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A regression approach for noise removal in image analysis

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Recording an image that is sharp and clear is sometimes challenging, and perturbations are inevitable. Brain CAT scans, for example, may contain noisy regions, and ultrasound images may have unclear object. Galactic images may be blurred and noised because the light is bent by the time it reached the camera or because of the existence of dust in the outer space. The objective of image de-noising is to reduce the noise generated during the process of capturing an image, which is due to several factors such as bad camera sensor, memory location or noise in the transmission channel. In this talk, I present a novel approach to tackle Gaussian noise introduced to an image at different levels using a multiple regression model in which the neighboring pixels are the predictors used to estimate the pixel value (color) on the grid. To this end, I consider balls of varying radius values around the predicted pixel. The underlying algorithm portrays a typical inverse problem that requires the introduction of a regularization term to the system. Finally, I utilize the structural similarity index (SSIM) for images and peak signal to noise ratio (PSNR) measure to assess the performance of the model at different noise levels and radii. The results are promising and produce high similarity measure between the de-noised and original sharp images.

Biography

Walid Sharabati joined the Department of Statistics at Purdue University in the fall of 2008. He earned his PhD in Computational Statistics from George Mason University and has an MS in Mathematics and Computer Science from Minnesota State University. His main research interests are social networks, preferential attachment, text mining, stochastic processes, statistical modeling, Gaussian mixture models, and statistical models for image de-blurring and de-noising. He has been serving as an Editorial Board Member of *Austin Statistics and Enliven: Biostatistics and Metrics*.

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