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Comparing models with deformation metrics.

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We propose using a deformation mapping metric to compare implied volatility surface models that result from differing model fitting frameworks. Deformation mapping was developed to measure and compare anatomical images resulting from medical imaging technology such as Magnetic Resonance Imaging (MRI). The goal of deformation mapping in medical imagery is to measure the distance between two images where distance can signify disease. The distance between two images is the minimum amount of energy required to deform one image to another measured by the velocity field required to map each point on the first image to the corresponding point on the second image. We will apply the deformation metric to statistical models in place of images and show that it preserves the intuitive notion of relative distance between the models. We will demonstrate the utility of deformation mapping by comparing volatility surfaces. We will model the SP500 index for each day in a period, then compare each day's volatility to the average over the period. The resulting deformation mappings will allow us to quantify the similarities between days.