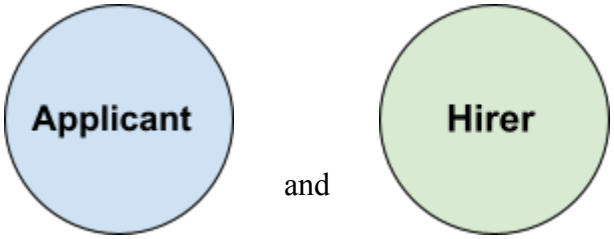
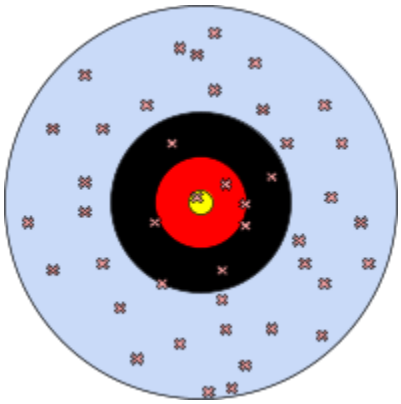
The hiring process is an interaction between two agents.



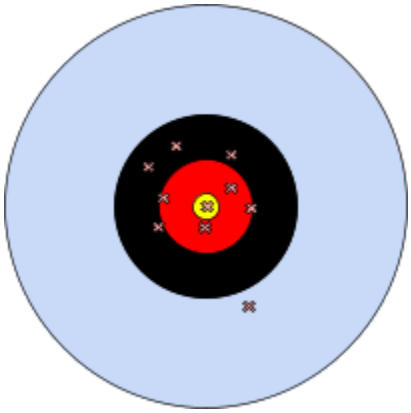
What are trying to solve? *(problem)*

Online job search systems are inefficient.

Currently, attempting to get a job offer is like trying to hit a bullseye with a shotgun. It needs to be much more like trying to hit a bullseye with a rifle.



Shotgun



Rifle

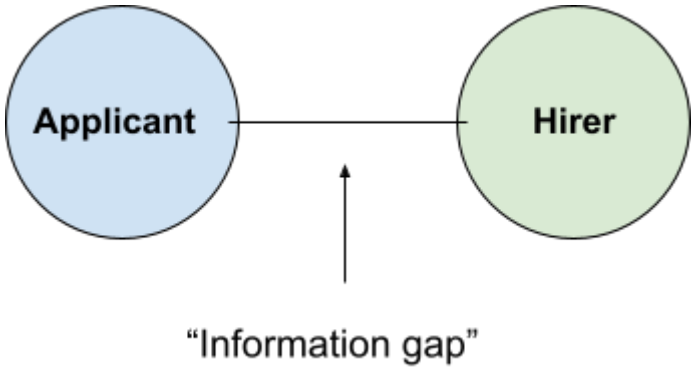
Why are online job search systems inefficient? *(subproblems)*

(1) Applicant sends a high volume of applications to land a job (or even just a interview)
(2) Hirer has a high volume of applications to filter through
(3) The system used by online job search systems fails to accurately match applicants and hirers.

- (A) Inherent algorithmic bias (should reach out to professor Deidre Mulligan for this)
- (B) Human bias/prejudice
- (C) Digital inequality: systems favor certain socioeconomic groups
- (D) Traditional resume submission encourages dishonesty (game theory), which perpetuates likelihood of match, and increases failure of objective and subjective applicant-hirer metrics.

Why does each of these *subproblems* occur?

Subproblems **(1)** and **(2)** occur because of an information gap between applicant and hirer.



Underlying assumption here is that the applicant and hirer's *goals are aligned.* Hirer wants an applicant that can serve the company - and the applicant wants a company in which they have the skills to serve.

The information gap can be characterized as the specific lack of information between the applicant and hirer that is needed for a successful applicant-hirer match.

Objective applicant-hirer match metrics:

- Nature of the work (e.g software engineer, architect, plumber)
- Location
- Pay
- Benefits
- Hours
- Accessibility (e.g office building has wheelchair access)
- etc.

Subjective applicant-hirer match metrics:

- "Culture" fit
- An applicant's potential within the organization
- Attitude
- Personality
- etc.

Applicant-hirer match (defined*)* *Suggestions for improving automation*

An applicant-hirer match metrics is essential just a desire. In this section a desire is also called an "element" (linear algebra terminology).

A match occurs when both the applicant and hirer get at *minimum* what they desire.

An applicant has a set of desires e.g $A_{desires}$ = {F, G, H, M, N, X, Y, Z}

A hirer has a set of desires e.g $H_{desires}$ = {F, G, H, W, N, X, Y, Z}

If the applicant requires minimum 6 out of 8 elements to be willing to accept a job offer, and if the hirer requires minimum 7 out of 8 elements to offer a job, the example above where {$A_{desires}$ = 7 elements & $H_{desires}$ = 8 elements} would be TRUE.

($A_{desires} \geq$ 6 elements & $H_{desires} \geq$ 7 elements) = *True* → Successful Match

($A_{desires} \geq$ 6 elements & $H_{desires} \geq$ 7 elements) = *False* → No Match

The minimum can be defined as the **matchmake threshold**.

This model assumes each element is weighted equally and that they're not conditional on each other (thus independent).

In reality, elements may be co-conditional, and dependent. For example, an applicant may accept a job doing investment banking only if it's in New York, OR alternatively accept a venture capital job but only if both it is in Silicon Valley and the office has a view of skyscrapers. Another example: a job applicant requires an office building with wheelchair access less than 5 miles from a hospital.

These "logical nuances" add complexity to the model, but do not render the model invalid. More can be said about this and a much deeper conceptual model can be developed. For now, just having a working understanding of this model proves useful for the social science analysis we are trying to do.

(There is an assumption here that all elements are objective. Later it should be explained why subjective elements need to be treated differently.)

Lack of precision and low likelihood of match success

There is a **lack of precision** in matching applicants with hirers. Language *obfuscates* the ability to express and interpret desires - what both agents in the transaction really want. In essence the research that ought to be done here to optimize the job hunt is one of improving **communication** between applicants and hirers.

The current system does not adequately weigh, count, and estimate the aggregate of desires (or elements). Why is this the case? Because language is imprecise, and job listings all rely on language.

For example, compare these single elements:

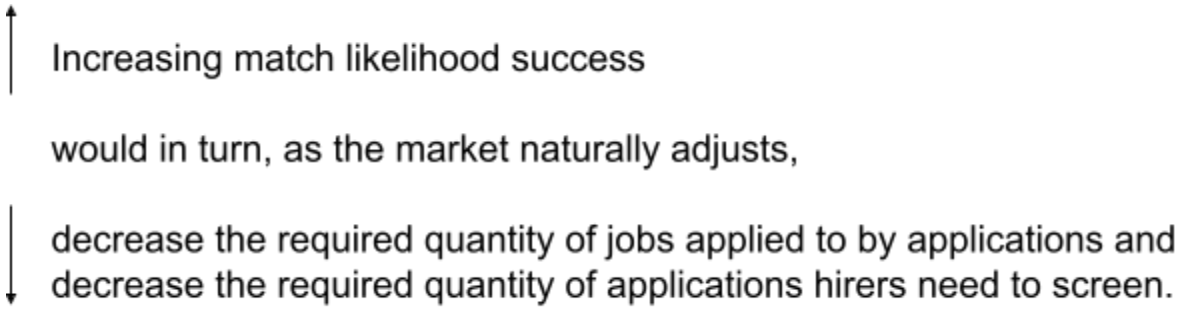
Applicant's desire	Hirer's desire
"Work for at least a year"	"Annual commitment at minimum"

While these two sentences are the same thing, an algorithm or a match-making system might not recognize this. If an algorithm did flag these as logically equivalent, then the likelihood for a successful applicant-hirer match would be increased.

General formula for evaluating likelihood of match success:

A *high* volume of applications with a *low* yield rate = *low* likelihood of match success

$$(Jobs\ Offered)\ /\ (Job\ Applications\ Sent)\ \ =\ \ (Likelihood\ of\ Match\ Success)$$



Dealing with linguistic obfuscation/interpretative variance? (*incomplete)*

There can be interpretative variance in communication - that is to say that the speaker says one thing, and the listener may think the speaker means another thing.

Humans are remarkably good at accounting for interpretative variance. As shown with the example above, the statements “Work for at least a year” and “Annual commitment at minimum” are identified to be logically equivalent. Computers and algorithms cannot do this nearly as well as humans. Hence why the hirer must screen a high volume of applicants resumes - even after an algorithm has filtered it.

How would an AI/ML system improve the likelihood of a successful match? **Opportuneness** and **robustness** as it relates to info-gap decision theory.

Opportuneness: is the likelihood of success (which we’ve defined as
Robustness: is the quality of accounting for failures (AI needs to account for robustness)

(Should reach out to someone with a working understanding of how natural language processing works.)

Being able to quantify opportuness and robustness would improve AI matchmaking.

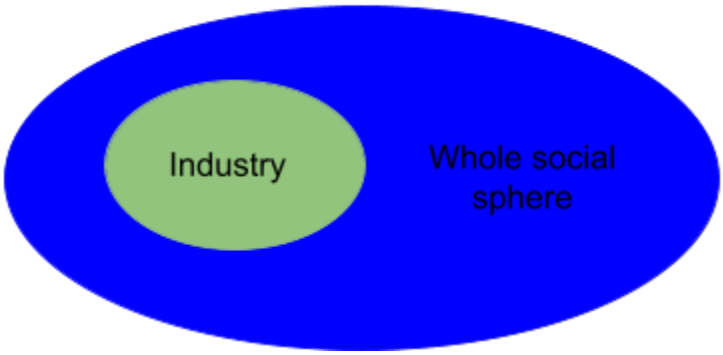
…

Online Competency / Digital Skills (*incomplete)*

Problem **(3)** has many variables/components - all of which are social challenges.

We should differentiate between the social challenges within the industry vs. social challenges that go beyond the industry.

Industry related challenges	vs.	Broader social challenges
(A) Algorithmic bias		(B) Human prejudice/bias
(D) Resume system		(C) Digital Inequality



(A) Algorithmic Bias

Exists because assumptions are required. The assumptions in place are too assuming.

For example, this study shows how a gender score from (-1 to 1) is given to google users to evaluate which job ads should be shown to them first.

(B) Human Bias

Name, age, race, or any identity related quality influences the hiring process too much (insert research here)

(C) Digital Inequality

Skills related. Increasing allocation of resources to schools/socioeconomic communities who do not have access to technology. Increasing education funding.

(D) Resume/Interview System

Discourages integrity by way of the obscuring objective/subjective terms → heightens the need for HR to weed through more resumes.

Can be described in a game theoretical framework per the prisoner's dilemma:

This example describes early recruiting.

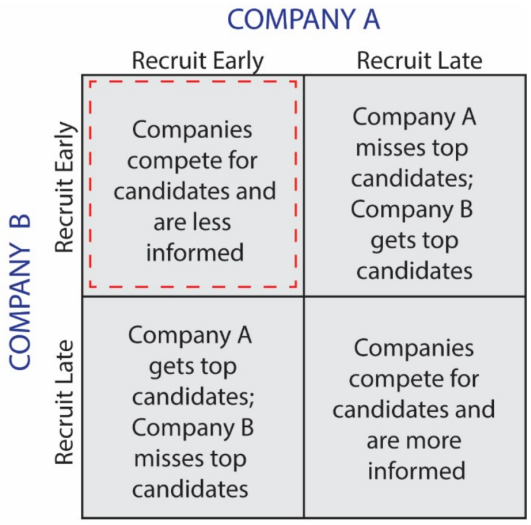
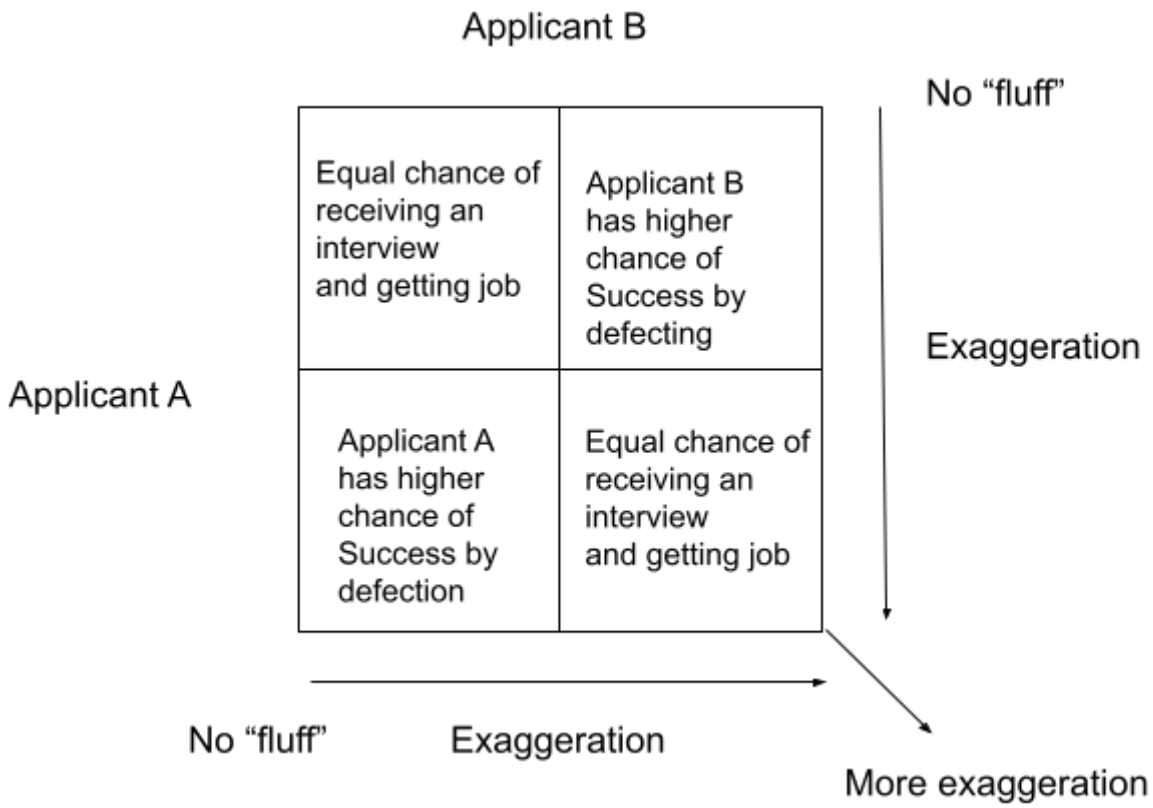


Image from this article

But we can illustrate how dishonesty is perpetuated with this model.

Game theoretical Nash solution: Applicants A and B exaggerate to the point that they maximize the likelihood they get hired while still not being perceived as dishonest to the point they do not get hired.



BUT in reality, Applicant A and B may get away with different levels of exaggeration because of how candidates are perceived → SOCIAL bias.
*Asymmetry from candidates' **perceived identities***