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## EXPLORING THE ROLE OF LOSS FUNCTIONS IN BIOMEDICAL IMAGE SEGMENTATION

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**Annotation.** The loss function is an important part of the segmentation method based on deep learning, and the improvement of the loss function can improve the segmentation effect of the network from the root, however, there are few literatures to do specific analysis and summary of various types of loss functions, this paper summaries some commonly used loss functions from the common problems in the current medical image segmentation task.

The loss function has important meanings such as measuring segmentation accuracy, promoting model convergence, improving spatial consistency, and improving the generalisation ability of the model. Following loss functions are commonly used:

1. Cross-entropy loss: this is a loss function commonly used for classification tasks and can also be used for image segmentation at the pixel level, which measures the loss by comparing the difference between the model's predicted segmentation results and the true labels. A number of articles have studied it, [1] have chosen to apply CE Loss in segmentation models. The formula for cross-entropy loss is as follows:

$$L_{CE} = -\sum_{i=1}^C q_i \log(p_i).$$

2. Dice loss: it is used to measure the overlap region between the predicted and true values, it works better when in dealing with the category imbalance problem. DSC reflects the segmentation results with the real situation size and localisation consistency, which is more in line with the perceived quality compared to the pixel level evaluation metrics. The Dice Loss formula is as follows:

$$Dice = \frac{2TP}{2TP + FP + FN} .$$

Jaccard Loss: it is based on Jaccard Index, also known as Intersection over Union (IoU) Loss, is a commonly used loss function for semantic segmentation tasks to evaluate the similarity between the segmentation results of a model and the real segmented labels[2]. The larger the value of Jaccard coefficient, the higher the sample similarity. Jaccard loss formula is as follows:

$$IOU = \frac{TP}{TP + FP + FN} = \frac{Dice}{2 - Dice}.$$

The loss function is an important module in biomedical image segmentation, the improvement of the loss function can solve a variety of problems in the task of biomedical image segmentation, and the improvement of the loss function has a broad prospect in the improvement of the performance of medical image segmentation models.

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### 一种服务于养老院的用于健康监测和药品管理的手环系统设计

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**Annotation.** This paper aims to introduce the design of a bracelet system for health monitoring and drug management serving nursing homes, in order to improve the quality of life of the elderly while improving and reducing the waste of human resources and reducing costs.

随着人口老龄化的趋势，社会面临着一系列的挑战和问题。养老院作为一种为老年人提供住宿、饮食、医疗和娱乐等服务的机构已成为现今许多老人的选择。对于养老院的运营方来说，一方面必须确保为住户们提供高质量的住宿环境与医疗资源，另一方面养老院也需要控制运营成本，保持经济效益。

在养老院中，雇佣护理人员是一项可观的开支。为了帮助老年人预防和治疗各种疾病，延长他们的寿命，护理人员的工作之一是监督老人的用药情况，及时提醒他们按照医嘱服用药物，并向医生反馈老人的身体状况，以便医生根据需要调整用药方案。为了减少人力开销，目前存在药盒管理和电子提醒等方案，然而这些方案仍然存在不足之处。以较为现代化的电子提醒为例，这个方案并未考虑到老年人不善于使用手机、平板等设备的情况，也无法反馈老人的身体状况。