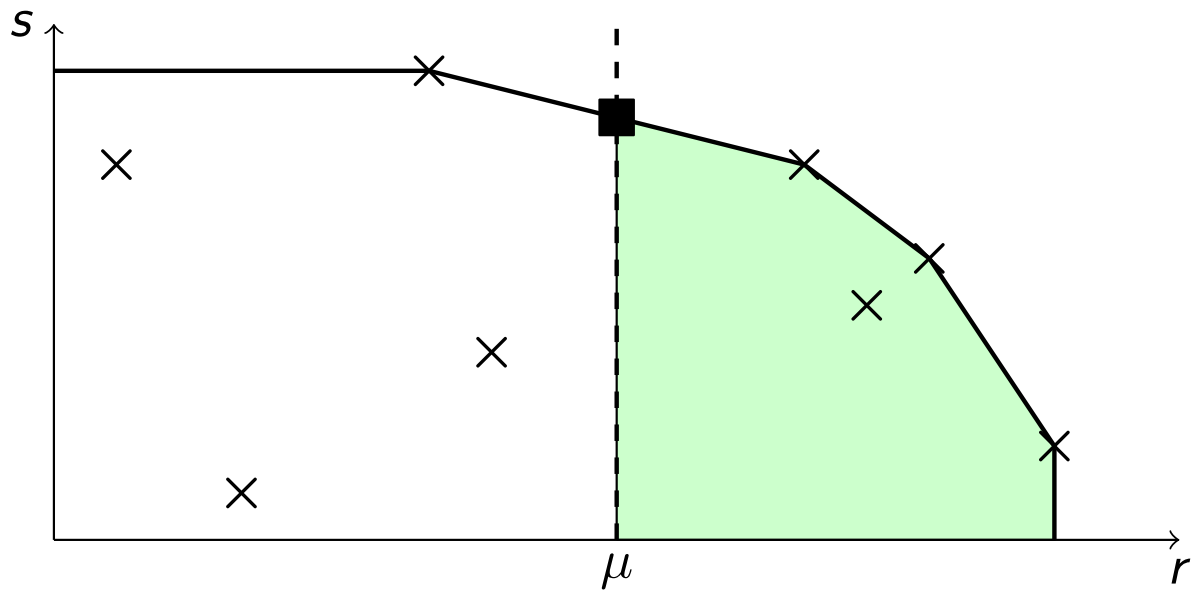
$\rightarrow$ Design good signaling mechanisms to maximize expected utility of $\mathcal{S}$

$\rightarrow$ Relate the achieved utility for $\mathcal{S}$ to a suitable utility benchmark

$\rightarrow$ Prove robust performance bounds for the mechanism

Utility Benchmark

For the utility benchmark, we assume that the value-pairs of all candidates are known to $\mathcal{S}$ and $\mathcal{R}$ a-priori.



The green area represents potential expected outcomes of persuasive mechanisms.

*Under the benchmark assumption, there is an **optimal persuasive** signaling mechanism achieving highest the optimal expected sender utility inside the green area.*

Our mechanisms provide approximation guarantees w.r.t. utility benchmark

Cardinal receiver objective:

Rejected θ_t ...	... not disclosed		... disclosed	
$\mathcal{S}$ objective	Ordinal	Cardinal	Ordinal	Cardinal
Benchmark	Optimal mechanism		$\mathbf{1/2}$	$1/3$
Secretary	$1/4$	$1/(3\sqrt{3})$	$\mathbf{\Theta(1/n)}$	$\mathbf{\Theta(1/n)}$

Ordinal receiver objective:

Rejected θ_t...	...not disclosed		...disclosed	
$\mathcal{S}$ objective	ordinal	cardinal	ordinal	cardinal
Benchmark	$\mathbf{1}$	$\mathbf{1}$	$\mathbf{1}$	$\mathbf{1}$
Secretary	$\mathbf{1/e}$	$\mathbf{1/e}$	$\mathbf{1/4}$	$\mathbf{1/4}$

Cardinal objective: Maximize **expected utility**
Ordinal objective: Maximize **probability of best candidate**

All bounds without lower order terms. Bold results have asympt. matching upper bounds.