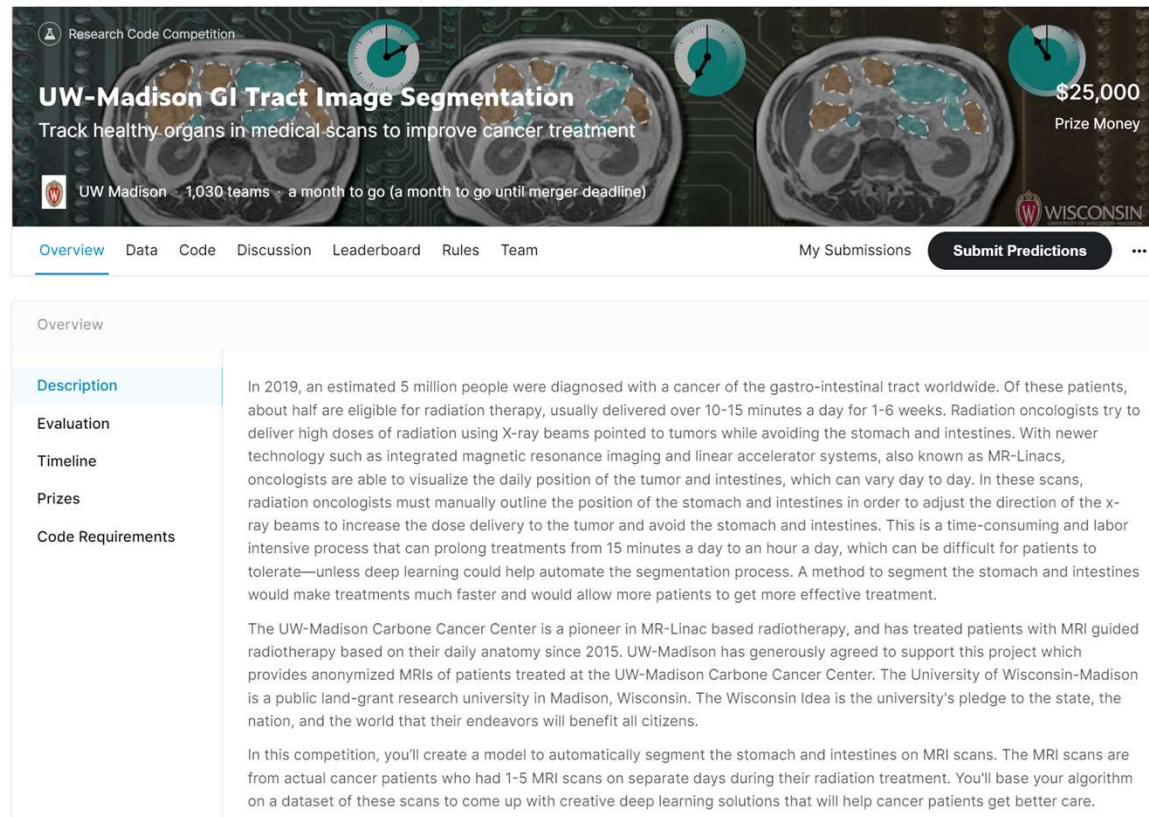


CSE455 Final Project

Medical Image Segmentation

Alan Li

Task



The screenshot shows the top banner of the Kaggle competition page. It features three axial MRI scans of the abdomen with the stomach and intestines highlighted in teal. The text 'UW-Madison GI Tract Image Segmentation' is prominently displayed, followed by the subtitle 'Track healthy organs in medical scans to improve cancer treatment'. A progress indicator shows 'UW Madison' with '1,030 teams' and a 'a month to go' timer. A prize money badge indicates '\$25,000 Prize Money'. The navigation bar includes links for Overview, Data, Code, Discussion, Leaderboard, Rules, and Team, along with buttons for 'My Submissions' and 'Submit Predictions'.

Research Code Competition

UW-Madison GI Tract Image Segmentation

Track healthy organs in medical scans to improve cancer treatment

UW Madison 1,030 teams a month to go (a month to go until merger deadline)

\$25,000 Prize Money

WISCONSIN

Overview Data Code Discussion Leaderboard Rules Team My Submissions Submit Predictions ...

Overview

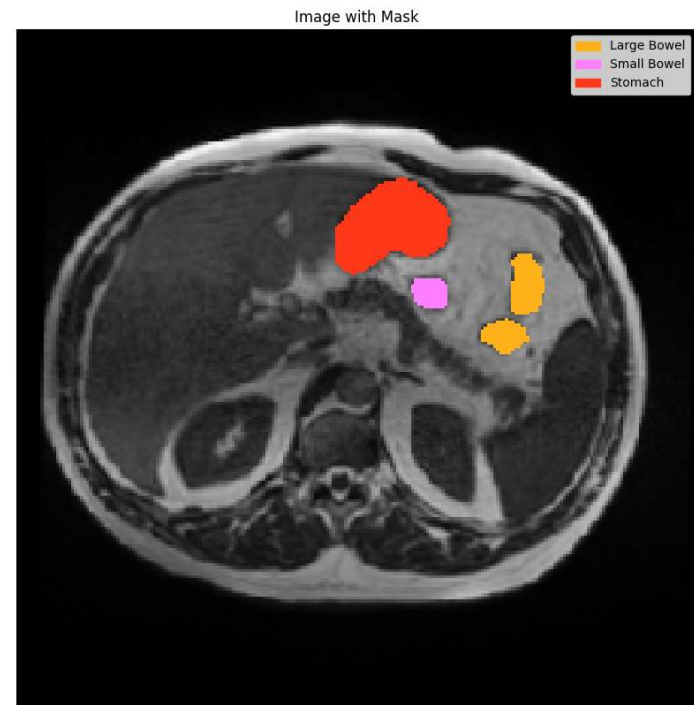
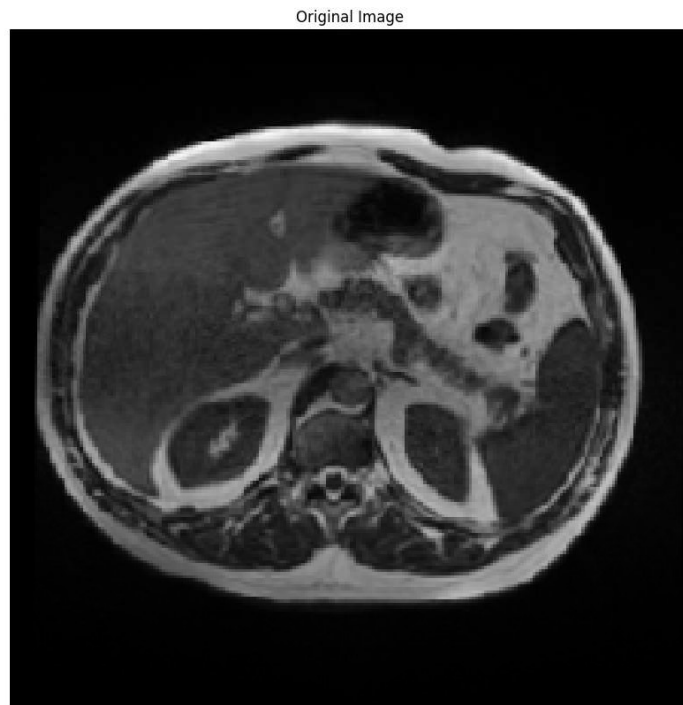
Description	In 2019, an estimated 5 million people were diagnosed with a cancer of the gastro-intestinal tract worldwide. Of these patients, about half are eligible for radiation therapy, usually delivered over 10-15 minutes a day for 1-6 weeks. Radiation oncologists try to deliver high doses of radiation using X-ray beams pointed to tumors while avoiding the stomach and intestines. With newer technology such as integrated magnetic resonance imaging and linear accelerator systems, also known as MR-Linacs, oncologists are able to visualize the daily position of the tumor and intestines, which can vary day to day. In these scans, radiation oncologists must manually outline the position of the stomach and intestines in order to adjust the direction of the x-ray beams to increase the dose delivery to the tumor and avoid the stomach and intestines. This is a time-consuming and labor intensive process that can prolong treatments from 15 minutes a day to an hour a day, which can be difficult for patients to tolerate—unless deep learning could help automate the segmentation process. A method to segment the stomach and intestines would make treatments much faster and would allow more patients to get more effective treatment.
Evaluation	
Timeline	
Prizes	
Code Requirements	

The UW-Madison Carbone Cancer Center is a pioneer in MR-Linac based radiotherapy, and has treated patients with MRI guided radiotherapy based on their daily anatomy since 2015. UW-Madison has generously agreed to support this project which provides anonymized MRIs of patients treated at the UW-Madison Carbone Cancer Center. The University of Wisconsin-Madison is a public land-grant research university in Madison, Wisconsin. The Wisconsin Idea is the university's pledge to the state, the nation, and the world that their endeavors will benefit all citizens.

In this competition, you'll create a model to automatically segment the stomach and intestines on MRI scans. The MRI scans are from actual cancer patients who had 1-5 MRI scans on separate days during their radiation treatment. You'll base your algorithm on a dataset of these scans to come up with creative deep learning solutions that will help cancer patients get better care.

Website: <https://www.kaggle.com/competitions/uw-madison-gi-tract-image-segmentation/overview>

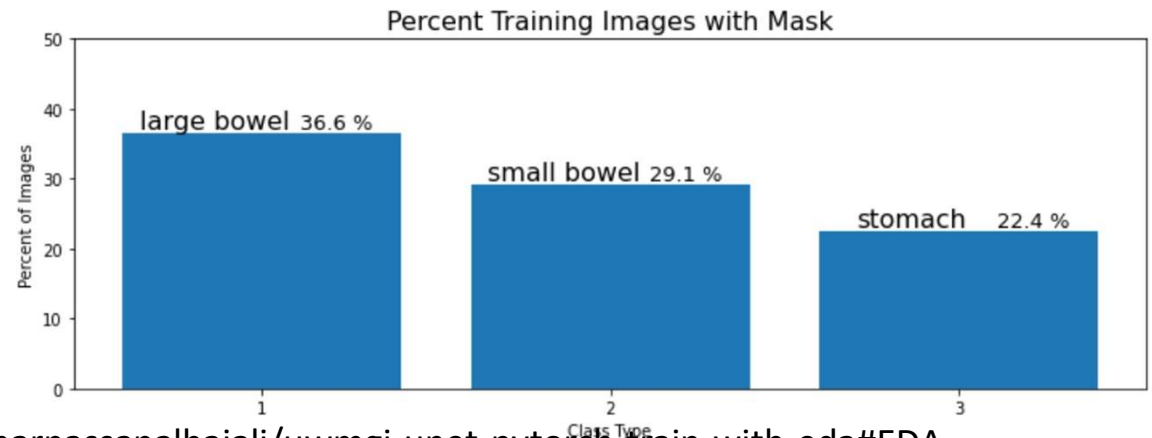
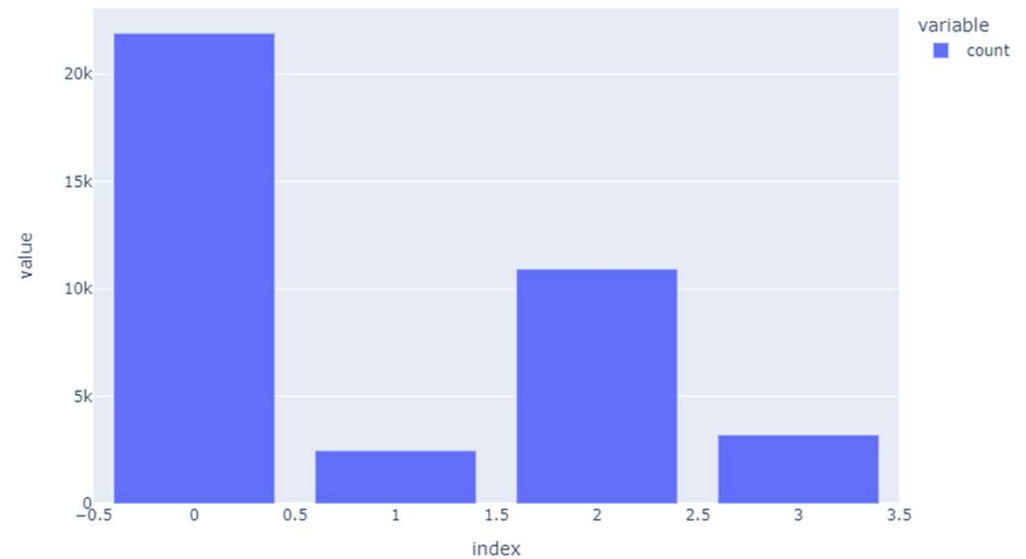
Dataset



Note: Dataset provided by the Kaggle Competition.

Preprocessing

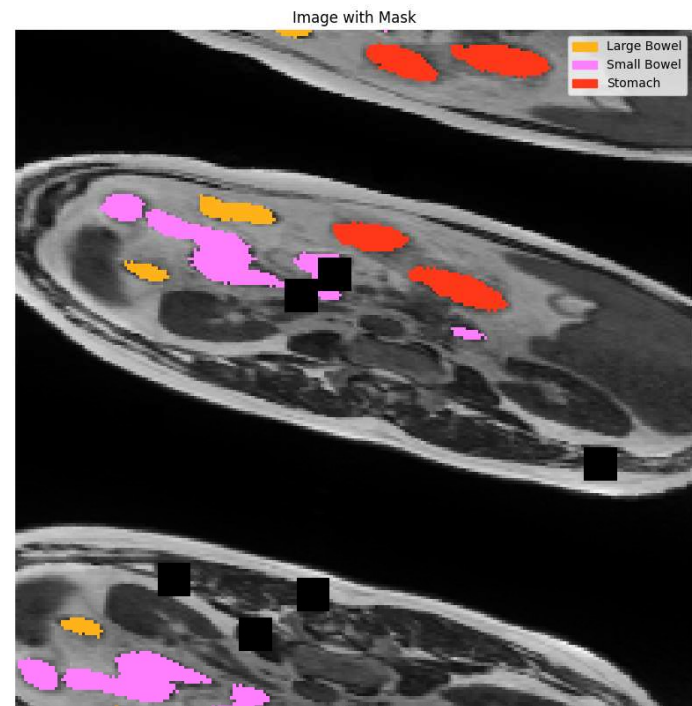
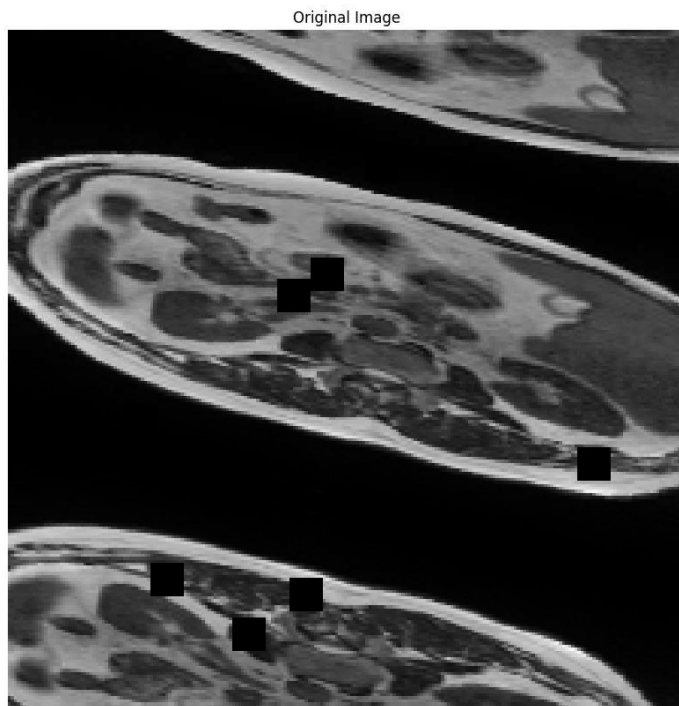
- Biased Dataset:
 - 38,496 total images
 - >50% has no labels
 - Uneven distribution among given 3 classes



Website: <https://www.kaggle.com/code/ammarnassanalhajali/uwmgi-unet-pytorch-train-with-eda#EDA>

Preprocessing

- Data Augmentation



Training

- Unet + EfficientNet b1
- Loss Criterion:
 - $0.5 * \text{BinaryCrossEntropy} + 0.5 * \text{TverskyLoss}$
- Hyperparameters:
 - LR: $1e-3$
 - Epoch: 15
 - Batch_size: 96
 - Image_size: [224, 224]
 - Lr-scheduler: CosineAnnealingLR
- Cross Validation:
 - Multiple folds cross validation adaptable, but single fold training due to time and computation constraints
- Training Curve:
 - Wandb: <https://wandb.ai/alanlee/uw-maddison-gi-tract/runs/39wyhil5?workspace=user-alanlee>

Prediction (Demo)

- `./pred_demo.ipynb`