

MANU GHULYANI

Effective Communication Series EE

## Fast total variation minimizing image restoration under mixed Poisson-Gaussian noise

27<sup>th</sup> July, 4-5pm at MMCR



### Abstract

Image acquisition in many biomedical imaging modalities is corrupted by Poisson noise followed by additive Gaussian noise. Maximum Likelihood Estimation (MLE) based restoration methods that use the exact Likelihood function for this mixed model with non-quadratic regularization are very few. In particular, while it has been demonstrated that total variation (TV) based regularization methods give better results, such methods that use exact Poisson-Gaussian Likelihood are slow. Here, we propose an ADMM based fast algorithm for image restoration using exact Poisson-Gaussian Likelihood function and TV regularization. Specifically, we propose a novel variable splitting approach that enables isolating the complexity in the exact log-likelihood functional from the image blurring

operation, allowing a fast Newton-like iteration on the log-likelihood functional. This leads to a significantly improved convergence rate of the overall ADMM iteration. We give sufficient conditions for convergence of this algorithm. We also propose Expectation-Minimization based iterations to further exploit the proposed splitting approach. The effectiveness of the proposed methods is demonstrated using restoration examples.

### Student,

Department of EE, IISc

Manu Ghulyani received the B.E. (Hons.) degree from BITS, Pilani, India, in 2012. After completing the B.E., he worked as an Operations engineer at NTPC Ltd from 2012 till 2015. Since 2015 he has been an M.Sc(Engg.) student under the supervision of Dr. Muthuvel Arigovindan at the Department Of Electrical Engg., IISc. His research interests include Image Restoration, Optimization, Machine Learning and Statistical Modeling.