

Comparison of Noise Models through ROC Analyses of Simulated Data

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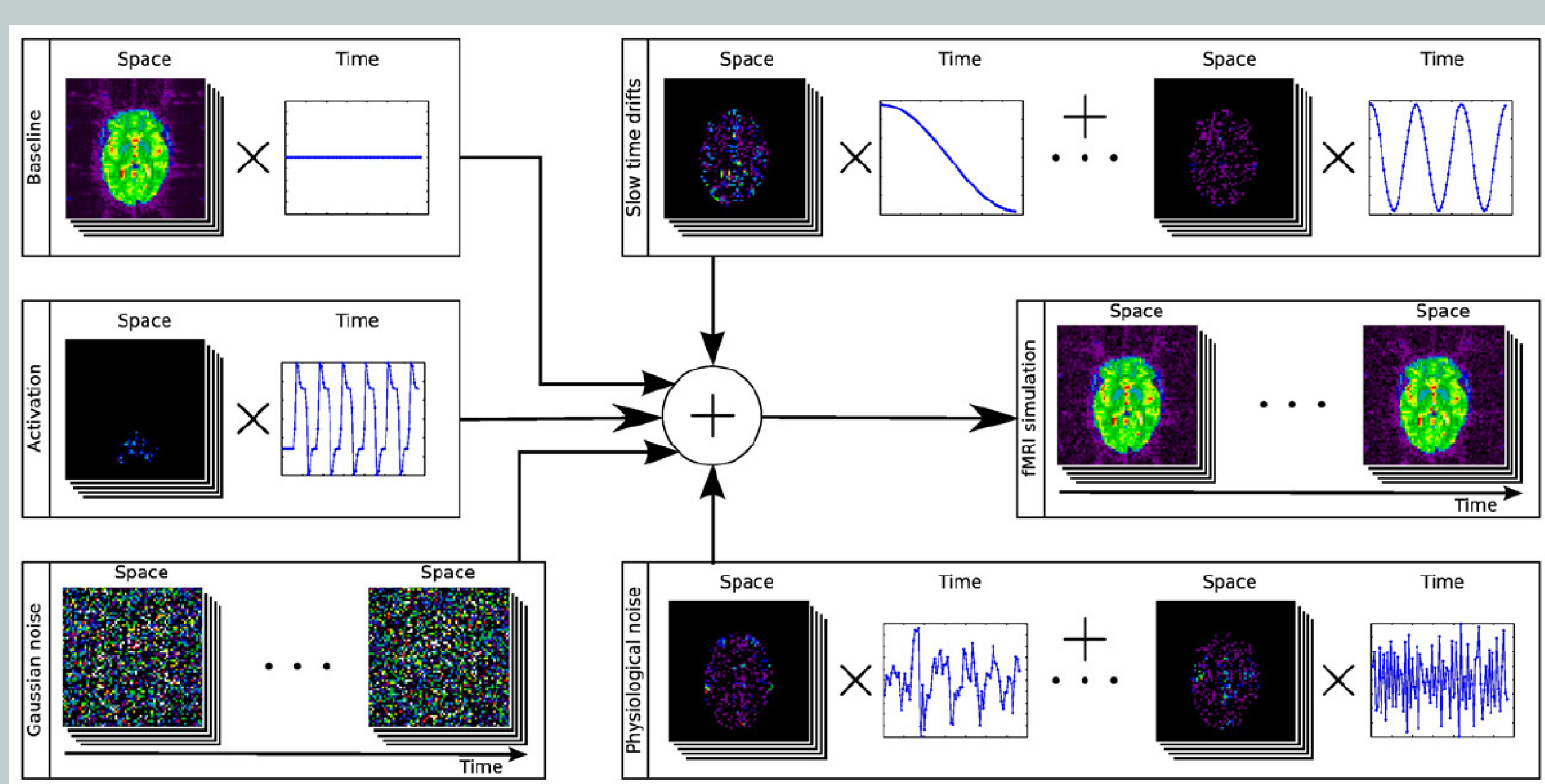


Goal

Simulation studies with fMRI data have gained great interest in the neuroscience community because it is the most feasible way to establish a ground truth. One important ingredient in generating fMRI data is the noise. This noise typically varies between studies without any existing knowledge of the effect on the simulation results.

Research question: Does generating fMRI data under different noise models have an impact on the sensitivity and specificity of localising active voxels in a standard SPM analysis?

Data Generation



Bellec et al., 2009

Simulation Design

Activation:

20s ON/20s OFF block design for 200s (TR = 2)

Noise: full-factorial design

(1) white vs coloured noise

(2) no drift vs low frequency drift

(3) low (SNR = 1) vs high (SNR = 0.6) noise data

Smoothing:

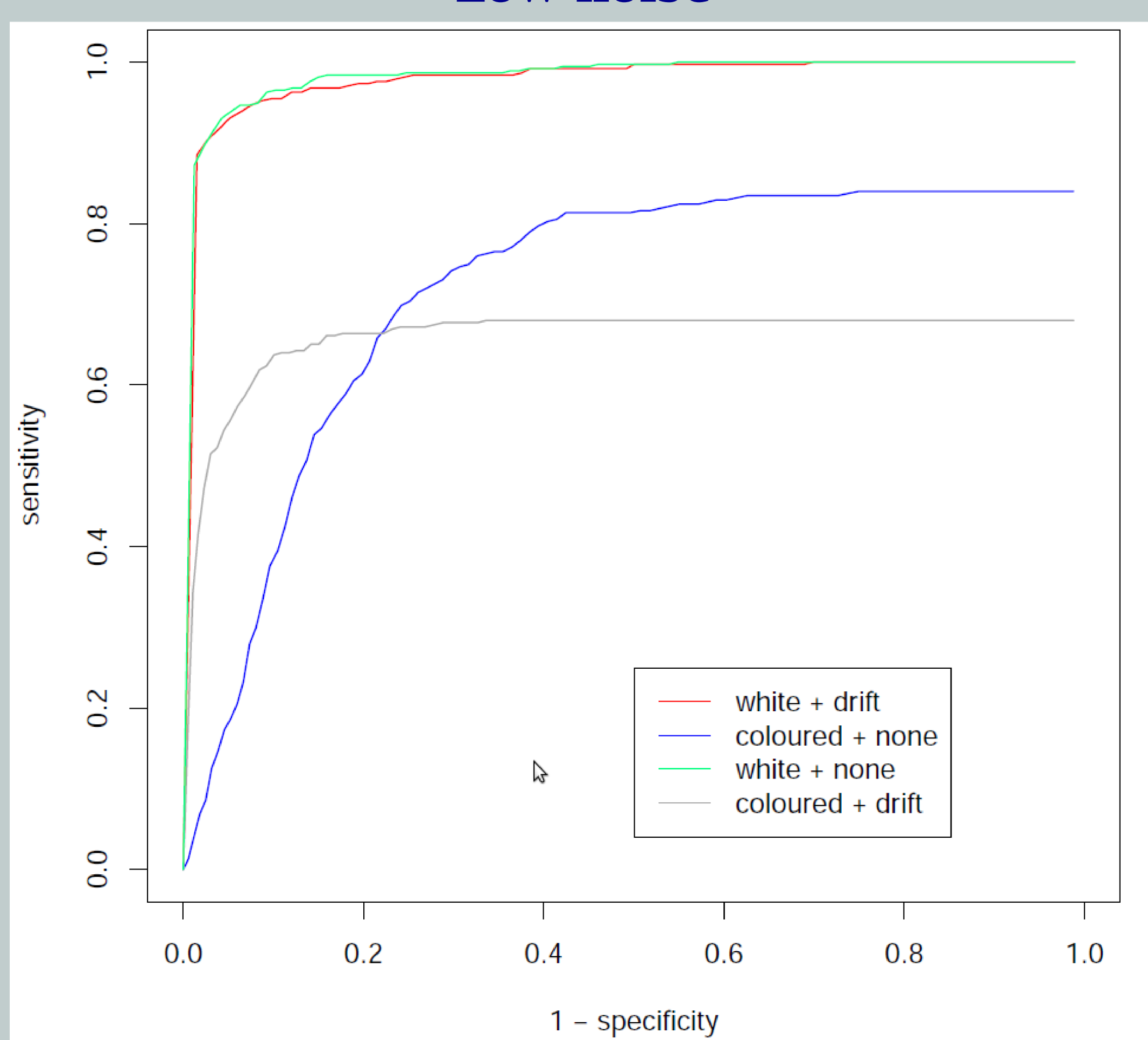
3D Gaussian kernel with FWHM = 4

Signal-to-noise ratio:

kept equal across conditions for raw data

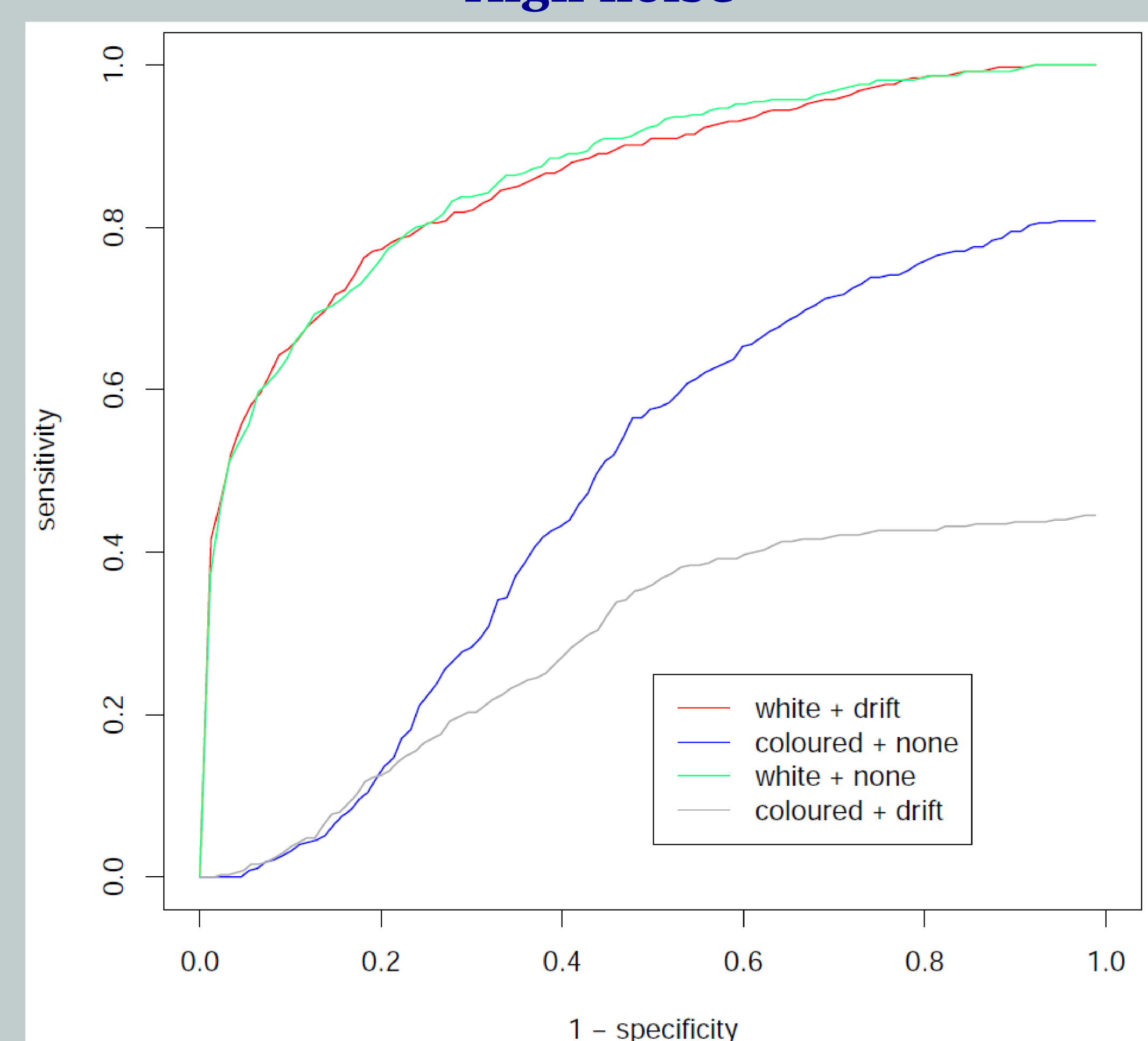
Results

Low noise



Major impact of coloured noise condition on both sensitivity and specificity

High noise



Conclusions

Since simulation research is highly important, we hope this study increases awareness that validation studies of data generating methods are necessary to increase confidence in fMRI simulation results

References

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- Kruger and Glover (2001). Physiological noise in oxygenation-sensitive magnetic resonance imaging. *Magnetic Resonance in Medicine*, 46, 631-637.
- Smith et al. (1999). Investigation of low frequency drift in fMRI signal. *NeuroImage*, 9, 526-533.

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