

THE COOPER UNION

Abstract

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This thesis presents a generative model for camera RGB values given latent variables that govern a material's surface reflectance spectra. Specifically, the RGB values of a bromothymol-blue based pH indicator strip as captured by a Nokia N900 camera, will be investigated. The model consists of two main components: a model of the pH indicator's surface reflectance spectra with the pH of the dipped solution as its latent variable, and a model of the camera imaging pipeline. The generative model is then used in a machine learning application to predict the latent variable, pH, given image observations from a camera. Additionally, the model provides a scheme for data augmentation. The generative model performs competitively against other traditional regression techniques. When used for data augmentation, the model improves the performance of other learning algorithms trained on the same dataset. Therefore, when sufficient domain knowledge is present, similar generative models to this one could be used to lessen the amount of data collection required.