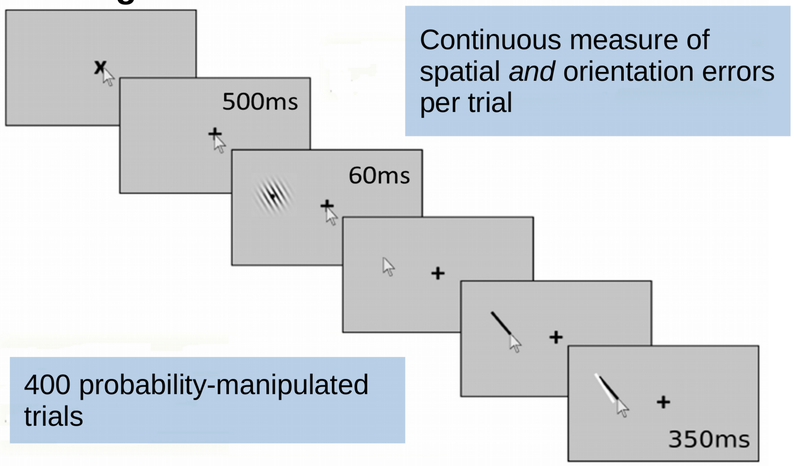
Spatial Probability Improves Detection, Orientation Probability Improves Precision: Modelling as Neural Gain versus Tuning

Syaheed B. Jabar[1] & Britt Anderson[1,2]

[1]Department of Psychology, University of Waterloo, [2]Centre for Theoretical Neuroscience, University of Waterloo

How does probability affect perceptual precision?

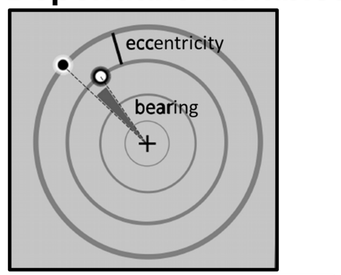
Paradigm

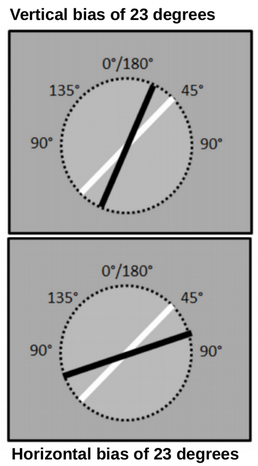


Continuous measure of spatial *and* orientation errors per trial

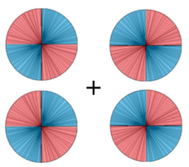
400 probability-manipulated trials

Dependant Variables

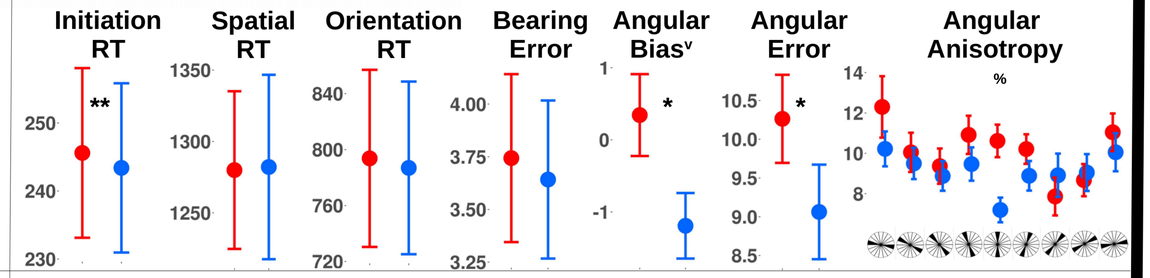




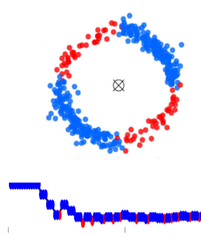
Experiment 1 : Orientation Probability



80 %
20%

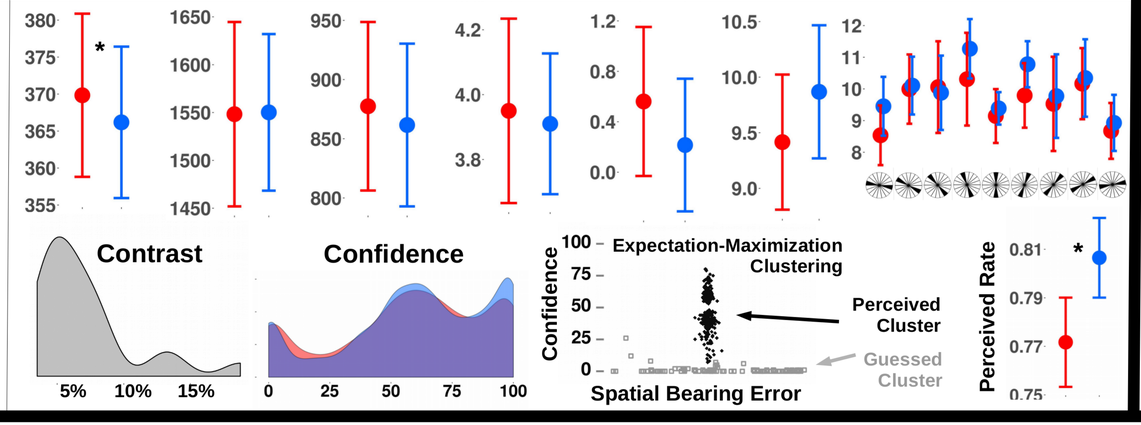


Experiment 4 [n] : Spatial Probability

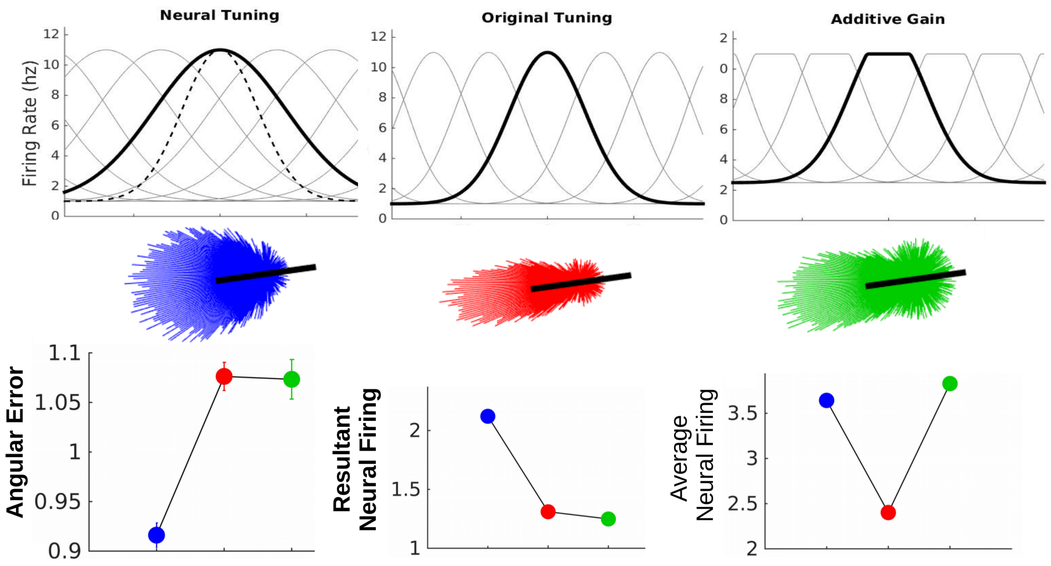


80 %
20%

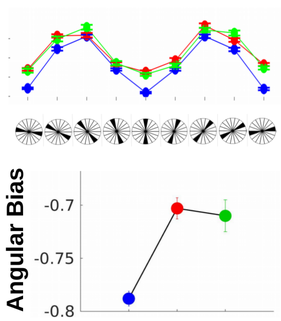
3 up, 1 down staircase procedure to lower contrast



Population Vector Coding (V1)



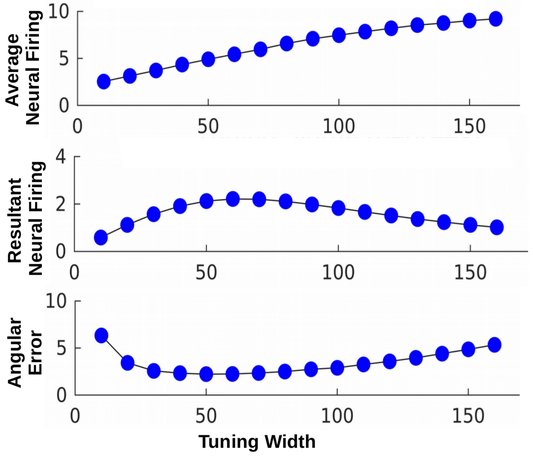
Modelled Anisotropy[#]



Introducing tuning differences across orientations can account for :

1) anisotropies
2) biases

Optimal Tuning



Neural tuning, like orientation probability, increases precision

Neural gain, like spatial probability, only increases detection, not precision

^ Confidence measure only used in Experiment 4

^v Negative bias refers to a vertical bias

[n] Experiments 2 & 3 manipulated spatial probability without lowering contrast. No effect of manipulation on precision measures

\# Vertical-preferring neurons given broader tuning, horizontal-preferring neurons given narrower tuning *(Li, Peterson & Freeman, 2003)*

*p<.05, pairwise, **p<.05 across trials

[%]2 way interaction, p <.05

syaheed.jabar@uwaterloo.ca

This work was sponsored by an NSERC grant