Modeling temporal attention in dynamic scenes: Hypothesis-driven resource allocation using adaptive computation explains both objective tracking performance and subjective effort judgments

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Abstract

Most work on attention (in terms of both psychophysical experiments and computational modeling) involves selection in static scenes. And even when dynamic displays are used, performance is still typically characterized with only a single variable (such as the number of items correctly tracked in Multiple Object Tracking; MOT). But the allocation of attention in daily life (e.g. during foraging, navigation, or play) involves both objective performance and subjective effort, and can vary dramatically from moment to moment. Here we attempt to capture this sort of rich temporal ebb and flow of attention in a novel and generalizable adaptive computation architecture. In this architecture, computing resources are dynamically allocated to perform partial belief updates over both objects (in space) and moments (in time) flexibly and according to task demands. During MOT this framework is able to explain both objective tracking performance and the subjective sense of trial-by-trial effort.