The Relationship Between Multivariate Pattern Classification Accuracy and Hemodynamic Response Level in Visual Cortical Areas

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Goal
Compare the timecourse of information availability in multivariate and univariate BOLD signal level analyses

Methods
• Fast PRESTO sequence (17 axial slices, 3 mm isometric, 739 ms acquisitions)
• Subjects viewed pictures of faces and houses (ISI: 15 acquisitions = 11.1 sec.)
• MVP analysis (PyMVPA2):
  • SVM classifier trained on each functionally defined ROI
  • Tested using leave-one-run-out cross-validation for every timepoint
• Univariate analysis:
  • Values within each ROI converted to % signal change (AFNI), averaged for each timepoint per condition
  • Within-subject t-values calculated at each timepoint for three distinct comparisons:

Results
• Above-chance classification preceded hemodynamic baseline deviation in V1
• Above-chance classification preceded conditional hemodynamic separation in V1, V3ab and FFA.
• Peak classification accuracy preceded the peak hemodynamic level in V1.

Conclusions
• Information sufficient to discriminate stimulus conditions is available in multivariate patterns of BOLD activity before it is available in the univariate signal level in early visual areas
• Peak classification accuracy in V1 preceded the univariate peak BOLD signal
• Remarkably, the information is available in the signal pattern:
  • Before the signal level has deviated from baseline in V1
  • Before univariate stimulus responses deviate from each other in V1, V3ab, and FFA

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* = p < .05 ** = p < .025 *** = p < .001