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Medical Image Segmentation with Interactive Refinement

-Medical Imaging is an important tool utilized for diagnosing, monitoring and treating medical conditions. In medical imaging, anatomical or pathological structures may be difficult to distinguish, thus medical image segmentation is utilized to make those structures clearer. Manual segmentation approaches are tedious, and expensive. Deep convolutional neural networks have shown to work well at segmentation, however, they require large sets of labeled training data, which is difficult to come by.

Researchers at Arizona State University have developed a novel interactive training strategy for medical image segmentation. This strategy interactively refines the segmentation map through several iterations of training for continuous improvement and prediction. A convolutional neural network is trained with user simulated inputs to edit the segmentation and improve segmentation accuracy. When tested on different datasets, this strategy showed superior performance in comparison to other strategies.

This semi-automatic strategy provides user interactions to the network as additional input or feedback to guide the neural network, correct segmentation error, improve segmentation accuracy and provide a feedback control loop.

Finally, using interactive network on top of the state-of-the-art segmentation architecture, improves the prediction accuracy further, compared to when the base model is a simple

encoder decoder architecture.

Potential Applications

- Image segmentation in various medical imaging modalities:
  - CT

- MRI
- More

Benefits and Advantages

- Speeds up annotations
- Corrects segmentation error and improves segmentation accuracy
- Provides maximum performance boost in just two to three user-inputs
- Can refine existing methods
- Is able to better predict boundaries of an object
- Continuously improves with each interaction from new information provided by the user and updated predictions
- Generalized and works on a variety of types of images
- Cost-effective
- Performance demonstrated on a prostate dataset and a heart, spleen, pancreas and hippocampus dataset

For more information about this opportunity, please see

Goyal - Thesis - 2021

For more information about the inventor(s) and their research, please see

Dr. Liang's departmental webpage