


Introduction to DDM

II CMB workshop

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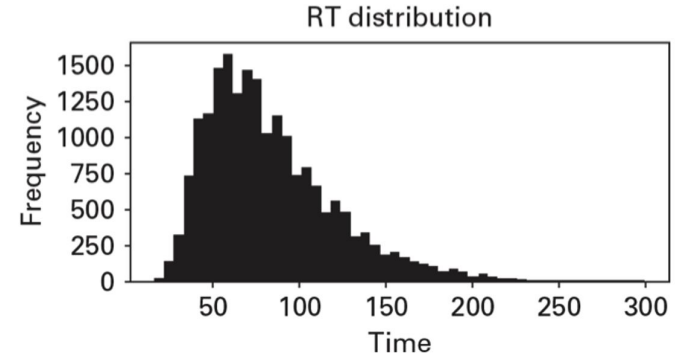
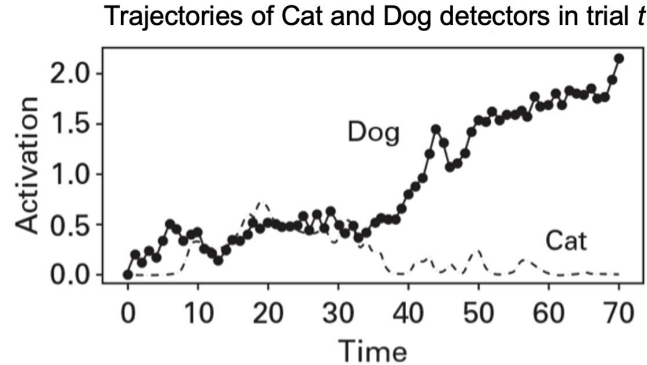
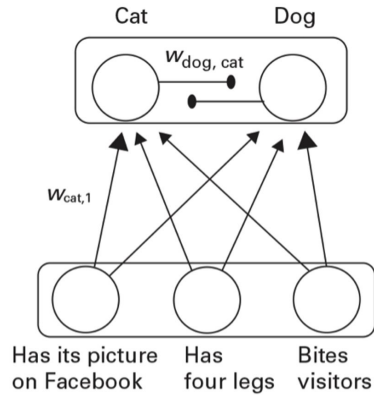
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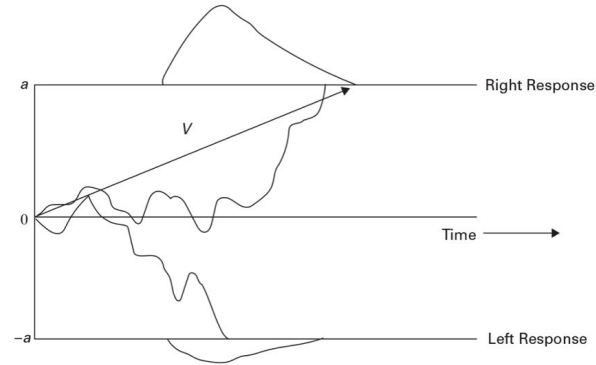
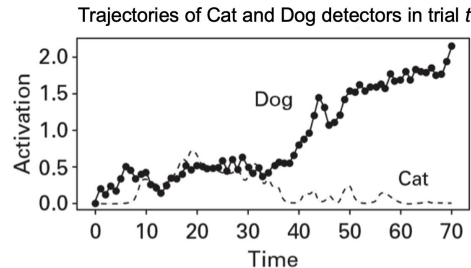
Modelling decision making

- Decision making can apply to any situation where an agent must choose between two or more actions
- “Is this a cat or a dog?”

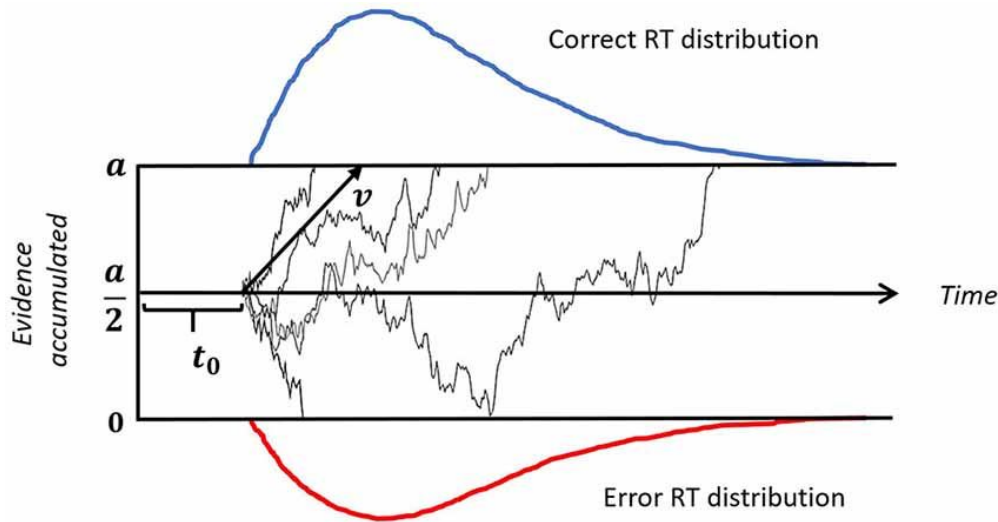


Modelling decision making – the Drift Diffusion Model

- Popularized in Psychology by Ratcliff (1978)
- In the DDM, a key aspect is the difference between the activations of the different (e.g. cat / dog) detectors
- When the difference reaches a threshold, the agent “decides” that the stimulus is a dog / cat



DDM main parameters

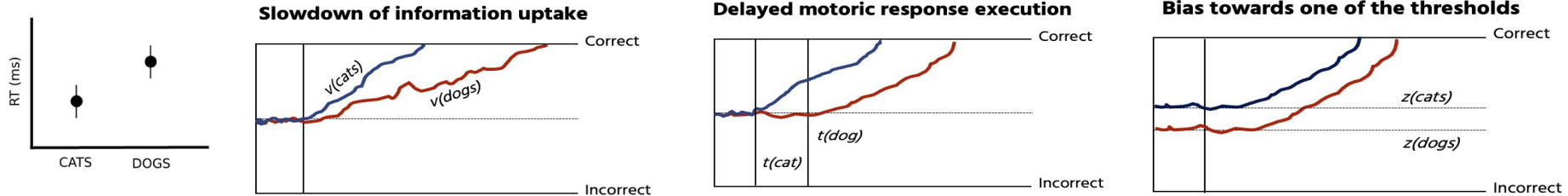


DDM models decision making as a noisy accumulation of evidence:

- **Drift rate (v):** average slope of the decision trajectory, that is, speed of information uptake
- **Threshold separation (a):** amount of information considered for a decision
- **Starting point (z):** point where the accumulation process starts. Reflects bias towards one of the thresholds
- **Nondecision time (t):** it captures all processes not related to the decision process. Reflected in rightward shifts in the RT distribution

DDM in Psychology

- Very popular in Psychology because it allows to fit RT and ACC simultaneously (i.e. common behavioral metric)
- Different cognitive processes are mapped to different **psychologically meaningful parameters**.
- Moreover, these parameter estimates are less noisy than RT or ACC alone, which improves reliability and effect sizes
- The promise is to gain information not only about whether participants are slower (or less accurate), but also **why**:

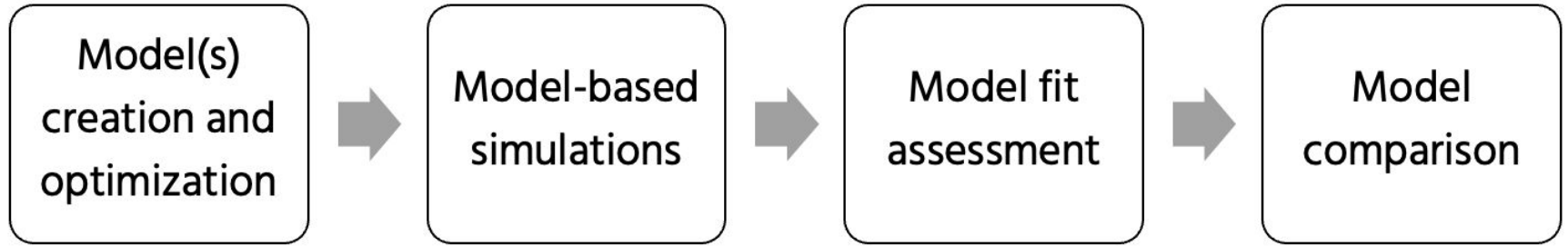


DDM in Psychology

DDM disentangles a number of intuitively appealing concepts:

- Changes in **drift rate** can express:
 - Stimulus quality
 - Participant ability
 - Decision difficulty
- Changes in **threshold** can express:
 - Cautiousness
 - Speed-accuracy trade-off (higher threshold entail slower but more accurate responses)
- Changes in **starting point** can express preference of a response threshold:
 - Reward
 - Priming
 - Proportion effects
- Changes in **nondecision time** can express:
 - Differences in basic encoding processes
 - Configuration of WM for a task
 - Differences in motoric processes related to response execution


DDM in Psychology



Mehdi

Thank you!

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