# 大作业：图像分割

**1.作业说明：**

- 这次作业是一次小组项目，4 人一组
- 每个组选择 1 个带有 label 的 MRI/CT 数据集进行分割
- 所有数据均为 nii 格式，可安装 ITK-SANAP 查看

**2.任务：**

- 分割所选数据中(至少 10 张图)的感兴趣目标
- 分割方法任选
- 如使用 chatgpt 等大模型需有对话交互记录并具有可复现性
- 对实验结果进行分析评价

**3.要求：**

最终报告中需包含三个文件：

1) 可执行代码（数据读入请使用相对路径）
2) 报告（PDF 形式）：
    a. 组别与小组成员，以及所选的数据
    b. 所采用方法的细节
    c. 分析并评价分割结果，其中定量的评价指标包括但不限于(详见附件)：dice score, sensitivity, specificity, precision, accuracy 等
    d. 列出组内成员在本项目中的贡献并进行组内互评（canvas 系统）
3) 分割结果（保存为 nii 形式）

每个小组在第 16 周课堂中将进行大作业的 10 分钟汇报。

附:

## Evaluation Metrics

**True Positives (TP):** pixels correctly segmented as foreground.
**False Positives (FP):** pixels falsely segmented as foreground.
**True Negatives (TN):** pixels correctly segmented as background.
**False Negatives (FN):** pixels falsely segmented as background.

**Dice Score:**
Dice score is the most commonly used metric in evaluating medical image segmentations. Dice score is used to calculate the pairwise overlap of the repeated segmentations.

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

**Sensitivity:**
Sensitivity measures the portion of foreground in the ground truth that is also identified as foreground by the segmentation being evaluated.

$$Sensitivity = \frac{TP}{TP + FN}$$

**Specificity:**
Specificity measures the portion of background in the ground truth that is also identified as background by the segmentation being evaluated.

$$Specificity = \frac{TN}{TN + FP}$$

**Precision:**
Precision measures the purity of foreground predictions relative to the segmented foreground.

$$Precision = \frac{TP}{TP + FP}$$

**Accuracy:**
Accuracy is defined as the percent of pixels in the image which were correctly classified.

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$