# Inferring Intrinsic Costs in Natural Behavior through Inverse Reinforcement Learning

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## SUBMISSION DETAILS

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**Presentation Abstract Summary** Understanding sequential visuomotor behavior in the wild will likely require computational, algorithmic, and implementational level explanations. One difficulty in natural behavior is the unknown underlying reward structure. Here we model visuomotor navigation in humans in the framework of optimal control and use inverse reinforcement learning to infer the costs and benefits underlying sequential navigation decisions. The proposed method obtains maximum a posteriori estimates of the costs contributing to observed navigation behavior on a subject-by-subject and trial-by-trial basis. Crucially, variability across trials is not modeled as noise, but arises from structured decision uncertainty. We validate the method on a battery of synthetic datasets. We then apply the method to data from subjects, who were instructed to navigate a walkway, avoid obstacles, and pass through via points in a naturalistic looking virtual reality walking environment. The results show, that meaningful rewards can be extracted, that averaging trajectories would remove variability that is crucial for inferring the underlying reward structure of the tasks, that inferred costs transfer between conditions, and that subjects seldom carried out the tasks instructed by the experimenter, but their trajectories instead were influenced by additional intrinsic costs. Overall, the methodology offers a normative account of human visuomotor navigation.

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### Keywords

| Keywords |
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