Reconstruction

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

Bayesian estimation

Extend decoding of s → s*(t)

The role of the conditional mean

Want an estimator s_{Bayes}

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

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

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

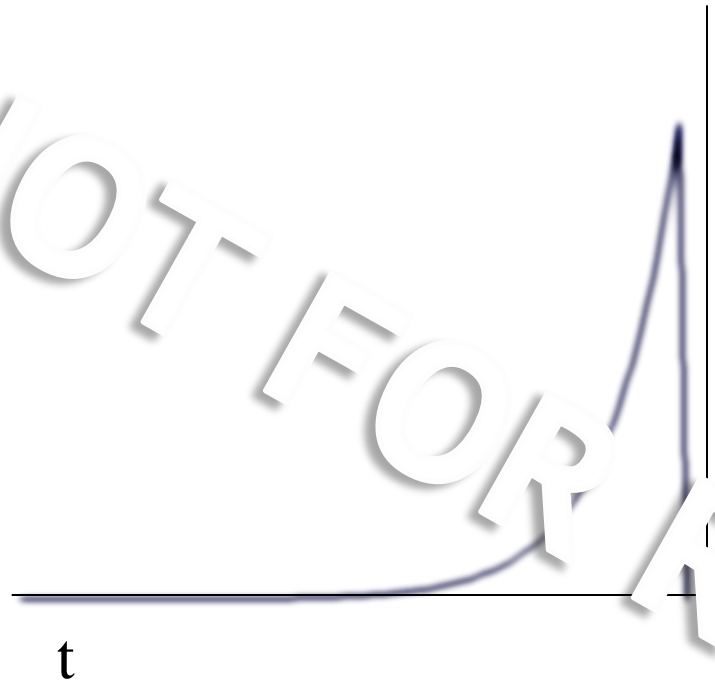
$$\frac{\partial}{\partial s_B} \int ds\, (s-s_B)^2 p(s|r) = 2\int ds\, (s-s_B) p(s|r) = 0$$

$$\int ds\, s\, p(s|r) = \int ds\, s_B\, p(s|r) = s_B$$

Solution: $$s_{\text{bayes}} = \int ds\, p[s|\mathbf{r}] s$$

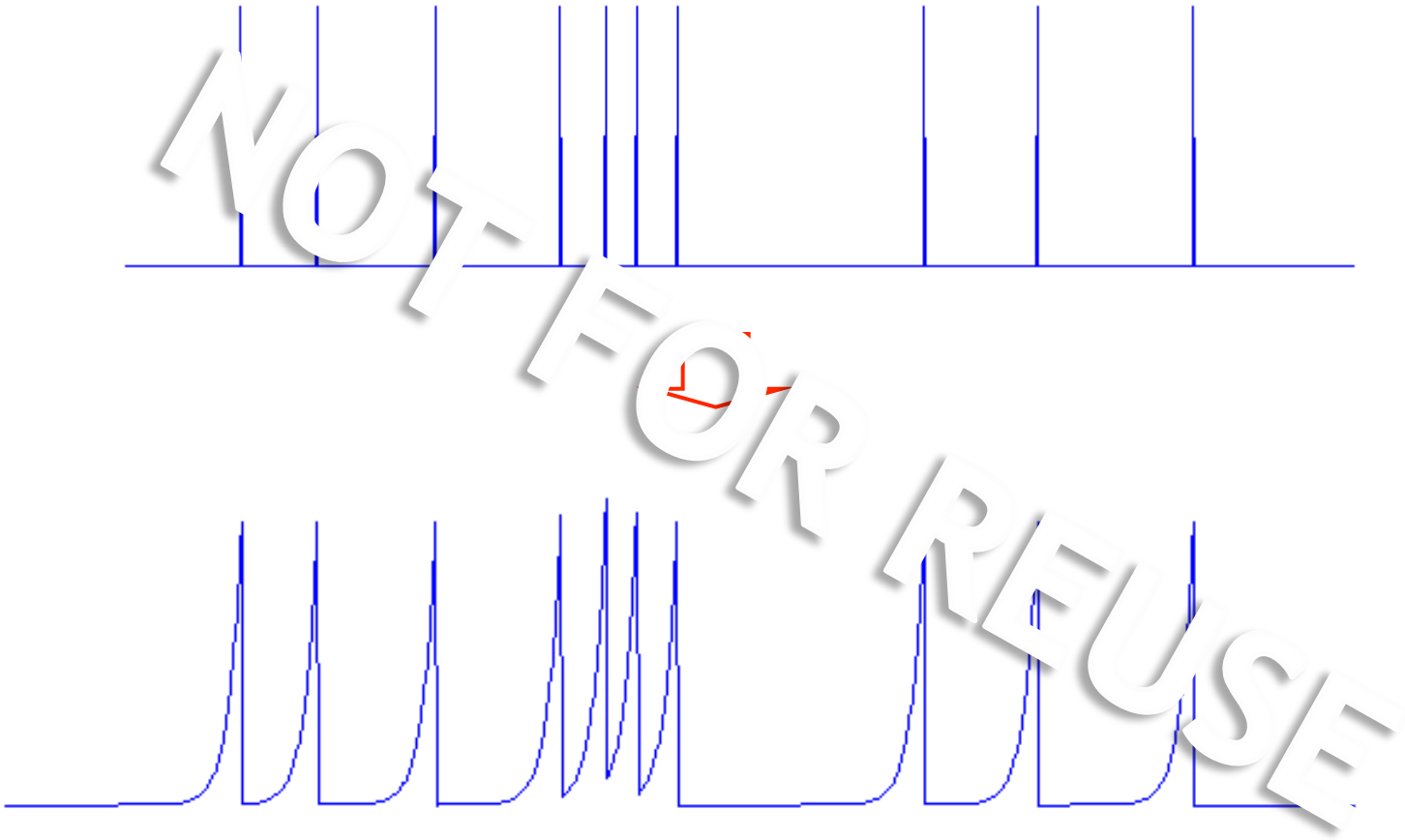
STA !

Stimulus reconstruction

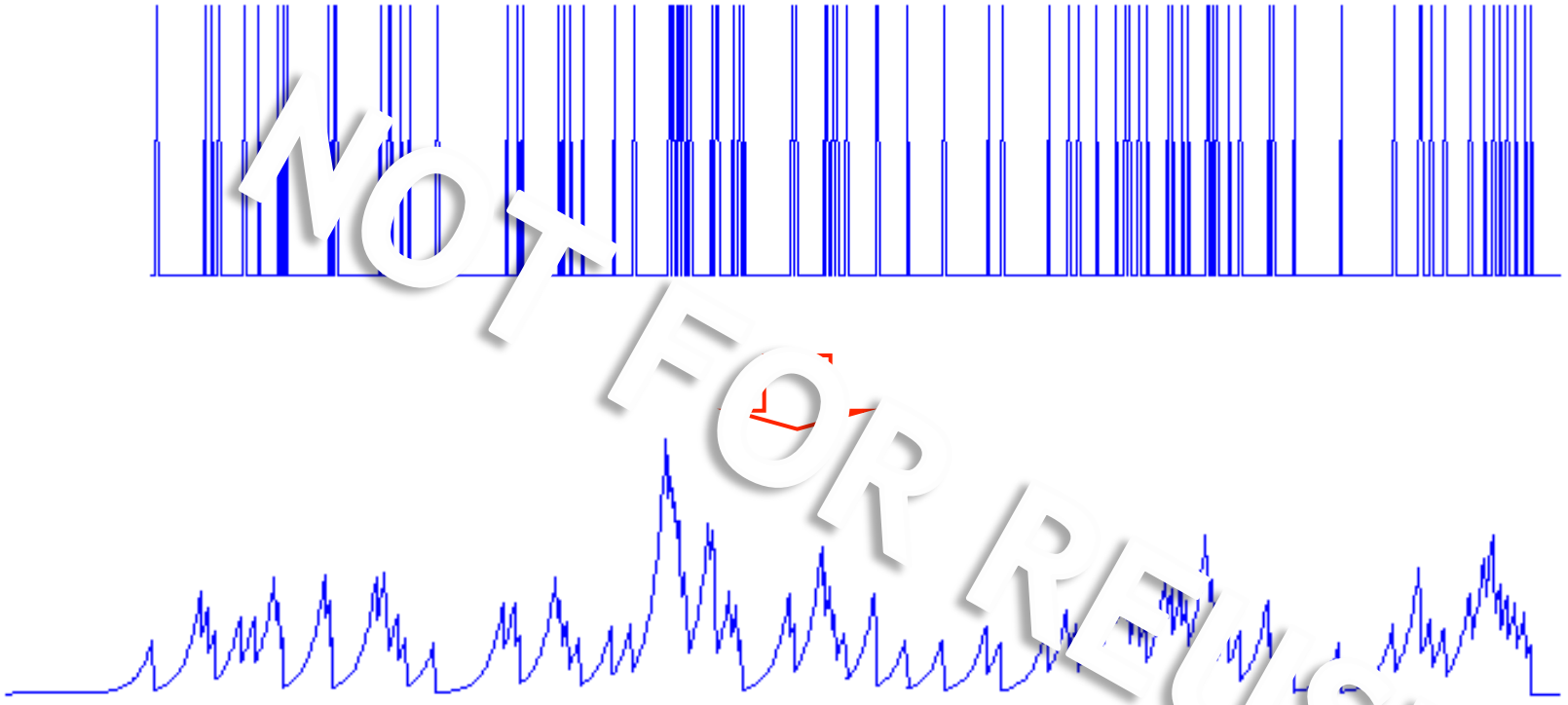


STA

Stimulus reconstruction



Stimulus reconstruction



Reading minds: the LGN

Reading minds: the LGN

Yang Dan, UC Berkeley

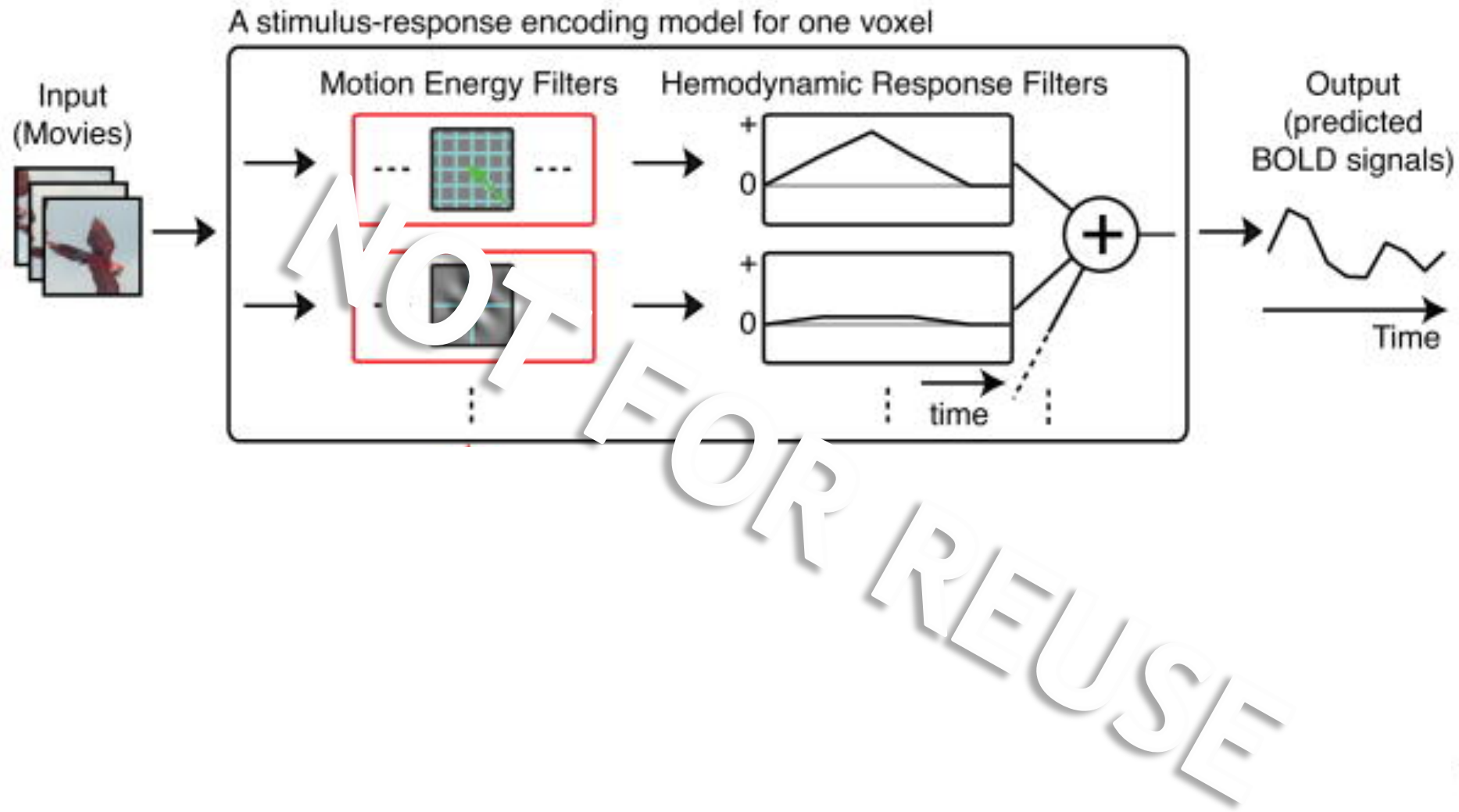
Reading minds: fMRI

Nishimoto et al., Current Biology, 2011

Reading minds: fMRI

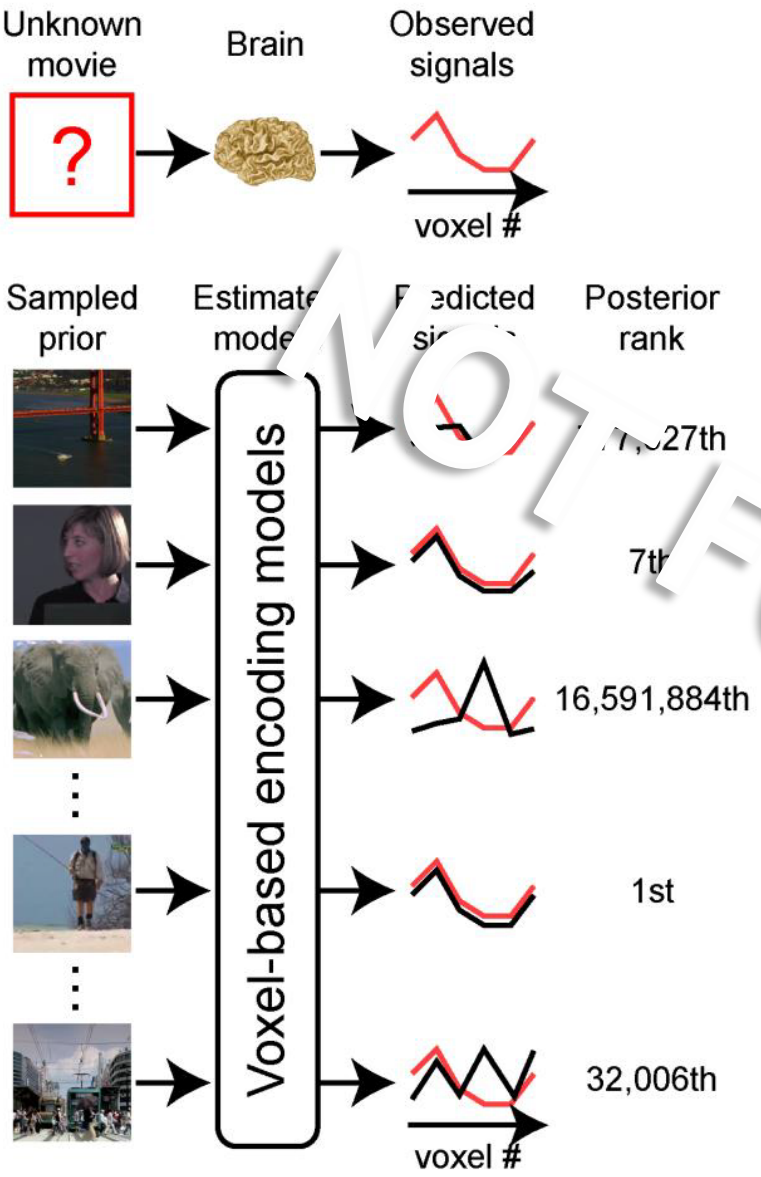
$$P(s|r) = P(r|s)\ P(s)$$

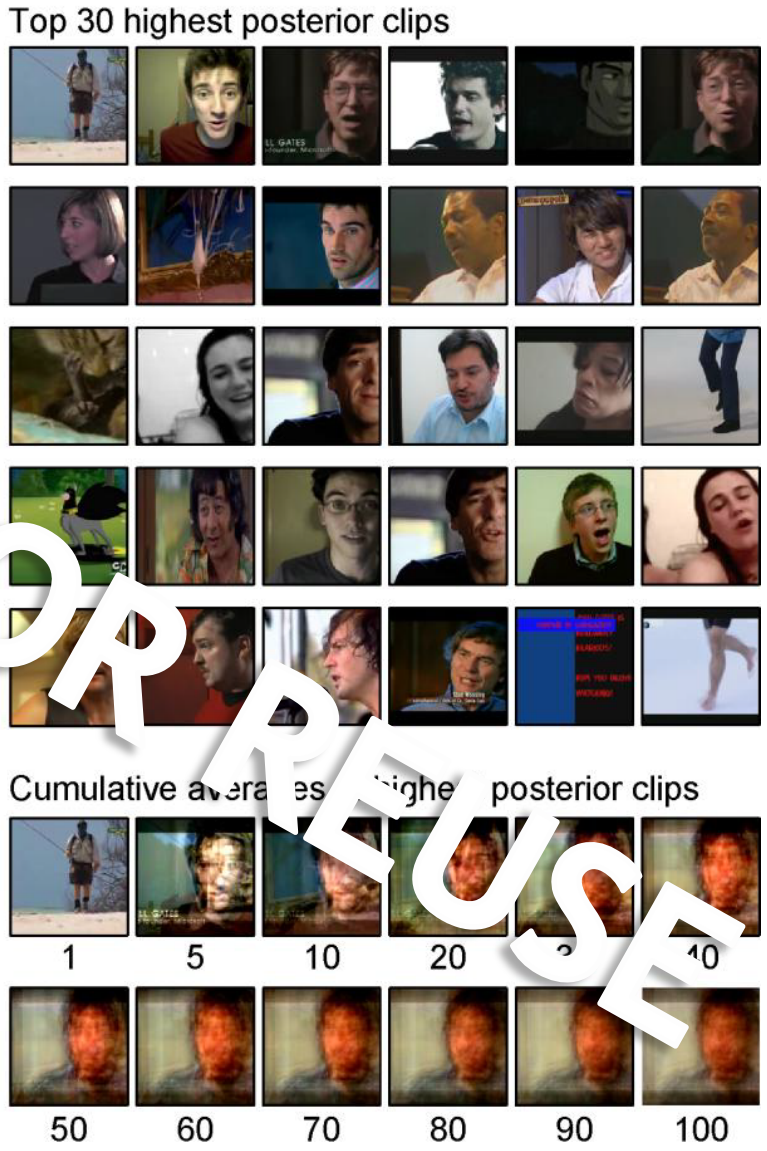
Reading minds: fMRI



Nishimoto et al., Current Biology, 2011

Reading minds: fMRI





Nishimoto et al., Current Biology, 2011

Coming up next

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