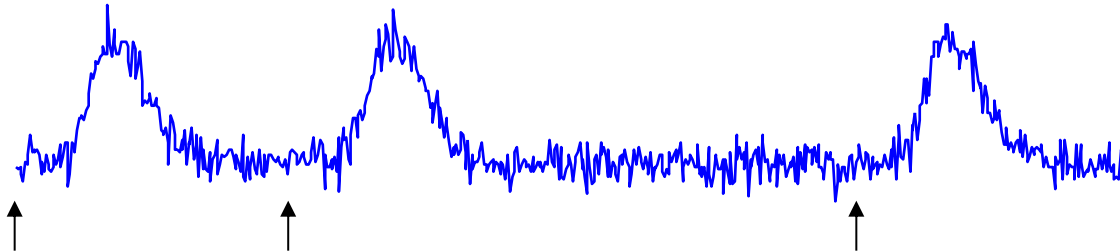

fMRI data analysis

Part 3: Deconvolution

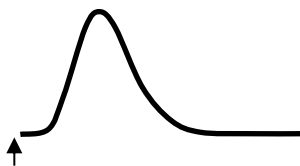
Deconvolution



Are there any significant signal changes
time-locked with my stimulus?

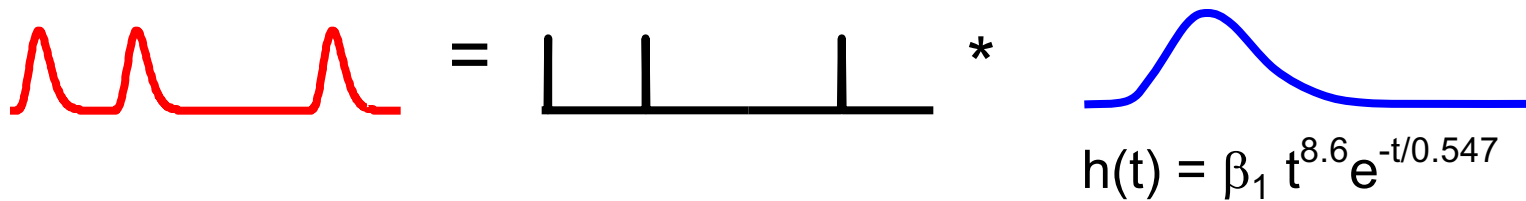
What do those changes look like?

(I'm not going to assume any particular shape of the ideal response)

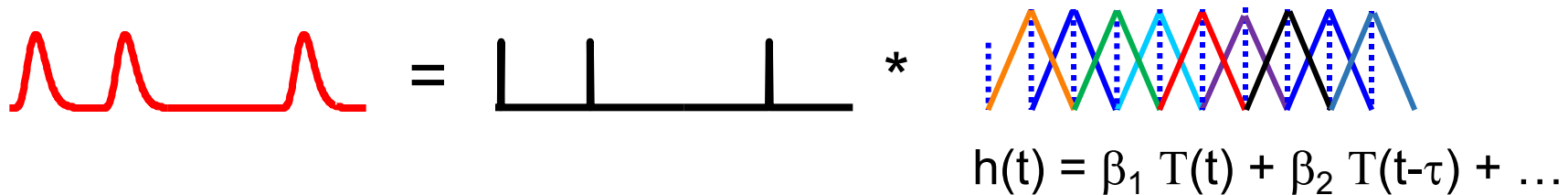


Multiple Regression

Fixed HRF shape

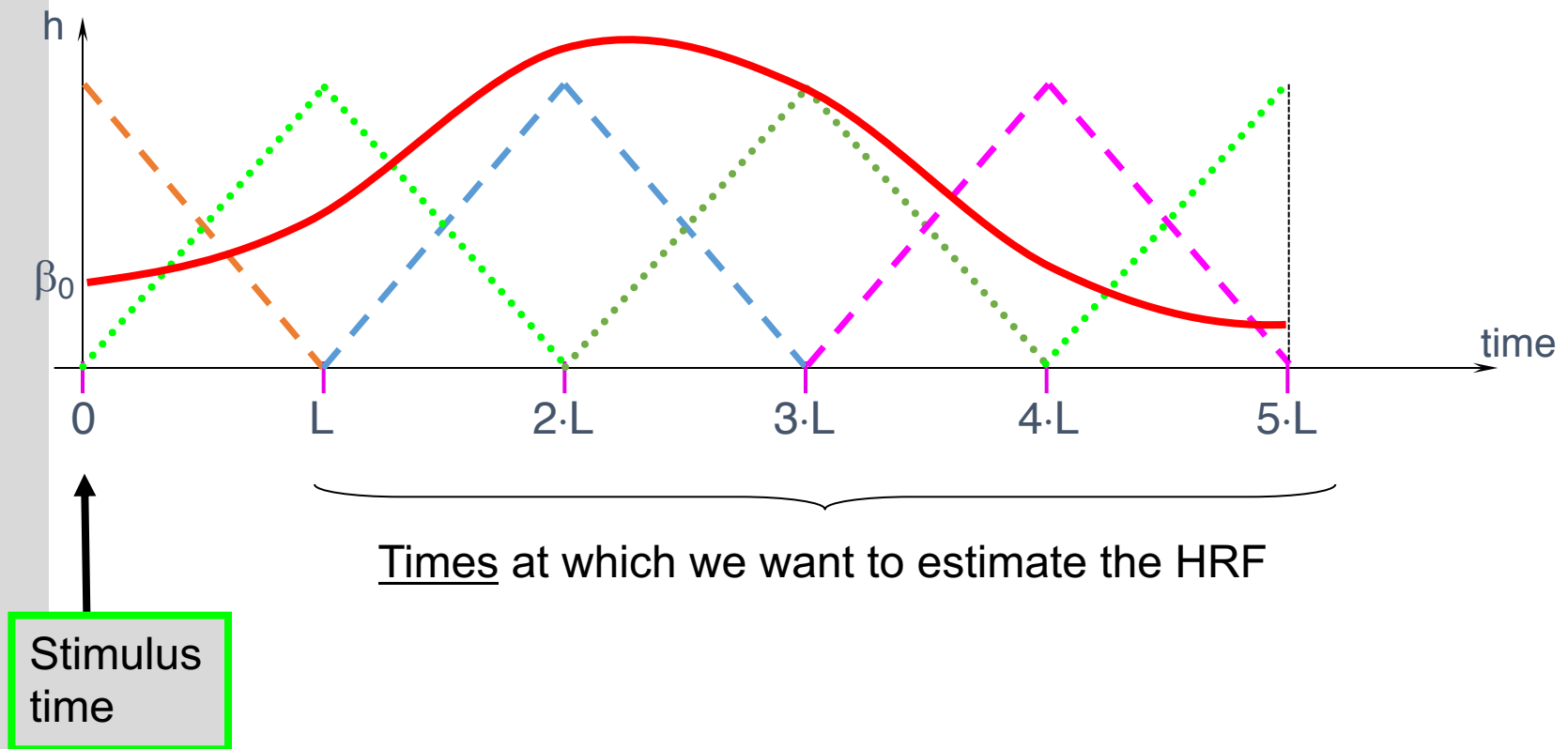


Flexible HRF shape



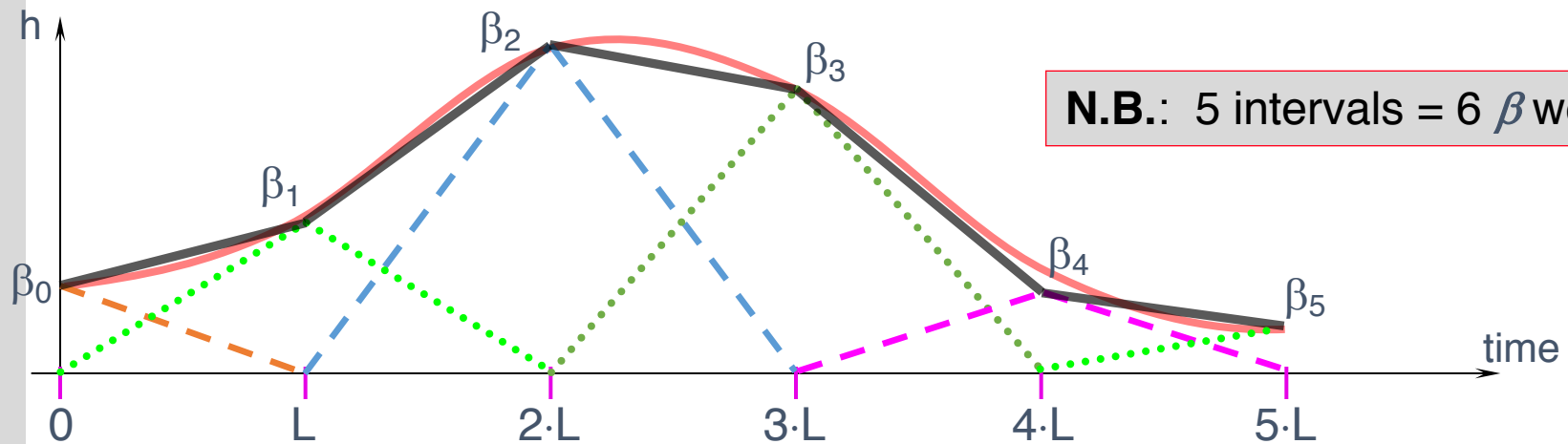
Tent functions

Tent with 5 intervals



Tent functions

Tent with 5 intervals



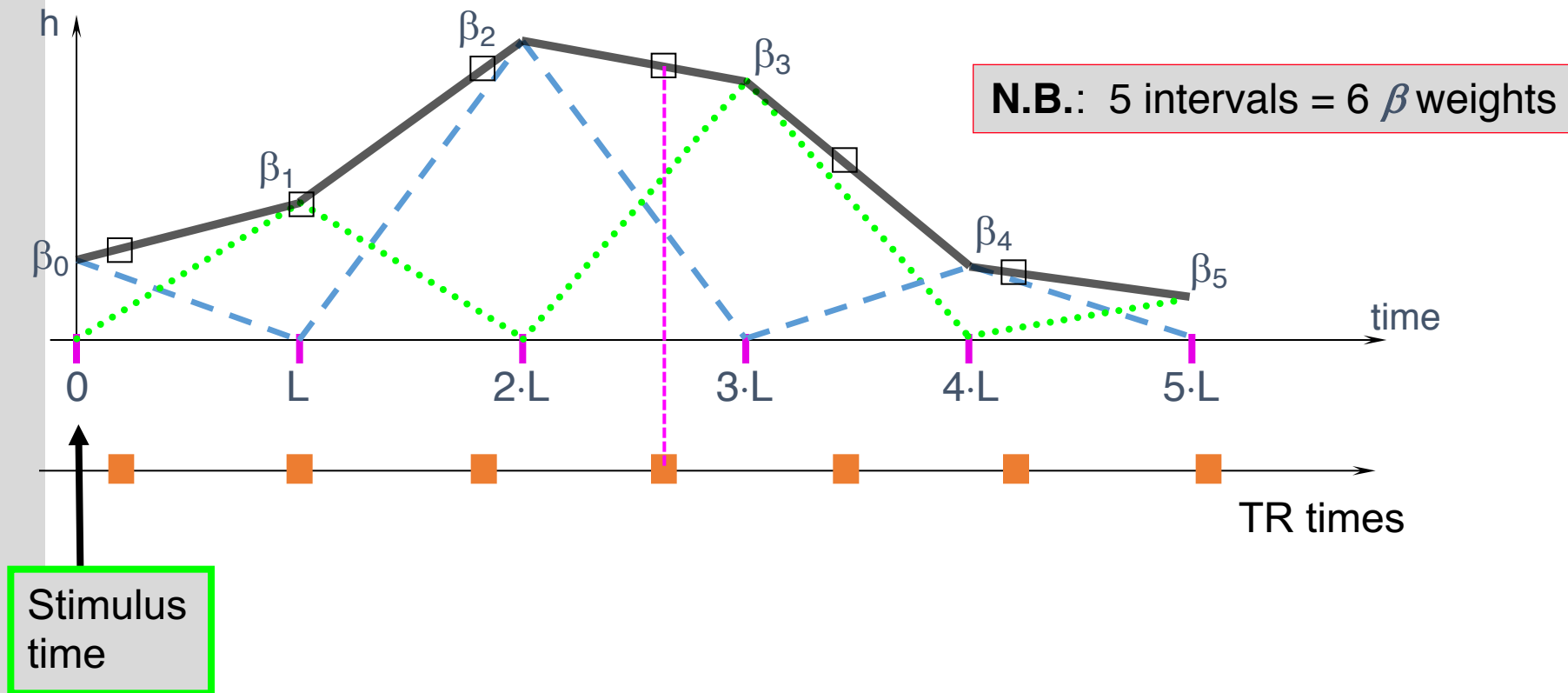
N.B.: 5 intervals = 6 β weights

Times at which we want to estimate the HRF

Stimulus
time

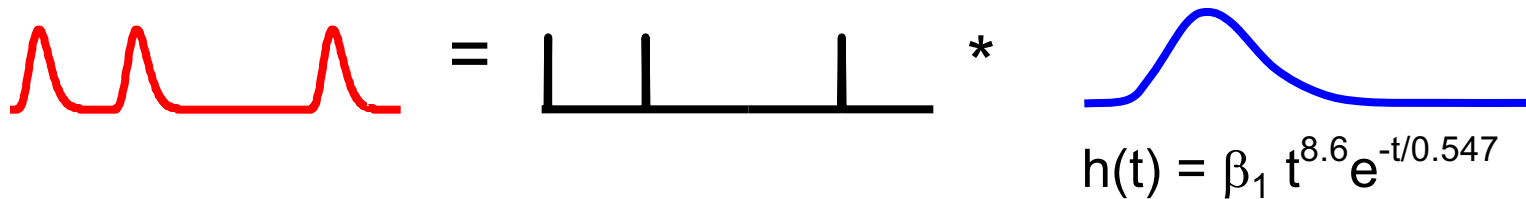
Tent functions

Tent with 5 intervals



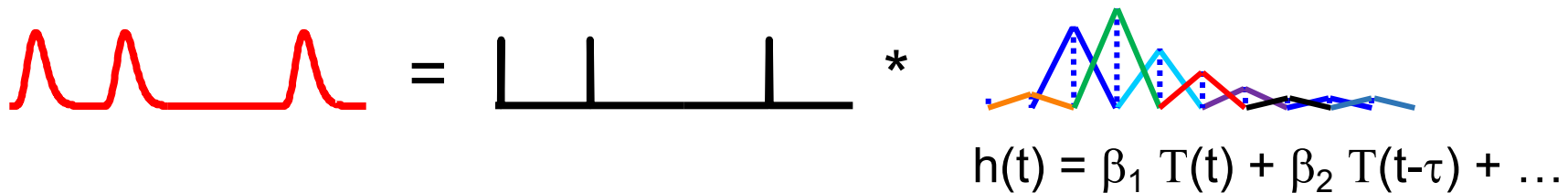
Multiple Regression

Fixed HRF shape



The diagram illustrates the process of generating a BOLD signal from a neural event train using a fixed HRF shape. On the left, a red line graph shows a BOLD signal with three distinct peaks. This is equal to the convolution of a neural event train (represented by three vertical black lines on a horizontal axis) with a fixed HRF (represented by a single blue curve). The HRF curve is labeled with the equation $h(t) = \beta_1 t^{8.6} e^{-t/0.547}$.

Flexible HRF shape

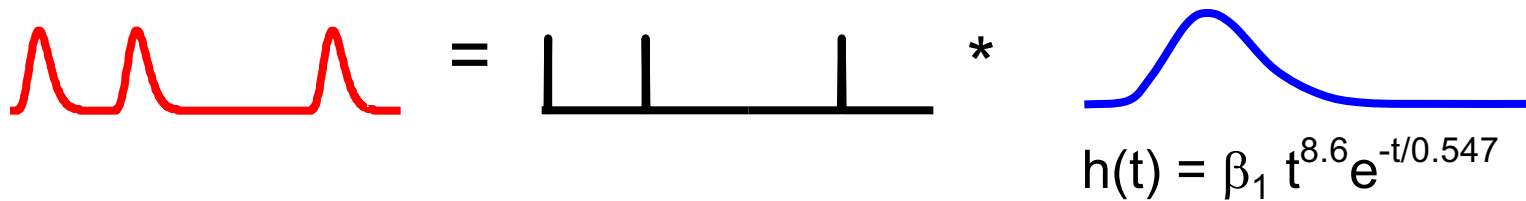


The diagram illustrates the process of generating a BOLD signal from a neural event train using a flexible HRF shape. On the left, a red line graph shows a BOLD signal with three distinct peaks. This is equal to the convolution of a neural event train (represented by three vertical black lines on a horizontal axis) with a flexible HRF (represented by multiple overlapping colored curves: blue, green, cyan, red, purple, and black). The HRF is labeled with the equation $h(t) = \beta_1 T(t) + \beta_2 T(t-\tau) + \dots$.

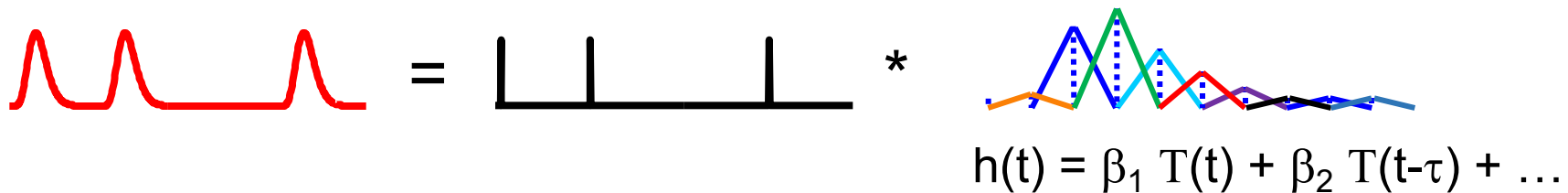
Convolution

Multiple Regression

Fixed HRF shape

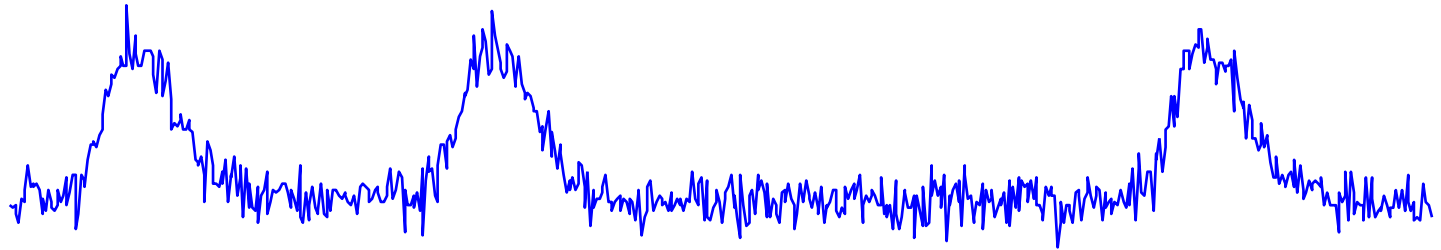


Flexible HRF shape



Deconvolution

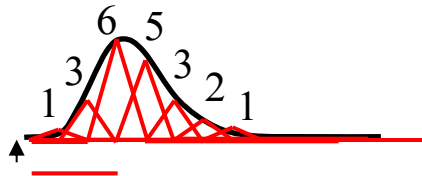
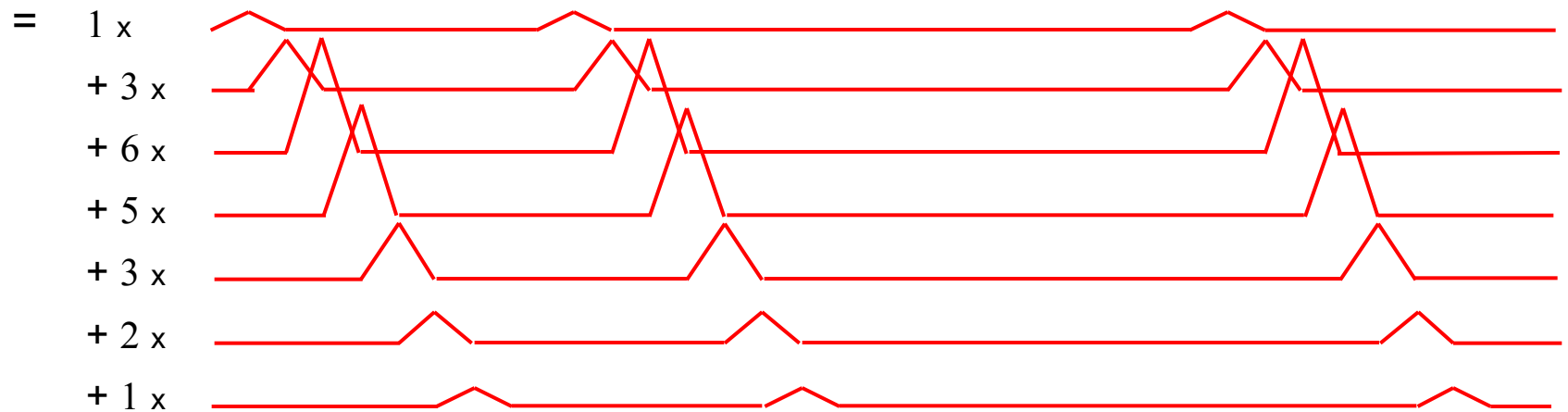
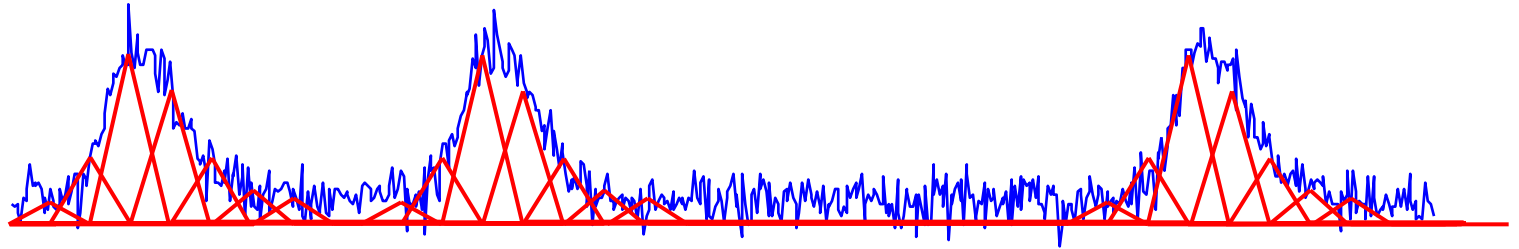
Fixed HRF



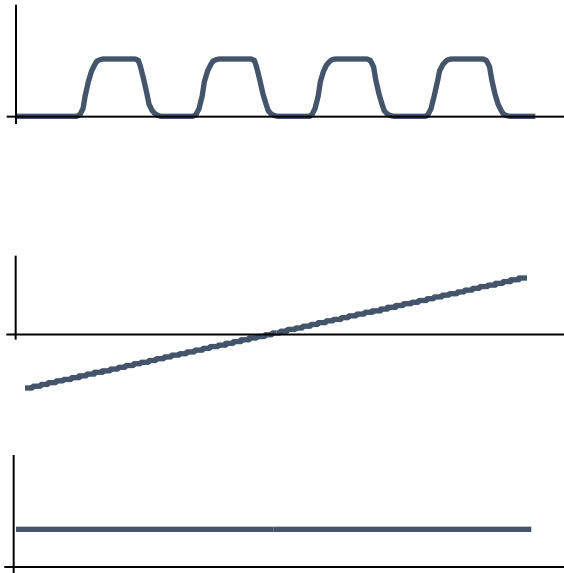
= $\beta_1 \times$



Tent Functions



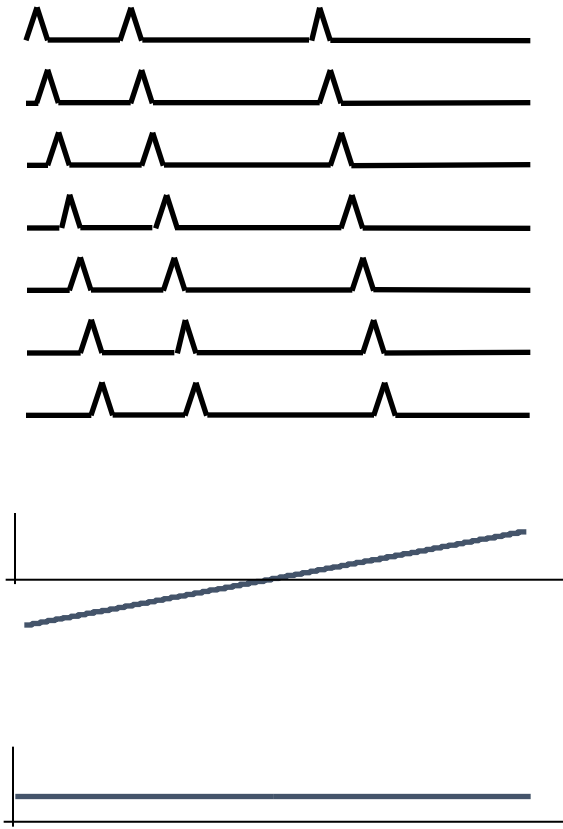
Regressors – 1 task vs. control



Design Matrix



Regressors – deconvolution (“tents”)



Design Matrix

