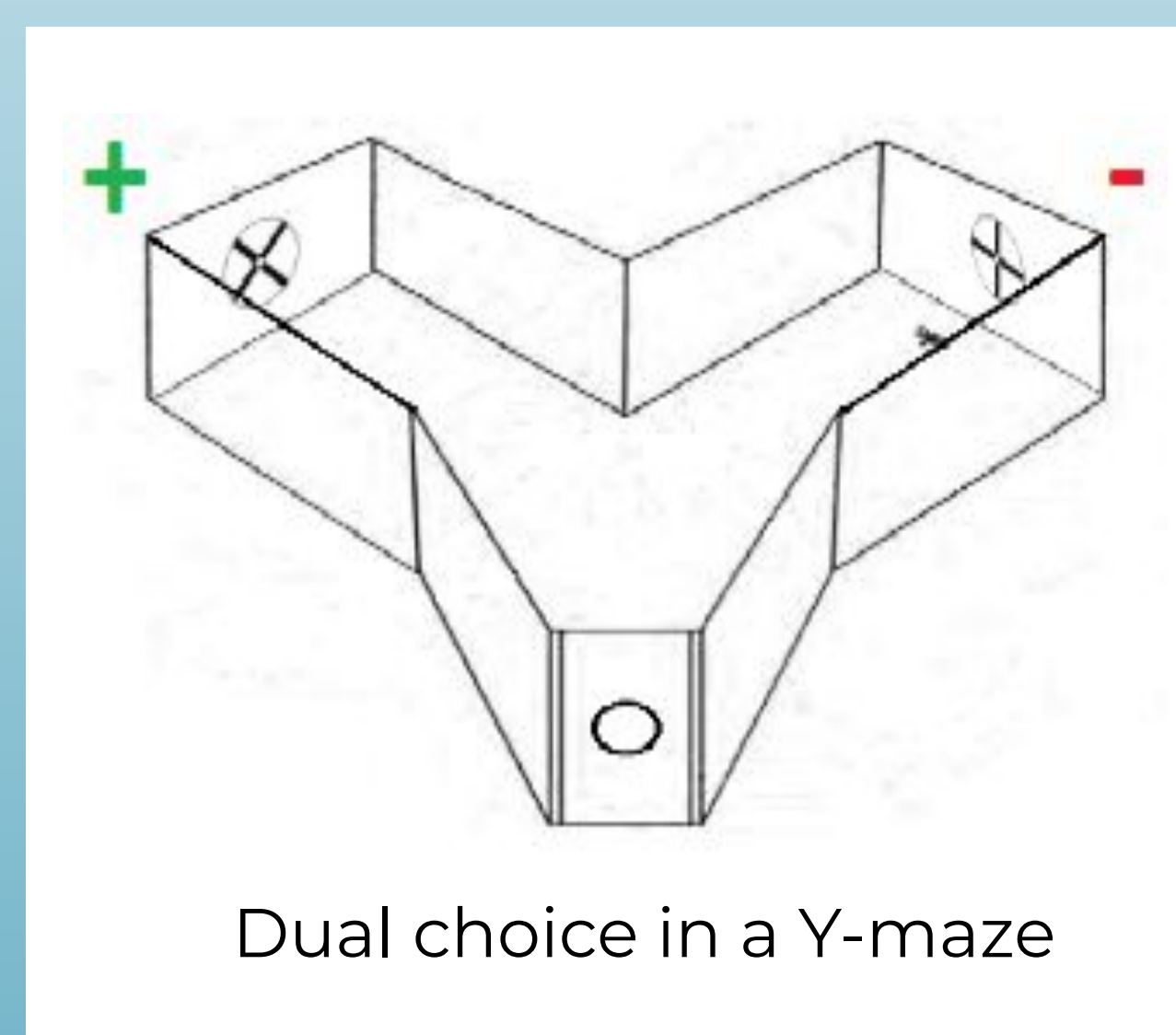
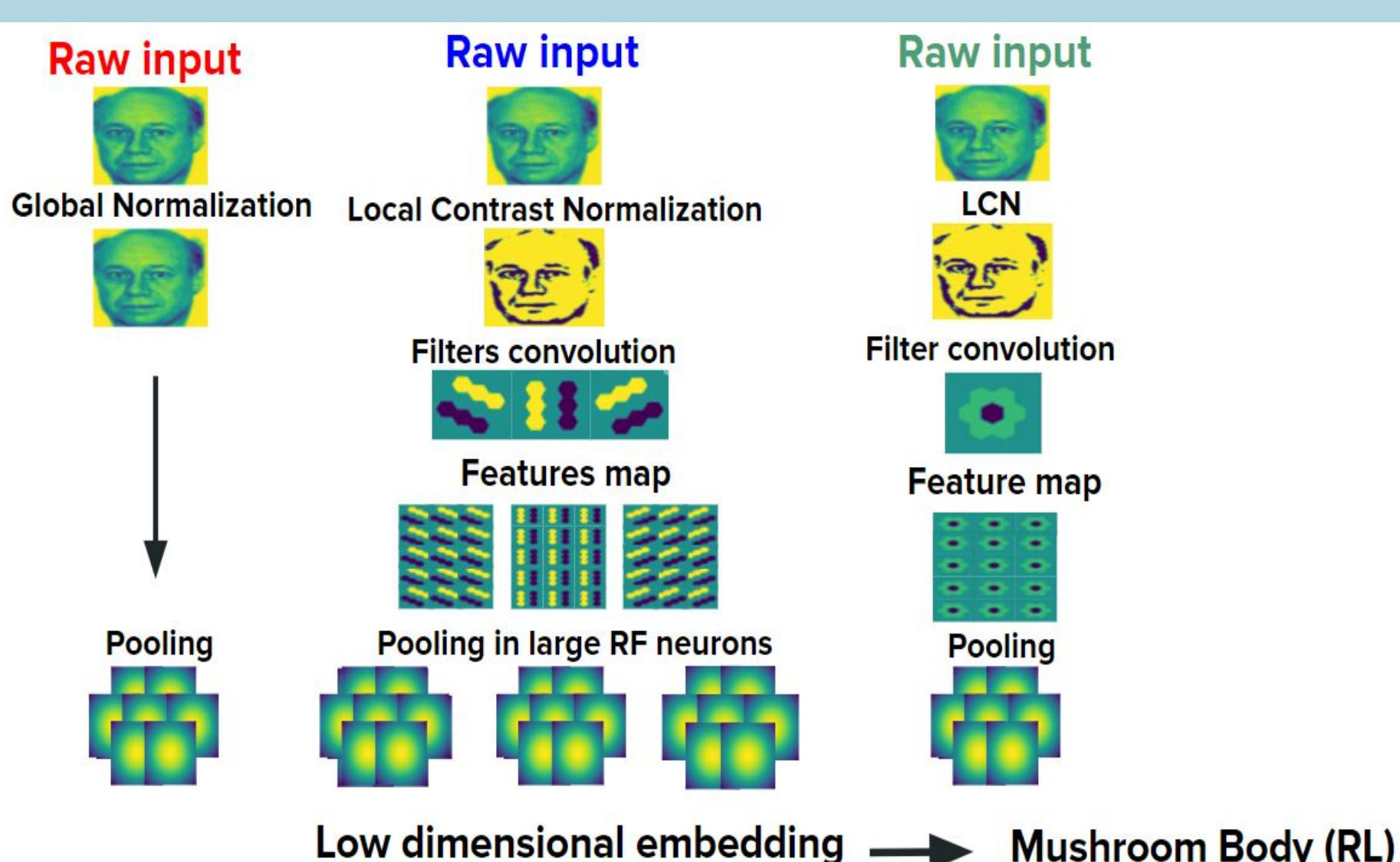


# A mechanistic model of honeybee visual discrimination

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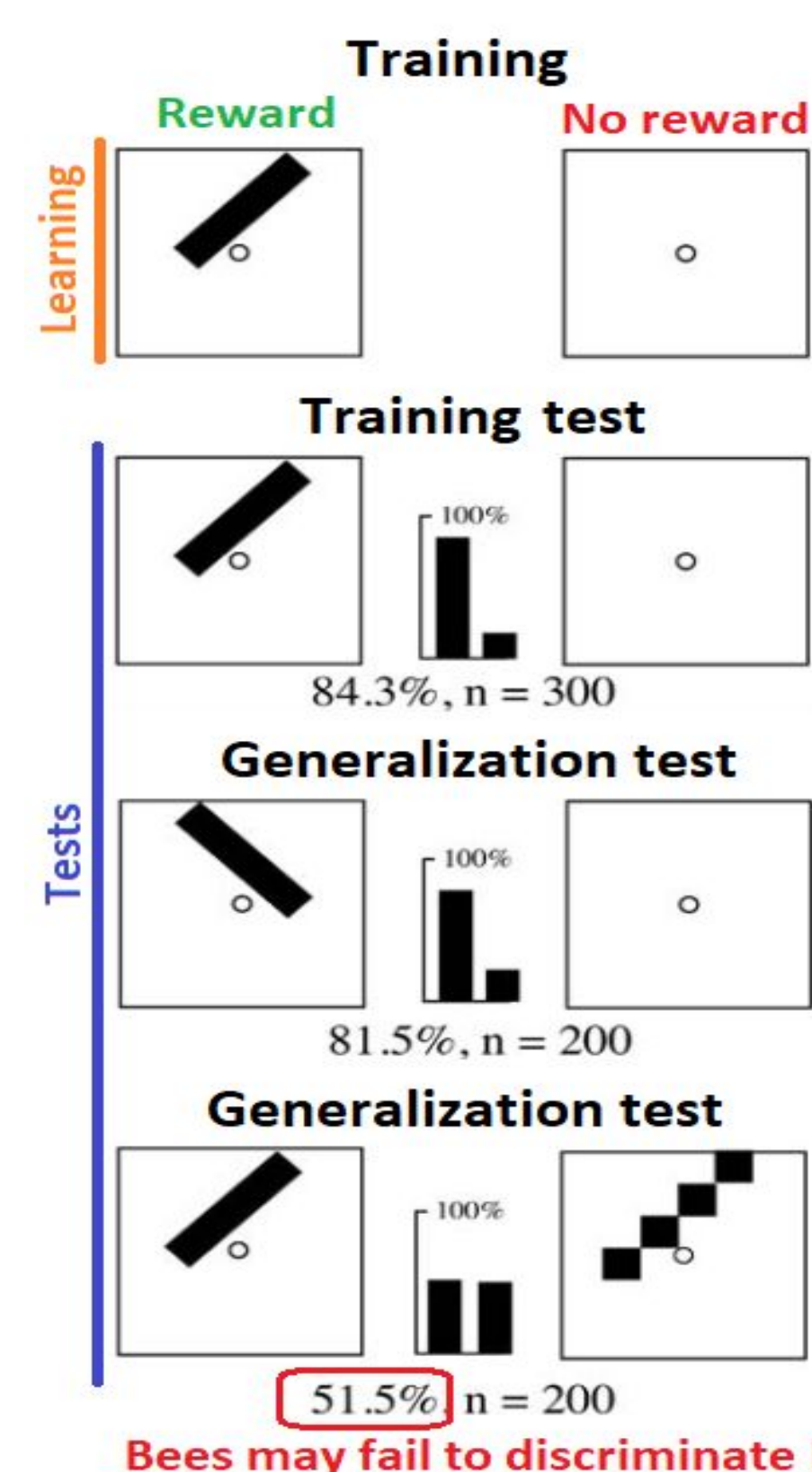
## Introduction

- The Mushroom Body (MB) is critical for navigation and visual learning [1,2].
- The visual input from the Optic-Lobe (OL) to the MB is poorly understood.
- We design a model of the honeybees visual projections from OL to MB, constrained by neurobiological data and inspired by behavioral findings [3].



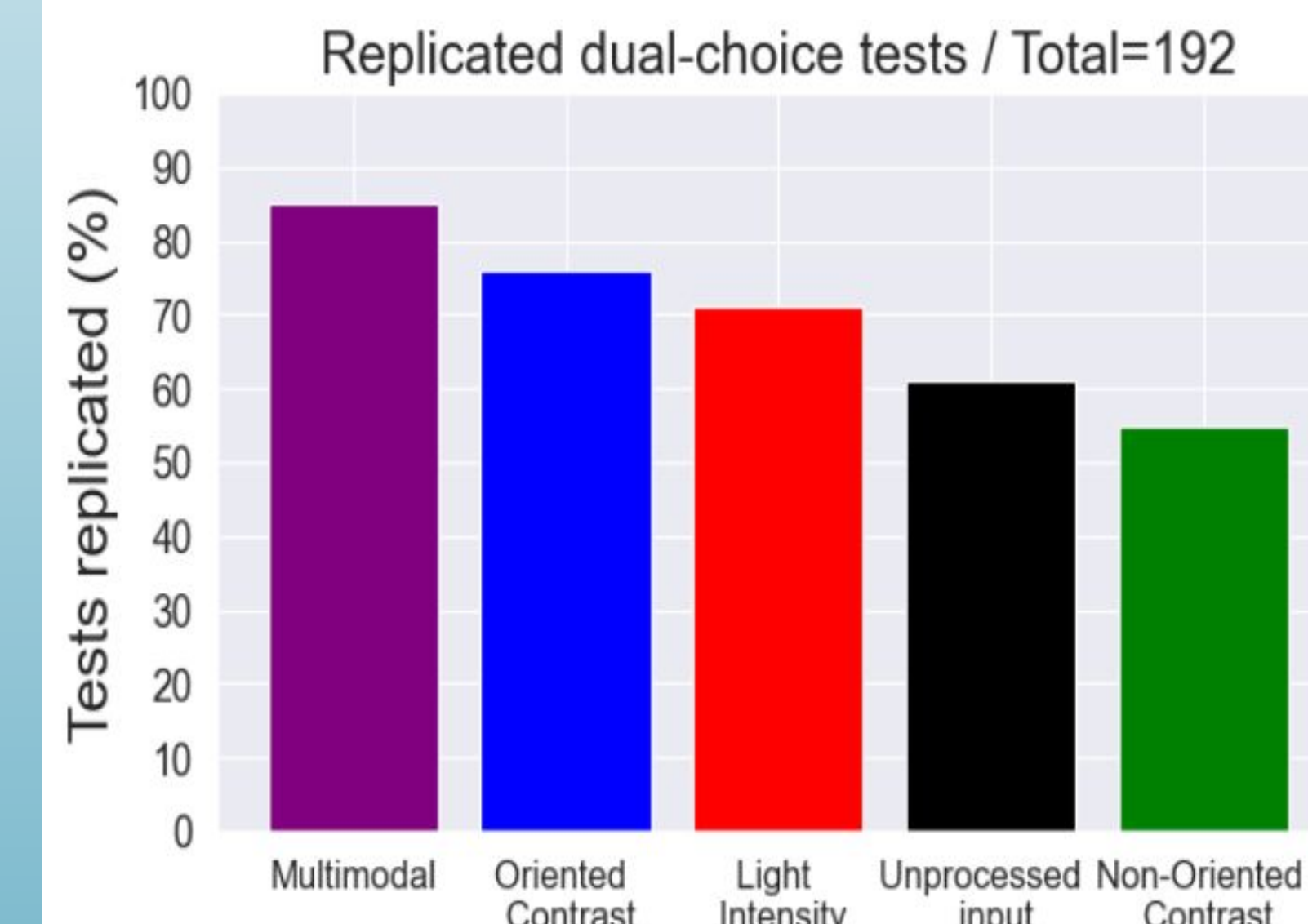
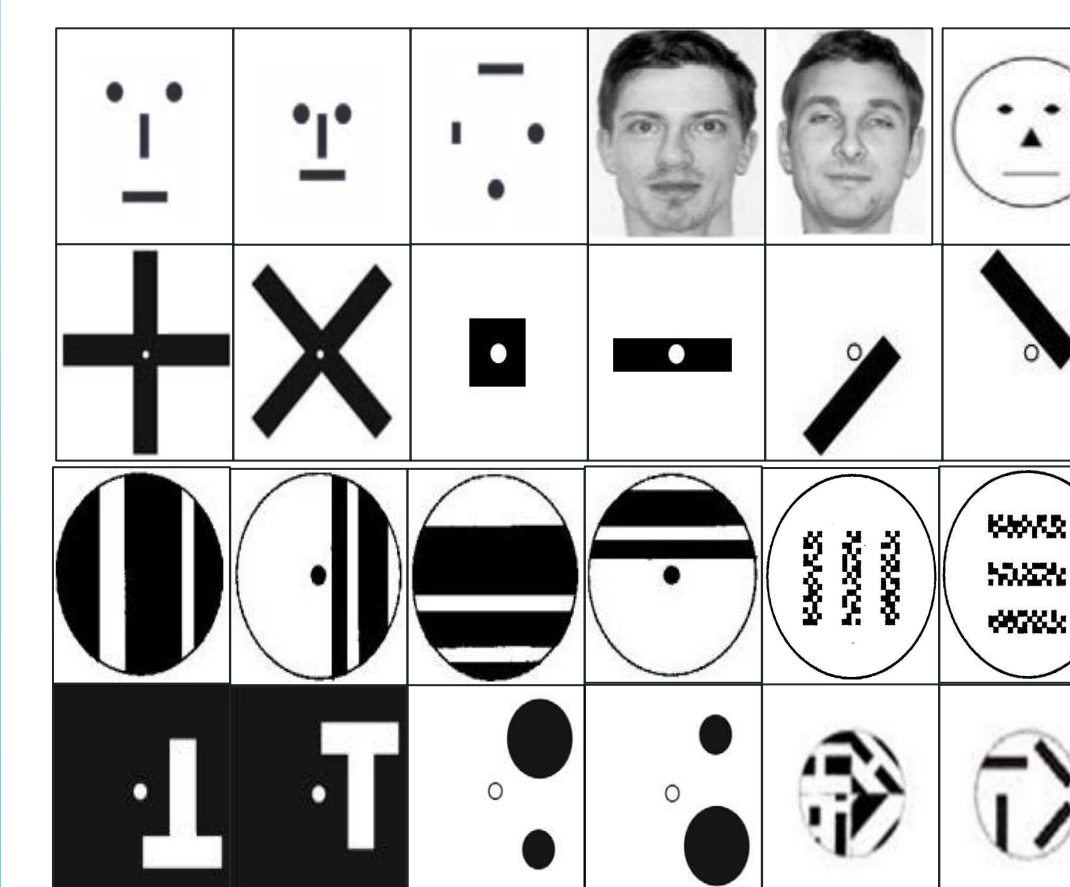
## Methods

- Model extracts **light-intensity**, **oriented-contrast** and **contrast**.
- Small feature are pooled linearly in large RF.
- 400d vector output resembling the bottleneck of projections from OL to MB [5].
- MB modelled by a RL algorithm, following [6].
- We simulate 192 Y-maze dual-choice tasks originating from behavioural studies. These include discrimination between position of cues, edge orientation, shapes, and faces [3,4,7,8].



## Results

- The model replicates 85% of the experiments.
- All face related tasks are replicated.
- Bees failure to discriminate are replicated by the model



## Conclusion

- Bees' visual perception for discrimination and spatial learning could be based on a shallow parallel network with fixed-weight.
- Studies reporting shapes and face-recognition abilities in bees can be replicated using this simple model.
- We aim to explore the relevance of this model for spatial navigation, e.g. for generalisation and robustness against noise.

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