Chapter 7

Conclusion and Future Work

This chapter concludes the models presented in this thesis. It also suggests the future works that can be explored in this area.

7.1 Conclusions

Salient object detection is a research area with broad applications in the field of computer vision. It is a pre-processing task for content-based image retrieval. There has been continuous research in this field, yet none of the methods are competent to extract the salient object. Some of the ways fail to identify heterogeneous objects. Others miss the salient object due to similarity to the background. In deep learning, the blurred edge is a consistent problem. To counter these issues, several models were proposed in this thesis. Application of a salient object detection model for

colon tumor localization and image annotation was also explored. The main highlight in image annotation was the study of feature selection for image annotation.

Chapter 1 introduced the field of salient object detection. It explained the motivation behind researching this field. The problem statement and contribution to the thesis were also introduced.

Chapter 2 gave the theoretical foundation of salient object detection and image annotation. It also reviewed the research done in these fields in the past decade. Issues and challenges of the fields were also mentioned. The benchmark databases of both the research areas and the performance metrics were also described in detail.

Chapter 3 proposed three models for salient object detection. The first model used multi-level and multi-plane Otsu thresholding and then used active contours for extracting the salient object. The second model used edge cues and active contours for finding the salient object. The last model used Gradient Vector Flow and Minimum Directional Contrast to locate the salient object. It also explored the area of scene analysis. These models mainly worked on giving clean edges and covering heterogeneous objects.

Chapter 4 used a machine learning-based model of salient object detection. It used background subtraction and developed a foreground map using minimum directional backgroundness. Texture segmentation using Gabor filters was done. Object proposals were generated which ensured the completeness of the salient object. The final result was corrected using graph-cut segmentation. This model tried to work on heterogeneous objects, object looking similar to the background, clean object

boundaries and completeness of the object.

Chapter 5 proposed a hybrid method of salient object detection which used deep learning method to detect possible salient objects and Gabor filter segmentation and graph-cut segmentation to obtain an accurate salient object with clean edges. This chapter also proposed a technique for colon tumor localization.

Chapter 6 proposed an efficient image annotation model. The first step was to detect salient objects. LBP and LDP features were extracted. A comprehensive study of feature selection was performed. Fisher feature selection was considered to be the best among 18 feature selection methods. A double sort feature selection algorithm was also proposed, which increased the accuracy of the results and also reduced the execution time of the algorithm.

7.2 Future Work

In spite of the continuous research in this field, significant issues are existing in this field. Saliency is a highly subjective topic. A more precise understanding of the human attention mechanism can clear the existing ambiguity. Various algorithms give grayscale results, which make it difficult for evaluation. A standard-setting for result can help for a better comparison of different proposed methods.

Some existing databases, like MSRA 10K, are very simple, while others are very complex like Judd-A. Generating a database that captures nearly all the varieties of images can help to create better models. Heterogeneity in objects is still not

entirely resolved. A study of mechanisms for better separation of background and foreground, in cases where they are similar, will be beneficial in military and wildlife applications.

Deep learning methods lose information, so the edges in the final result become blurry. Some models must be developed that incorporate the benefits of traditional as well as deep learning models. Such hybrid models can be time-efficient as deep learning methods require much time for training.

In image annotation, inconsistent image tags are a critical issue that must be resolved. A comprehensible classification of objects might solve the problem to some extent. An efficient label transfer mechanism must be developed. Understanding the correlation between labels may increase the accuracy of models.

The proposed method for salient object detection can be extended and improved using features extracted from better deep learning models. The deep learning models can be developed by utilizing some prior information from traditional models. More applications of the proposed models can be found in medical image processing areas. Many improvements in the proposed model of image annotation are possible, in terms of better features to be extracted and superior models of multi-label classification.