

# Reconstruction

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Interuniversity Microelectronics Centre (IMEC) (2009) Wireless Sensor Systems Enable A Better Sleep. *ScienceDaily*. (Photo: Holst Center)

# Bayesian estimation

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Extend decoding of  $s \rightarrow s^*(t)$

NOT FOR REUSE

# The role of the conditional mean

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Want an estimator  $s_{\text{Bayes}}$

Introduce an error function,  $L(s, s_{\text{Bayes}})$ ; minimize error.

$$\int ds L(s, s_{\text{Bayes}}) p[s|\mathbf{r}]$$

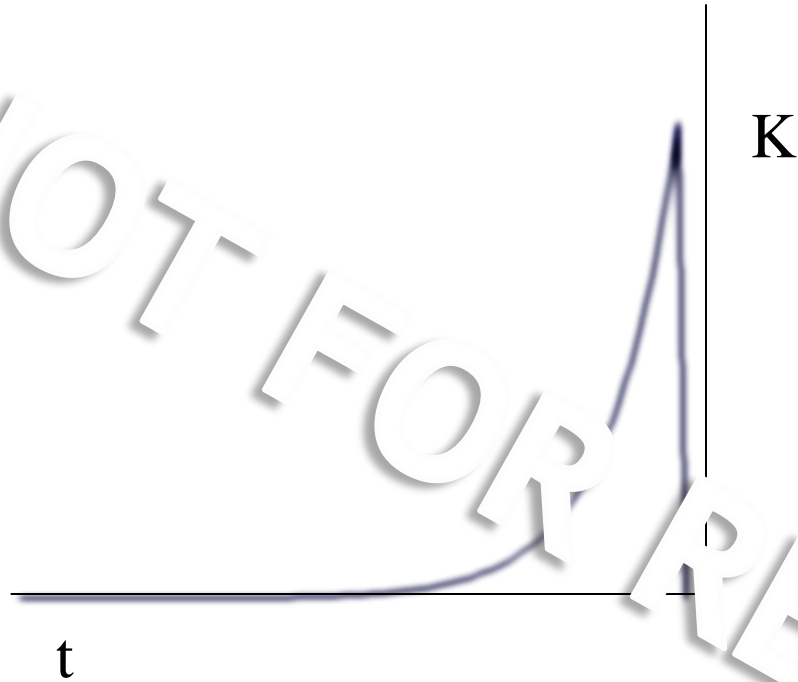
For least squares cost  $L(s, s_{\text{Bayes}}) = (s - s_{\text{Bayes}})^2$  ;

Solution:

$$s_{\text{Bayes}} = \int ds p[s|\mathbf{r}] s$$

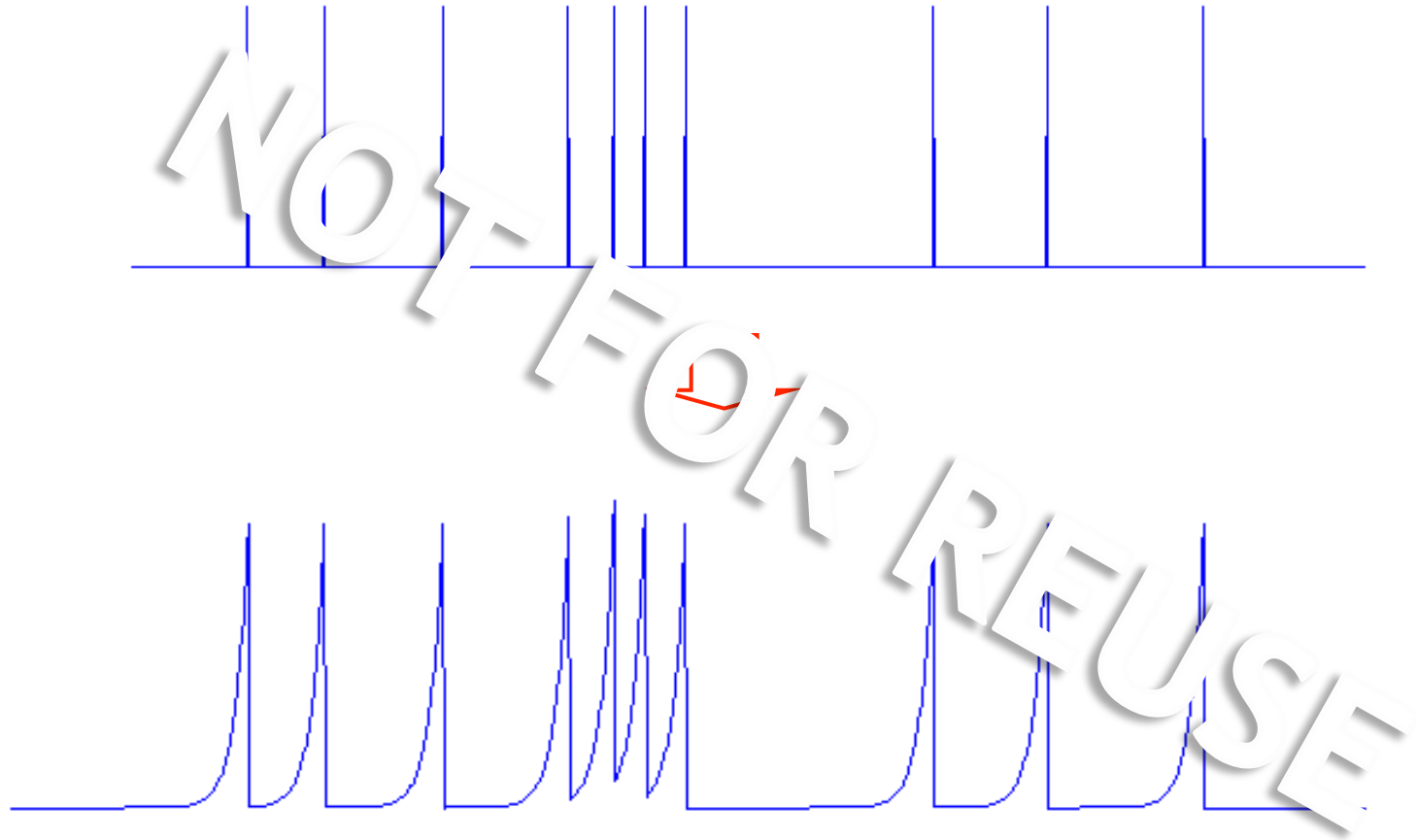
# Stimulus reconstruction

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# Reading minds: the LGN

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# Reading minds: fMRI



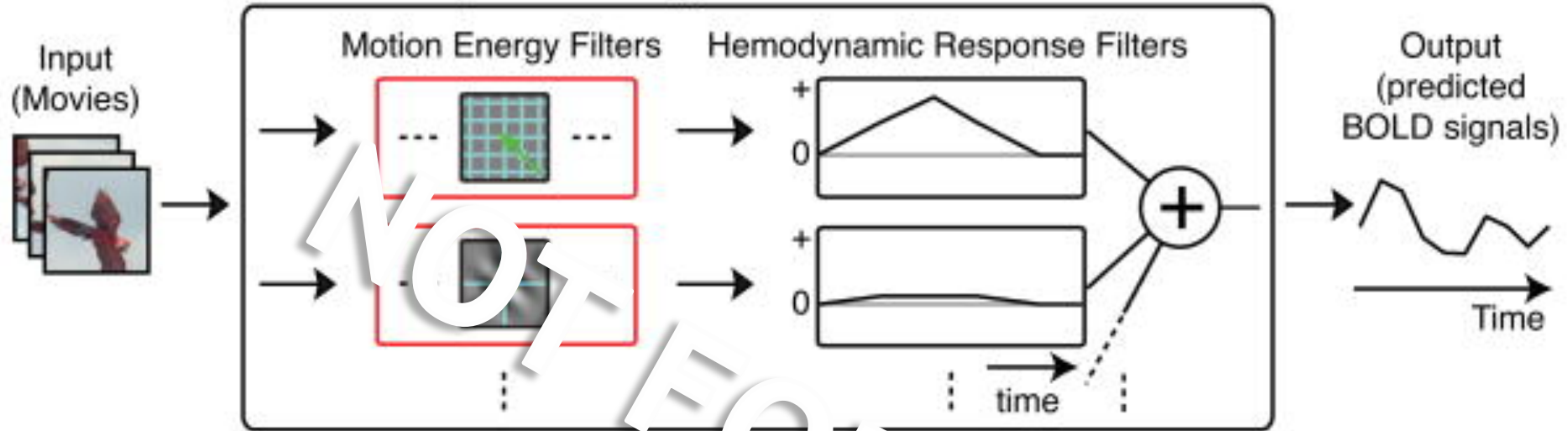
# Reading minds: fMRI

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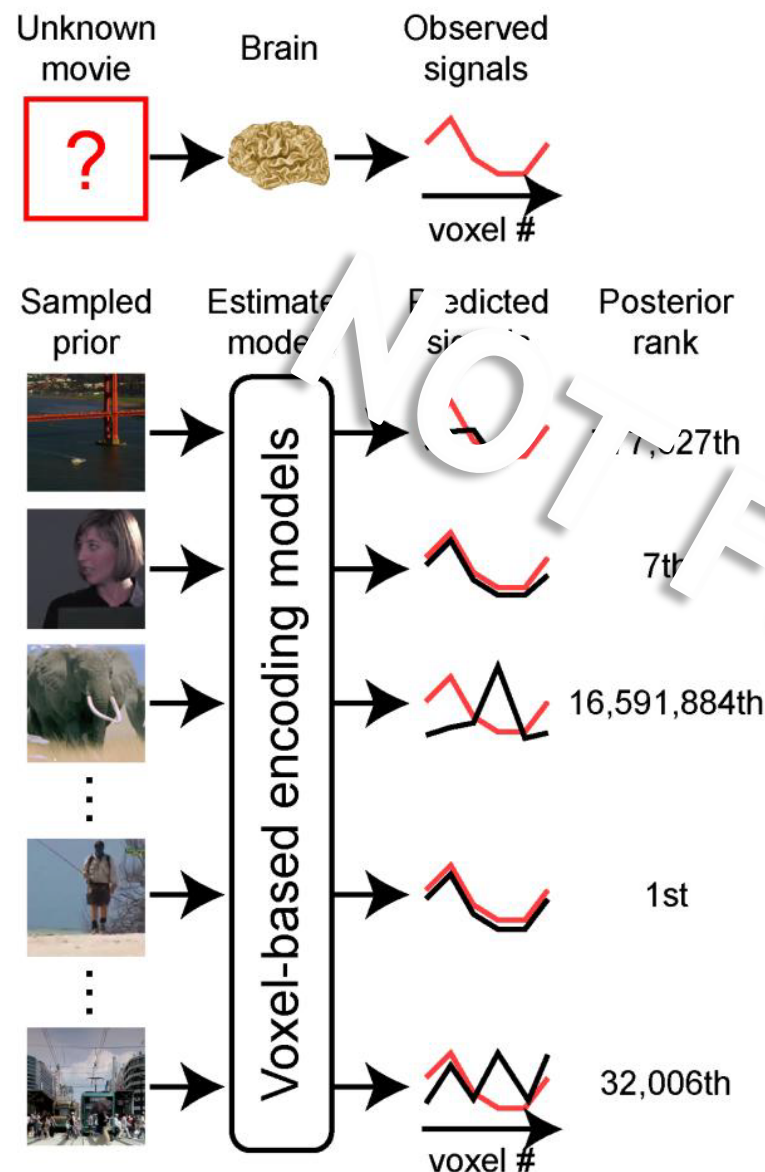
$$P(s|r) = P(r|s) P(s)$$

# Reading minds: fMRI

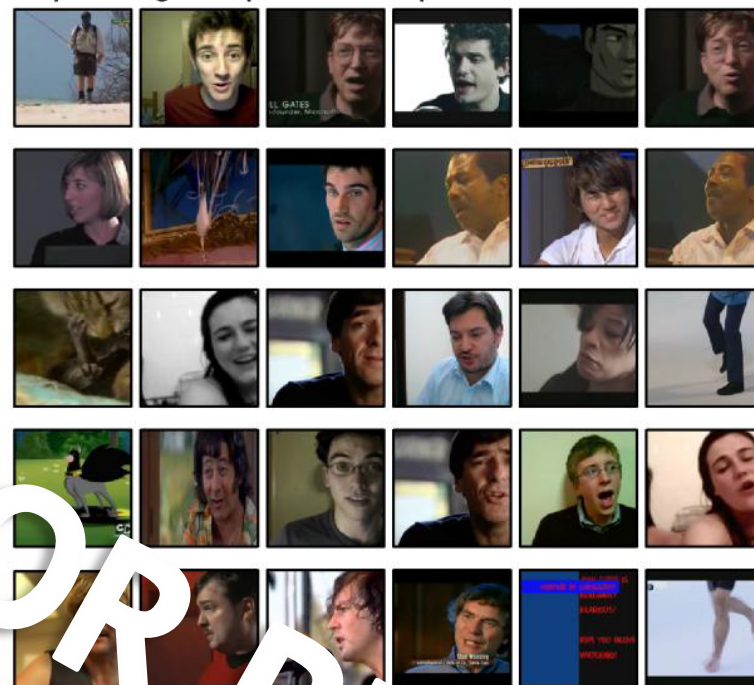
A stimulus-response encoding model for one voxel



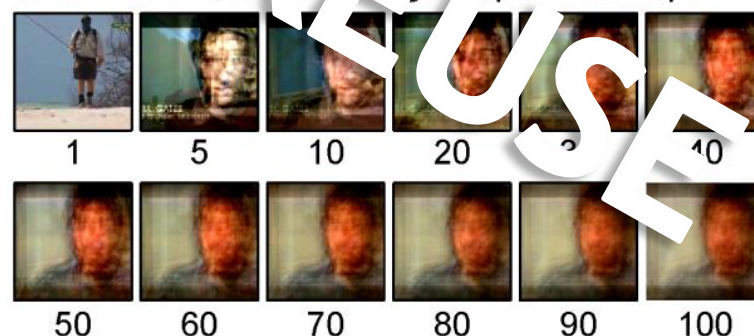
# Reading minds: fMRI



Top 30 highest posterior clips



Cumulative averages of highest posterior clips



Nishimoto et al., Current Biology, 2011

# Coming up next

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- Guest lecture by retina wizard Fred Rieke!
- Information and coding principles