Test of Goodness for Population Receptive Field Estimates

simulation study

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Stimulation

We first used the exact drifting bar stimululation in Dumoulin and Wandell, 2008:

fMRI Signal Modelling

BOLD response model

$$B(t) = \mathcal{H}(\quad r(t, \Theta = \theta)) + e(t)$$

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Linear or Non-linear HRF function

fMRI Signal Modelling

assumed pRF response (neuronal response)

BOLD response model

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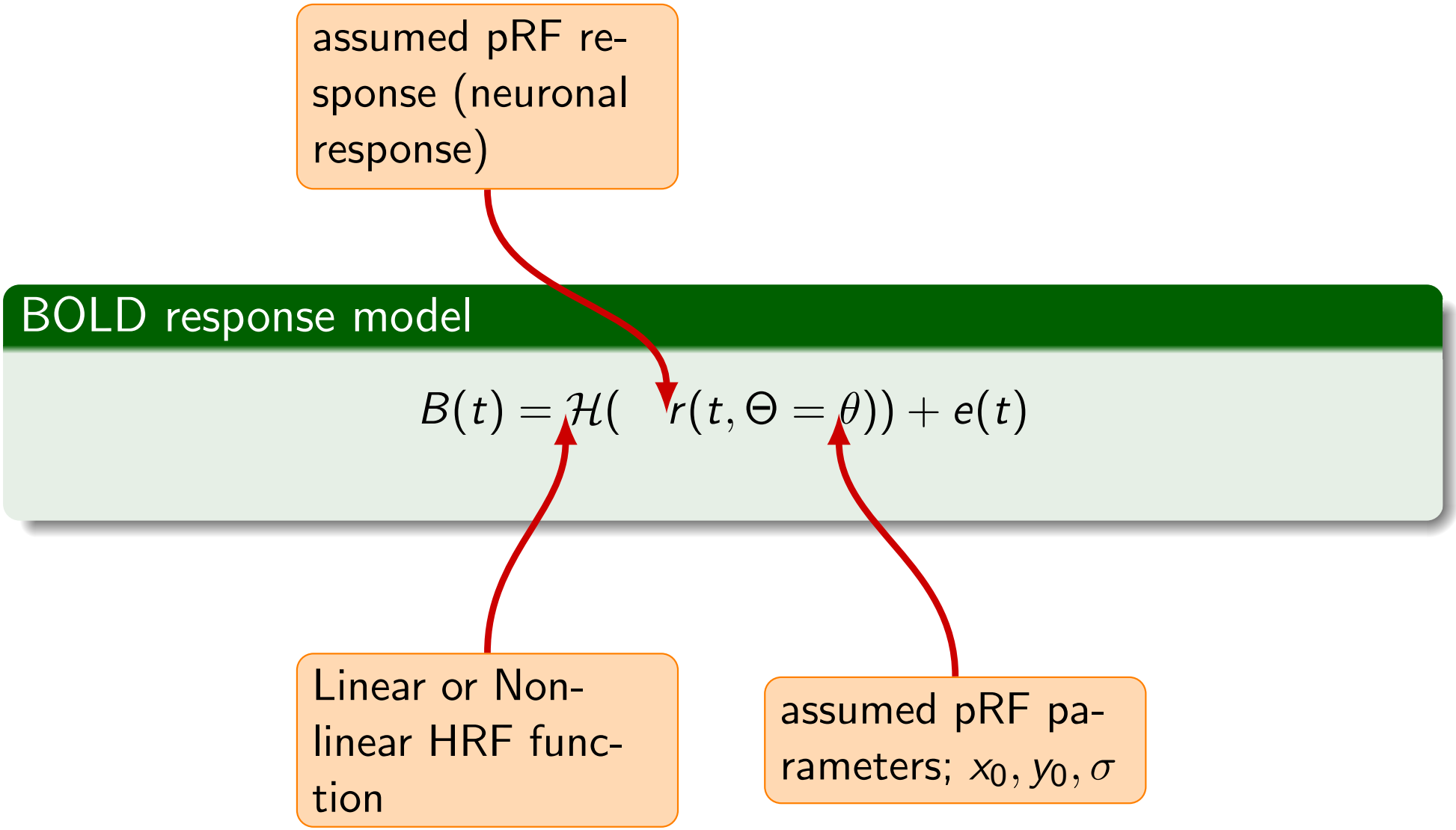
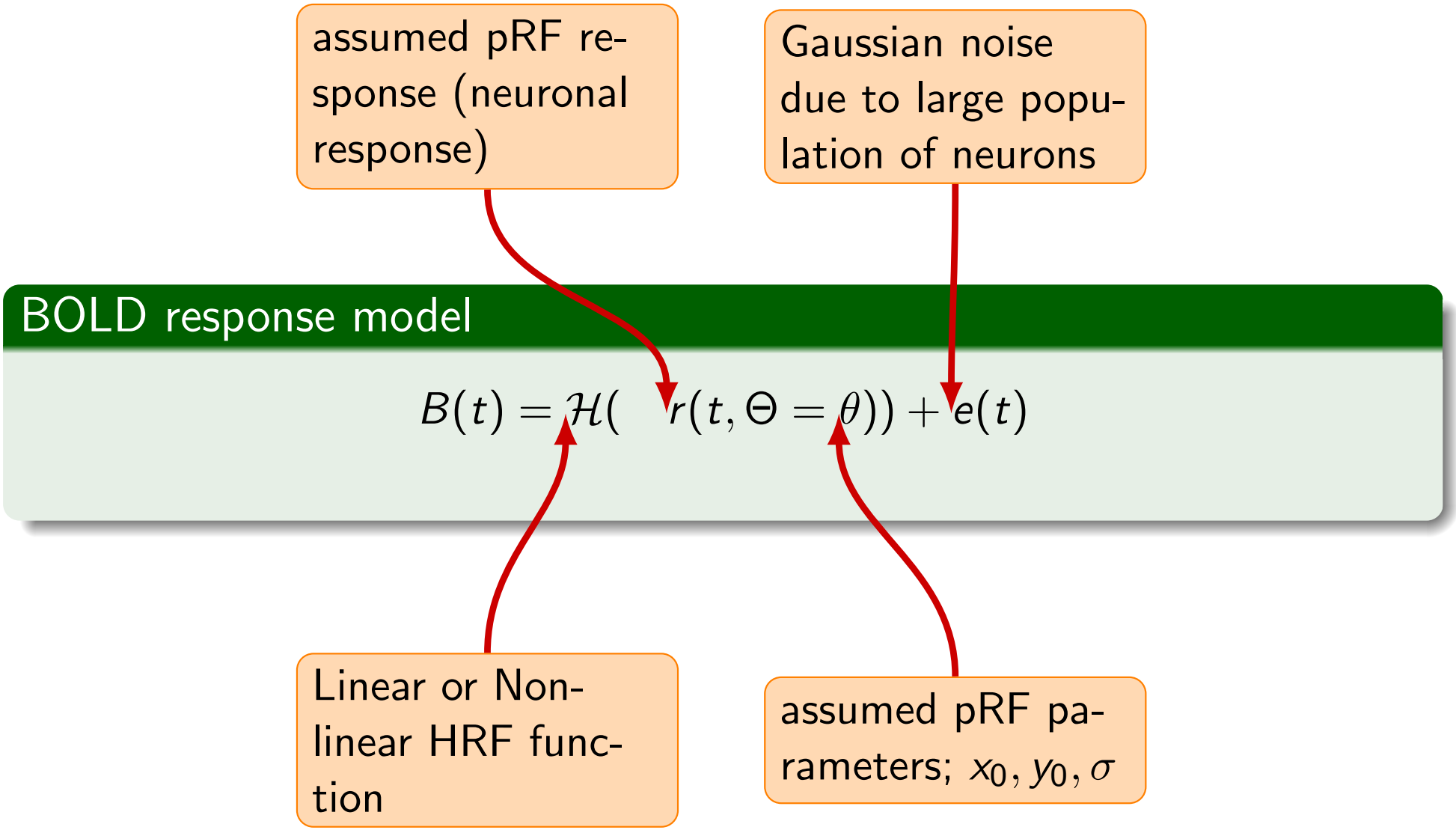
fMRI Signal Modelling



fMRI Signal Modelling



Neuronal Response Modelling

- Neurons within a small region of visual cortex respond to stimuli within a restricted region of the visual field.
- The population response of such neurons can **not** be modeled using a model that sums contrast linearly across the visual field. hence, Compressive spatial summation (CSS) model is used Kay et al., 2013,

pRF response model

$$r(t, \Theta = \theta) = (\sum_{x,y} s(x, y, t) g(x, y, \theta))^n$$

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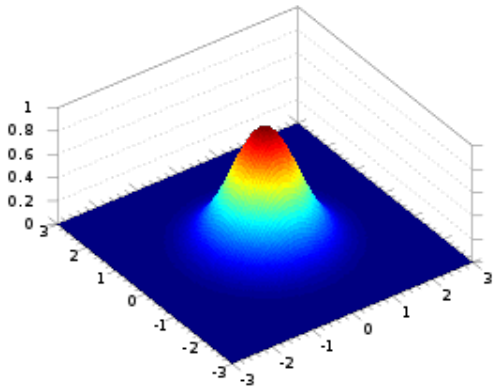
pRF response model

$$r(t, \Theta = \theta) = \left(\sum_{x,y} s(x, y, t) g(x, y, \theta)\right)^n$$

- $s(x, y, t)$: stimulus function to be presented
- $g(x, y, \theta)$: assumed pRF model
- n: spatial linearity factor from 0 to 1

pRF Modelling

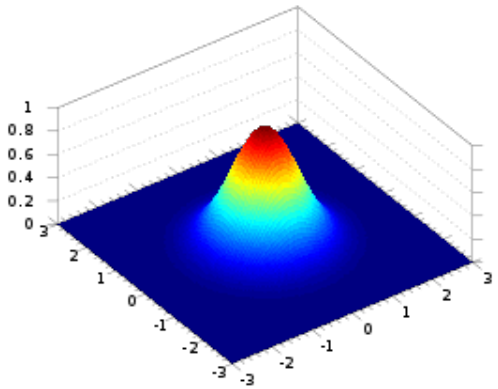


$$\sigma = \frac{1}{2} \ln(e + \sqrt{x_0^2 + 2y_0^2})$$

pRF response model

$$g(x, y, \Theta = \theta) = e^{-\frac{(x-x_0)^2+(y-y_0)^2}{2\sigma^2}}$$

pRF Modelling



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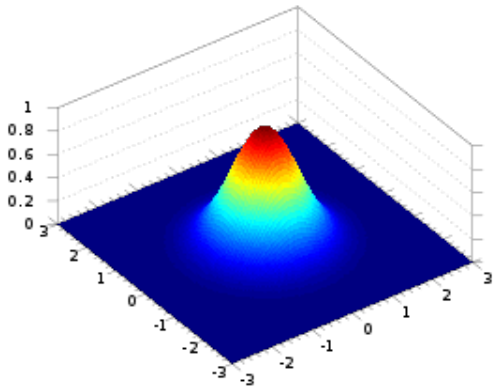
assumed pRF center for the voxel

pRF Modelling



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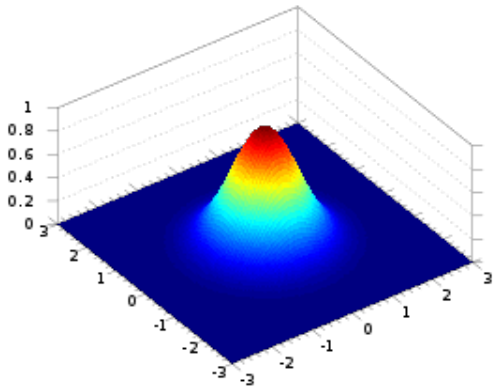

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pRF size assumed to be a log-polar function of pRF center

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References I

Dumoulin, Serge O. and Brian A. Wandell (2008). "Population receptive field estimates in human visual cortex". In: *NeuroImage* 39.2, pp. 647–660. ISSN: 10538119. DOI: 10.1016/j.neuroimage.2007.09.034.

Kay, Kendrick N. et al. (2013). "Compressive spatial summation in human visual cortex.". In: *Journal of neurophysiology*. ISSN: 1522-1598. DOI: 10.1152/jn.00105.2013.