Separating signal from noise

We consider the problems of detection and recovery of a signal under additive Gaussian noise. In our variant, the transmitted signal is an infinite sequence taken from a set of admissible messages. Detection and recovery are then required to hold with probability one for each possible signal. The scaling limit of these problems is perfect detection or recovery of the drift of a Brownian motion. We introduce several general criteria and apply them to establish sharp transitions in the behavior of particular cases. The examples we consider are related to statistics, harmonic analysis, ergodic theory and probability.
Joint work with Nir Lev and Yuval Peres.