OAK RIDGE NATIONAL LABORATORY
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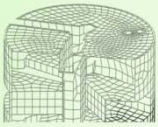
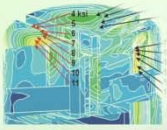
FACT SHEET





Modeling and Simulation Group

DATA ANALYTICS FOR MEDICINE USING SEMI-SUPERVISED LEARNING (DAMSEL)

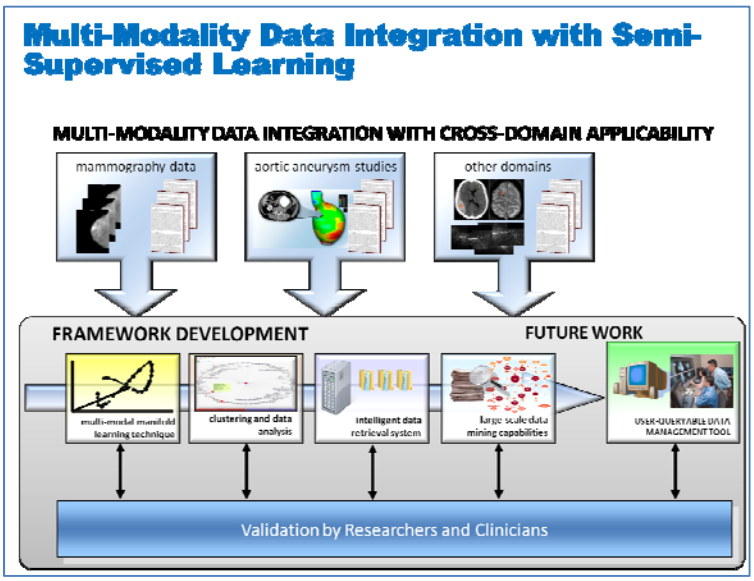
Multi-Modality Data Analysis

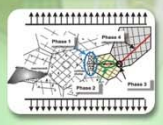
Overview

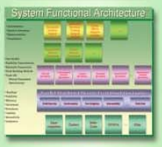
The Data Analytics for Medicine using Semi-Supervised Learning (DAMSEL) project involves the creation of a multi-modal architecture and tools for the analysis of biomedical data, including images and test reports. DAMSEL applications include mammography and abdominal aortic aneurysma (AAA). A semi-supervised machine learning framework was developed in order to integrate the text and image modalities by transforming an image feature vector produced through image processing to a lower dimensional space that is smooth with respect to the problem-specific similarities described in the text reports. DAMSEL provides support for combining image and text modalities in previously unavailable ways, but the general framework is also generic enough to support the combination of any number of different modalities that represent different views of the medical problem. The effectiveness of the framework when the secondary modality set is engineered to consist of features representative of the target problem has been demonstrated via improvement over state-of-the-art results. Ultimately, such a system could be used for both clinical and research decision support.

Components

- Text Analysis
  - Maximum Variation Sampling (MVS) – non-probabilistic sampling
  - Genetic Algorithms
  - Unsupervised Clustering
- Image Analysis and Feature Extraction
- Semi-Supervised Learning Environment
  - Manifold Learning
  - Deep Belief Networks
- Testing and Validation







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