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Sensing multiple ligands with single receptor[1] VIJAY SINGH, ILYA NEMENMAN, Emory University — Cells use surface receptors to measure concentrations of external ligand molecules. Limits on the accuracy of such sensing are well-known for the scenario where concentration of one molecular species is being determined by one receptor [Endres[2]]. However, in more realistic scenarios, a cognate (high-affinity) ligand competes with many non-cognate (low-affinity) ligands for binding to the receptor. We analyze effects of this competition on the accuracy of sensing. We show that maximum-likelihood statistical inference allows determination of concentrations of multiple ligands, cognate and non-cognate, by the same receptor concurrently. While it is unclear if traditional biochemical circuitry downstream of the receptor can implement such inference exactly, we show that an approximate inference can be performed by coupling the receptor to a kinetic proofreading cascade. We characterize the accuracy of such kinetic proofreading sensing in comparison to the exact maximum-likelihood approach.

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[2]**Phys. Rev. Lett. 103, 158101 (2009)**

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