# Study of experimental conditions relevance in a Bayesian framework for functional MRI analysis

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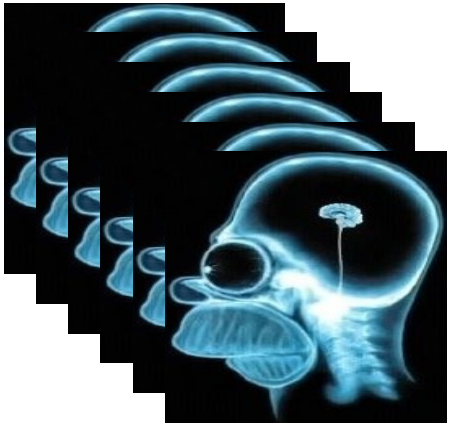
3nd year

20/11/2012


**Undertand brain activity**

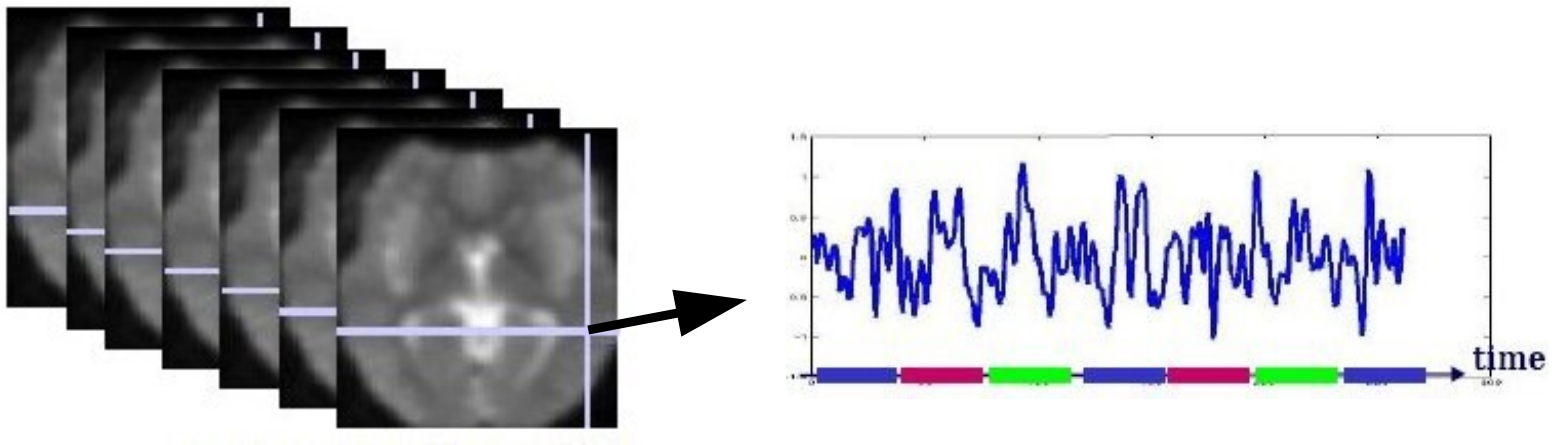

Undertand
brain activity

3D signal + time

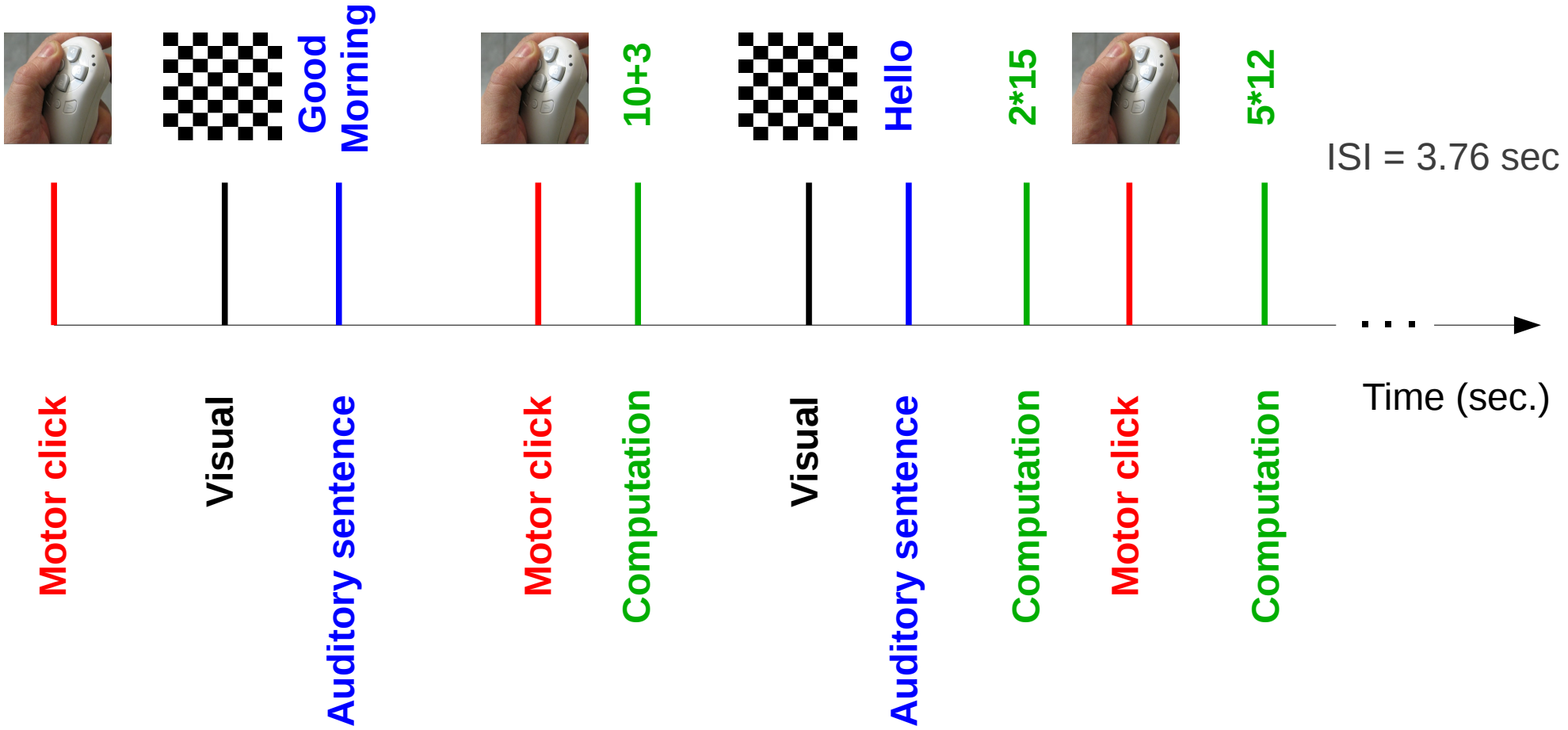
***BOLD***

*Blood Oxygenation Level Dependent signal*

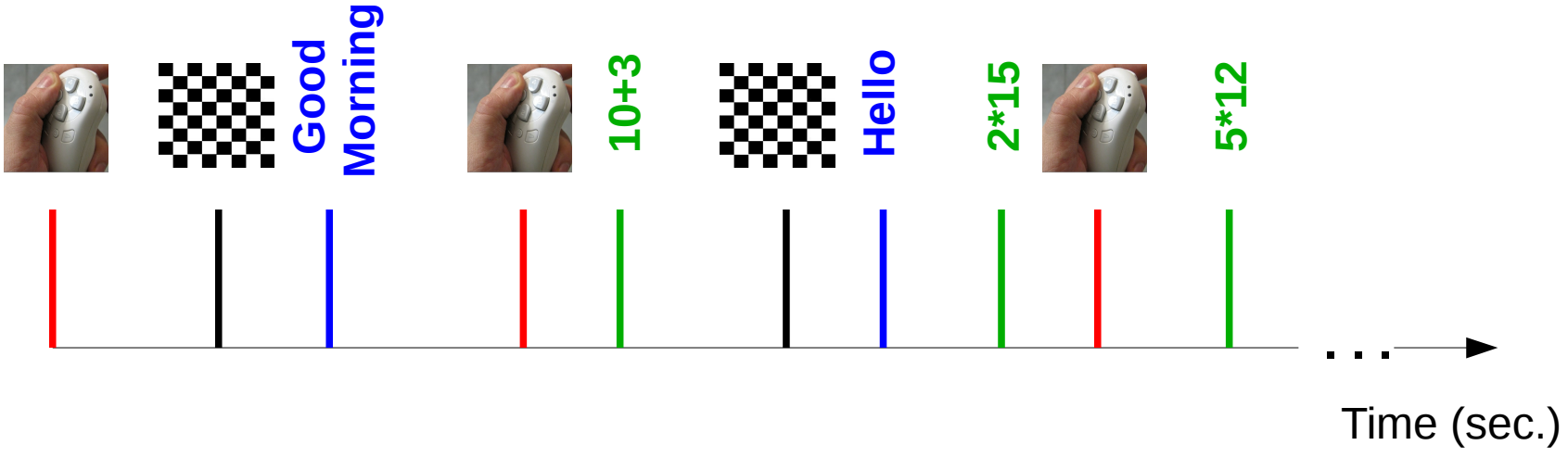


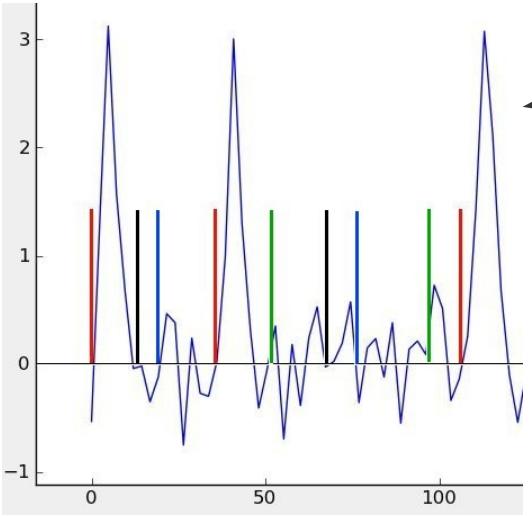

**3D signal + time**

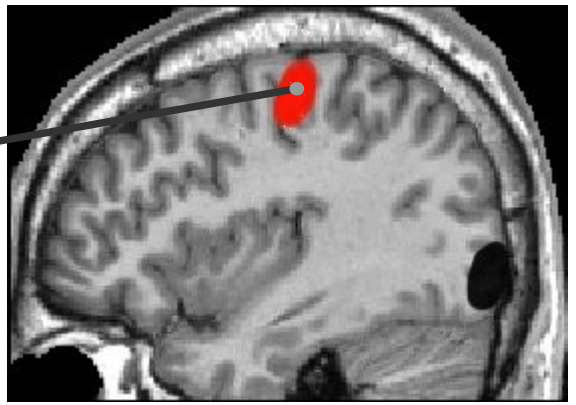
# EVENT-RELATED PARADIGM



# RELEVANCE PROBLEM



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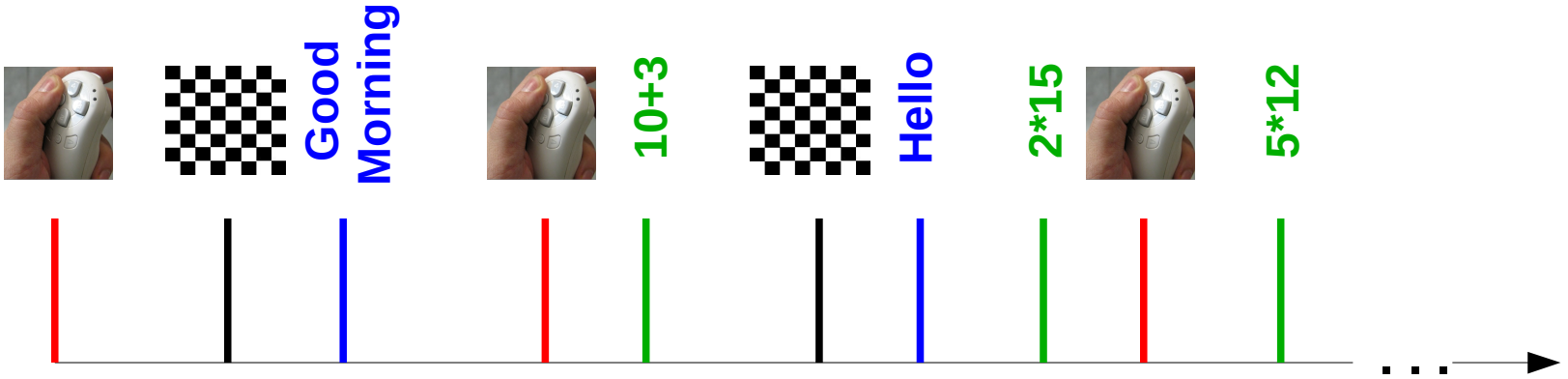
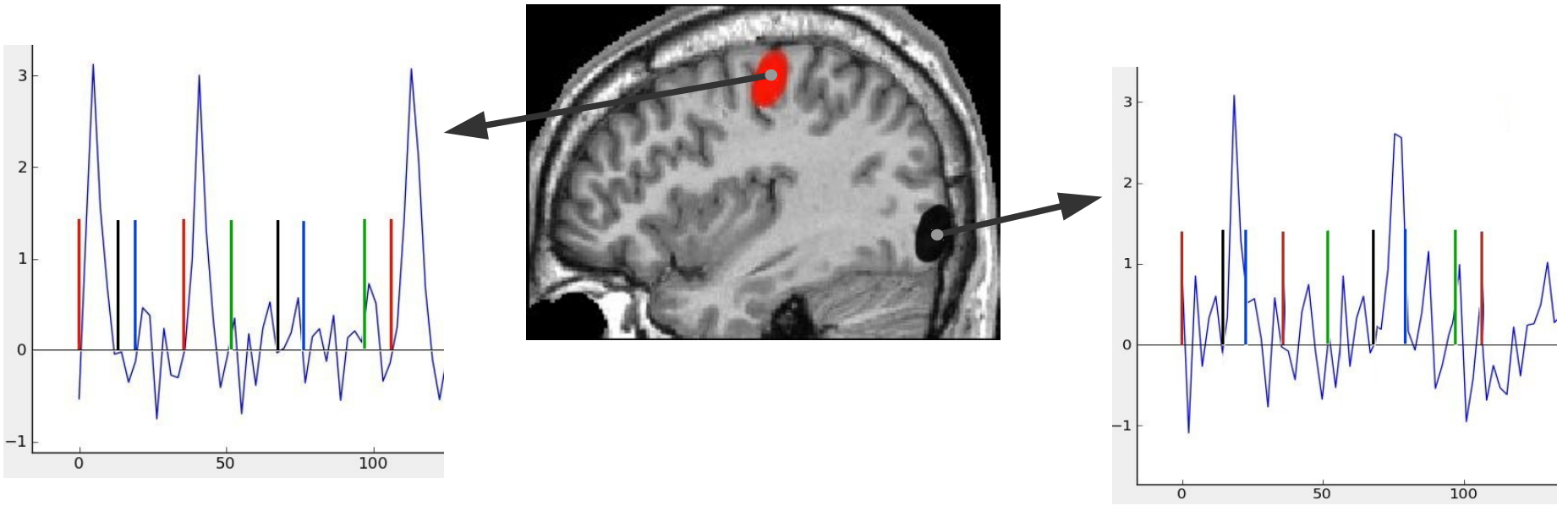
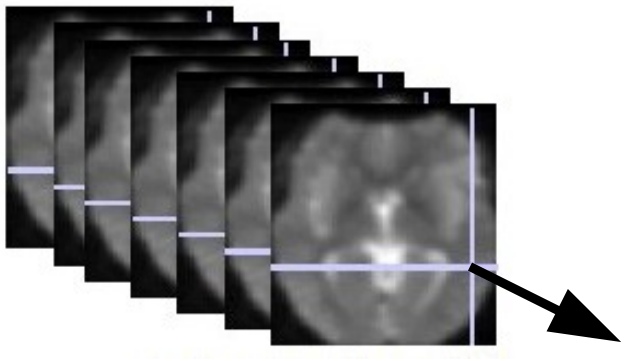
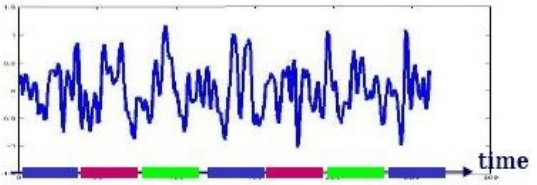


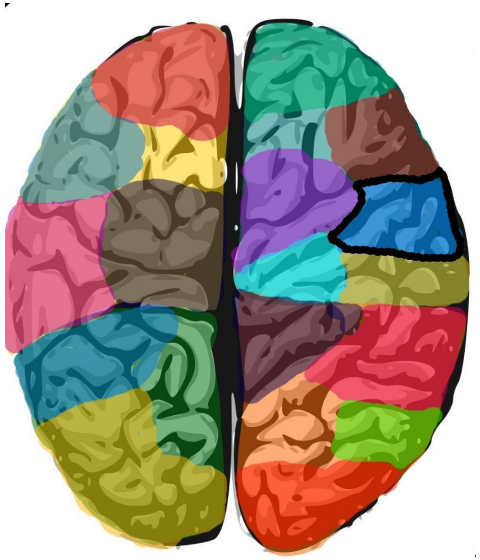
# JOINT DETECTION-ESTIMATION



3D signal + time




*Makni et al, IEEE TSP 2005*
*Vincent et al, IEEE TMI 2010*



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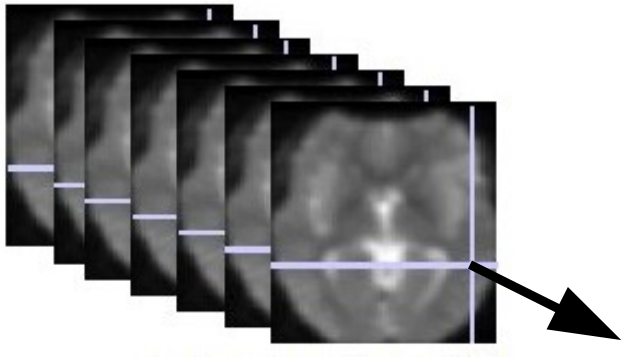

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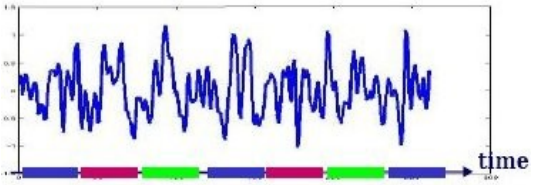


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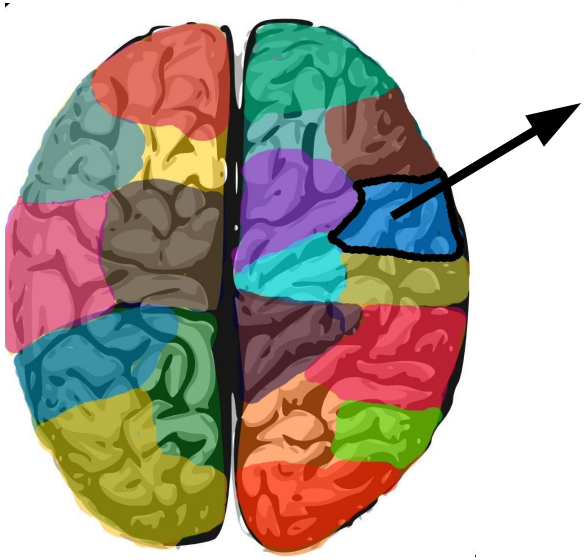

Signal at voxel j

Useful signal

noise

$$y_j = \sum_{m=1}^{M} a_j^m w^m X^m h + n_j$$

# JOINT DETECTION-ESTIMATION

**Number of experimental tasks**

$$w^m \in \{0,1\}$$

**Relevance of condition m**

$$y_j = \sum_{m=1}^{M} a_j^m w^m X^m h + n_j$$

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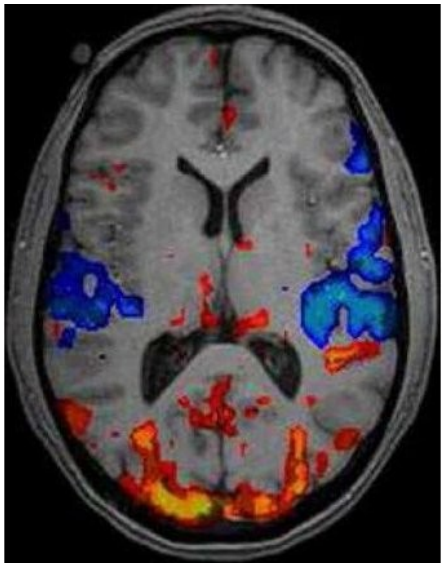
**Activation level at voxel j for condition m**



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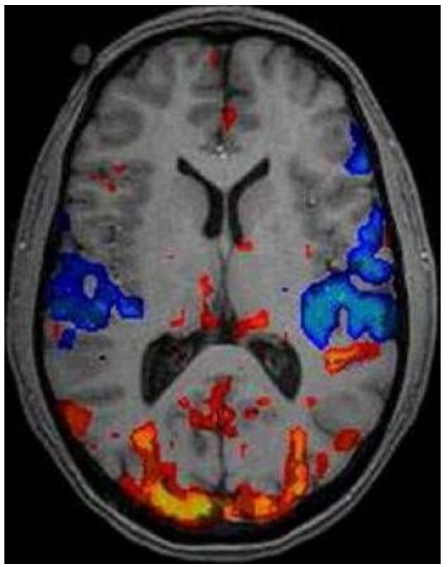
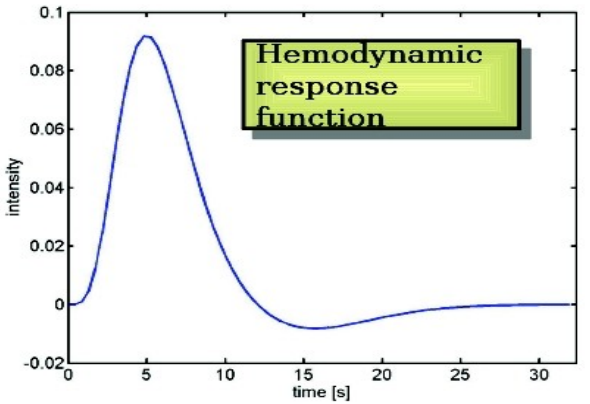
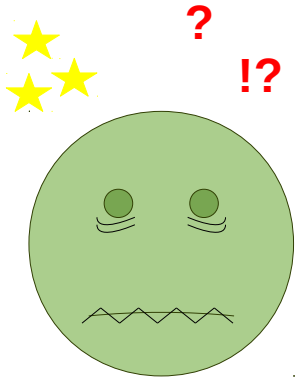


Dynamic of blood flow In activated area



# PARAMETERS ESTIMATION !



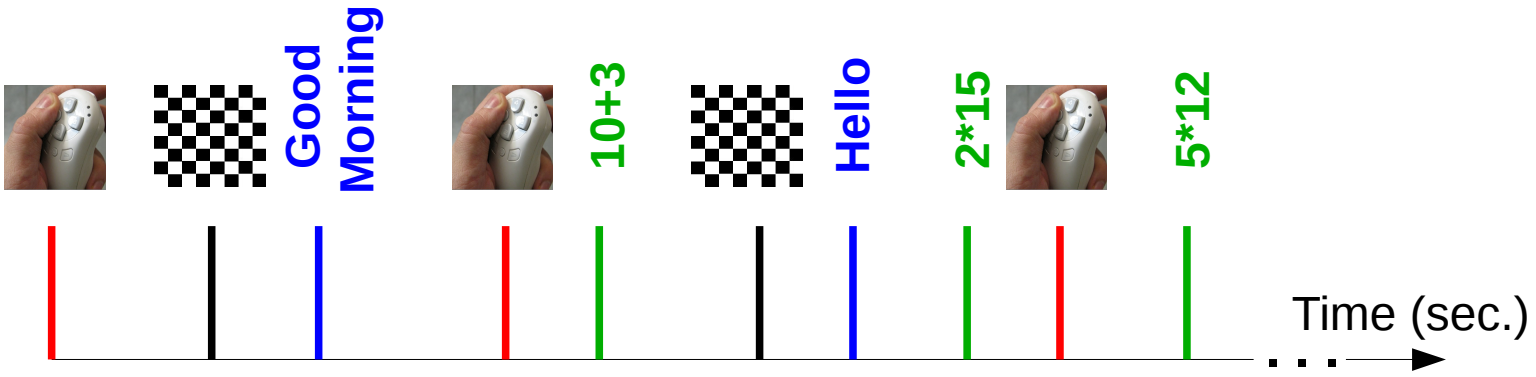

**MCMC**
**VEM**

$$y_j = \sum_{m=1}^{M} a_j^m w^m X^m h + n_j$$

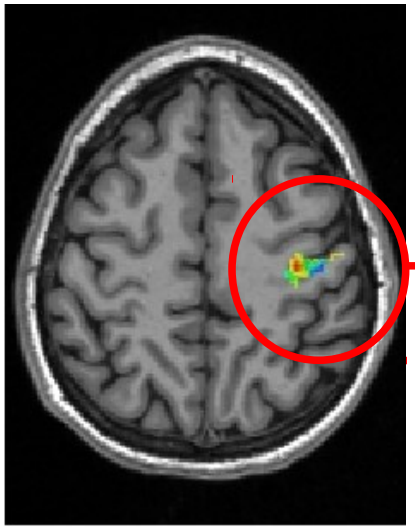
# RESULTS : REAL DATA-SET

**Experimental Paradigm :**

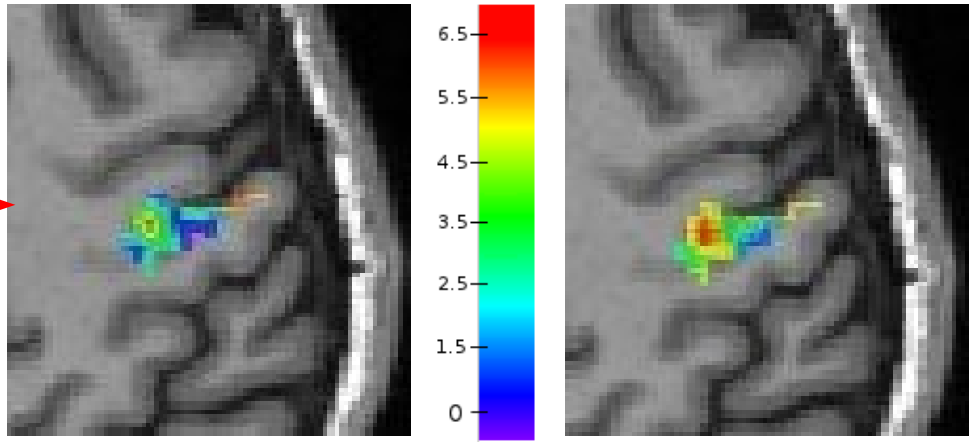
M = 4 Conditions
Auditory sentence,
motor click,
computation
and checkboard




**Activation Maps** $\hat{a}_j^m$



**Right motor area**




**Complete Model** **Parsimonious Model**

| $\hat{w}^m$ | Conditions |
|---|---|
| **1** | **Motor click** |
| 0 | Auditory sentence |
| 0 | Computation |
| 0 | Checkboard |

THANK YOU ...