I recommend that the recommender recommends…:

How **habit learning** shapes **information receptivity & search behaviour**

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Processing latency

Initial biases

Response caution

Task difficulty

User The level at which existing mental models are activated. It includes pre-established links between actions and outcomes or between different states, which people use to simulate future scenarios.

States of **accessibility**

Access to increasingly complex mental models is inhibited under states of stress (Otto et al., 2013). Instead, people have an enhanced ability to extract and rely on simple regularities in an information stream (Tóth-Fáber et al. 2021).

During information search, a person must distinguish relevant and irrelevant information.
1a) Anxiety may broaden selective filtering for topics due to a bias towards information seen as threatening.
1b) Anxiety may enhance receptivity to low quality information, due to an overreliance on the statistical properties of the environment.

Information Reflects how prepared someone is to update their expectations when outcomes differ from predictions, generating an internal signal prompting a memory update.

States of **receptivity**

Higher states of receptivity may be initiated when information is simpler and more efficiently processed. For example, it is easier to process new information about trivial topics compared to issues central to a person's worldview (Ecker & Ang, 2019).
2a) An increase in the emotional valence of the content accelerates the speed of evidence accumulation for truth evaluations.
2b) An increase in the emotional valence of the content reduces the ability to distinguish true from false claims

Environment Describes the context in which information is encountered.

States of **sequentiality**

Repetitive sequences are associated with greater memory for surprising information (Ben-Yakov et al., 2022), while noisy sequences are associated with greater memory for confirming information (Wu et al., 2023). States of receptivity may therefore rely on an enhanced ability to track the statistical properties of the sequence.
3a) People who are frequently affirmed in their initial expectations will have a reduced ability to discern truth in a subsequent task.
3b) People who are frequently refuted in their initial expectations will have an enhanced ability to discern truth in subsequent task.
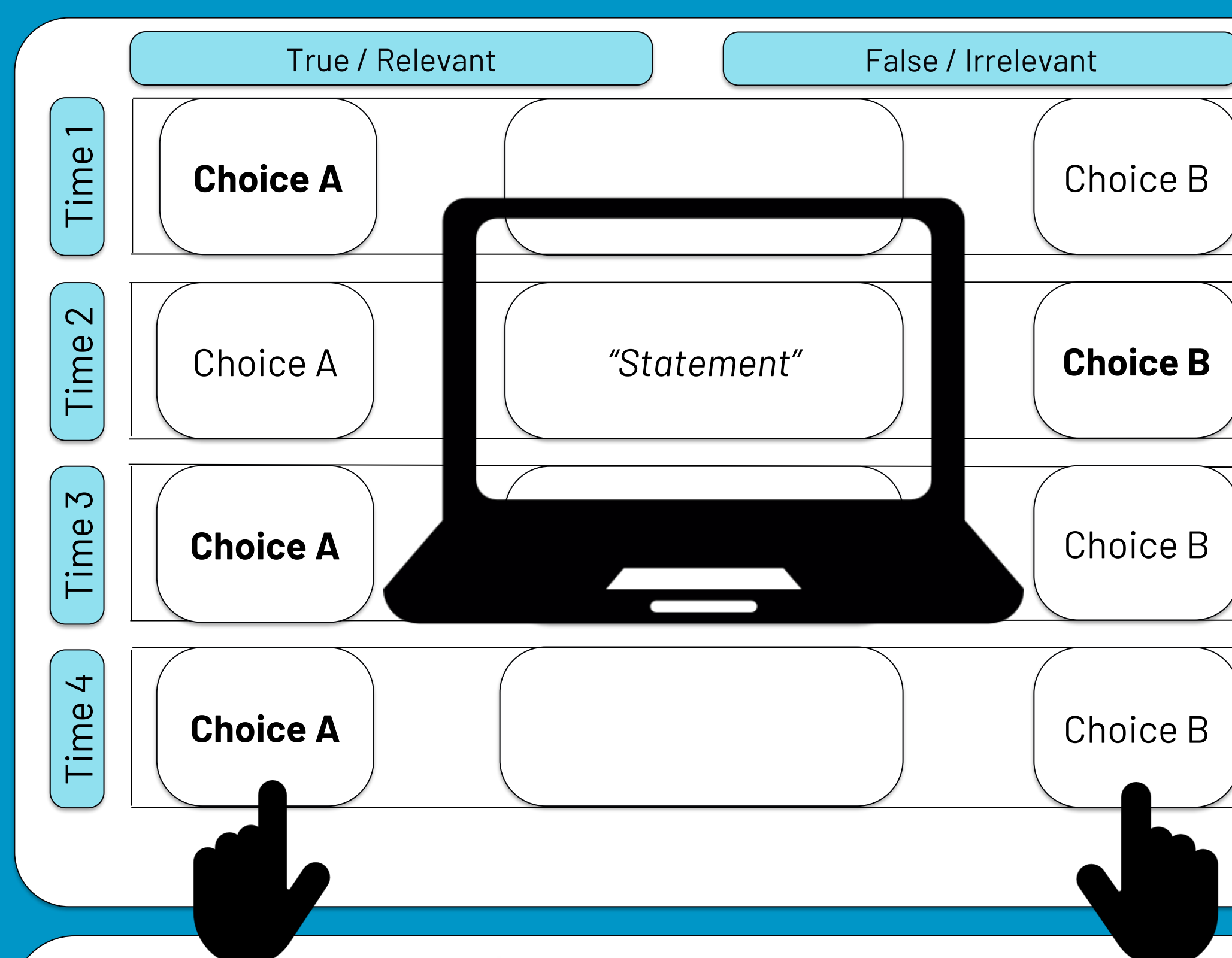
The DDM framework can generate hypotheses concerning the cognitive thresholds that govern receptivity to low quality information. These hypotheses serve as a basis for applying **Bayesian inference methods**, which in turn yield precise mathematical criteria for determining when an individual is likely to initiate or suppress receptivity states in shifting environments. This could be useful for integration into SR systems.

Introduction

- Information in online spaces, due to an abundance of low quality or outright false information, has only partial observability, meaning that the indicators for its relevance to an information need or veracity are highly imprecise.
- Whether new information should affect learning depends on if it represents the typical range of outcomes or signals an environmental change.
- Successful learning from online information depends on estimating both expected uncertainty (variability in quality) and unexpected uncertainty (changes in variability).
- As crises (e.g., COVID-19) emerge or users transition between platforms (e.g., from Instagram to Twitter), habitual states may develop that affect receptivity in separate contexts.
- Understanding these uncertainties and their interactions is crucial for elucidating how sequential recommenders induce habitual attention states that facilitate biased reasoning processes.

Research Aim: To track the receptive states that users occupy when processing sequenced information.

Research Question: How does sequenced information maintain consistent elements across multiple decisions in a way that may reinforce updating strategies that interfere with separate contexts?

Experimental Paradigm

	True / Relevant	False / Irrelevant	
Time 1	**Choice A**		Choice B
Time 2	Choice A	*"Statement"*	**Choice B**
Time 3	**Choice A**		Choice B
Time 4	**Choice A**		Choice B

Adapted Predictive Inference Task

- A series of rapid decision-making trials.
- Each trial features a brief headline/topic.
- Trials, in one condition, form a series that provide feedback to users according to an unknown distribution.
- Trials, in another condition, form a series where feedback reflects only random fluctuations.
- This manipulation assesses how users adjust their learning strategies when faced with different levels of uncertainty in the environment.

Group-level comparisons of:
(i) Choice data
(ii) Response times
(iii) Task conditions
(iv) Individual differences

Drift Diffusion Modelling (DDM)

Response density (Choice A)

Encoding (Ter)

Drift rate (v)

Time (ms)

Starting point (z)

Boundary separation (a)

Response density (Choice B)

DDM accounts for decision-making as the noisy accumulation of evidence. Studies in cognitive psychology have validated that systematic changes in task conditions reliably alter DDM parameters, taken to represent states in information processing.

v Reflects how clearly information accumulates, making decisions faster when data is clear and slower when noisy.

a Reflects how much evidence is needed before deciding, with higher values indicating more cautious decision-making.

z Reflects any initial bias or preference that shifts the decision process before new evidence is added.

Ter Reflects the time taken by processes outside the decision, like perceiving inputs and executing outputs.
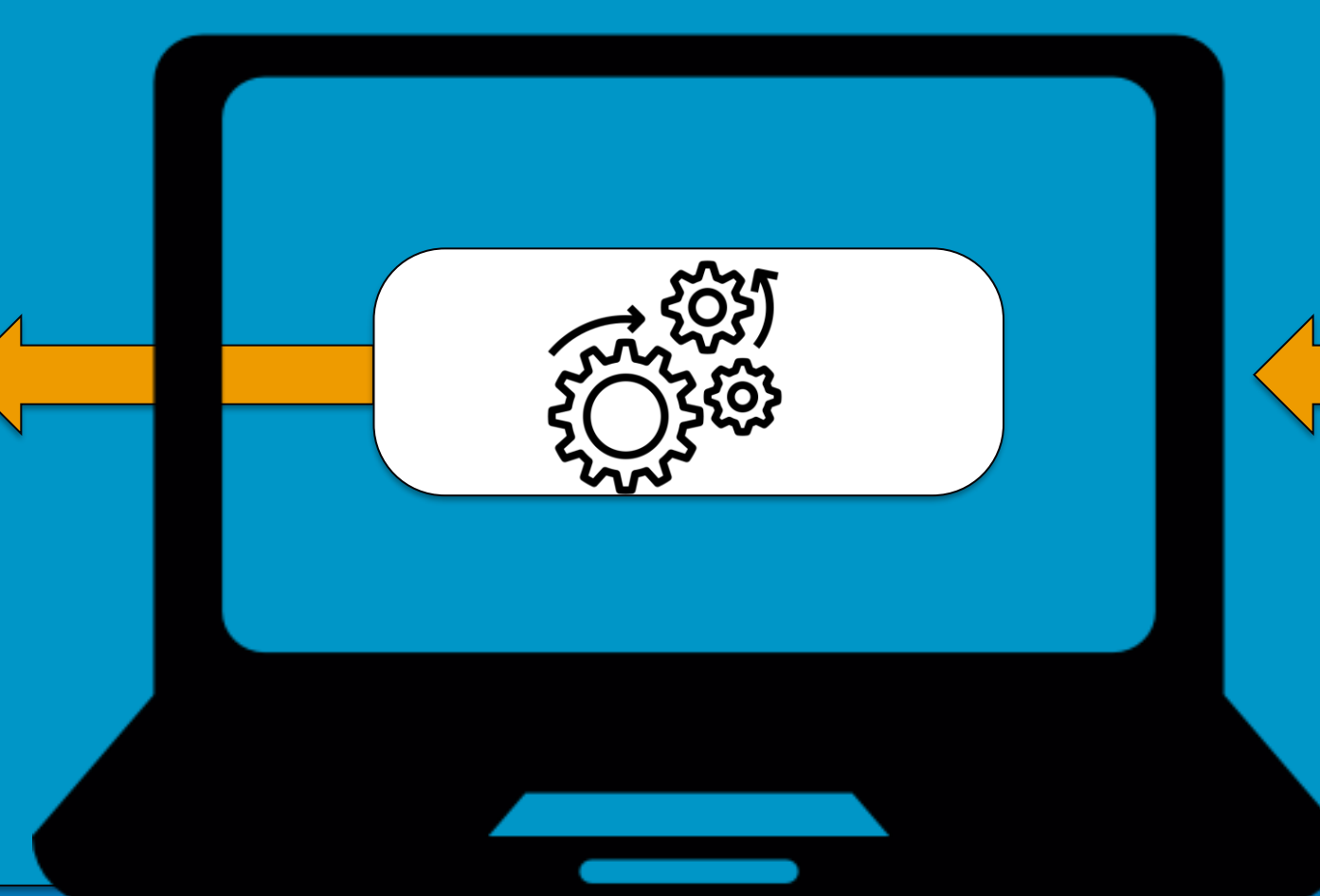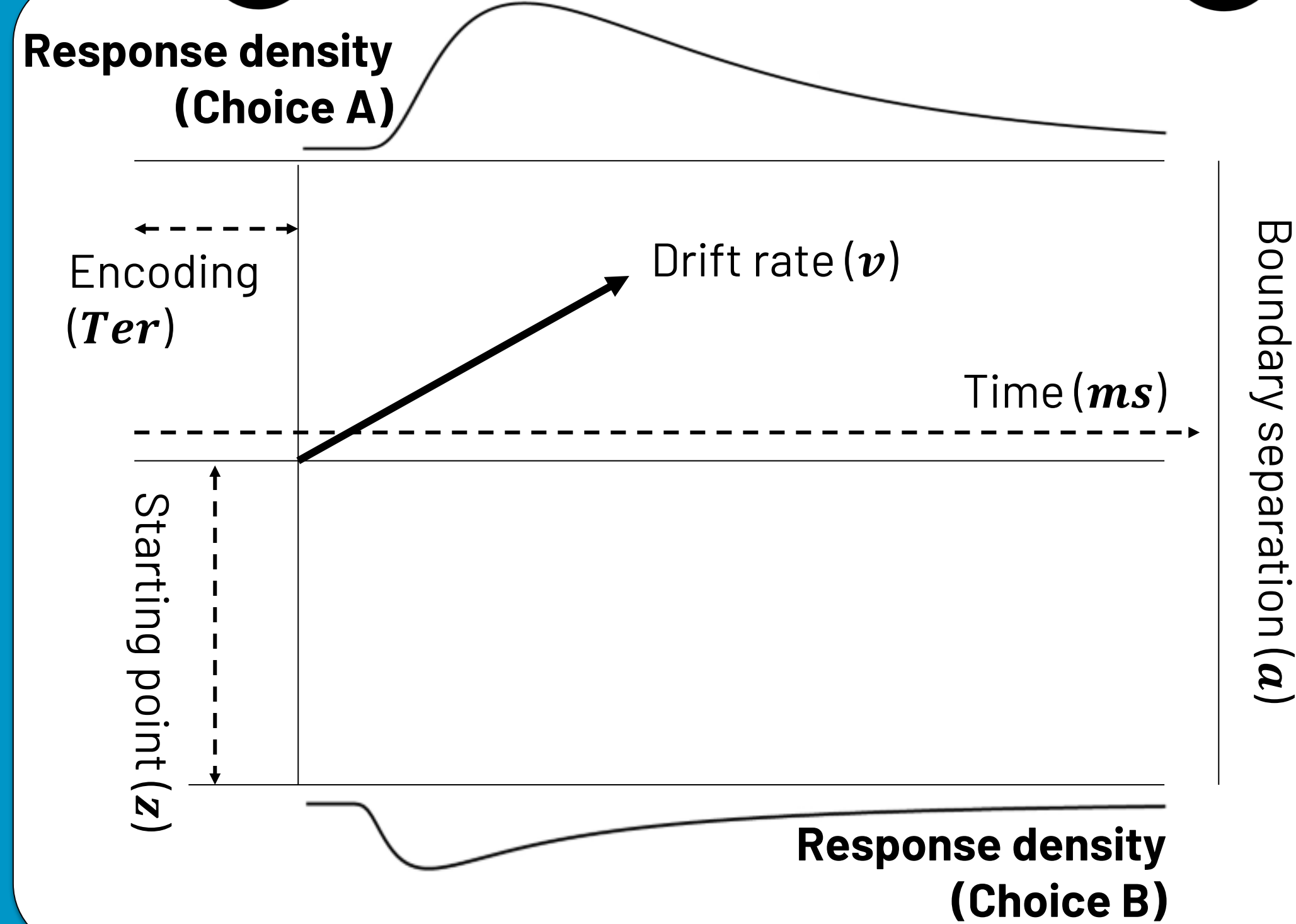
Accuracy (Expectation-confirming)

"Evidence supporting topic A"

"Evidence supporting topic A"

"Evidence supporting topic A-

"Evidence supporting topic A"

Sequences tailored to assess and modify learning rate

The user is in a state of high **receptivity**, indicated by rapid and low-quality choices.

The user is in a state of low **accessibility**, indicated by a preference for simple or easily processed information.

The user is in a highly volatile **sequenced** environment, with an increasing availability of low-quality information.

Weighted value

Bias-aware sequential recommenders

Diversity (Expectation-violating)

"Evidence opposing topic A"

"Evidence opposing topic A"

"Evidence opposing topic A"

"Evidence opposing topic A"

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