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Models of Information Integration in Perceptual Decision Making

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Abstract: In cognitive science there is a seeming paradox: On the one hand researchers studying judgment and decision making (JDM) have repeatedly shown that people employ simple and often sub-optimal strategies when integrating information from multiple sources. On the other hand another set of researchers has had great success using Bayesian optimal models to explain information integration in fields such as categorization, perception, and memory. One impediment to reconciling this paradox lies in the different experimental methods each group has used. Recently, Hotaling, Cohen, Busemeyer, & Shiffrin (submitted) conducted a perceptual decision making study designed to bridge this methodological divide and test whether the sub-optimal integration found in verbal problems stated in terms of probabilities may also appear in perceptual tasks. Their results indicate that a classic JDM finding, the dilution effect, does arise in perceptual decision making. Observers were given strong evidence X favoring A over B, and weak evidence Y also favoring A over B. According to Bayesian analysis, the odds in favor of A should be multiplied, resulting in an increased likelihood of A. Instead, Hotaling et al. found that the weak evidence diluted the strong evidence, producing decreased judgments and choice probabilities favoring A, given X & Y, than given X alone. I review these empirical findings and test both rational and cognitive models of the integration process.