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Designing Pareto-Optimal Systems for Complex Selection Decisions:

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Topics: Selection (genetic algorithm) and Personnel selection

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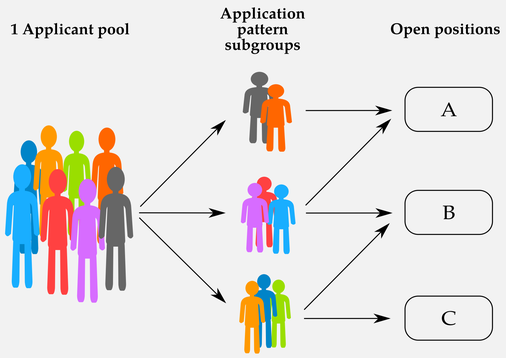
1. Complex Selection Decisions

- One applicant pool and several open positions
- Many applicants are apt and show interest in one or more of a number of different positions



- Large industrial or governmental organisations
- Currently no methods available to estimate outcomes: (1) selection quality and (2) adverse impact ratio (AIR)
- Importance: wrongly handling a complex selection decision as if it was a series of seperate simple selection decisions, leads to biased expectations concerning the outcomes

2. Method

- Outcomes as expected under **rational selection strategy**: predictor information is used so as to maximize expected criterion performance of retained applicants
- We propose two different analytic methods to estimate expected selection quality and adverse impact
  1. **variable prediction method**: a different predictor composite for each position
  2. **uniform prediction method**: same predictor composite for all positions
- Both methods integrated in a multi-objective optimization framework to obtain Pareto-optimal complex selection systems

3. Example application

- Characteristics of selection predictors in light of envisioned jobs:

Variable	Effect Size d	Correlation Matrix 1	2	3	4
Predictors					
1. Cognitive ability	-0.72				
2. Structured Interview	-0.31	.31			
3. Conscientiousness	-0.06	.03	.26		
4. Biodata	-0.57	.37	.17	.31	
Criteria					
5. Performance Jobs 1-2-3	-0.43	.51	.48	.22	.32

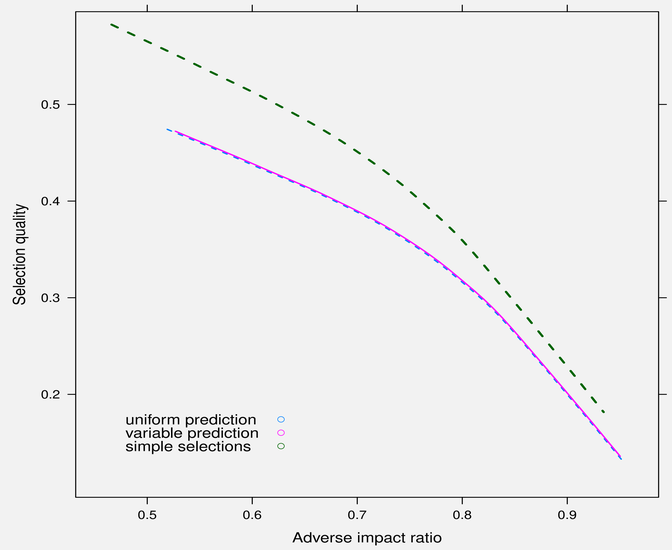
- Characteristics applicant pool: minority / majority group composition .12 / .88 and job application patterns:

Subgroup	Prevalence	Application Pattern
1	.30	Job 1
2	.25	Job 2
3	.20	Job 3
4	.10	Jobs 1 and 2
5	.10	Jobs 1 and 3
6	.05	Jobs 1, 2 and 3

- Complex selection situation as 25% of applicant pool applies for more than one job

4. Results

- Set of Pareto-optimal complex selection systems
- Pareto-optimal trade offs between selection quality and AIR



Comparison Pareto front (a) uniform prediction (dotted) vs (b) variable prediction method (solid) for complex selection situations, and (c) 3 separate simple selection decisions (dashed)

5. Conclusions

- We propose the first analytic method to estimate efficiency and AIR of complex selection decisions
- Uniform and variable prediction method result in practically the same Pareto front
- Wrongy handling a complex selection situation as a series of simple selection decisions, leads to **substantively biased expectations** about attainable trade offs
- Method permits an **informed design of composite predictors** to perform complex selection decisions

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