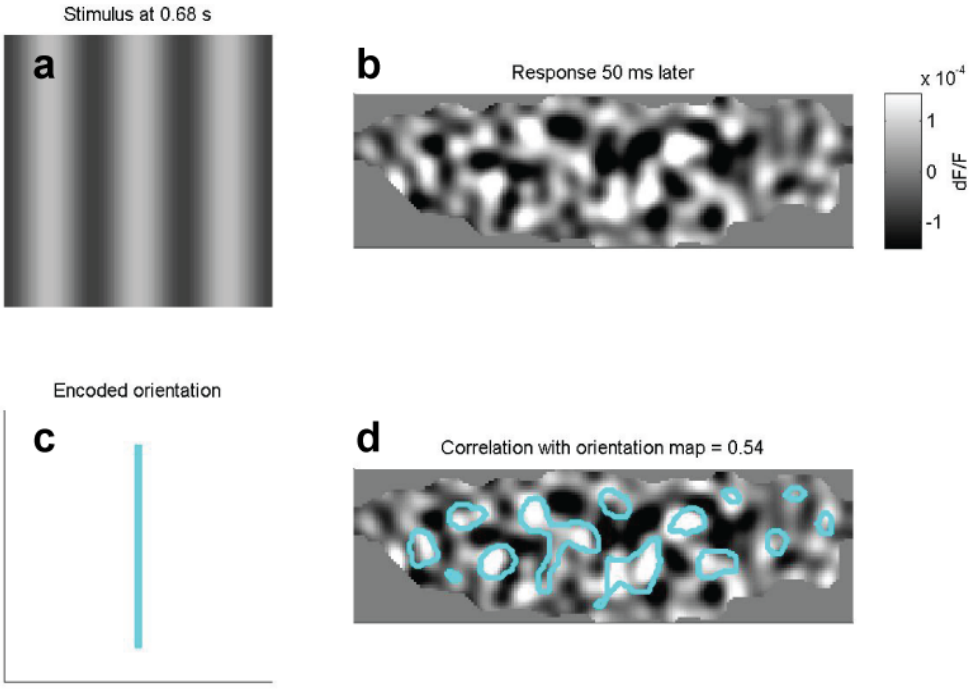
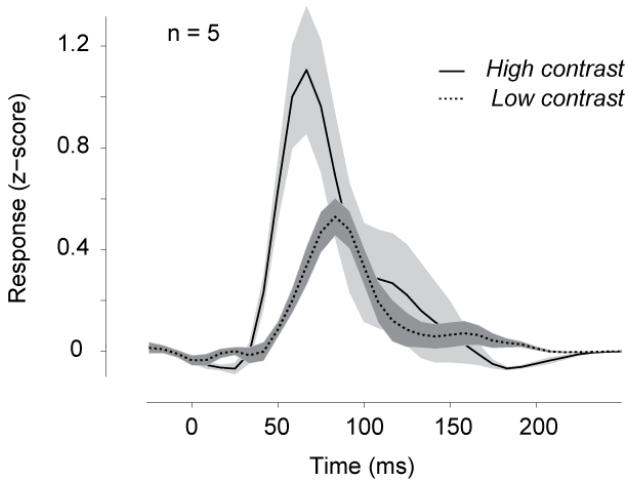
Dynamics and persistence of population responses in visual cortex, Benucci A, Ringach DL, Carandini M.

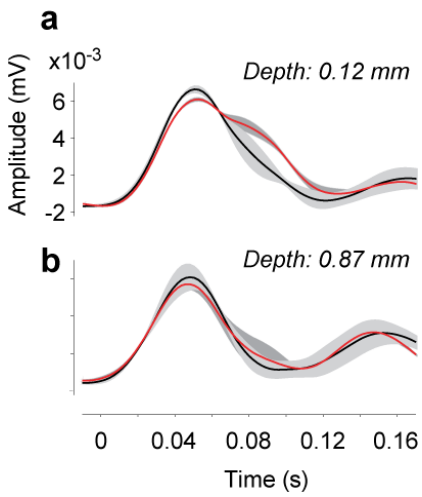
Supplementary Figures



Supplementary Figure 1. Decoding the population responses to recover the stimulus orientation. This image is a single frame in Supplementary Movie 1. (a) A randomly-selected frame of the stimulus (the one presented at t=0.68 s). (b) The pattern of activation exhibited by the imaged region of V1 50 ms later. (c, d) A simple decoding scheme applied to these responses predicts (correctly) that the stimulus was vertical. Having found the map of orientation preference for the cortical region (Figure 1b), we correlated activation profiles such as the one in panel **b** with the profiles of activity expected for each orientation. The profile with highest correlation is indicated by contours in panel **c**, and the corresponding orientation is indicated by the bar in panel **c**, whose length is proportional to correlation. As can be observed in Supplementary Movie 1, this decoded orientation consistently matched the orientation of the stimulus. In the movie, stimulus and response are slowed down by a factor of 40.



Supplementary Figure 2. Dependence of the dynamics of population responses on stimulus contrast. The average response to a stimulus was computed as in Figure 2c for two stimulus contrasts: 5% (dotted line) and 80% (solid line). At the lower contrast, response amplitude is significantly reduced and peak latency is longer, in agreement with electrophysiological data. Shaded gray areas indicate ± 1 s.e.



Supplementary Figure 3. Dependence of response persistence on cortical depth. We measured field potentials using a 16-site silicon probe with sites spaced uniformly over 1.6 mm. The probe was inserted vertically and the field potentials were analyzed to obtain current source density (CSD). Stimuli were the same orientation noise sequences used in the VSD imaging. Time courses of the responses are shown here for two cortical depths: 0.12 and 0.87 mm seen in the average CSD responses to the grating at the preferred orientation (110º) of the targeted cortical column. (a) In superficial layers (depth = 0.12 mm) the CSD responses show evidence for persistence similar to that observed with VSD (Figure 5): the responses when a stimulus is followed by a blank screen (*red*) lasted a few tens of millisecond longer than when a stimulus was followed by another stimulus (*black*). (b) In deeper layers (depth = 0.87 mm) this phenomenon was not present: response durations for the two stimulus conditions were indistinguishable. Shaded regions indicate ± 1 s.e.