An algorithm for estimating average magnitudes

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Abstract

Representing numbers spatially allows us to more quickly and accurately compute average magnitudes. For instance, a bar graph lets us quickly estimate the average height of several values. What algorithm might we implement to find the average position of observations in space, and how might we leverage this algorithm for quick numeric estimates? We asked subjects to estimate either the average spatial location of points on a line or the average value of written integers. We propose an iterative algorithm where the subject 1) makes a noisy estimate of the distance of each observation to a visual reference point, 2) infers the posterior of the average of those distances, and 3) updates the reference point to the new posterior mean. Our algorithm correctly predicts that subjects accuracy and confidence decrease with the variance of observations. We further investigate similarities and differences between the fitted models for spatial vs. numeric averaging.