CS 234r Paper Presentation

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Presenting Ran I. Shorrer (2019) *Simultaneous Search: Beyond Independent Successes*, ACM EC19.

Roadmap

1. Background on College Admissions[1]
2. Modeling the Admissions Process: Simultaneous Search
3. Behaviors from Modeling Simultaneous Search

[1] The paper uses college admissions process, but it can be generalized to high school admissions, etc.

College Admission Problem

1. Something all of us gone through somewhat recently.
2. Students apply to college I. For some set $A \subset I$, the colleges decide to admit the student. Then, they choose one school $a \in A$ to go to.
3. Students (generally) know which schools they prefer, but are unsure how strong an applicant they are compared to the rest of the pool.

Background, cont.

1. If students can apply to every college with no cost, they can apply to all and go to their favorite school.

Background, cont.

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2. However, applications take money and time.
3. "Extended Essay: Who does Sally sell her seashells to?" – UChicago

Background, cont.

1. What is the practical behavior of college admissions?

Background, cont.

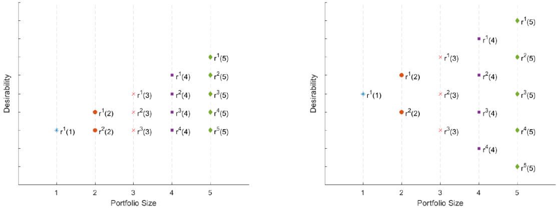
1. What is the practical behavior of college admissions?
2. “Reach”, “match” and “safety” schools.
3. Question: What causes this behavior?

Previous Work

- Chade and Smith[2] models colleges as making independent admissions decisions ("independent success").
- Concludes that students should not apply to safety schools and should expand their range of schools upwards.
- Question: Do you think the assumption of "independent success" is appropriate in this context?

Contributions

Present a reasonable model of school choice and shows how the model gives rise to the "safety school" behavior.



(a) Independent admission decisions

(b) Perfectly aligned admission decisions

Figure 1: Optimal portfolios under independent and perfectly aligned admission decisions

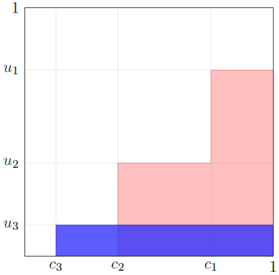
Model

- Each agent s is assigned an unknown score $X \sim Unif(0, 1)$. Each college i has a publicly announced cutoff c_i, and the agent knows the utility she will derive from the school, u_i.
- Agent submits a list of schools r, and gets into the highest-ranked school i in r that accepts her. Her utility is $u_i - C(|r|)$. $C(\cdot)$ describes cost of application. Maximize expected utility.
- Assume college has no quota constraint and sometimes that C is convex. (appropriate?)

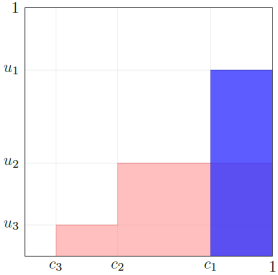
Graphing Expected Utility

First, drop schools that are more selective but less desirable and order the list in decreasing desirability.

Expected utility becomes the area under the red curve:



(a) "safety" school



(b) "reach" school

Example cost functions

Suppose $C(x) = 0$ if $x \leq k$ else ∞, i.e. students need to find k rectangles whose union covers the largest area.
Solvable using DP: details are easy to fill in[2]. Let n be the number of colleges, this runs in time $O(kn^2)$.
So, agents can find their optimal portfolio.

[2] let $f(k, c)$ be the maximal area covered by a portfolio of size k, where the least selective school has cutoff c

Changing Beliefs

What happens when we change the student's beliefs about themselves? We model this by changing the distribution $Unif(0,1)$ to some different f_s. A belief is more aggressive if it assigns higher weight to higher scores. A portfolio is more (weakly) aggressive than another if at every place it chooses school at least as aggressive as the other.

Further Results

1. When students have more aggressive beliefs, they choose more aggressive portfolios.
2. When students are less risk averse, they would choose more aggressive portfolios.
3. When students value the outside option more (okay with not going to college), they would choose more aggressive portfolios.
4. Agrees with intuition.

Summary

- Create model with “single cutoff”.
- See how real-life behavior in college admissions arise.

References

- Ran I. Shorrer (2019) *Simultaneous Search: Beyond Independent Successes*, ACM EC19.
- Chade, Hector, and Lones Smith (2006) *Simultaneous search,* Econometrica.