Abstract of – “Some Studies on Quantification and Fusion of Differential Information”

Multi-modal image fusion has been one of the active areas of research due to its extensive practical application in surveillance, military and especially object detection in bad weather conditions. Since fog, rain and other weather conditions reduce the visibility in general, it causes the visible image not to gather the information required, and that is where infrared images come into the picture.

In this work, we propose a set of techniques to quantify differential information of one pattern over the other and subsequently fuse information in limited and optimal data scenarios. In this regard we propose a novel approach for quantification of differential information, of one pattern over the other and observe that this leads to the solution of matrix pencil equation. This mathematical formulation has been tested on a variety of applications like image classification, audio classification, seizure detection, the transformation of patterns and fusion in a constrained scenario.

Multi-modal image fusion techniques have been proposed for limited data and optimal data scenario. A novel adversarially constrained residual neural network, with symmetric skip connections, has been proposed for infrared and visible image fusion. The architecture has been trained and tested on the TNO dataset for military applications.

In the case of single instance data availability, a novel spatially constrained adaptive multi-rate filter bank structure has also been presented. Its efficacy has been tested for multi-modal fusion and image super-resolution on the TNO dataset and SupER database, respectively.