

Week 6 – First-level fMRI data analysis

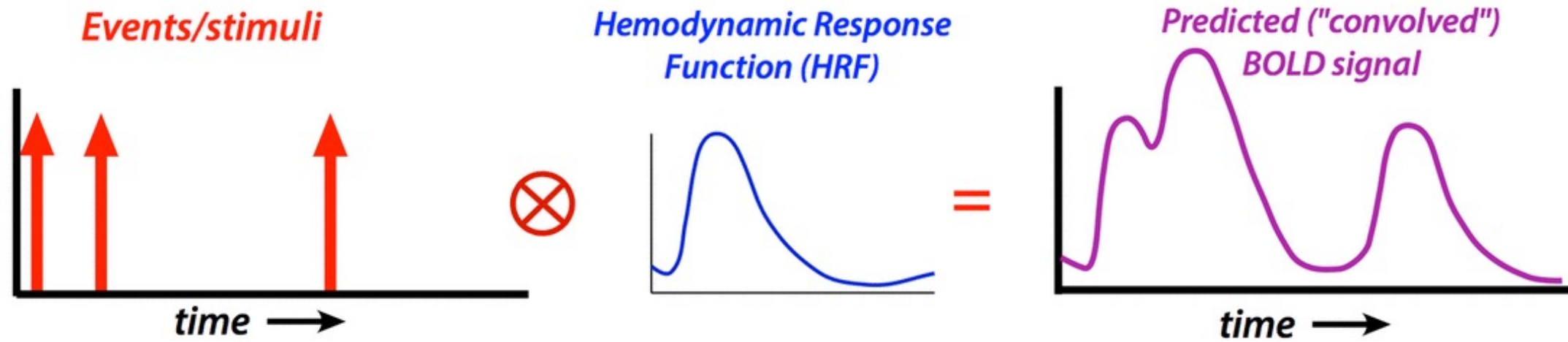
L06-01. HRF modeling – Reasons for using basis functions

Byeol, Hongji, and Jungwoo

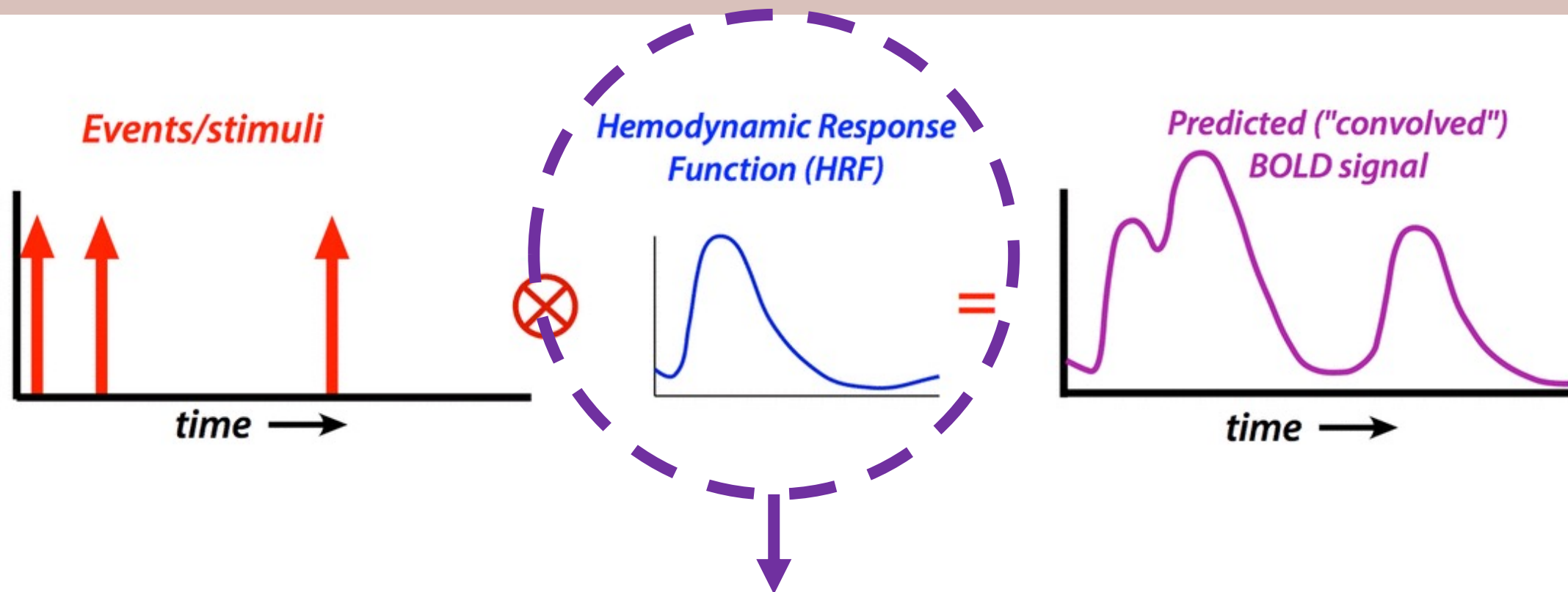
2 April 2021



HRF modeling



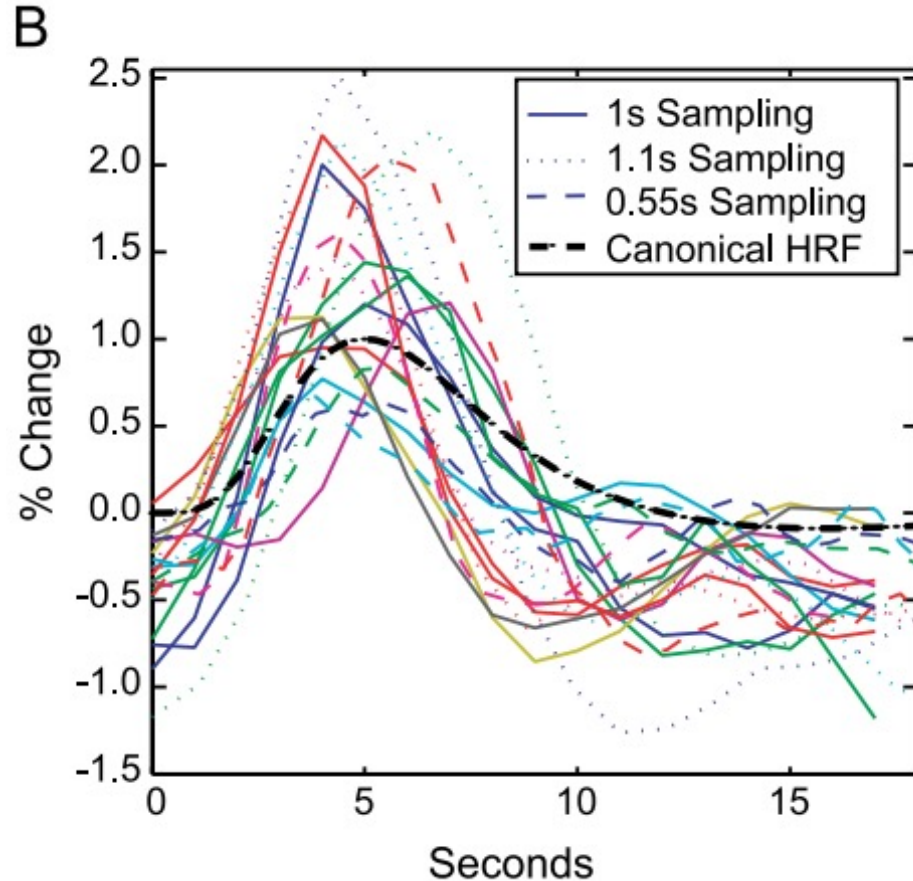
HRF modeling



Is this model good enough for capturing our BOLD signal?



HRF difference across subjects in M1



HRF is different across

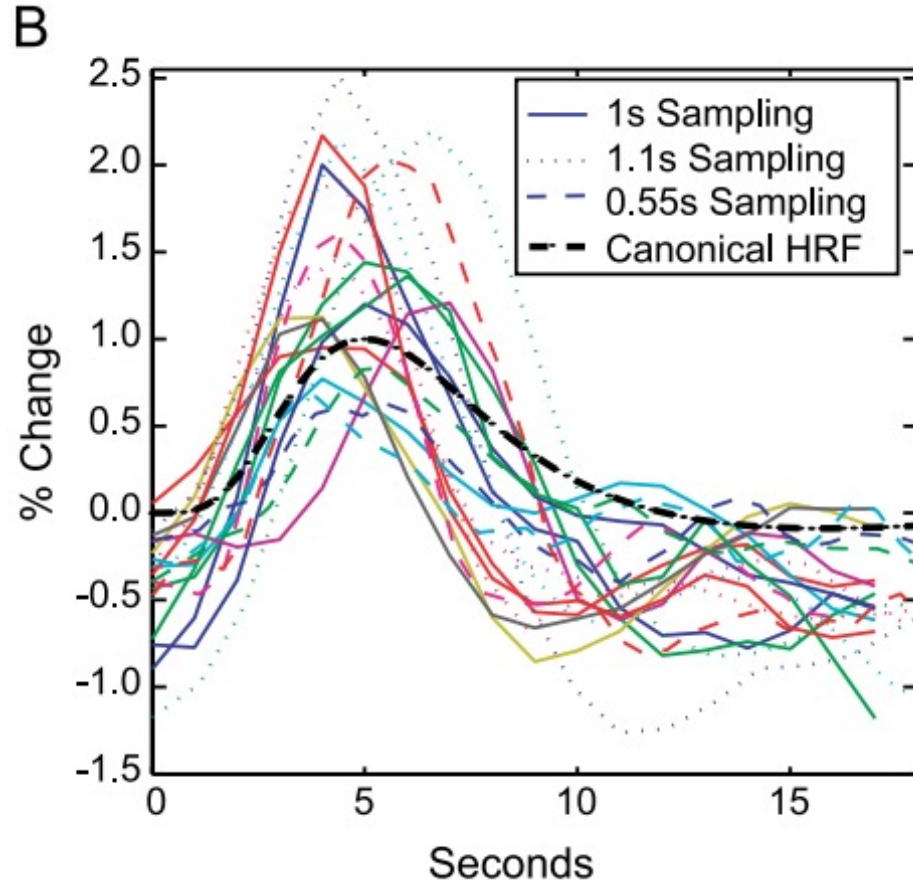
- regions
- species
- subjects

etc...

Handwerker et al. Neuroimage. 2004



HRF difference across subjects in M1



HRF is different across

- regions
- species
- subjects

etc...

Then HOW?

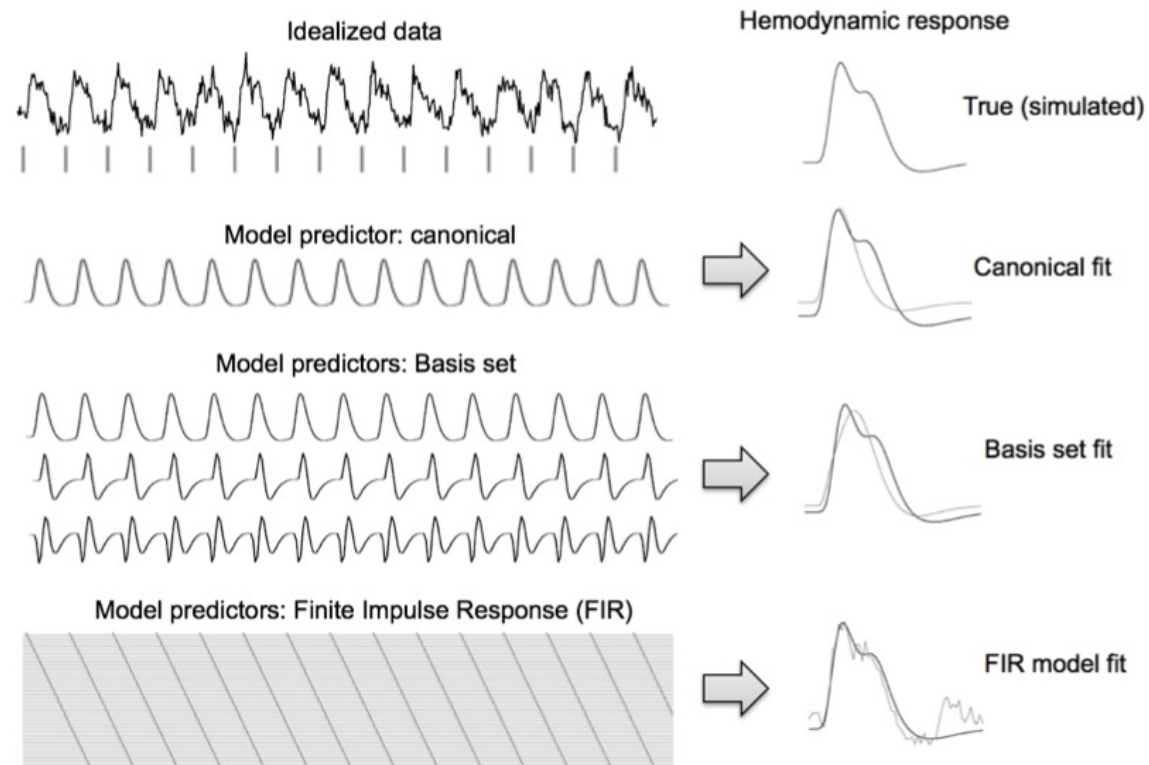
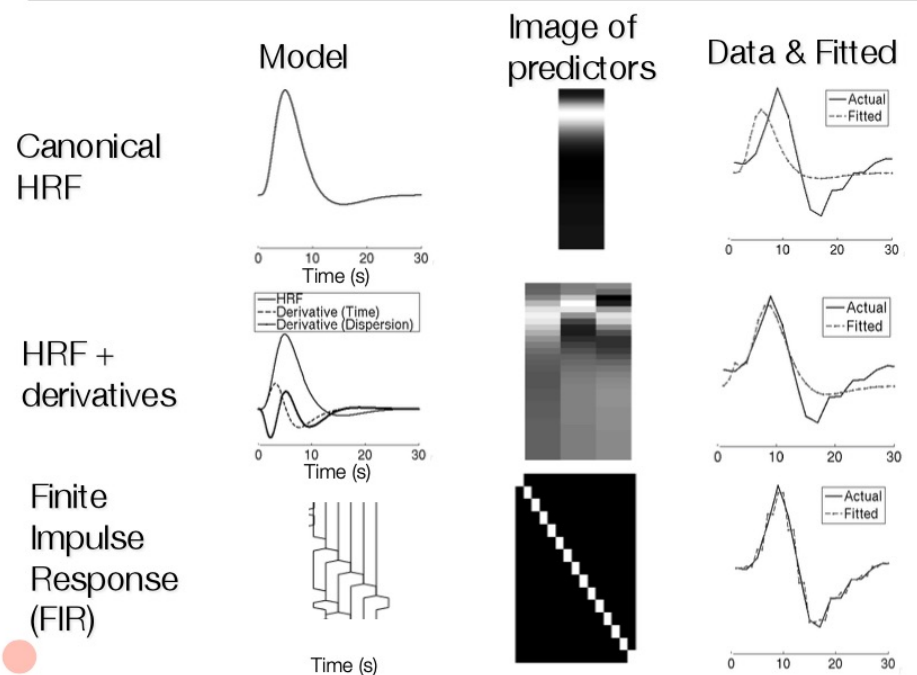
Handwerker et al. Neuroimage. 2004



3. Single-trial model - Basis sets

Basis sets

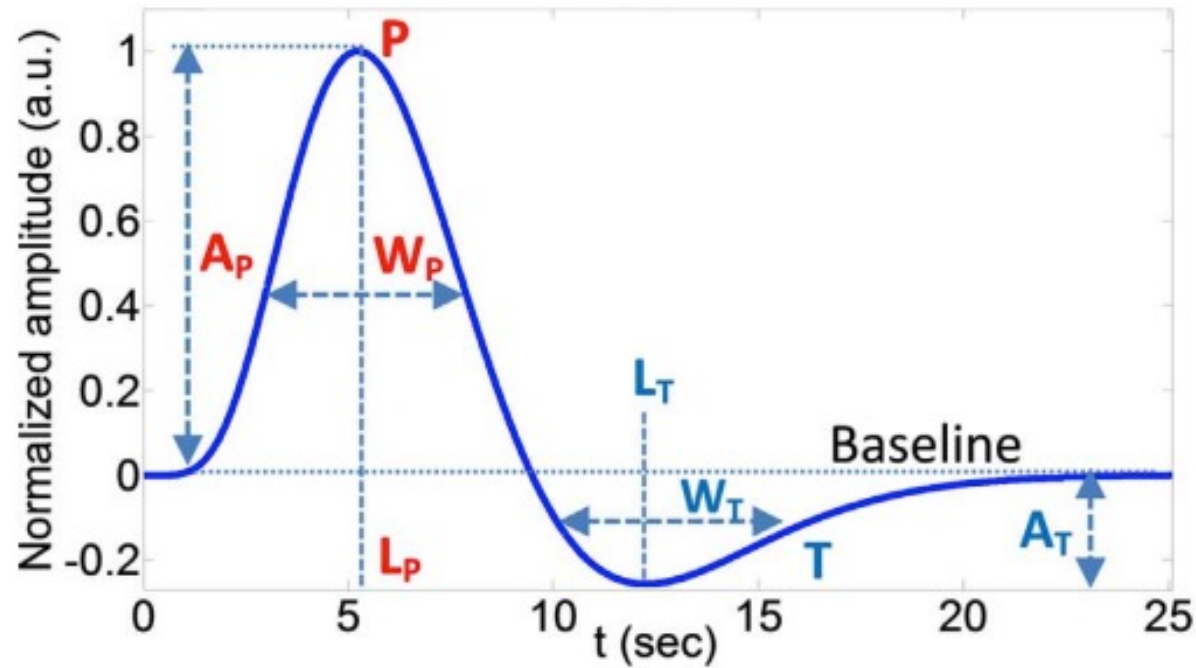
Principles of fMRI
Part 1



Contents credit: Tor Wager



HRF modeling



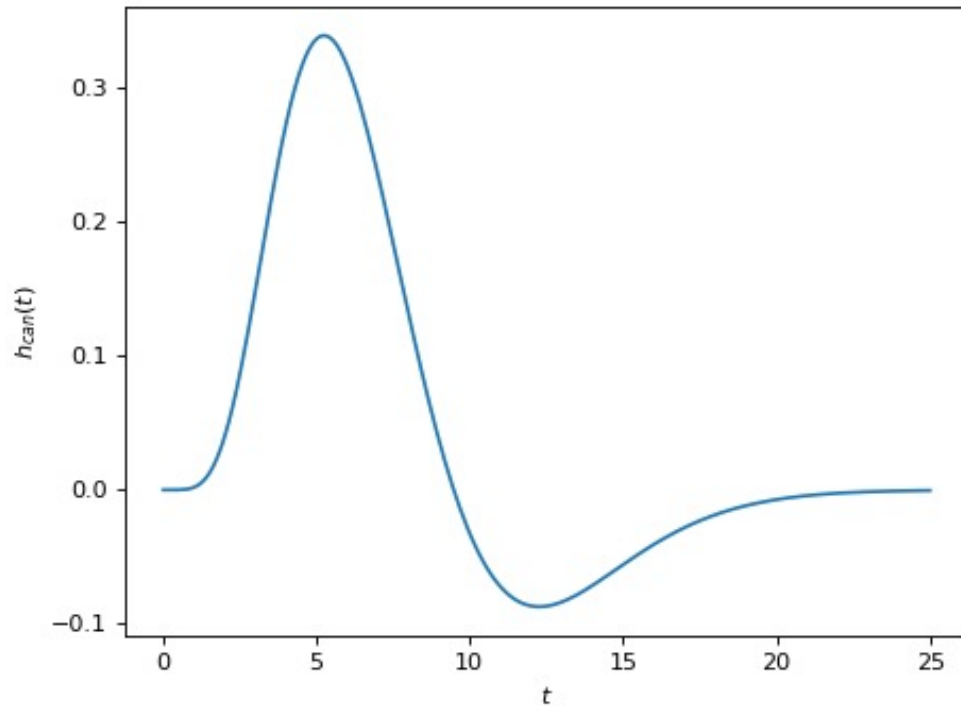
In HRF...

There are several parameters that define its shape.

- width
- height
- time to peak
- post dip



Advantages and Disadvantages of using canonical HRF



Advantages

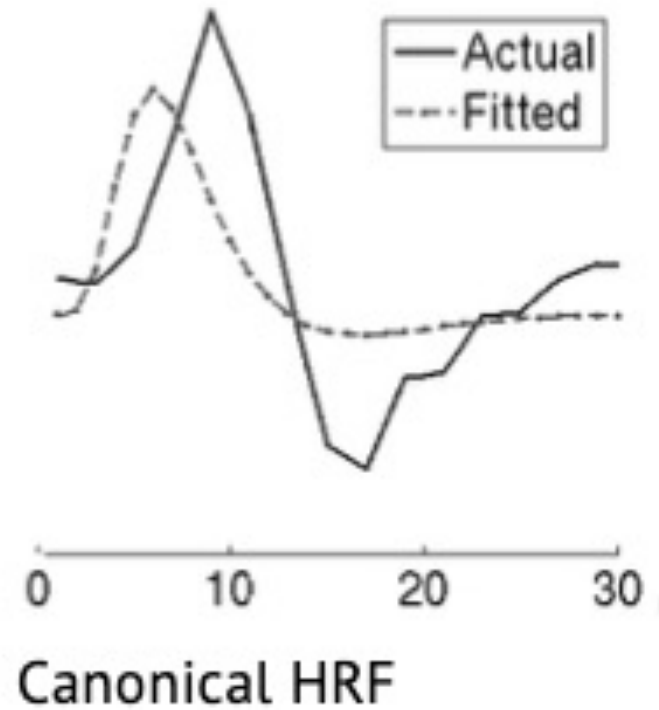
- Simple analysis
- Easy to interpret

Disadvantages

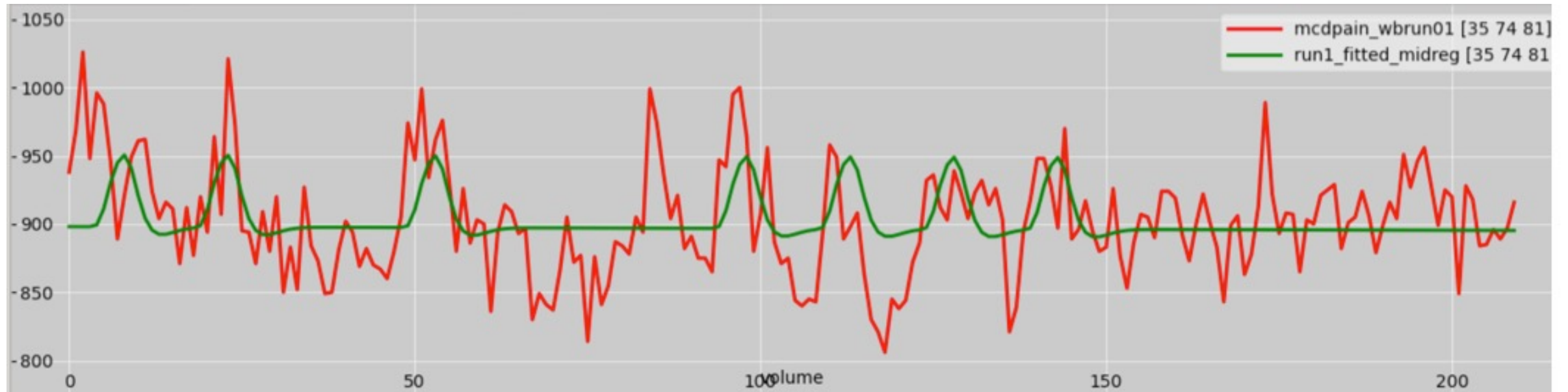
- If canonical HRF is incorrect...biased!



Advantages and Disadvantages of using canonical HRF



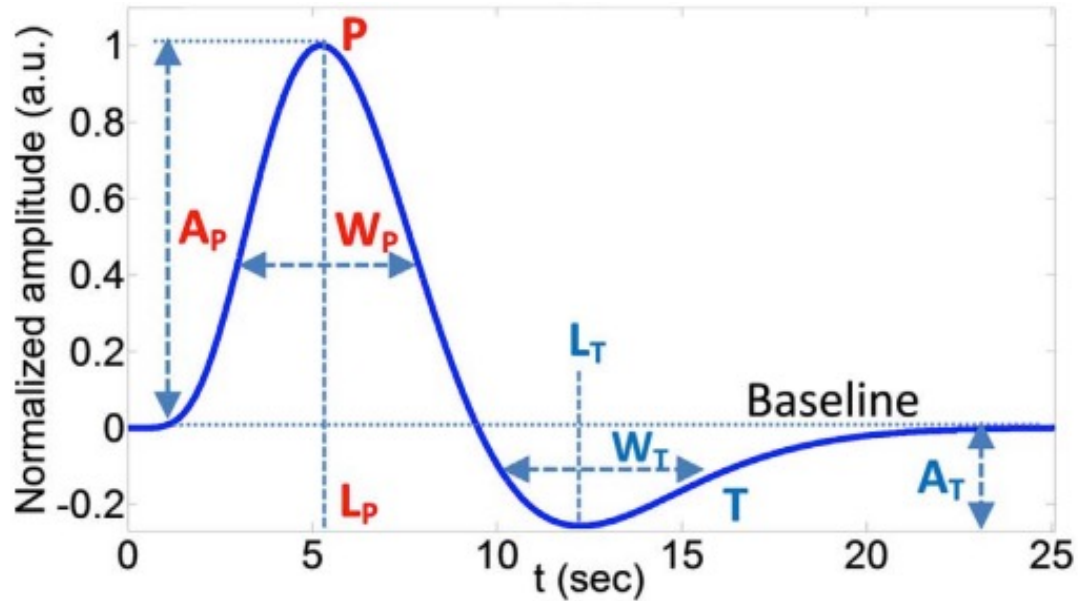
Advantages and Disadvantages of using canonical HRF



Most of all... works just fine



Advantages and Disadvantages of using more than two parameters



Advantages

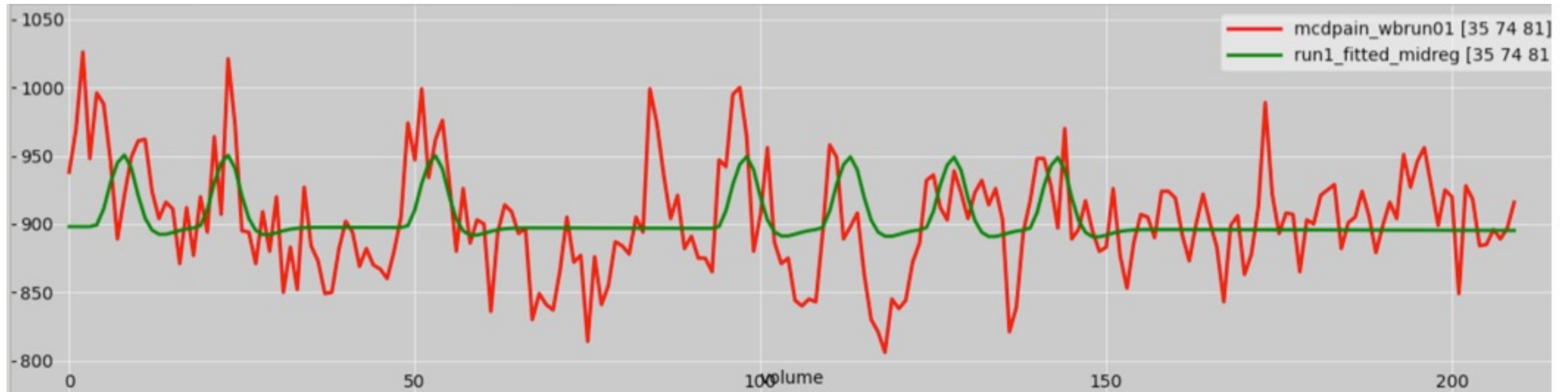
- Less biased and allows more variance.
- Possible to test hypothesis about parameters of HRF.

Disadvantages

- Possibility of overfitting
- More complicated analysis required.



Advantages and Disadvantages of using canonical HRF



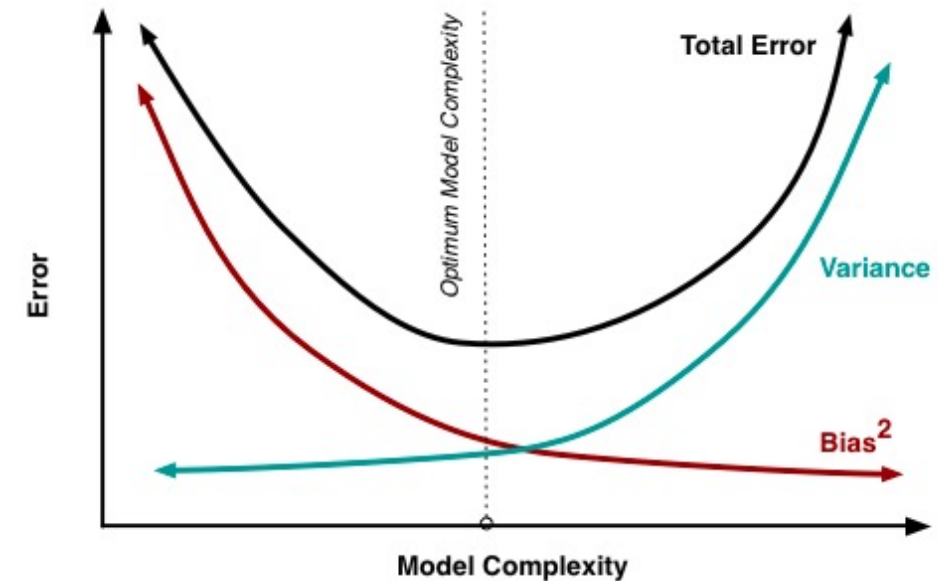
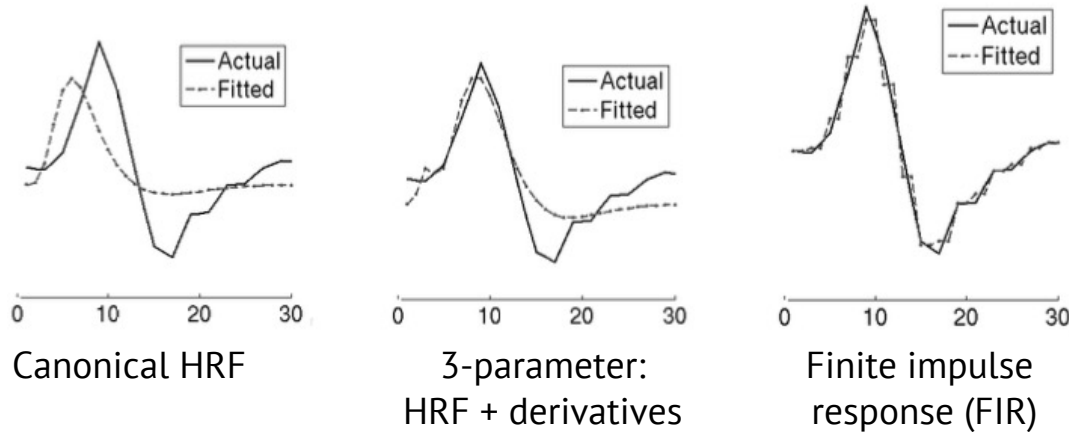
HRF modeling

Trade-off between bias and variance

High Bias & Low variance

vs.

Low Bias & High Variance



Cocoan 101

<https://cocoanlab.github.io>

