

The value of image processing and fusion of different imaging modalities has been analyzed for both diagnostic and prognostic purposes - less so for interventions. There are numerous technical approaches for registration and image fusion of radiological images to consolidate imaging data from different modalities. Registration is defined as aligning the two data sets spatially to each other, where as fusion refers to overlaying and visualizing these merged sets.

In the case of imaging data sets of fixed or rigid organs such as the spine or brain, these algorithms are well studied and the results generally more robust and computationally fast. But the problem is more difficult in organs with physiologic motion and non-rigid organs. Furthermore, image-to-image registration from different modalities increases the complexity of the problem. Issues related to strengths and disadvantages of different techniques and how different imaging modalities impact these algorithms will be discussed. The details and implementation of translating these techniques from the research bench to clinical application will be presented.

This lecture will provide an overview of the different algorithms that have been studied for registration of imaging datasets, challenges and limitations of practical implementation and use cases in clinical scenarios.

Learning Objectives:

1. Understand the concept of registration and image fusion.
2. Understand the issues and trade-offs between different registration algorithms in relation to various imaging modalities.
3. Understand the issues in translating these to clinical application.