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Investigating the Dynamics of Functional Brain Networks with MRI SHELLA KEILHOLZ, Emory University, WAQAS MAJEED, Georgia Institute of Technology — Functional Magnetic Resonance Imaging (fMRI) is sensitive to changes in blood oxygenation levels. While fMRI has traditionally mapped changes in these levels that localize to brain areas activated by an external stimulus, recent work has focused on detecting correlated, non-stimulus-related fluctuations in the fMRI signal throughout the brain. These fluctuations are believed to arise from spontaneous variations in local neural activity, and so correlated fluctuations from different brain areas may indicate coordinated activity. Maps of "functional connectivity" based upon these fluctuations show reproducible patterns of correlated signals. To date, research has focused on steady-state networks that persist over the entire imaging session (minutes). We are exploring the possibility of detecting changes in network activity on much shorter time scales (seconds). Preliminary analysis shows that power in the frequency band used to map functional connectivity varies over time, and that power differences correspond to changes in correlation between areas. We also detected phase differences in fluctuations that are consistent with propagating waves. These results indicate that time-varying analysis of fMRI data may provide insight into the dynamics of functional networks in the brain.

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