INTRODUCTION

Cancer grading plays an important role in the treatment and management of patients. It has been primarily studied as a categorical classification problem where the relationship among cancer grades is, by and large, ignored. We propose an order learning vision transformer (Order-ViT) for cancer grading in pathology images that can learn both the histopathological patterns of individual cancer grades and the ordering relationship among cancer grades.

METHODS

Dataset

- Public colorectal cancer datasets [1] and a gastric cancer dataset [2] are employed in this study.
- Colorectal cancer: Benign (BN), well-differentiated (WD), moderately-differentiated (MD), and poorly-differentiated (PD) tumors.
- Gastric cancer: Benign (BN), tubular well-differentiated (WD), tubular moderately-differentiated (MD), and tubular poorly-differentiated (PD) tumors.

Model Architecture

- Input image undergoes ResNet50V2 and ViT for feature representation.
- Categorical classifier predicts the class label of input images and order classification result among cancer grades.

Order Classifier

- Order-ViT demonstrates superior cancer classification performance.
- Order-ViT utilizes the individual histological patterns of pathology images by categorical classification and the relationship among different pathological images by order learning.

RESULTS

- Result of Colorectal and gastric cancer classification.

CONCLUSIONS

- Order-ViT demonstrates superior cancer classification performance.
- Order-ViT utilizes the individual histological patterns of pathology images by categorical classification and the relationship among different pathological images by order learning.