Model Training and Testing

Benjamin Frost 2022

```
In [ ]:    import os
           import pandas as pd
           import numpy as np
           import time
           import torch
           from torch.utils.data import DataLoader, TensorDataset, random_split
           from torch.utils.data.sampler import WeightedRandomSampler
           from pytorch_lightning.callbacks import ModelCheckpoint
           from pytorch_lightning.callbacks.early_stopping import EarlyStopping
           from pytorch_lightning import Trainer, seed_everything
           from sklearn.ensemble import RandomForestClassifier
           from sklearn.tree import DecisionTreeClassifier
           from sklearn.model_selection import StratifiedKFold, train_test_split
           from sklearn.feature_selection import mutual_info_classif, chi2
           from sklearn.linear_model import LassoCV
           import matplotlib.pyplot as plt
           from pytorch_lightning.loggers import TensorBoardLogger
           import seaborn as sns
           import os
           import sys
           from sklearn.metrics import f1_score
           from sklearn.metrics import recall_score
           from sklearn.metrics import precision_score
           from torch_explain.models.explainer import Explainer
           from torch_explain.logic.metrics import formula_consistency
           from imblearn.under_sampling import RandomUnderSampler
           from imblearn.over_sampling import SMOTEN
           from imblearn.combine import SMOTEENN
           from torch.nn.functional import one_hot
           from func_timeout import func_set_timeout, func_timeout, FunctionTimedOut
           import datetime
           import time

           seed_everything(42)
           base_dir = f'./runs'
```

```
Global seed set to 42
```

Loading in the datasets

```
In [ ]:    files = os.listdir("./categorisedData/")

           datasets = {file : pd.read_csv("./categorisedData/" + file) for file in files}

           print(files)

           results_dict = {}
```

```
['breastCancer.csv', 'clusteredData.csv', 'clusteredDataSepsis.csv', 'expertLabelledData.csv', 'metricExtractedData.cs
v', 'staticData.csv']
```

Defining the timeout wrapper around the explainer API

```
In [ ]:    @func_set_timeout(90)
           def explain_with_timeout(model, val_data, train_data, test_data, topk_expl, concepts):

               return model.explain_class(val_dataloaders=val_data, train_dataloaders=train_data, test_dataloaders=test_data, top
```

```
In [ ]:    # Nodes in each hidden layer, learning rate

           hiddenLayers = {
               'breastCancer.csv' : [[20], 0.01],
               'clusteredData.csv' : [[20], 0.01],
               'clusteredDataSepsis.csv' : [[20, 40, 20], 0.0001],
               'expertLabelledData.csv' : [[20], 0.01],
               'metricExtractedData.csv' : [[20, 20], 0.01],
               'staticData.csv': [[20], 0.01]
           }
```

K-Fold Validation

```
In [ ]:    for file in files:
```

```python
    if file in hiddenLayers:
        layers = hiddenLayers[file]
    else:
        print("Set layers for " + file)
        layers = [[20], 0.01]

    print(f"Training {file}\n")

    data = datasets[file]

    if "PatientID" in data.columns:
        data = data.drop(columns=["PatientID"])


    targetName = "Mortality14Days"

    targetSeries = data[targetName]
    print(data[targetName].value_counts())
    data = data.drop(columns=[targetName])

    n_concepts = data.shape[1]
    print("There are " + str(n_concepts) + " concepts")
    n_classes = 2

    splitResults_list = []

    """ The following lines were taken from the MIMIC example code by Pietro Barbiero"""

    dataTensor = torch.FloatTensor(data.to_numpy())
    targetTensor = one_hot(torch.tensor(targetSeries.values).to(torch.long)).to(torch.float)

    n_splits = 5
    skf = StratifiedKFold(n_splits=n_splits, shuffle=True, random_state=42)

    x = dataTensor
    y = targetTensor

    for split, (trainval_index, test_index) in enumerate(skf.split(x.cpu().detach().numpy(),
                                                            y.argmax(dim=1).cpu().detach().numpy())):
        print(f'Split [{split + 1}/{n_splits}]')


        x_trainval, x_test = torch.FloatTensor(x[trainval_index]), torch.FloatTensor(x[test_index])
        y_trainval, y_test = torch.FloatTensor(y[trainval_index]), torch.FloatTensor(y[test_index])
        x_train, x_val, y_train, y_val = train_test_split(x_trainval, y_trainval, test_size=0.2, random_state=42)
        print(f'{len(y_train)}/{len(y_val)}/{len(y_test)}')


        """ End of reference code """

        print(pd.Series(np.argmax(y_train.numpy(), axis=1)).value_counts().values)

        # For oversampling...
        clf = SMOTEN(random_state=0)

        x_train, y_train = clf.fit_resample(x_train.numpy(), np.argmax(y_train.numpy(), axis=1))

        x_train = torch.FloatTensor(x_train)
        y_train = one_hot(torch.tensor(y_train).to(torch.long)).to(torch.float)

        print(pd.Series(np.argmax(y_train.numpy(), axis=1)).value_counts().values)

        batch_size = 64

        train_data = TensorDataset(x_train, y_train)
        train_loader = DataLoader(train_data, batch_size = batch_size, shuffle=True)

        # For random sampling...
        # class_count = pd.Series(targetSeries).value_counts()
        # print(class_count)
        # weights = 1. / torch.FloatTensor(class_count.values)
        # print(weights)
        # train_weights = np.array([weights[t] for t in torch.argmax(y_train, axis=1).numpy()]).astype(np.float64)
        # sampler = WeightedRandomSampler(train_weights, train_size)
        # train_data = TensorDataset(x_train, y_train)
        # train_loader = DataLoader(train_data, batch_size=train_size, sampler=sampler)

        early_stopping_callback = EarlyStopping(monitor='val_loss', patience=20, verbose=True, mode='min')

        logger = TensorBoardLogger("./runs/splits/", name=file)

        """ The following lines were taken from the MIMIC example code by Pietro Barbiero"""

        val_data = TensorDataset(x_val, y_val)
```

```python
            test_data = TensorDataset(x_test, y_test)
            val_loader = DataLoader(val_data, batch_size = len(x_val))
            test_loader = DataLoader(test_data, batch_size = len(x_test))

            checkpoint_callback = ModelCheckpoint(dirpath=base_dir, monitor='val_loss', mode='min', save_top_k=1)

            trainer = Trainer(max_epochs=100, gpus=1, auto_lr_find=True, deterministic=True,
                            check_val_every_n_epoch=1, default_root_dir=base_dir,
                            weights_save_path=base_dir, callbacks=[checkpoint_callback, early_stopping_callback],
                            logger=logger, enable_progress_bar=False, gradient_clip_val=0.5)

            model = Explainer(n_concepts=n_concepts, n_classes=n_classes, l1=1e-3, lr=layers[1],
                            explainer_hidden=layers[0], temperature=0.7)

            # Training the model
            trainer.fit(model, train_loader, val_loader)
            model.freeze()

            """ End of reference code """

            # Precision, Recall, F1
            y_pred = torch.argmax(model(x_test), axis=1)
            y_test_argmax = torch.argmax(y_test, axis=1)

            scores = [f1_score(y_test_argmax.numpy(), y_pred.numpy(), average='macro'),
                    recall_score(y_test_argmax.numpy(), y_pred.numpy(), average='macro'),
                    precision_score(y_test_argmax.numpy(), y_pred.numpy(), average='macro')]

            print(f"Before loading best: {scores}")

            # Loading in the best weights from training
            model = model.load_from_checkpoint(checkpoint_callback.best_model_path)

            # Precision, Recall, F1
            scores = [f1_score(y_test_argmax.numpy(), y_pred.numpy(), average='macro'),
                    recall_score(y_test_argmax.numpy(), y_pred.numpy(), average='macro'),
                    precision_score(y_test_argmax.numpy(), y_pred.numpy(), average='macro')]

            print(f"{file} split {split+1} scores: {scores}")

            print("\nTesting...\n")
            # test_loader is giving a new batch of testing values, hence why the output here is different than above.
            model_results = trainer.test(model, dataloaders=test_loader)


            print("\nExplaining\n")

            start = time.time()

            try:

                results, f = explain_with_timeout(model, val_data=val_loader, train_data=train_loader, test_data=test_load
                                        topk_expl=3,
                                        concepts=data.columns)

            except FunctionTimedOut:
                print("Explanation timed out, skipping...")
                continue


            end = time.time()

            """ The following lines were taken from the MIMIC example code by Pietro Barbiero"""

            print(f"Explaining time: {end - start}")
            results['model_accuracy'] = model_results[0]['test_acc_epoch']
            results['extraction_time'] = end - start

            for j in range(n_classes):
                n_used_concepts = sum(model.model[0].concept_mask[j] > 0.5)
                print(f"Number of features that impact on target {j}: {n_used_concepts}")
                print(f"Explanation for target {j}: {f[j]['explanation']}")
                print(f"Explanation accuracy: {f[j]['explanation_accuracy']}")

            """ End of reference code """


            splitResults = [results['model_accuracy'], results['extraction_time'], *scores, f]

            splitResults_list.append(splitResults)


    results_dict[file] = splitResults_list

Training breastCancer.csv
```

```
0     458
1     241
Name: Mortality14Days, dtype: int64
There are 89 concepts
Split [1/5]
447/112/140
[298 149]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs

```
[298 298]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

```
  | Name  | Type             | Params
-------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 3.6 K
-------------------------------------------
3.6 K     Trainable params
0         Non-trainable params
3.6 K     Total params
0.014     Total estimated model params size (MB)
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
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c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (10) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.311
Metric val_loss improved by 0.083 >= min_delta = 0.0. New best score: 0.228
Metric val_loss improved by 0.060 >= min_delta = 0.0. New best score: 0.168
Metric val_loss improved by 0.020 >= min_delta = 0.0. New best score: 0.149
Metric val_loss improved by 0.017 >= min_delta = 0.0. New best score: 0.132
Metric val_loss improved by 0.006 >= min_delta = 0.0. New best score: 0.126
Metric val_loss improved by 0.013 >= min_delta = 0.0. New best score: 0.113
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.113. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
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LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
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value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(

```
Before loading best: [0.9519560741249142, 0.947463768115942, 0.9569842738205365]
breastCancer.csv split 1 scores: [0.9519560741249142, 0.947463768115942, 0.9569842738205365]

Testing...
─────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
      Test metric              DataLoader 0
─────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
     f1_test_epoch            0.976102352142334
    test_acc_epoch            0.9785714149475098
─────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─

Explaining
```

```
Explaining time: 1.049743413925171
Number of features that impact on target 0: 9
Explanation for target 0: Bare_Nuclei_1 & ~Cell_Shape_Uniformity_10
Explanation accuracy: 0.9001700400416872
Number of features that impact on target 1: 6
Explanation for target 1: ~Bare_Nuclei_1
Explanation accuracy: 0.8755555555555556
Split [2/5]
447/112/140
[292 155]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
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  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

```
  | Name  | Type            | Params
-----------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential      | 3.6 K
-----------------------------------------
3.6 K     Trainable params
0         Non-trainable params
3.6 K     Total params
0.014     Total estimated model params size (MB)
[292 292]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
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_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.298
Metric val_loss improved by 0.104 >= min_delta = 0.0. New best score: 0.194
Metric val_loss improved by 0.077 >= min_delta = 0.0. New best score: 0.117
Metric val_loss improved by 0.021 >= min_delta = 0.0. New best score: 0.096
Metric val_loss improved by 0.015 >= min_delta = 0.0. New best score: 0.081
Metric val_loss improved by 0.017 >= min_delta = 0.0. New best score: 0.064
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.064. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
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LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
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value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(

```
Before loading best: [0.945793462027767, 0.9569746376811594, 0.9376490999783127]
breastCancer.csv split 2 scores: [0.945793462027767, 0.9569746376811594, 0.9376490999783127]

Testing...
```

```
_____
—
      Test metric           DataLoader 0
_____
—
     f1_test_epoch        0.9533333778381348
     test_acc_epoch       0.9571428298950195
_____
—

Explaining
```

```
Explaining time: 2.6255316734313965
Number of features that impact on target 0: 7
Explanation for target 0: Single_Epi_Cell_Size_2
Explanation accuracy: 0.8134228903459673
Number of features that impact on target 1: 4
Explanation for target 1: (~Cell_Shape_Uniformity_1 & ~Normal_Nucleoli_2) | (~Cell_Shape_Uniformity_1 & ~Cell_Shape_Un
iformity_2 & ~Bare_Nuclei_1)
Explanation accuracy: 0.7973531844499586
Split [3/5]
447/112/140
[302 145]
```

```
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recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
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TPU available: False, using: 0 TPU cores
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HPU available: False, using: 0 HPUs
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c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
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ts and is not empty.
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LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
---------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 3.6 K
---------------------------------------------
3.6 K     Trainable params
0         Non-trainable params
3.6 K     Total params
0.014     Total estimated model params size (MB)
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
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of training batches (10) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.239
```

```
[302 302]
```

```
Metric val_loss improved by 0.055 >= min_delta = 0.0. New best score: 0.184
Metric val_loss improved by 0.094 >= min_delta = 0.0. New best score: 0.090
Metric val_loss improved by 0.039 >= min_delta = 0.0. New best score: 0.051
Metric val_loss improved by 0.001 >= min_delta = 0.0. New best score: 0.050
Metric val_loss improved by 0.002 >= min_delta = 0.0. New best score: 0.048
Metric val_loss improved by 0.011 >= min_delta = 0.0. New best score: 0.037
Metric val_loss improved by 0.001 >= min_delta = 0.0. New best score: 0.036
Metric val_loss improved by 0.005 >= min_delta = 0.0. New best score: 0.031
Metric val_loss improved by 0.002 >= min_delta = 0.0. New best score: 0.030
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.030. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
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LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
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value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

```
Before loading best: [0.9765611920308053, 0.9836956521739131, 0.9705882352941176]
breastCancer.csv split 3 scores: [0.9765611920308053, 0.9836956521739131, 0.9705882352941176]

Testing...

────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
──
        Test metric            DataLoader 0
────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
──
```

```
       f1_test_epoch          0.9688888788223267
       test_acc_epoch         0.9714285731315613
─────────────────────────────────────────────────────────────────────────────────────────────────
──

Explaining

Explaining time: 2.1465632915496826
Number of features that impact on target 0: 6
Explanation for target 0: Cell_Shape_Uniformity_1
Explanation accuracy: 0.8458392323422999
Number of features that impact on target 1: 2
Explanation for target 1: ~Clump_Thickness_2 & ~Cell_Shape_Uniformity_1
Explanation accuracy: 0.8372437116888608
Split [4/5]
447/112/140
[293 154]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 3.6 K
------------------------------------------
3.6 K     Trainable params
0         Non-trainable params
3.6 K     Total params
0.014     Total estimated model params size (MB)
[293 293]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (10) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.236
Metric val_loss improved by 0.031 >= min_delta = 0.0. New best score: 0.206
Metric val_loss improved by 0.040 >= min_delta = 0.0. New best score: 0.165
Metric val_loss improved by 0.054 >= min_delta = 0.0. New best score: 0.112
Metric val_loss improved by 0.014 >= min_delta = 0.0. New best score: 0.098
Metric val_loss improved by 0.002 >= min_delta = 0.0. New best score: 0.096
Metric val_loss improved by 0.002 >= min_delta = 0.0. New best score: 0.093
Metric val_loss improved by 0.004 >= min_delta = 0.0. New best score: 0.089
Metric val_loss improved by 0.007 >= min_delta = 0.0. New best score: 0.082
Metric val_loss improved by 0.004 >= min_delta = 0.0. New best score: 0.078
Metric val_loss improved by 0.005 >= min_delta = 0.0. New best score: 0.073
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.073. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

```
Before loading best: [0.9519560741249142, 0.9434850863422293, 0.9625730994152046]
breastCancer.csv split 4 scores: [0.9519560741249142, 0.9434850863422293, 0.9625730994152046]

Testing...
```

```
_____
—
        Test metric              DataLoader 0
_____
—
      f1_test_epoch              0.9442389607429504
     test_acc_epoch              0.949999988079071
_____
—
```

Explaining

```
Explaining time: 0.7234373092651367
Number of features that impact on target 0: 5
Explanation for target 0: (Cell_Size_Uniformity_1 & ~Normal_Nucleoli_10) | (~Clump_Thickness_9 & ~Bare_Nuclei_10 & ~Bl
and_Chromatin_10 & ~Normal_Nucleoli_10)
Explanation accuracy: 0.8715674882270198
Number of features that impact on target 1: 5
Explanation for target 1: ~Cell_Shape_Uniformity_1 & ~Normal_Nucleoli_2
Explanation accuracy: 0.8363095238095238
Split [5/5]
448/112/139
[296 152]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
-------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 3.6 K
-------------------------------------------
3.6 K     Trainable params
0         Non-trainable params
3.6 K     Total params
0.014     Total estimated model params size (MB)
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (10) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.268
[296 296]
```

```
Metric val_loss improved by 0.097 >= min_delta = 0.0. New best score: 0.172
Metric val_loss improved by 0.029 >= min_delta = 0.0. New best score: 0.142
Metric val_loss improved by 0.015 >= min_delta = 0.0. New best score: 0.128
Metric val_loss improved by 0.026 >= min_delta = 0.0. New best score: 0.102
Metric val_loss improved by 0.003 >= min_delta = 0.0. New best score: 0.099
Metric val_loss improved by 0.009 >= min_delta = 0.0. New best score: 0.089
Metric val_loss improved by 0.003 >= min_delta = 0.0. New best score: 0.087
Metric val_loss improved by 0.003 >= min_delta = 0.0. New best score: 0.084
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.084. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
```

mprove performance.
  rank_zero_warn(
Before loading best: [0.9440322116767329, 0.9418498168498168, 0.9463459759481961]
breastCancer.csv split 5 scores: [0.9440322116767329, 0.9418498168498168, 0.9463459759481961]

Testing...

_____
—
       Test metric   DataLoader 0
_____
—
      f1_test_epoch   0.9363553524017334
     test_acc_epoch   0.9424460530281067
_____
—

Explaining

Explaining time: 1.4893903732299805
Number of features that impact on target 0: 4
Explanation for target 0: Cell_Shape_Uniformity_1 | (Single_Epi_Cell_Size_2 & ~Bare_Nuclei_10)
Explanation accuracy: 0.9120506183491517
Number of features that impact on target 1: 2
Explanation for target 1: ~Cell_Size_Uniformity_1 & ~Cell_Shape_Uniformity_2 & ~Bare_Nuclei_1
Explanation accuracy: 0.9350163627863488
Training clusteredData.csv

0   924
1   35
Name: Mortality14Days, dtype: int64
There are 48 concepts
Split [1/5]
613/154/192
[592 21]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name | Type | Params
----
0 | loss | CrossEntropyLoss | 0
1 | model | Sequential | 2.0 K

2.0 K   Trainable params
0   Non-trainable params
2.0 K   Total params
0.008   Total estimated model params size (MB)
[592 592]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.419
Metric val_loss improved by 0.057 >= min_delta = 0.0. New best score: 0.362
Metric val_loss improved by 0.053 >= min_delta = 0.0. New best score: 0.309
Metric val_loss improved by 0.032 >= min_delta = 0.0. New best score: 0.277
Metric val_loss improved by 0.002 >= min_delta = 0.0. New best score: 0.275
Metric val_loss improved by 0.002 >= min_delta = 0.0. New best score: 0.272
Metric val_loss improved by 0.005 >= min_delta = 0.0. New best score: 0.268
Metric val_loss improved by 0.033 >= min_delta = 0.0. New best score: 0.235

```
Metric val_loss improved by 0.022 >= min_delta = 0.0. New best score: 0.213
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.213. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```
```
Before loading best: [0.488, 0.4945945945945946, 0.48157894736842105]
clusteredData.csv split 1 scores: [0.488, 0.4945945945945946, 0.48157894736842105]

Testing...
```

———
—
         Test metric   DataLoader 0
———
—
       f1_test_epoch   0.4880000054836273
       test_acc_epoch   0.953125
———
—

```
Explaining

Explaining time: 0.8098030090332031
Number of features that impact on target 0: 10
Explanation for target 0: Arterial BP [Systolic]_StdDev_low
Explanation accuracy: 0.439845720219552
Number of features that impact on target 1: 4
Explanation for target 1: None
Explanation accuracy: 0
Split [2/5]
613/154/192
[591  22]
```
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
---------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 2.0 K
---------------------------------------------
2.0 K     Trainable params
0         Non-trainable params
2.0 K     Total params
0.008     Total estimated model params size (MB)
[591 591]
```
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.489
Metric val_loss improved by 0.036 >= min_delta = 0.0. New best score: 0.453
Metric val_loss improved by 0.009 >= min_delta = 0.0. New best score: 0.444
Metric val_loss improved by 0.082 >= min_delta = 0.0. New best score: 0.361
```

Metric val_loss improved by 0.077 >= min_delta = 0.0. New best score: 0.285
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.285. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Before loading best: [0.47540983606557374, 0.4702702702702703, 0.48066298342541436]
clusteredData.csv split 2 scores: [0.47540983606557374, 0.4702702702702703, 0.48066298342541436]

Testing...

_____

—
        Test metric   DataLoader 0
_____

—
       f1_test_epoch   0.4893616735935211
       test_acc_epoch   0.9583333134651184
_____

—

Explaining

Explaining time: 0.9948132038116455
Number of features that impact on target 0: 9
Explanation for target 0: SVRI_StdDev_low | (~Hemoglobin_StdDev_high & ~SVRI_Mean_high)
Explanation accuracy: 0.4886363636363637
Number of features that impact on target 1: 8
Explanation for target 1: ~Arterial BP [Systolic]_Mean_high & ~Arterial pH_StdDev_low & ~Hemoglobin_StdDev_low & ~SVR_
StdDev_high
Explanation accuracy: 0.5252747252747253
Split [3/5]
613/154/192
[591 22]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name | Type | Params
----
0 | loss | CrossEntropyLoss | 0
1 | model | Sequential | 2.0 K

2.0 K   Trainable params
0   Non-trainable params
2.0 K   Total params
0.008   Total estimated model params size (MB)
[591 591]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.423
Metric val_loss improved by 0.098 >= min_delta = 0.0. New best score: 0.325
Metric val_loss improved by 0.033 >= min_delta = 0.0. New best score: 0.292

```
Metric val_loss improved by 0.003 >= min_delta = 0.0. New best score: 0.289
Metric val_loss improved by 0.010 >= min_delta = 0.0. New best score: 0.279
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.279. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```
Before loading best: [0.47107438016528924, 0.46216216216216216, 0.4803370786516854]
clusteredData.csv split 3 scores: [0.47107438016528924, 0.46216216216216216, 0.4803370786516854]

Testing...

──
—
        Test metric   DataLoader 0
──
—
      f1_test_epoch   0.4880000054836273
     test_acc_epoch   0.953125
──
—

Explaining

Explaining time: 1.5424087047576904
Number of features that impact on target 0: 5
Explanation for target 0: Arterial BP [Diastolic]_Mean_low | Arterial PaO2_Mean_high | Hemoglobin_Mean_low
Explanation accuracy: 0.49378531073446325
Number of features that impact on target 1: 8
Explanation for target 1: ~Arterial BP Mean_StdDev_high & ~Arterial BP [Systolic]_Mean_high & ~Arterial PaO2_Mean_high
& ~Hemoglobin_StdDev_low & ~SVRI_Mean_high
Explanation accuracy: 0.4666666666666667
Split [4/5]
613/154/192
[590 23]

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
----------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 2.0 K
----------------------------------------
2.0 K     Trainable params
0         Non-trainable params
2.0 K     Total params
0.008     Total estimated model params size (MB)
```
[590 590]
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.448
Metric val_loss improved by 0.072 >= min_delta = 0.0. New best score: 0.376
```

```
Metric val_loss improved by 0.016 >= min_delta = 0.0. New best score: 0.359
Metric val_loss improved by 0.114 >= min_delta = 0.0. New best score: 0.246
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.246. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```
```
Before loading best: [0.507966573816156, 0.5254826254826255, 0.5105363984674329]
clusteredData.csv split 4 scores: [0.507966573816156, 0.5254826254826255, 0.5105363984674329]

Testing...
```

```
────────────────────────────────────────────────────────────────────────────────
—
       Test metric              DataLoader 0
────────────────────────────────────────────────────────────────────────────────
—
     f1_test_epoch            0.47826087474823
    test_acc_epoch           0.9166666865348816
────────────────────────────────────────────────────────────────────────────────
—

Explaining

Explaining time: 0.8957555294036865
Number of features that impact on target 0: 11
Explanation for target 0: Platelets_StdDev_high | ~Arterial PaCO2_StdDev_high | ~Arterial pH_Mean_low
Explanation accuracy: 0.4768392370572207
Number of features that impact on target 1: 1
Explanation for target 1: None
Explanation accuracy: 0
Split [5/5]
614/154/191
[589  25]
```
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
```
```
  | Name  | Type             | Params
---------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 2.0 K
---------------------------------------------
2.0 K     Trainable params
0         Non-trainable params
2.0 K     Total params
0.008     Total estimated model params size (MB)
[589 589]
```
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.534
Metric val_loss improved by 0.053 >= min_delta = 0.0. New best score: 0.481
Metric val_loss improved by 0.091 >= min_delta = 0.0. New best score: 0.391
```

```
Metric val_loss improved by 0.015 >= min_delta = 0.0. New best score: 0.376
Metric val_loss improved by 0.012 >= min_delta = 0.0. New best score: 0.364
Metric val_loss improved by 0.043 >= min_delta = 0.0. New best score: 0.321
Metric val_loss improved by 0.001 >= min_delta = 0.0. New best score: 0.320
Metric val_loss improved by 0.026 >= min_delta = 0.0. New best score: 0.294
Metric val_loss improved by 0.057 >= min_delta = 0.0. New best score: 0.237
Metric val_loss improved by 0.027 >= min_delta = 0.0. New best score: 0.210
Metric val_loss improved by 0.003 >= min_delta = 0.0. New best score: 0.207
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.207. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Before loading best: [0.4104938271604938, 0.36141304347826086, 0.475]
clusteredData.csv split 5 scores: [0.4104938271604938, 0.36141304347826086, 0.475]


Testing...
_____
—
      Test metric              DataLoader 0
_____
—
     f1_test_epoch            0.485175222158432
     test_acc_epoch           0.9424083828926086
_____
—

Explaining

Explaining time: 0.5616412162780762
Number of features that impact on target 0: 10
Explanation for target 0: Arterial PaO2_StdDev_high | SVR_Mean_low
Explanation accuracy: 0.45838198498748955
Number of features that impact on target 1: 2
Explanation for target 1: None
Explanation accuracy: 0
Training clusteredDataSepsis.csv

0    31606
1     2422
Name: Mortality14Days, dtype: int64
There are 72 concepts
Split [1/5]
21777/5445/6806
[20225  1552]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 4.6 K
------------------------------------------
4.6 K     Trainable params
0         Non-trainable params
4.6 K     Total params
0.018     Total estimated model params size (MB)
[20225 20225]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```
Metric val_loss improved. New best score: 0.634
Metric val_loss improved by 0.054 >= min_delta = 0.0. New best score: 0.580
Metric val_loss improved by 0.011 >= min_delta = 0.0. New best score: 0.569
Metric val_loss improved by 0.011 >= min_delta = 0.0. New best score: 0.558
Metric val_loss improved by 0.054 >= min_delta = 0.0. New best score: 0.504
Metric val_loss improved by 0.039 >= min_delta = 0.0. New best score: 0.465
Metric val_loss improved by 0.008 >= min_delta = 0.0. New best score: 0.457
Metric val_loss improved by 0.035 >= min_delta = 0.0. New best score: 0.422
Metric val_loss improved by 0.044 >= min_delta = 0.0. New best score: 0.379
Metric val_loss improved by 0.014 >= min_delta = 0.0. New best score: 0.364
Metric val_loss improved by 0.004 >= min_delta = 0.0. New best score: 0.361
Metric val_loss improved by 0.001 >= min_delta = 0.0. New best score: 0.359
Metric val_loss improved by 0.012 >= min_delta = 0.0. New best score: 0.348
Metric val_loss improved by 0.004 >= min_delta = 0.0. New best score: 0.344
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.344. Signaling Trainer to stop.
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```
Before loading best: [0.5559768464458875, 0.5651254572122537, 0.5505680063480898]
clusteredDataSepsis.csv split 1 scores: [0.5559768464458875, 0.5651254572122537, 0.5505680063480898]

Testing...

_____
—
        Test metric   DataLoader 0
_____
—
      f1_test_epoch   0.5646570324897766
     test_acc_epoch   0.8729062080383301
_____
—

Explaining

Explaining time: 9.052464008331299
Number of features that impact on target 0: 45
Explanation for target 0: SBP_StdDev_high | Gender_high | Gender_low
Explanation accuracy: 0.4815661182205972
Number of features that impact on target 1: 46
Explanation for target 1: Gender_high & ~Age_low
Explanation accuracy: 0.44265345424282715
Split [2/5]
21777/5445/6806
[20213 1564]
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
```
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
```
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

```
  | Name  | Type            | Params
---------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential      | 4.6 K
---------------------------------------------
4.6 K     Trainable params
0         Non-trainable params
4.6 K     Total params
0.018     Total estimated model params size (MB)
```
[20213 20213]

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.638
Metric val_loss improved by 0.003 >= min_delta = 0.0. New best score: 0.634
Metric val_loss improved by 0.059 >= min_delta = 0.0. New best score: 0.576
Metric val_loss improved by 0.038 >= min_delta = 0.0. New best score: 0.538
Metric val_loss improved by 0.059 >= min_delta = 0.0. New best score: 0.479
Metric val_loss improved by 0.006 >= min_delta = 0.0. New best score: 0.473
Metric val_loss improved by 0.026 >= min_delta = 0.0. New best score: 0.447
Metric val_loss improved by 0.020 >= min_delta = 0.0. New best score: 0.427
Metric val_loss improved by 0.014 >= min_delta = 0.0. New best score: 0.413
Metric val_loss improved by 0.028 >= min_delta = 0.0. New best score: 0.386
Metric val_loss improved by 0.003 >= min_delta = 0.0. New best score: 0.383
Metric val_loss improved by 0.000 >= min_delta = 0.0. New best score: 0.382
Metric val_loss improved by 0.018 >= min_delta = 0.0. New best score: 0.365
Metric val_loss improved by 0.021 >= min_delta = 0.0. New best score: 0.344
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.344. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

```
Before loading best: [0.5649893957957862, 0.5816424388024211, 0.5569792981363406]
clusteredDataSepsis.csv split 2 scores: [0.5649893957957862, 0.5816424388024211, 0.5569792981363406]

Testing...
```

```
────────────────────────────────────────────────────────────────────────────────
─
      Test metric            DataLoader 0
────────────────────────────────────────────────────────────────────────────────
─
      f1_test_epoch         0.5679110288619995
     test_acc_epoch         0.8853952288627625
────────────────────────────────────────────────────────────────────────────────
─
```

```
Explaining

Explaining time: 11.816979169845581
Number of features that impact on target 0: 50
Explanation for target 0: Platelets_Mean_low | ~Potassium_Mean_low | ~Gender_high
Explanation accuracy: 0.48152662451435974
Number of features that impact on target 1: 49
Explanation for target 1: ~SBP_StdDev_high
Explanation accuracy: 0.3630895208932751
Split [3/5]
21777/5445/6806
[20264  1513]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 4.6 K
------------------------------------------
```

```
4.6 K     Trainable params
0         Non-trainable params
4.6 K     Total params
0.018     Total estimated model params size (MB)
```

```
[20264 20264]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.649
Metric val_loss improved by 0.052 >= min_delta = 0.0. New best score: 0.597
Metric val_loss improved by 0.021 >= min_delta = 0.0. New best score: 0.576
Metric val_loss improved by 0.052 >= min_delta = 0.0. New best score: 0.525
Metric val_loss improved by 0.037 >= min_delta = 0.0. New best score: 0.487
Metric val_loss improved by 0.038 >= min_delta = 0.0. New best score: 0.450
Metric val_loss improved by 0.013 >= min_delta = 0.0. New best score: 0.437
Metric val_loss improved by 0.012 >= min_delta = 0.0. New best score: 0.425
Metric val_loss improved by 0.002 >= min_delta = 0.0. New best score: 0.422
Metric val_loss improved by 0.023 >= min_delta = 0.0. New best score: 0.399
Metric val_loss improved by 0.042 >= min_delta = 0.0. New best score: 0.357
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.357. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

```
Before loading best: [0.5487538468328955, 0.5678631366236256, 0.542745331538435]
clusteredDataSepsis.csv split 3 scores: [0.5487538468328955, 0.5678631366236256, 0.542745331538435]

Testing...
────────────────────────────────────────────────────────────────────────────────────────
─
      Test metric              DataLoader 0
────────────────────────────────────────────────────────────────────────────────────────
─
     f1_test_epoch           0.5627663135528564
     test_acc_epoch          0.8817219138145447
────────────────────────────────────────────────────────────────────────────────────────
─

Explaining

Explaining time: 12.240967512130737
Number of features that impact on target 0: 52
Explanation for target 0: Gender_high | ~Gender_high
Explanation accuracy: 0.48152662451435974
Number of features that impact on target 1: 48
Explanation for target 1: ~Age_low
Explanation accuracy: 0.31979061718714274
Split [4/5]
21778/5445/6805
```

```
[20224  1554]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name | Type             | Params
-----------------------------------------
0 | loss | CrossEntropyLoss | 0
```

```
 1 | model | Sequential     | 4.6 K
-------------------------------------------
4.6 K     Trainable params
0         Non-trainable params
4.6 K     Total params
0.018     Total estimated model params size (MB)
```
```
[20224 20224]
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.663
Metric val_loss improved by 0.073 >= min_delta = 0.0. New best score: 0.590
Metric val_loss improved by 0.028 >= min_delta = 0.0. New best score: 0.562
Metric val_loss improved by 0.025 >= min_delta = 0.0. New best score: 0.537
Metric val_loss improved by 0.046 >= min_delta = 0.0. New best score: 0.491
Metric val_loss improved by 0.059 >= min_delta = 0.0. New best score: 0.432
Metric val_loss improved by 0.006 >= min_delta = 0.0. New best score: 0.426
Metric val_loss improved by 0.062 >= min_delta = 0.0. New best score: 0.364
Metric val_loss improved by 0.006 >= min_delta = 0.0. New best score: 0.358
Metric val_loss improved by 0.012 >= min_delta = 0.0. New best score: 0.346
Metric val_loss improved by 0.004 >= min_delta = 0.0. New best score: 0.342
Metric val_loss improved by 0.001 >= min_delta = 0.0. New best score: 0.341
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.341. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```
```
Before loading best: [0.5748453123808115, 0.585928643992673, 0.5676723374547971]
clusteredDataSepsis.csv split 4 scores: [0.5748453123808115, 0.585928643992673, 0.5676723374547971]
```
```
Testing...
```
```
──
─
       Test metric   DataLoader 0
──
─
     f1_test_epoch   0.5806083679199219
    test_acc_epoch   0.8921381235122681
──
─
```
```
Explaining
```
```
Explaining time: 7.75366997718811
Number of features that impact on target 0: 55
Explanation for target 0: Gender_low | (Glucose_StdDev_low & Gender_high)
Explanation accuracy: 0.4815633094621362
Number of features that impact on target 1: 51
Explanation for target 1: ~Age_high & ~Age_low
Explanation accuracy: 0.4815633094621362
Split [5/5]
21778/5445/6805
```
```
[20242 1536]
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

```
 | Name  | Type            | Params
-----------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 4.6 K
-----------------------------------------
4.6 K     Trainable params
0         Non-trainable params
4.6 K     Total params
0.018     Total estimated model params size (MB)
[20242 20242]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWarning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to improve performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWarning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to improve performance.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.632
Metric val_loss improved by 0.058 >= min_delta = 0.0. New best score: 0.574
Metric val_loss improved by 0.001 >= min_delta = 0.0. New best score: 0.573
Metric val_loss improved by 0.071 >= min_delta = 0.0. New best score: 0.502
Metric val_loss improved by 0.038 >= min_delta = 0.0. New best score: 0.464
Metric val_loss improved by 0.024 >= min_delta = 0.0. New best score: 0.440
Metric val_loss improved by 0.044 >= min_delta = 0.0. New best score: 0.395
Metric val_loss improved by 0.006 >= min_delta = 0.0. New best score: 0.389
Metric val_loss improved by 0.025 >= min_delta = 0.0. New best score: 0.365
Metric val_loss improved by 0.017 >= min_delta = 0.0. New best score: 0.348
Metric val_loss improved by 0.009 >= min_delta = 0.0. New best score: 0.339
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.339. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' is an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.save_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWarning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to improve performance.
  rank_zero_warn(
Before loading best: [0.5628175979216188, 0.5816017642882638, 0.5547182503100305]
clusteredDataSepsis.csv split 5 scores: [0.5628175979216188, 0.5816017642882638, 0.5547182503100305]

Testing...

——
—
      Test metric   DataLoader 0
——
—
      f1_test_epoch   0.5678743720054626
      test_acc_epoch   0.8803820610046387
——
—

Explaining

Explaining time: 13.367179870605469
Number of features that impact on target 0: 57
Explanation for target 0: Unit1_low & ~ICULOS_high
Explanation accuracy: 0.46630467739648546
Number of features that impact on target 1: 43
Explanation for target 1: Platelets_Mean_high
Explanation accuracy: 0.3847940248809004
Training expertLabelledData.csv

0   1077
1   49
Name: Mortality14Days, dtype: int64
There are 140 concepts
Split [1/5]
720/180/226
[684 36]

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDeprecationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' is an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s

```
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
-------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 5.7 K
-------------------------------------------
5.7 K     Trainable params
0         Non-trainable params
5.7 K     Total params
0.023     Total estimated model params size (MB)
[684 684]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (22) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.435
Metric val_loss improved by 0.247 >= min_delta = 0.0. New best score: 0.188
Metric val_loss improved by 0.036 >= min_delta = 0.0. New best score: 0.152
Metric val_loss improved by 0.022 >= min_delta = 0.0. New best score: 0.130
Metric val_loss improved by 0.041 >= min_delta = 0.0. New best score: 0.089
Metric val_loss improved by 0.009 >= min_delta = 0.0. New best score: 0.080
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.080. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

```
Before loading best: [0.5221987315010571, 0.524537037037037, 0.5206386292834891]
expertLabelledData.csv split 1 scores: [0.5221987315010571, 0.524537037037037, 0.5206386292834891]

Testing...

────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
      Test metric              DataLoader 0
────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
    f1_test_epoch           0.4851936101913452
   test_acc_epoch           0.9424778819084167
────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─

Explaining

Explaining time: 2.543801784515381
Number of features that impact on target 0: 6
Explanation for target 0: Arterial_BP_Diastolic_medium
Explanation accuracy: 0.42346938775510207
Number of features that impact on target 1: 7
Explanation for target 1: ~Arterial_pH_Min_medium & ~CVP_Min_low & ~Daily_Weight_low & ~SVI_medium
Explanation accuracy: 0.4593301435406698
Split [2/5]
720/181/225
[687  33]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
```

s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name | Type | Params
----
0 | loss | CrossEntropyLoss | 0
1 | model | Sequential | 5.7 K

5.7 K   Trainable params
0   Non-trainable params
5.7 K   Total params
0.023   Total estimated model params size (MB)
[687 687]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (22) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.380
Metric val_loss improved by 0.130 >= min_delta = 0.0. New best score: 0.250
Metric val_loss improved by 0.028 >= min_delta = 0.0. New best score: 0.221
Metric val_loss improved by 0.026 >= min_delta = 0.0. New best score: 0.195
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.195. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Before loading best: [0.6038732394366197, 0.6388888888888888, 0.5857142857142857]
expertLabelledData.csv split 2 scores: [0.6038732394366197, 0.6388888888888888, 0.5857142857142857]

Testing...
_____
—
        Test metric   DataLoader 0
_____
—
     f1_test_epoch   0.6111751198768616
    test_acc_epoch   0.9466667175292969
_____
—

Explaining

Explaining time: 3.1704859733581543
Number of features that impact on target 0: 7
Explanation for target 0: Hamoglobin_medium | ~SVI_low | ~Sodium_Max_medium
Explanation accuracy: 0.5254745254745256
Number of features that impact on target 1: 7
Explanation for target 1: ~Arterial_pH_Min_medium & ~Heart_Rate_Max_medium & ~NBP_Mean_high
Explanation accuracy: 0.3682356544823361
Split [3/5]
720/181/225
[690 30]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s

```
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
-----------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 5.7 K
-----------------------------------------
5.7 K     Trainable params
0         Non-trainable params
5.7 K     Total params
0.023     Total estimated model params size (MB)
[690 690]
```
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (22) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.485
Metric val_loss improved by 0.196 >= min_delta = 0.0. New best score: 0.289
Metric val_loss improved by 0.017 >= min_delta = 0.0. New best score: 0.272
Metric val_loss improved by 0.005 >= min_delta = 0.0. New best score: 0.267
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.267. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```
```
Before loading best: [0.47183098591549294, 0.46744186046511627, 0.476303317535545]
expertLabelledData.csv split 3 scores: [0.47183098591549294, 0.46744186046511627, 0.476303317535545]

Testing...

_____
—
      Test metric              DataLoader 0
_____
—
     f1_test_epoch          0.47795823216438293
    test_acc_epoch          0.9155555963516235
_____
—

Explaining

Explaining time: 3.6726107597351074
Number of features that impact on target 0: 6
Explanation for target 0: Arterial_pH_Min_high | ~CVP_Max_low
Explanation accuracy: 0.4578313253012048
Number of features that impact on target 1: 5
Explanation for target 1: (SVI_low & ~CVP_Min_low) | (SVI_low & ~Daily_Weight_low)
Explanation accuracy: 0.38773995646150805
Split [4/5]
720/181/225
[690  30]
```
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
```

```
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
-----------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 5.7 K
-----------------------------------------
5.7 K     Trainable params
0         Non-trainable params
5.7 K     Total params
0.023     Total estimated model params size (MB)
[690 690]
```
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (22) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.351
Metric val_loss improved by 0.031 >= min_delta = 0.0. New best score: 0.320
Metric val_loss improved by 0.024 >= min_delta = 0.0. New best score: 0.296
Metric val_loss improved by 0.032 >= min_delta = 0.0. New best score: 0.264
Metric val_loss improved by 0.027 >= min_delta = 0.0. New best score: 0.237
Metric val_loss improved by 0.007 >= min_delta = 0.0. New best score: 0.230
Metric val_loss improved by 0.006 >= min_delta = 0.0. New best score: 0.224
Metric val_loss improved by 0.006 >= min_delta = 0.0. New best score: 0.218
Metric val_loss improved by 0.011 >= min_delta = 0.0. New best score: 0.207
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.207. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```
```
Before loading best: [0.4779582366589327, 0.4790697674418605, 0.47685185185185186]
expertLabelledData.csv split 4 scores: [0.4779582366589327, 0.4790697674418605, 0.47685185185185186]

Testing...

_____
—
      Test metric            DataLoader 0
_____
—
      f1_test_epoch          0.48394498229026794
    test_acc_epoch           0.9377778172492981
_____
—

Explaining

Explaining time: 2.1718990802764893
Number of features that impact on target 0: 7
Explanation for target 0: Arterial_pH_Min_medium | Sodium_Max_low | (Heart_Rate_Max_medium & ~Hamoglobin_high)
Explanation accuracy: 0.45223647396533556
Number of features that impact on target 1: 1
Explanation for target 1: None
Explanation accuracy: 0
Split [5/5]
720/181/225
[689  31]
```
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
```

```
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
---------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 5.7 K
---------------------------------------
5.7 K     Trainable params
0         Non-trainable params
5.7 K     Total params
0.023     Total estimated model params size (MB)
```
[689 689]
```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (22) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.343
Metric val_loss improved by 0.001 >= min_delta = 0.0. New best score: 0.342
Metric val_loss improved by 0.034 >= min_delta = 0.0. New best score: 0.308
Metric val_loss improved by 0.019 >= min_delta = 0.0. New best score: 0.289
Metric val_loss improved by 0.015 >= min_delta = 0.0. New best score: 0.274
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.274. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```
Before loading best: [0.5576671035386631, 0.5430232558139535, 0.6046380090497738]
expertLabelledData.csv split 5 scores: [0.5576671035386631, 0.5430232558139535, 0.6046380090497738]

Testing...
```
────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
       Test metric           DataLoader 0
────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
      f1_test_epoch          0.5917997360229492
     test_acc_epoch          0.9111111164093018
────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─


Explaining

Explaining time: 1.461946964263916
Number of features that impact on target 0: 2
Explanation for target 0: Heart_Rate_Max_medium | ~SVI_low
Explanation accuracy: 0.4122387727879057
Number of features that impact on target 1: 5
Explanation for target 1: SVI_low & Sodium_Max_medium & ~CVP_Min_low & ~CaO2_high
Explanation accuracy: 0.5507745266781411
Training metricExtractedData.csv

0    924
1     35
Name: Mortality14Days, dtype: int64
There are 70 concepts
Split [1/5]
613/154/192
[587  26]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
```

```
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
-------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 3.3 K
-------------------------------------------
3.3 K     Trainable params
0         Non-trainable params
3.3 K     Total params
0.013     Total estimated model params size (MB)
[587 587]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.374
Metric val_loss improved by 0.063 >= min_delta = 0.0. New best score: 0.312
Metric val_loss improved by 0.069 >= min_delta = 0.0. New best score: 0.242
Metric val_loss improved by 0.011 >= min_delta = 0.0. New best score: 0.231
Metric val_loss improved by 0.009 >= min_delta = 0.0. New best score: 0.223
Metric val_loss improved by 0.038 >= min_delta = 0.0. New best score: 0.185
Metric val_loss improved by 0.042 >= min_delta = 0.0. New best score: 0.142
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.142. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Before loading best: [0.5620982790794111, 0.5579150579150579, 0.5672043010752689]
metricExtractedData.csv split 1 scores: [0.5620982790794111, 0.5579150579150579, 0.5672043010752689]

Testing...
```

—

```
      Test metric           DataLoader 0
```

—

```
      f1_test_epoch        0.4880000054836273
      test_acc_epoch             0.953125
```

—

```
Explaining

Explaining time: 1.3118126392364502
Number of features that impact on target 0: 6
Explanation for target 0: CVP__quantile__q_0.1_medium | CVP__root_mean_square_high | ~CVP__c3__lag_1_high
Explanation accuracy: 0.488
Number of features that impact on target 1: 6
Explanation for target 1: ~CVP__quantile__q_0.1_medium & ~CVP__root_mean_square_high & ~CVP__root_mean_square_low & ~C
VP__quantile__q_0.7_medium
Explanation accuracy: 0.49378531073446325
Split [2/5]
```

```
613/154/192
[591  22]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
-------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 3.3 K
-------------------------------------------
3.3 K     Trainable params
0         Non-trainable params
3.3 K     Total params
0.013     Total estimated model params size (MB)
```

```
[591 591]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.388
Metric val_loss improved by 0.012 >= min_delta = 0.0. New best score: 0.376
Metric val_loss improved by 0.075 >= min_delta = 0.0. New best score: 0.301
Metric val_loss improved by 0.008 >= min_delta = 0.0. New best score: 0.293
Metric val_loss improved by 0.060 >= min_delta = 0.0. New best score: 0.234
Metric val_loss improved by 0.001 >= min_delta = 0.0. New best score: 0.233
Metric val_loss improved by 0.015 >= min_delta = 0.0. New best score: 0.217
Metric val_loss improved by 0.005 >= min_delta = 0.0. New best score: 0.212
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.212. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

```
Before loading best: [0.5919854280510017, 0.6185328185328185, 0.5770969362129583]
metricExtractedData.csv split 2 scores: [0.5919854280510017, 0.6185328185328185, 0.5770969362129583]

Testing...
```

```
────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
      Test metric            DataLoader 0
────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
    f1_test_epoch            0.5620983242988586
    test_acc_epoch           0.9427083134651184
────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
```

```
Explaining

Explaining time: 0.9273629188537598
Number of features that impact on target 0: 1
Explanation for target 0: CVP__quantile__q_0.2_high | CVP__quantile__q_0.2_medium | CVP__root_mean_square_high
Explanation accuracy: 0.46404100898340356
Number of features that impact on target 1: 9
```

Explanation for target 1: ~CVP__quantile__q_0.4_very_low & ~CVP__quantile__q_0.2_high & ~CVP__quantile__q_0.2_low & ~C
VP__quantile__q_0.1_very_high & ~CVP__c3__lag_3_very_high
Explanation accuracy: 0.30859375000000006
Split [3/5]
613/154/192
[592 21]

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name | Type | Params
----
0 | loss | CrossEntropyLoss | 0
1 | model | Sequential | 3.3 K

3.3 K   Trainable params
0   Non-trainable params
3.3 K   Total params
0.013   Total estimated model params size (MB)
[592 592]

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.356
Metric val_loss improved by 0.042 >= min_delta = 0.0. New best score: 0.314
Metric val_loss improved by 0.078 >= min_delta = 0.0. New best score: 0.236
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.236. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Before loading best: [0.48387096774193544, 0.4864864864864865, 0.48128342245989303]
metricExtractedData.csv split 3 scores: [0.48387096774193544, 0.4864864864864865, 0.48128342245989303]

Testing...

_____
—
       Test metric   DataLoader 0
_____
—
     f1_test_epoch   0.4810810983181
    test_acc_epoch   0.9270833134651184
_____
—

Explaining

Explaining time: 1.401003122329712
Number of features that impact on target 0: 2
Explanation for target 0: CVP__minimum_low | CVP__minimum_very_low
Explanation accuracy: 0.41646478438972817
Number of features that impact on target 1: 2
Explanation for target 1: ~CVP__quantile__q_0.4_medium & ~CVP__minimum_very_low & ~CVP__c3__lag_3_medium & ~CVP__quant

```
ile__q_0.7_low
Explanation accuracy: 0.4037267080745342
Split [4/5]
613/154/192
[589  24]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
---------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 3.3 K
---------------------------------------------
3.3 K     Trainable params
0         Non-trainable params
3.3 K     Total params
0.013     Total estimated model params size (MB)
[589 589]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.376
Metric val_loss improved by 0.081 >= min_delta = 0.0. New best score: 0.296
Metric val_loss improved by 0.016 >= min_delta = 0.0. New best score: 0.280
Metric val_loss improved by 0.003 >= min_delta = 0.0. New best score: 0.277
Metric val_loss improved by 0.006 >= min_delta = 0.0. New best score: 0.271
Metric val_loss improved by 0.012 >= min_delta = 0.0. New best score: 0.259
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.259. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

```
Before loading best: [0.514392388293388, 0.5308880308880309, 0.5142045454545454]
metricExtractedData.csv split 4 scores: [0.514392388293388, 0.5308880308880309, 0.5142045454545454]

Testing...
```
```
————————————————————————————————————————————————————————————————————————————————————————————————————————————————
—
      Test metric              DataLoader 0
————————————————————————————————————————————————————————————————————————————————————————————————————————————————
—
     f1_test_epoch           0.54347825050354
     test_acc_epoch         0.9270833134651184
————————————————————————————————————————————————————————————————————————————————————————————————————————————————
—

Explaining

Explaining time: 0.6613006591796875
Number of features that impact on target 0: 6
Explanation for target 0: CVP__quantile__q_0.4_medium | CVP__root_mean_square_high | CVP__quantile__q_0.7_low
Explanation accuracy: 0.45841674249317554
```

```
Number of features that impact on target 1: 3
Explanation for target 1: None
Explanation accuracy: 0
Split [5/5]
614/154/191
[589  25]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
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  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
---------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 3.3 K
---------------------------------------------
3.3 K     Trainable params
0         Non-trainable params
3.3 K     Total params
0.013     Total estimated model params size (MB)
[589 589]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\trainer.py:1933: PossibleUserWarning: The number
of training batches (19) is smaller than the logging interval Trainer(log_every_n_steps=50). Set a lower value for log
_every_n_steps if you want to see logs for the training epoch.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.314
Metric val_loss improved by 0.058 >= min_delta = 0.0. New best score: 0.256
Metric val_loss improved by 0.024 >= min_delta = 0.0. New best score: 0.232
Metric val_loss improved by 0.009 >= min_delta = 0.0. New best score: 0.222
Metric val_loss improved by 0.038 >= min_delta = 0.0. New best score: 0.185
Metric val_loss improved by 0.017 >= min_delta = 0.0. New best score: 0.167
Metric val_loss improved by 0.017 >= min_delta = 0.0. New best score: 0.150
Metric val_loss improved by 0.003 >= min_delta = 0.0. New best score: 0.147
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.147. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

```
Before loading best: [0.5787797108551826, 0.5632763975155279, 0.6089572192513368]
metricExtractedData.csv split 5 scores: [0.5787797108551826, 0.5632763975155279, 0.6089572192513368]

Testing...

──────────────────────────────────────────────────────────────────────────────────────
──
       Test metric              DataLoader 0
──────────────────────────────────────────────────────────────────────────────────────
──
     f1_test_epoch          0.4837837815284729
     test_acc_epoch         0.9371727705001831
──────────────────────────────────────────────────────────────────────────────────────
──

Explaining

Explaining time: 0.835308313369751
```

```
Number of features that impact on target 0: 7
Explanation for target 0: CVP__mean_very_low | (~CVP__c3__lag_2_medium & ~CVP__quantile__q_0.7_low)
Explanation accuracy: 0.49094752320558777
Number of features that impact on target 1: 5
Explanation for target 1: None
Explanation accuracy: 0
Training staticData.csv


0    4584
1     678
Name: Mortality14Days, dtype: int64
There are 31 concepts
Split [1/5]
3367/842/1053
[2928  439]
```

<div style="background-color:#fcdfdf">

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
---------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 1.3 K
---------------------------------------------
1.3 K     Trainable params
0         Non-trainable params
1.3 K     Total params
0.005     Total estimated model params size (MB)
[2928 2928]
```

```
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.523
Metric val_loss improved by 0.041 >= min_delta = 0.0. New best score: 0.481
Metric val_loss improved by 0.027 >= min_delta = 0.0. New best score: 0.455
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.455. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

</div>

```
Before loading best: [0.5418881941360728, 0.5694600359227661, 0.5429151061173533]
staticData.csv split 1 scores: [0.5418881941360728, 0.5694600359227661, 0.5429151061173533]

Testing...

────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
       Test metric              DataLoader 0
────────────────────────────────────────────────────────────────────────────────────────────────────────────
─
      f1_test_epoch          0.5770694017410278
     test_acc_epoch          0.7853751182556152
────────────────────────────────────────────────────────────────────────────────────────────────────────────
─

Explaining

Explaining time: 1.0778207778930664
```

```
Number of features that impact on target 0: 10
Explanation for target 0: (respiration_high & renal_low) | (coagulation_medium & renal_low) | (renal_low & cns_high)
Explanation accuracy: 0.29539509702536654
Number of features that impact on target 1: 3
Explanation for target 1: None
Explanation accuracy: 0
Split [2/5]
3367/842/1053
[2946  421]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

```
  | Name  | Type             | Params
-------------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 1.3 K
-------------------------------------------
1.3 K     Trainable params
0         Non-trainable params
1.3 K     Total params
0.005     Total estimated model params size (MB)
[2946 2946]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.759
Metric val_loss improved by 0.155 >= min_delta = 0.0. New best score: 0.604
Metric val_loss improved by 0.127 >= min_delta = 0.0. New best score: 0.477
Metric val_loss improved by 0.005 >= min_delta = 0.0. New best score: 0.472
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.472. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(

```
Before loading best: [0.6002813504823151, 0.5910537879273847, 0.6150553213909378]
staticData.csv split 2 scores: [0.6002813504823151, 0.5910537879273847, 0.6150553213909378]

Testing...

_____
—
       Test metric              DataLoader 0
_____
—
     f1_test_epoch            0.5753709673881531
     test_acc_epoch           0.8385564684867859
_____
—

Explaining

Explaining time: 1.1893930435180664
Number of features that impact on target 0: 5
Explanation for target 0: coagulation_medium | (age_medium & ~renal_medium)
Explanation accuracy: 0.42816268966411625
Number of features that impact on target 1: 4
Explanation for target 1: None
```

```
Explanation accuracy: 0
Split [3/5]
3368/842/1052
[2935  433]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name | Type | Params
----
0 | loss | CrossEntropyLoss | 0
1 | model | Sequential | 1.3 K

1.3 K   Trainable params
0   Non-trainable params
1.3 K   Total params
0.005   Total estimated model params size (MB)

```
[2935 2935]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.668
Metric val_loss improved by 0.121 >= min_delta = 0.0. New best score: 0.547
Metric val_loss improved by 0.016 >= min_delta = 0.0. New best score: 0.531
Metric val_loss improved by 0.059 >= min_delta = 0.0. New best score: 0.472
Metric val_loss improved by 0.014 >= min_delta = 0.0. New best score: 0.458
Metric val_loss improved by 0.026 >= min_delta = 0.0. New best score: 0.432
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.432. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(

```
Before loading best: [0.5544551229841994, 0.5739731006906579, 0.5508877219304826]
staticData.csv split 3 scores: [0.5544551229841994, 0.5739731006906579, 0.5508877219304826]

Testing...

————————————————————————————————————————————————————————————————————————————————————————————————————————————————
—
      Test metric              DataLoader 0
————————————————————————————————————————————————————————————————————————————————————————————————————————————————
—
     f1_test_epoch           0.5418853759765625
     test_acc_epoch          0.8374524712562561
————————————————————————————————————————————————————————————————————————————————————————————————————————————————
—

Explaining

Explaining time: 0.8806140422821045
Number of features that impact on target 0: 4
Explanation for target 0: (cns_medium & gender_male) | (gender_female & ~cns_high) | (gender_male & ~respiration_low &
~cns_high)
Explanation accuracy: 0.4935281622332801
Number of features that impact on target 1: 5
Explanation for target 1: None
Explanation accuracy: 0
Split [4/5]
```

```
3368/842/1052
[2933  435]
```

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name | Type | Params
----
0 | loss | CrossEntropyLoss | 0
1 | model | Sequential | 1.3 K

1.3 K   Trainable params
0   Non-trainable params
1.3 K   Total params
0.005   Total estimated model params size (MB)
[2933 2933]

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.634
Metric val_loss improved by 0.118 >= min_delta = 0.0. New best score: 0.516
Metric val_loss improved by 0.007 >= min_delta = 0.0. New best score: 0.509
Metric val_loss improved by 0.041 >= min_delta = 0.0. New best score: 0.468
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.468. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Before loading best: [0.5466947922582506, 0.5538390080374813, 0.5436271044432226]
staticData.csv split 4 scores: [0.5466947922582506, 0.5538390080374813, 0.5436271044432226]

Testing...

_____
—
       Test metric   DataLoader 0
_____
—
      f1_test_epoch   0.5633728504180908
     test_acc_epoch   0.8241444826126099
_____
—

Explaining

Explaining time: 1.7567577362060547
Number of features that impact on target 0: 8
Explanation for target 0: cns_medium | ~coagulation_high
Explanation accuracy: 0.510337310354986
Number of features that impact on target 1: 5
Explanation for target 1: None
Explanation accuracy: 0
Split [5/5]
3368/842/1052
[2931 437]

c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\callback_connector.py:57: LightningDep
recationWarning: Setting `Trainer(weights_save_path=)` has been deprecated in v1.6 and will be removed in v1.8. Please

```
pass ``dirpath`` directly to the `ModelCheckpoint` callback
  rank_zero_deprecation(
GPU available: True, used: True
TPU available: False, using: 0 TPU cores
IPU available: False, using: 0 IPUs
HPU available: False, using: 0 HPUs
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
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  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\callbacks\model_checkpoint.py:611: UserWarning: Checkpoin
t directory C:\Users\benma\OneDrive\Kings\Modules\Term 2\Individual Project\LEN Individual Project\Notebooks\runs exis
ts and is not empty.
  rank_zero_warn(f"Checkpoint directory {dirpath} exists and is not empty.")
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]

  | Name  | Type             | Params
---------------------------------------
0 | loss  | CrossEntropyLoss | 0
1 | model | Sequential       | 1.3 K
---------------------------------------
1.3 K     Trainable params
0         Non-trainable params
1.3 K     Total params
0.005     Total estimated model params size (MB)
[2931 2931]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, val_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, train_dataloader, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
Metric val_loss improved. New best score: 0.645
Metric val_loss improved by 0.111 >= min_delta = 0.0. New best score: 0.534
Metric val_loss improved by 0.044 >= min_delta = 0.0. New best score: 0.490
Metric val_loss improved by 0.006 >= min_delta = 0.0. New best score: 0.483
Metric val_loss improved by 0.026 >= min_delta = 0.0. New best score: 0.458
Metric val_loss improved by 0.017 >= min_delta = 0.0. New best score: 0.441
Monitored metric val_loss did not improve in the last 20 records. Best score: 0.441. Signaling Trainer to stop.
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\utilities\parsing.py:261: UserWarning: Attribute 'loss' i
s an instance of `nn.Module` and is already saved during checkpointing. It is recommended to ignore them using `self.s
ave_hyperparameters(ignore=['loss'])`.
  rank_zero_warn(
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0]
c:\Users\benma\anaconda3\lib\site-packages\pytorch_lightning\trainer\connectors\data_connector.py:240: PossibleUserWar
ning: The dataloader, test_dataloader 0, does not have many workers which may be a bottleneck. Consider increasing the
value of the `num_workers` argument` (try 8 which is the number of cpus on this machine) in the `DataLoader` init to i
mprove performance.
  rank_zero_warn(
```

Before loading best: [0.5412742206577237, 0.541805805291549, 0.5407894736842105]
staticData.csv split 5 scores: [0.5412742206577237, 0.541805805291549, 0.5407894736842105]

Testing...

```
─────────────────────────────────────────────────────────────────────────────────────────────────
─
      Test metric           DataLoader 0
─────────────────────────────────────────────────────────────────────────────────────────────────
─
    f1_test_epoch          0.5548878908157349
   test_acc_epoch          0.839353621006012
─────────────────────────────────────────────────────────────────────────────────────────────────
─
```

Explaining

Explaining time: 0.6849987506866455
Number of features that impact on target 0: 7
Explanation for target 0: (respiration_low & renal_low & cns_medium) | (los_high & respiration_low & renal_low & cns_l
ow)
Explanation accuracy: 0.1235575059184532
Number of features that impact on target 1: 5
Explanation for target 1: ~gender_female & ~gender_male
Explanation accuracy: 0.4654471544715447

In [ ]:
```python
# Helper function to remove explanation attempts that returned None.

def removeNoneExplanations(explanations):

    toRemove = []
    for idx, expl in enumerate(explanations):
```

```python
        if expl['explanation'] == None:
            toRemove.append(idx)
    for i in sorted(toRemove, reverse=True):
        del explanations[i]

    return explanations
```

Averaging results across all folds

In [ ]:

```python
kFoldMeans = []


for x in results_dict:

    cols = ['file', 'model_accuracy', 'extraction_time', 'f1', 'recall', 'precision']

    # Fetching results
    rows = []

    class0Explanations = []
    class1Explanations = []

    for split in results_dict[x]:
        row = [x]

        # Model accuracy results
        row.extend(split[:5])

        rows.append(row)

        # Explanation accuracy results
        class0Explanations.append(split[5][0])
        class1Explanations.append(split[5][1])


    class0Explanations = removeNoneExplanations(class0Explanations)

    class1Explanations = removeNoneExplanations(class1Explanations)

    class0DF = pd.DataFrame(class0Explanations)
    class1DF = pd.DataFrame(class1Explanations)

    average0 = class0DF.mean().values
    average1 = class1DF.mean().values

    # If the explanation attempt returned None fill with zeros
    if len(class0Explanations) == 0:
        average0 = [0]*4

    if len(class1Explanations) == 0:
        average1 = [0]*4

    df = pd.DataFrame(columns=cols, data=rows)

    df = df.set_index('file')

    combinedCols = list(df.describe().columns)

    row = [x]
    row.extend(np.round(df.describe().loc['mean'].values, 2))

    row.extend(list(average0)[1:])
    row.extend(list(average1)[1:])

    kFoldMeans.append(row)


# Getting average, formatting into a dataframe

kFoldMeansCols = list(df.describe().columns)

combinedCols.insert(0, "file")


for idx, d in enumerate(results_dict[list(results_dict.keys())[0]][0][5]):
    combinedCols.extend([str(x) + "_" + str(idx) for x in list(d)[2:]])


totalMeans = pd.DataFrame(columns=combinedCols, data=kFoldMeans)

totalMeans = totalMeans.set_index('file')
```

```python
cols = totalMeans.columns

cols = [c.replace("explanation", "expl").replace("accuracy", "acc").replace("complexity", "comp") for c in cols]

totalMeans.columns = cols

totalMeans = totalMeans.round(2)

totalMeans = totalMeans.drop("extraction_time", axis=1)

display(totalMeans)


timeNow = datetime.datetime.now().strftime("%Y-%m-%d_%H%M%S")
totalMeans.to_csv(f"./processingCache/totalMeans{timeNow}.csv")
```

```
C:\Users\benma\AppData\Local\Temp/ipykernel_26956/1696261679.py:34: FutureWarning: Dropping of nuisance columns in Dat
aFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select onl
y valid columns before calling the reduction.
  average0 = class0DF.mean().values
C:\Users\benma\AppData\Local\Temp/ipykernel_26956/1696261679.py:35: FutureWarning: Dropping of nuisance columns in Dat
aFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select onl
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  average1 = class1DF.mean().values
C:\Users\benma\AppData\Local\Temp/ipykernel_26956/1696261679.py:34: FutureWarning: Dropping of nuisance columns in Dat
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aFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select onl
y valid columns before calling the reduction.
  average1 = class1DF.mean().values
```

file	model_acc	f1	recall	precision	expl_acc_0	expl_fidelity_0	expl_comp_0	expl_acc_1	expl_fidelity_1	expl_comp_1
breastCancer.csv	0.96	0.95	0.95	0.95	0.87	0.90	2.6	0.86	0.88	2.60
clusteredData.csv	0.94	0.47	0.46	0.49	0.47	0.84	2.4	0.50	0.92	4.50
clusteredDataSepsis.csv	0.88	0.56	0.58	0.55	0.48	0.84	2.6	0.40	0.58	1.40
expertLabelledData.csv	0.93	0.53	0.53	0.53	0.45	0.78	2.4	0.44	0.71	3.75
metricExtractedData.csv	0.94	0.55	0.55	0.55	0.46	0.79	2.8	0.40	0.69	4.33
staticData.csv	0.82	0.56	0.57	0.56	0.37	0.51	5.0	0.47	0.90	2.00