Auto-PCOS Classification Challenge

Team name:

Team member names and affiliation:

Members	Member Name	Affiliation
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Brief write up about the pipeline:

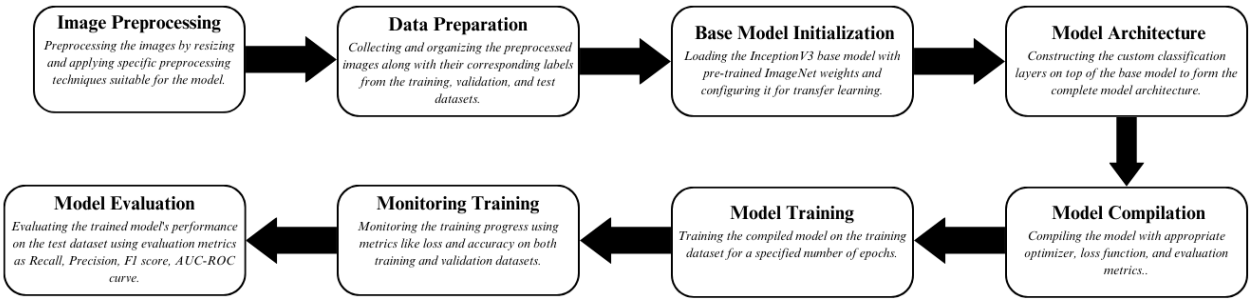
This pipeline involves training a binary classification model using transfer learning with a ResNetRS420 base model. Here's a brief overview of the steps involved:

1. **Image Preprocessing**:
    - Images are loaded and preprocessed using the **preprocess_image** function, which resizes the images to the specified dimensions (**img_width**, **img_height**) and applies preprocessing suitable for the ResNetRS420 model using **tf.keras.applications.inception_v3.preprocess_input**.
2. **Data Preparation**:
    - The preprocessed images are collected along with their corresponding labels from the training, validation, and test datasets (**train_df**, **val_df**, **test_df**).
    - Images are converted to numpy arrays to be fed into the model.
3. **Base Model Initialization**:
    - The InceptionV3 model is loaded with the pre-trained ImageNet weights. Only the convolutional base of the model is included (**include_top=False**) as custom dense layers will be added for classification.
4. **Model Architecture**:
    Custom classification layers are added on top of the base model:
    - **LayerNormalization** layer to normalize the activations.
    - Convolutional layer with 1024 filters and a ReLU activation function.
    - MaxPooling layer to downsample the spatial dimensions.
    - Dropout layer with a dropout rate of 0.3 to prevent overfitting.
    - Flattening layer to convert the 2D feature maps into a 1D vector.
    - Dense layer with 512 units and a ReLU activation function.
    - Output dense layer with a single unit and a sigmoid activation function for binary classification.
5. **Model Compilation**:
    - The model is compiled with the Adam optimizer and binary cross-entropy loss function. Binary accuracy is chosen as the evaluation metric.
6. **Model Training**:
    - The model is trained on the training dataset (**train_images**, **train_labels**) for 50 epochs.
    - Validation data (**val_images**, **val_labels**) is provided for monitoring the model's performance during training.
7. **Monitoring Training Progress**:
    - The training progress is monitored using the **history** object returned by the **fit** method, which contains metrics like loss and accuracy on both training and validation datasets for each epoch.

8. **Model Evaluation**:
    - After training, the model's performance can be evaluated on the test dataset (**test_images**, **test_labels**) using appropriate evaluation metrics.

This pipeline leverages transfer learning to utilize the pre-trained InceptionV3 model's feature extraction capabilities while fine-tuning the model for the specific binary classification task. It follows standard practices for training deep learning models, including data preprocessing, model construction, training, and evaluation.

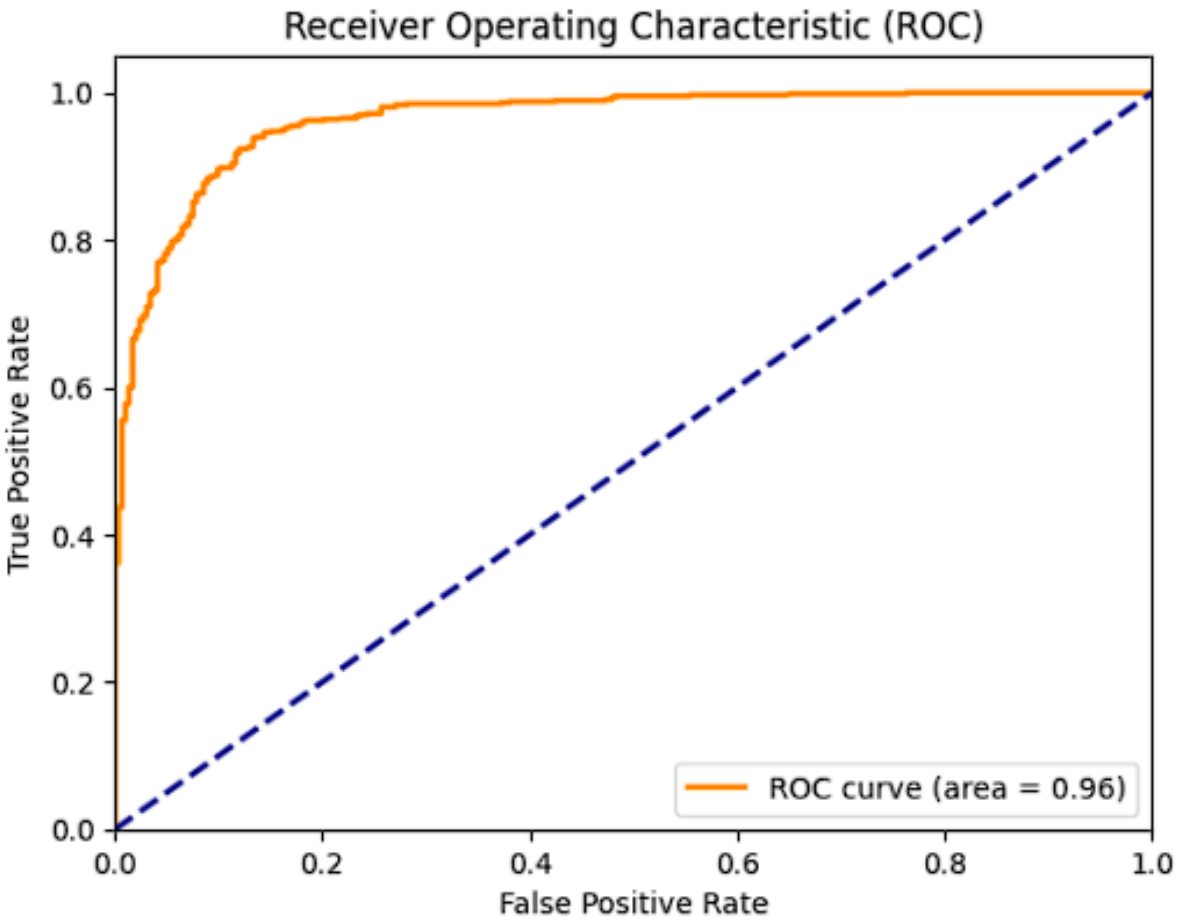
Figure of the developed pipeline:



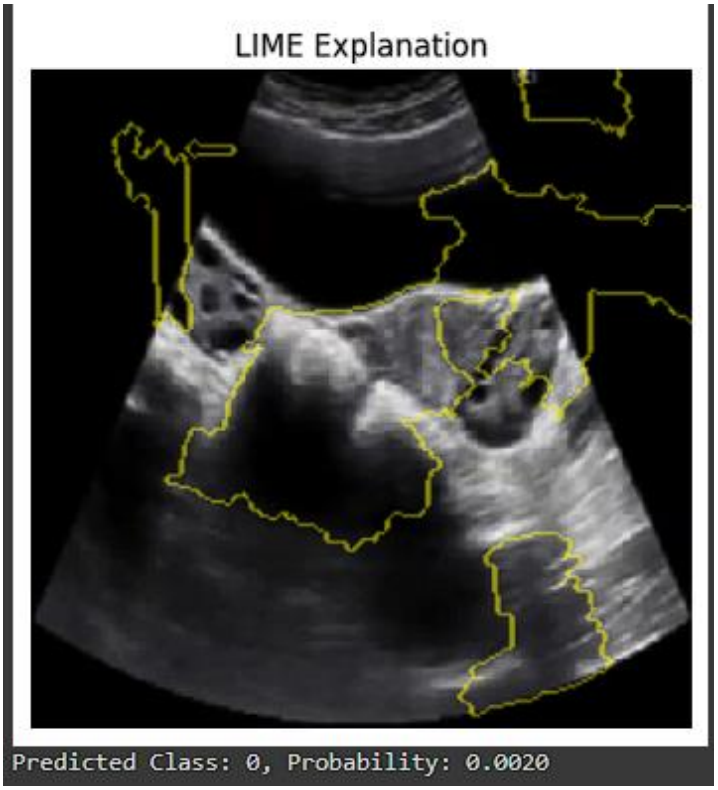
Achieved results on validation dataset including:

- A table of the achieved evaluation metrics on validation dataset for automatic classification of healthy and un-healthy frames in ultrasound imaging:

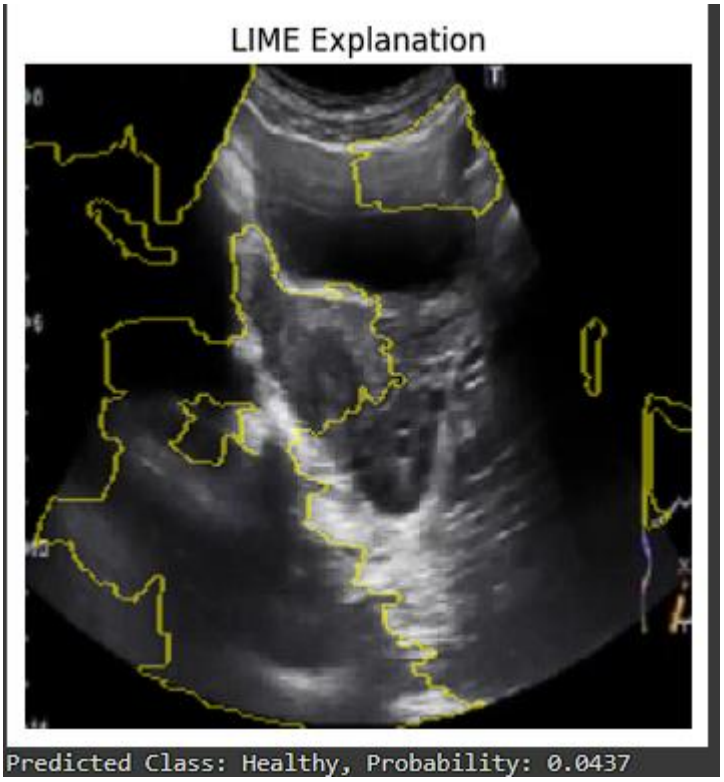
Metrics	Score
Accuracy	0.9052083333333333
Precision	0.9001386962552012
Recall	0.9715568862275449
F1 Score	0.9344852411807055



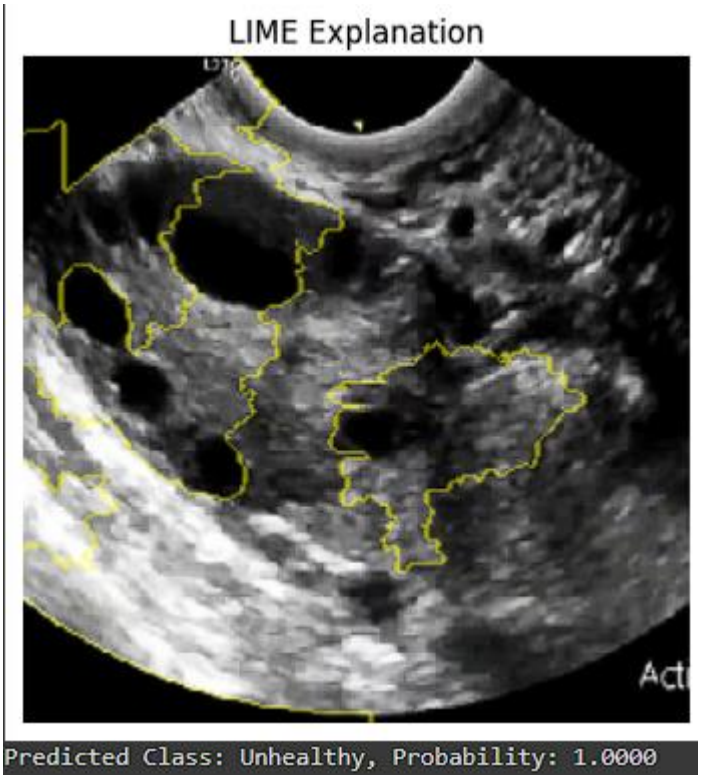
- Pictures (resolution 600 DPI) of any 5 best frames selected from validation dataset showing its classification:



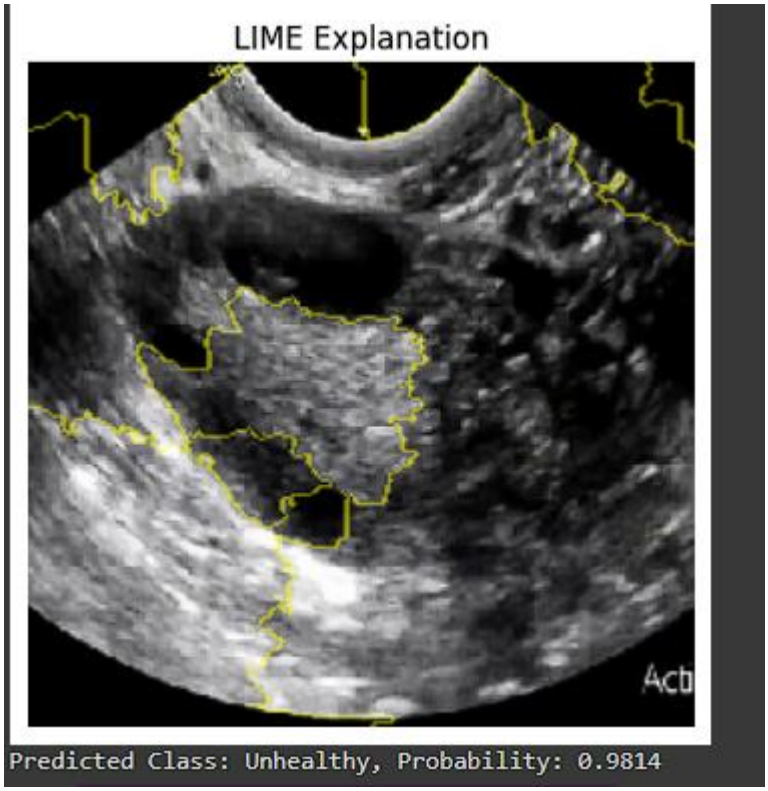
Original Class = Healthy



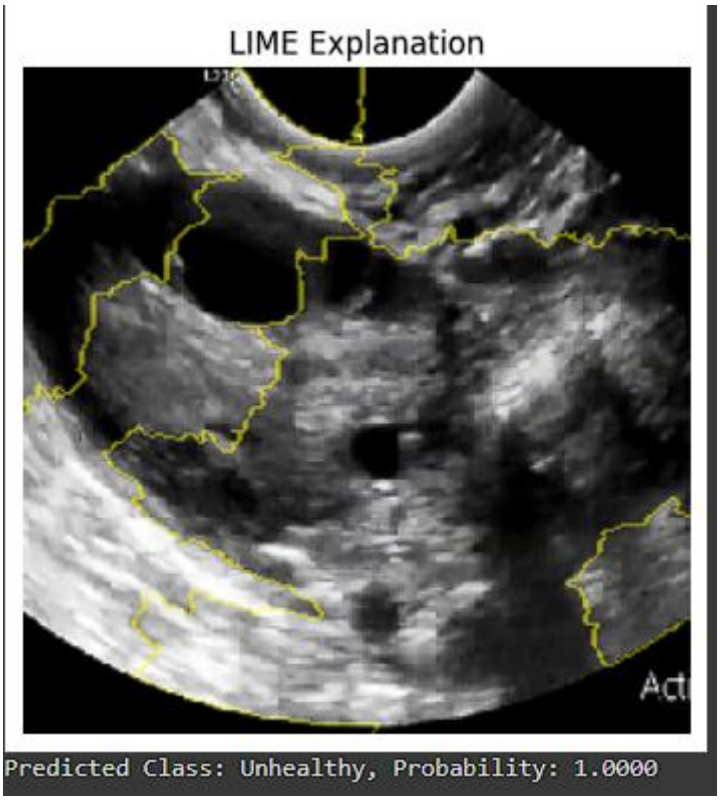
Original Class = Healthy



Original Class Unhealthy

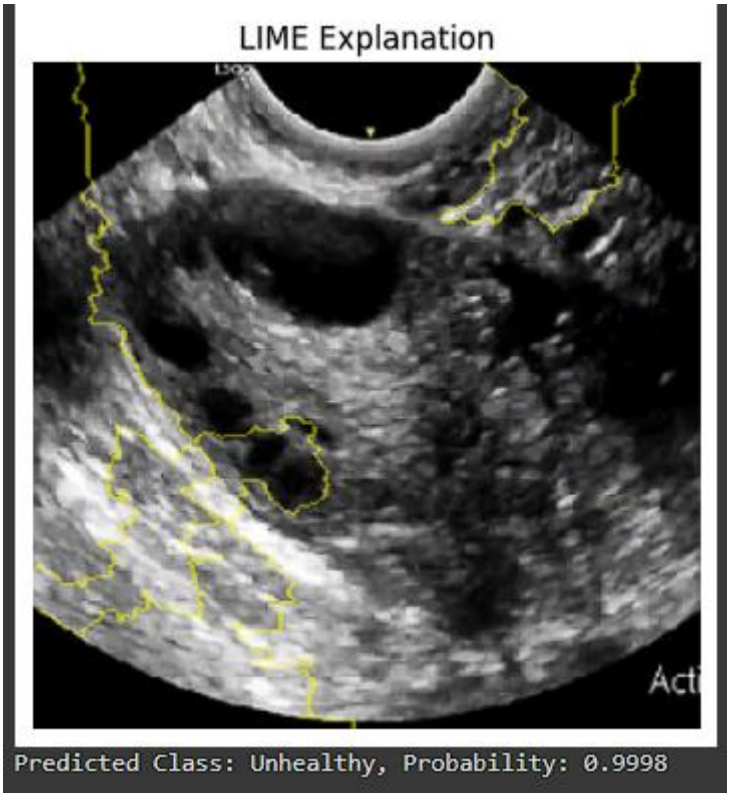


Original Class = Unhealthy

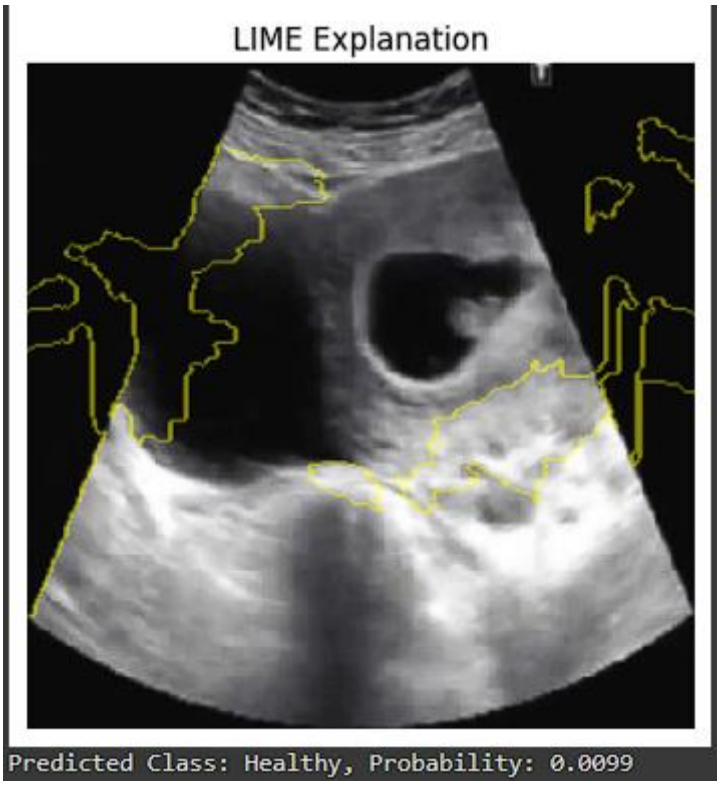


Original Class = Unhealthy

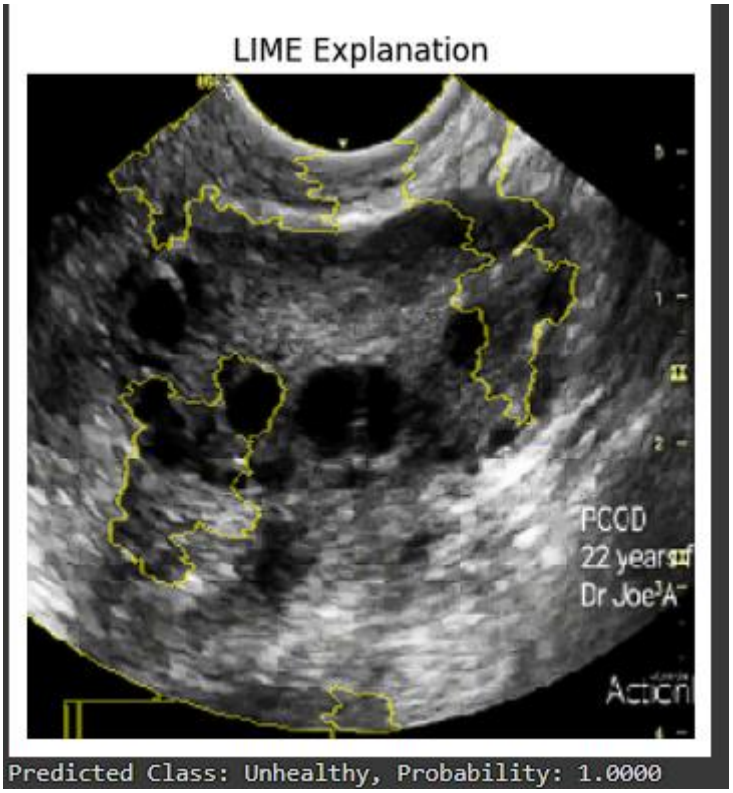
- Pictures (resolution 600 DPI) of achieved interpretability plots of any 5 best frames selected from validation dataset:



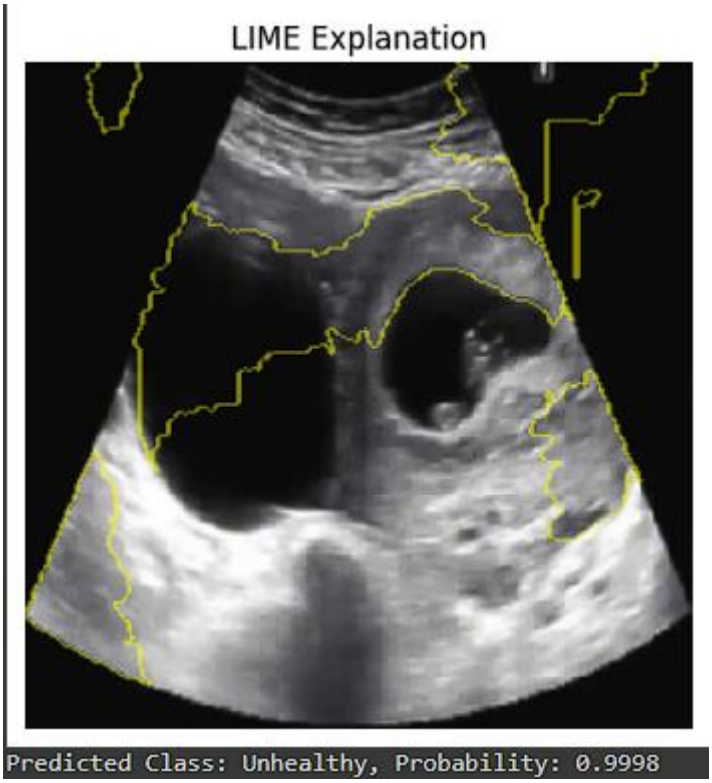
Original Class = Unhealthy



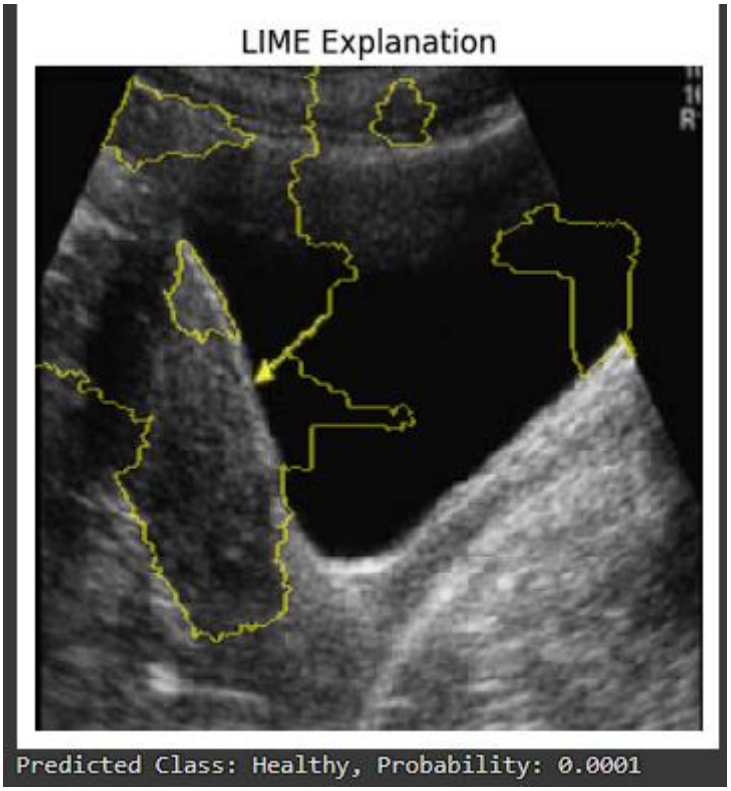
Original Class = Healthy



Original Class = Unhealthy



Original Class = Unhealthy



Original Class = Healthy

Achieved results on testing dataset including:

- Pictures (resolution 600 DPI) of any 5 best frames selected from testing dataset showing its classification:

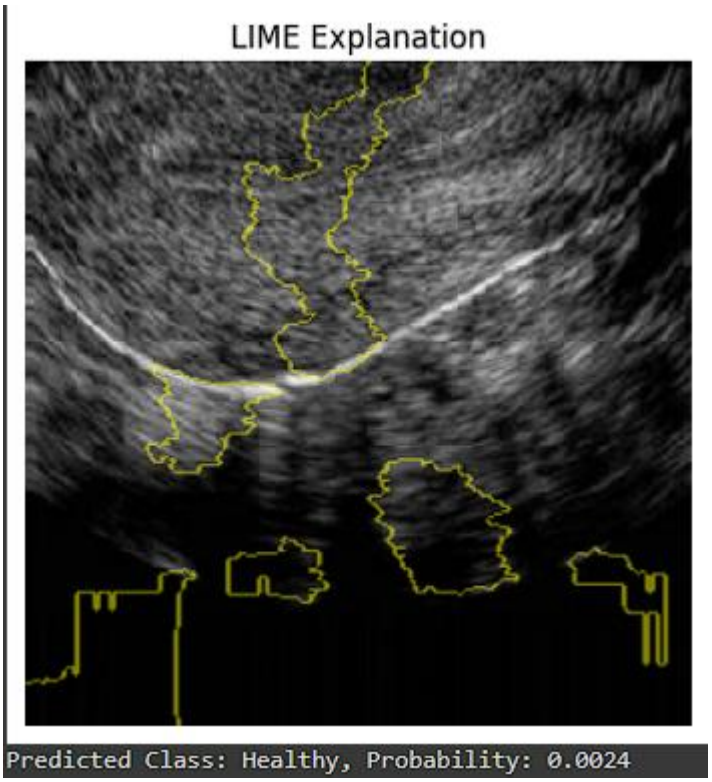
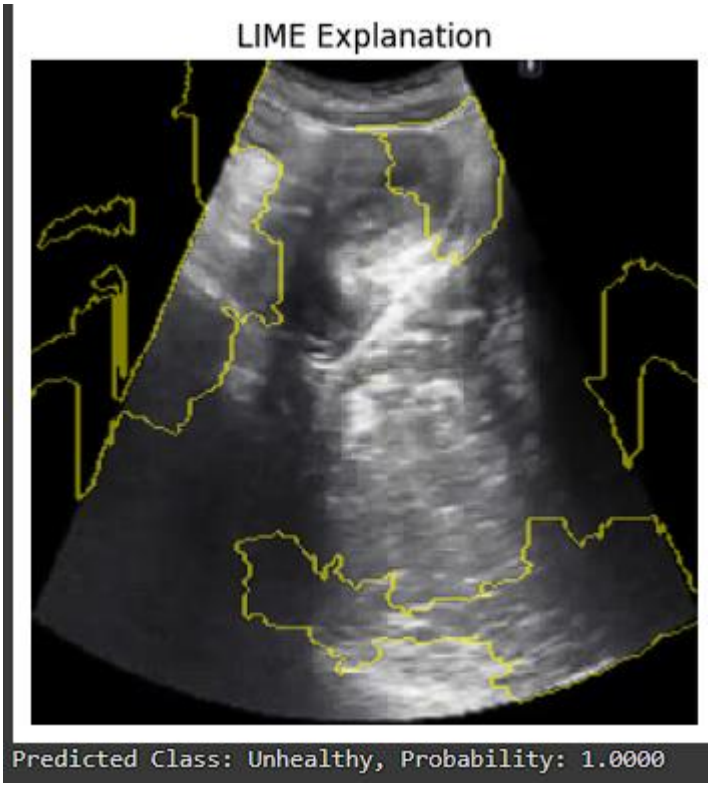


Image – image10000.jpg



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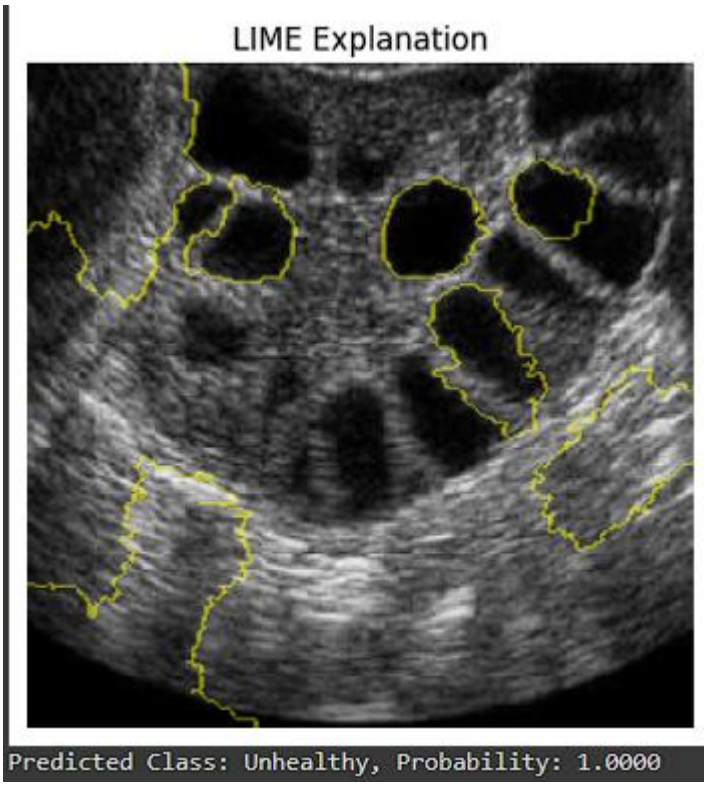


Image – image10301.jpg

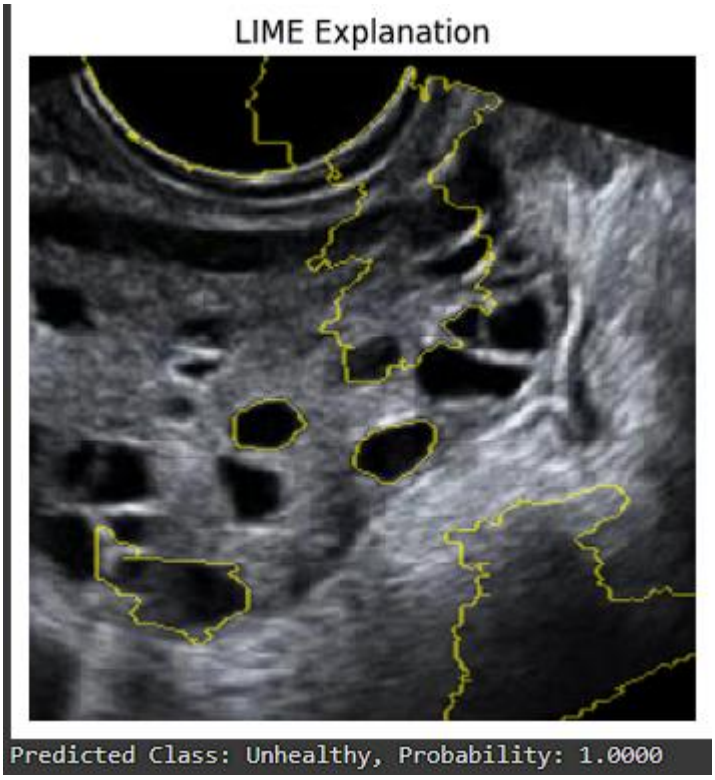


Image – image10999.jpg

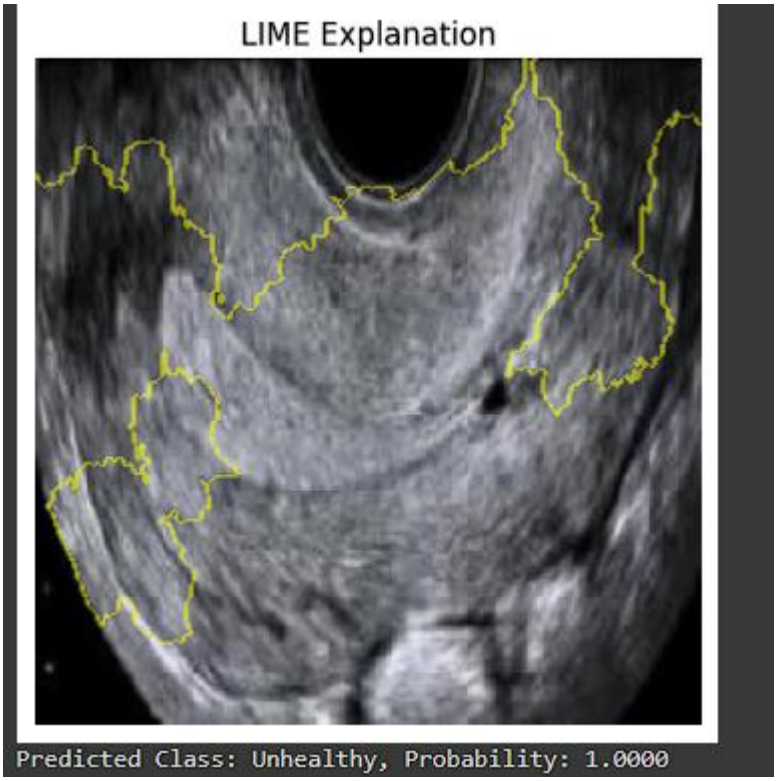
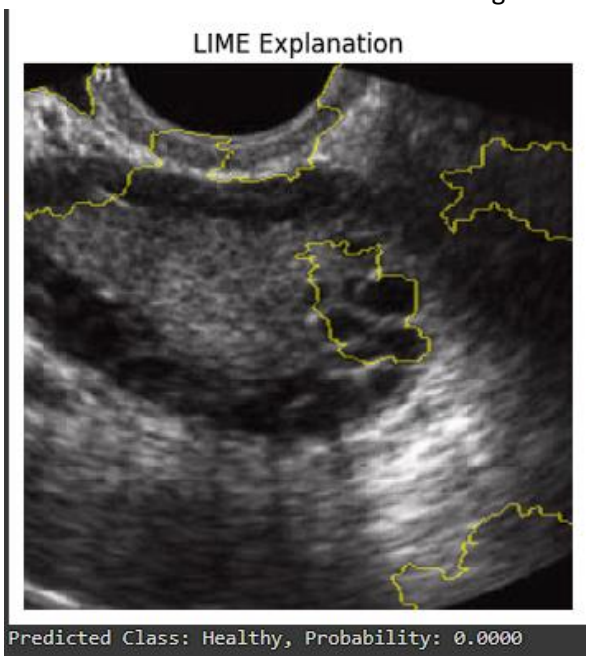
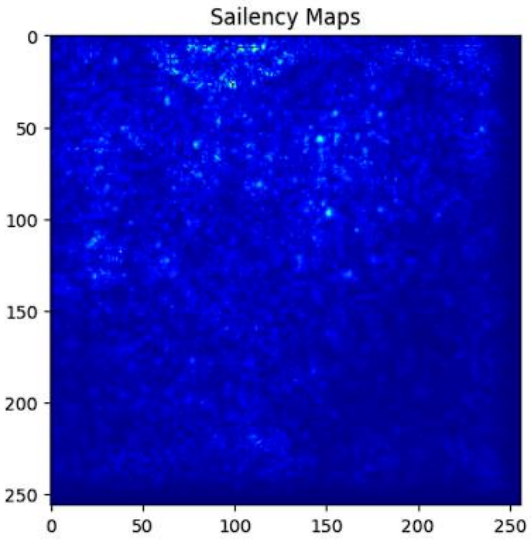


Image – image11189.jpg

- Pictures (resolution 600 DPI) of achieved interpretability plot of any 5 best frames selected from testing dataset:

Image – image10499.jpg





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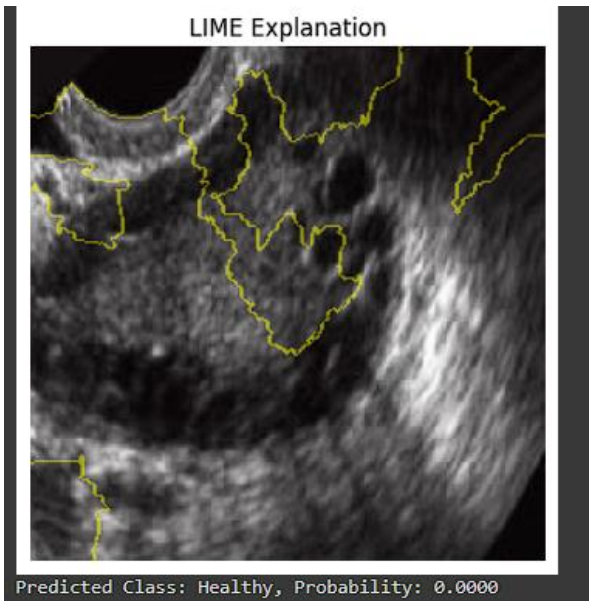

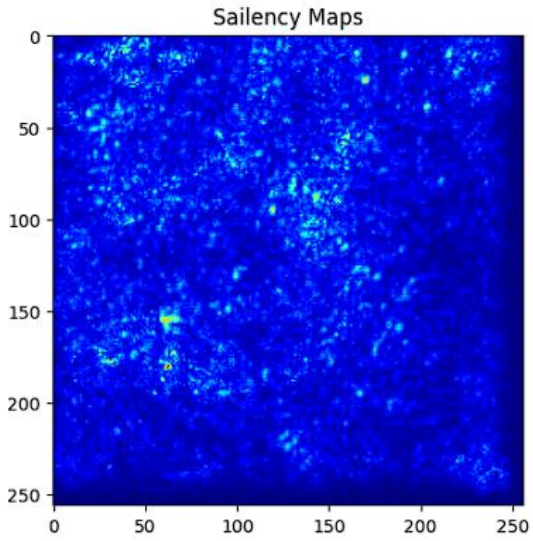

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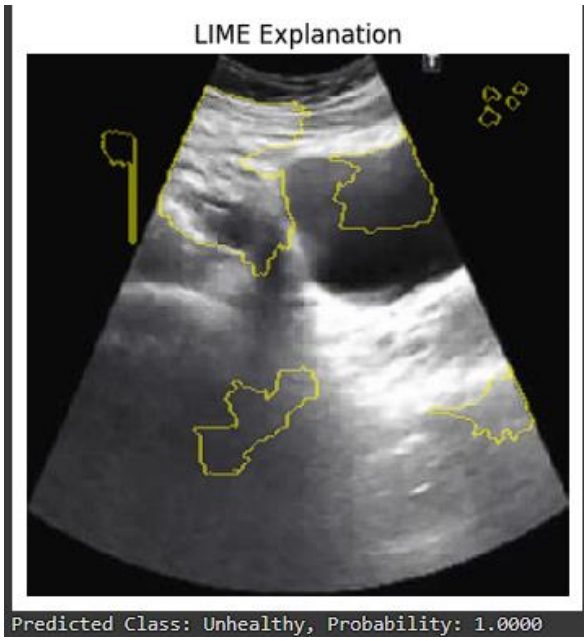


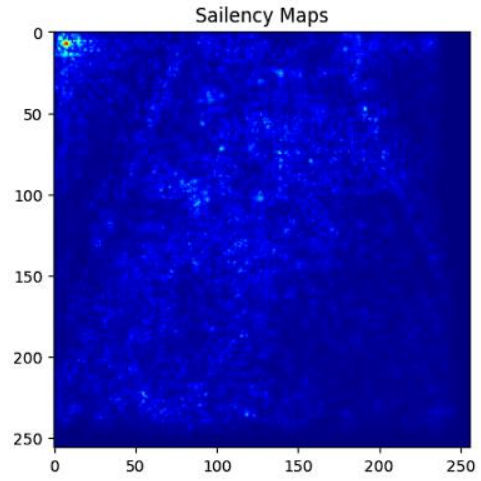
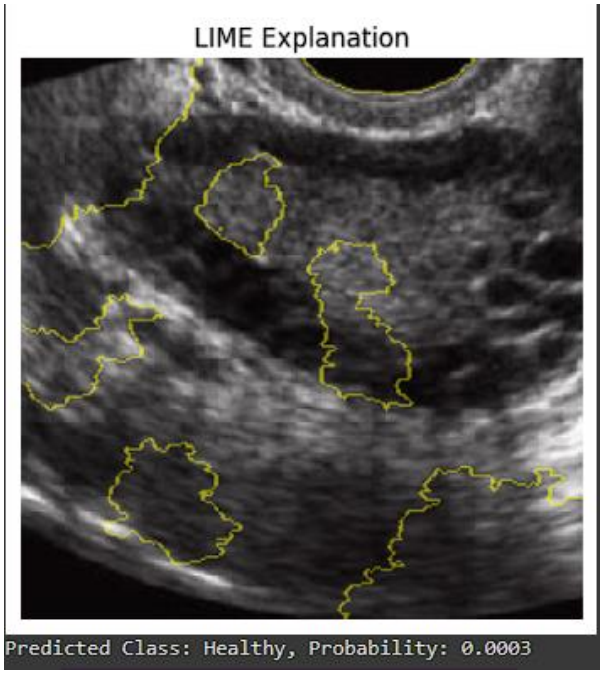


Image – image10210.jpg



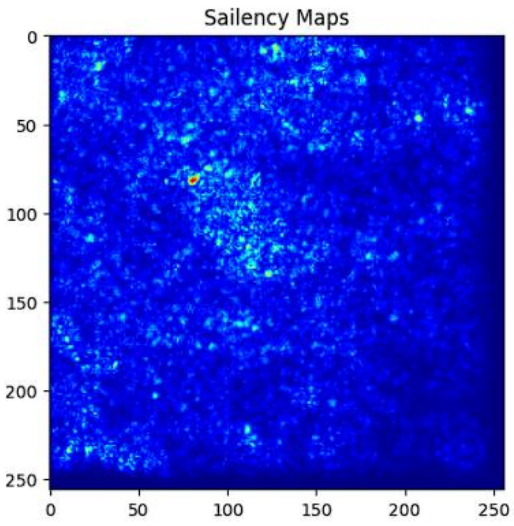


Image – image10841.jpg