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Fairness and Robustness in Algorithmic Recourse

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What is algorithmic recourse?

Algorithmic recourse is the idea individuals should have the ability to take **action against the outcome** of an algorithmic decision-making system

Recourse is concerned with answering two questions:

> (1) <u>Why</u> an outcome was produced by the system
> (2) <u>What</u> can be done in order to reverse it

The "lending" example

In the US, algorithms are currently being used to evaluate **whether or not an individual is approved for a loan**

If they are denied, the US government requires that be given an **adverse action code,** ex. 02-Too much outstanding debt

Algorithmic recourse would mean telling individuals **what actions they can take** so that if they **re-apply for a loan**

The critical importance of recourse

(1) Many have argued that providing recourse is **morally good and equitable**, particularly for marginalized groups

(2) Recourse can **improve systems**

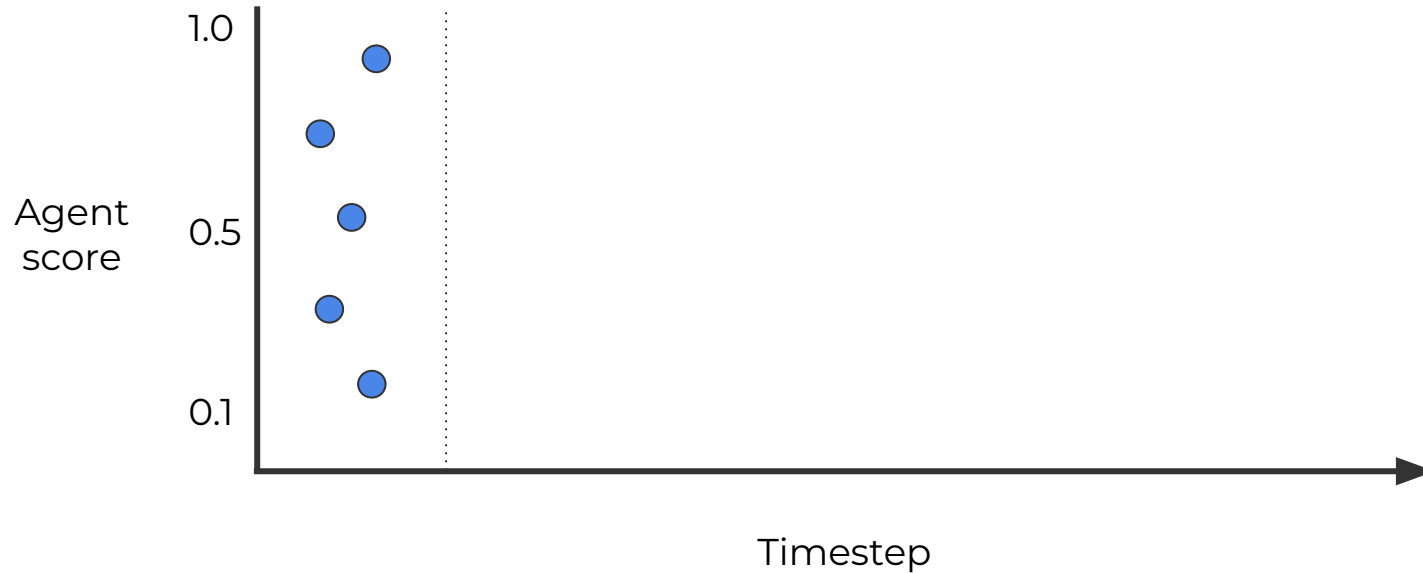(3) Recourse will likely soon **be codified into law**

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TECH

EU lawmakers pass landmark artificial intelligence regulation

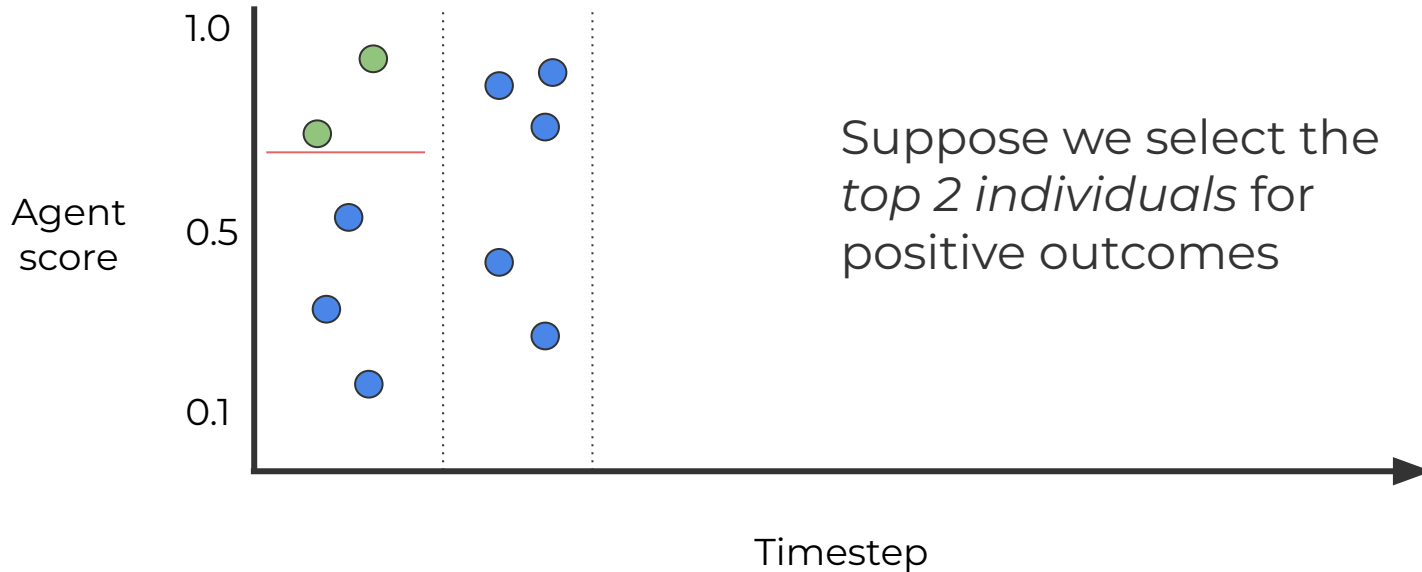PUBLISHED WED, JUN 14 2023•9:45 AM EDT | UPDATED WED, JUN 14 2023•1:28 PM EDT
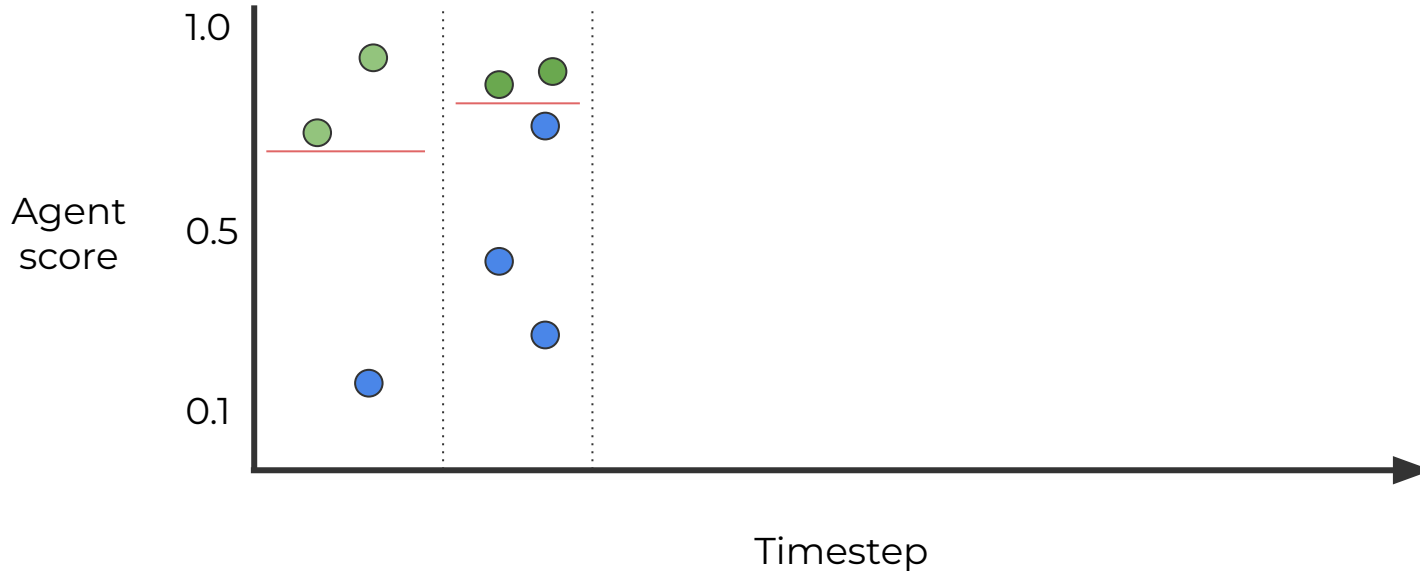
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Challenges

Expectations may not always be met due to a continually changing environment over time

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Suppose we select the *top 2 individuals* for positive outcomes

Expectations may not always be met due to a continually changing environment over time

More info here: *https://dl.acm.org/doi/pdf/10.1145/3617694.3623251*

A fair model does not imply fair recourse
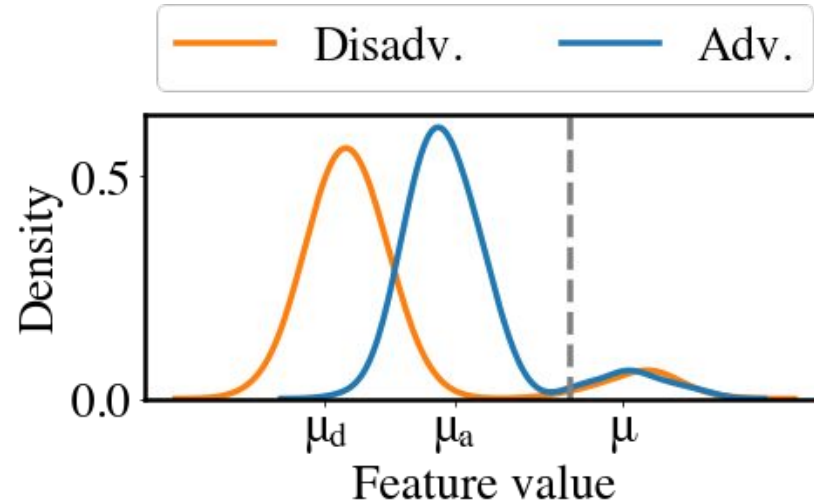
Imagine we select individuals *to the right of the grey line* for positive outcomes. While selection would be equal number, **Disadv. individuals would have to put in significantly more effort to achieve recourse.**

Equality of Opportunity

Equality of Opportunity is a philosophical doctrine that aims to remove morally irrelevant barriers to the attainment of desirable positions

In many contexts, the starting position of individuals attempting recourse is *morally irrelevant*, implying that **equal effort between individuals should result in an equal chance at the outcome**

The "schools admissions" example

Imagine two students are denied for a gifted program at their college, where their application was evaluated by an algorithm that offered recourse to denied students via recommendations like **"improve your math score by X%."**

Imagine that one student is accepted when they apply next semester, but the other has *worse starting conditions that were completely outside of their control*, and is not accepted even after they re-apply three times, **substantially improving their score**.

Naturally, due to limited capacity, there will always be a cut-off for the program --- but the amount of effort a student exerts may itself be a signal for admission.

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Fairness metrics for recourse

Metric name	Definition
Effort-to-Recourse	Measures the amount of effort *per successful recourse event*
Time-to-Recourse	Measures the amount of time *per successful recourse event*
Recourse Reliability	Measures the robustness of recommendations given at time *t* relative to a future time *t* + *y*

More info here: https://arxiv.org/abs/2401.16088
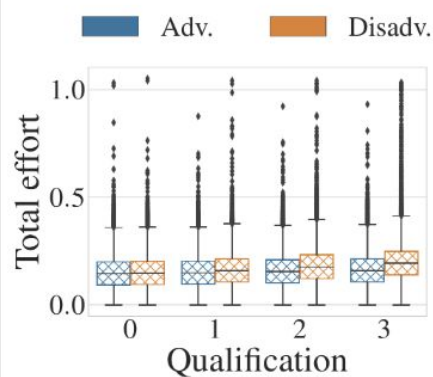
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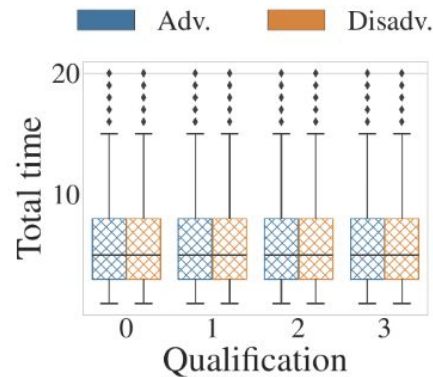# Results of mitigating bias on recourse
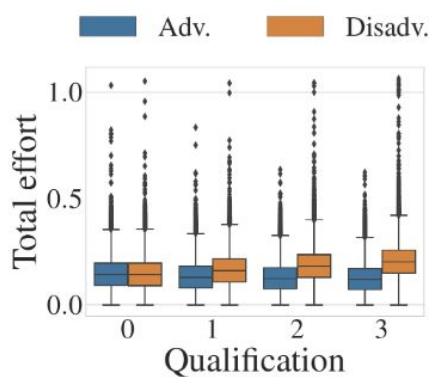
(a) Total effort
Without mitigation
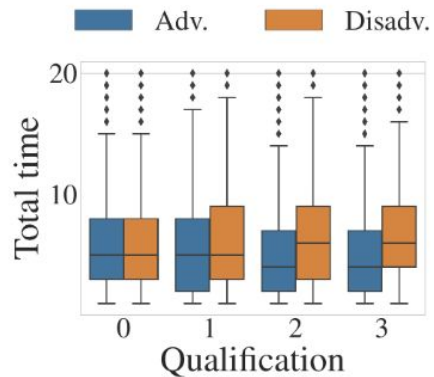
(b) Total time
Without mitigation

(c) Total effort
With mitigation

(d) Total time
With mitigation

Mitigation method described here: https://arxiv.org/abs/2401.16088