Faculty of Science
Department of Mathematics

NUS National University of Singapore

MA4198 PROJECT PROPOSAL (PROJECT CUM SEMINAR GROUP)

SUPERVISOR'S INFO

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PROJECT ID: PS2420-01

TITLE

Image Deconvolution Using Wavelet Transform

BRIEF DESCRIPTION OF PROJECT

This project explores the use of wavelet transform techniques for image deconvolution, aiming to recover sharp images from blurred and noisy observations. Students will study the theoretical foundations of wavelet transforms, including multiresolution analysis and sparsity, and apply these to tackle deblurring challenges caused by point spread functions (PSFs). The practical focus will be on designing and optimizing wavelet-based algorithms to separate noise and blur effectively.
Each student will address a distinct aspect of the problem, such as:

1. Analysis of wavelet basis functions for edge preservation.
2. Development and testing of iterative methods with wavelet regularization.
3. Evaluation of deconvolution performance using synthetic and real-world data.

EXPECTATION/S

Students must rigorously apply wavelet transforms to develop advanced deconvolution algorithms, independently solving challenging subproblems while contributing to group discussions. They are expected to critically evaluate performance, balancing noise reduction, edge preservation, and efficiency. A well-structured 40-page report detailing theoretical insights and experimental results is required.

PREREQUISITE/S (at level 3000 or below, with at most one course at level 3000)

MA2311 and MA3227

READING REFERENCE/S

Mallat, S. (2009). *A Wavelet Tour of Signal Processing: The Sparse Way (3rd ed.)*. Academic Press.ISBN: 978-0-12-374370-1