

# Model Development Phase Template

Date	21st June 2025
Team ID	LTVIP2025TMID42174
Project Title	Revolutionizing Liver Care: Predicting Liver Cirrhosis Using Advanced Machine Learning Techniques.

## Initial Model Training Code, Model Validation and Evaluation Report

The initial model training code will be showcased in the future through a screenshot. The model validation and evaluation report will include classification reports, accuracy, and confusion matrices for multiple models, presented through respective screenshots.

### Initial Model Training Code:

#### NAIVE BAYES

```
from sklearn.naive_bayes import GaussianNB

nb = GaussianNB()
nb.fit(X_train, y_train)

[52]
.. GaussianNB()
```

#### RANDOM FOREST

```
from sklearn.ensemble import RandomForestClassifier

rf = RandomForestClassifier()
rf.fit(X_train, y_train)

[53]
.. RandomForestClassifier()
```

#### LOGISTIC REGRESSION CV

```
from sklearn.linear_model import LogisticRegressionCV

# Logistic Regression CV
lcv = LogisticRegressionCV(cv=5)
lcv.fit(X_train, y_train)

[54]
.. LogisticRegressionCV(cv=5)
```

#### RIDGE CLASSIFIER

```
from sklearn.linear_model import RidgeClassifier

# Ridge Classifier
rg = RidgeClassifier()
rg.fit(X_train, y_train)

[155]
... RidgeClassifier()
```

#### SUPPORT VECTOR CLASSIFIER [ SVC ]

```
from sklearn.svm import SVC

# Support Vector Classifier (SVC)
svc = SVC()
svc.fit(X_train, y_train)

[156]
... SVC()
```

#### LOGISTIC REGRESSION

```
from sklearn.linear_model import LogisticRegression

log = LogisticRegression()
logistic = log.fit(X_train, y_train)

[157]
```

KNN

```
from sklearn.neighbors import KNeighborsClassifier

knn = KNeighborsClassifier()
knn.fit(X_train, y_train)
```

[162]

... KNeighborsClassifier()

XGBOOST

```
from xgboost import XGBClassifier
model=XGBClassifier()
model.fit(X,y)
```

9]

```
XGBClassifier(base_score=None, booster=None, callbacks=None,
               colsample_bylevel=None, colsample_bynode=None,
               colsample_bytree=None, device=None, early_stopping_rounds=None,
               enable_categorical=False, eval_metric=None, feature_types=None,
               gamma=None, grow_policy=None, importance_type=None,
               interaction_constraints=None, learning_rate=None, max_bin=None,
               max_cat_threshold=None, max_cat_to_onehot=None,
               max_delta_step=None, max_depth=None, max_leaves=None,
               min_child_weight=None, missing=nan, monotone_constraints=None,
               multi_strategy=None, n_estimators=None, n_jobs=None,
               num_parallel_tree=None, random_state=None, ...)
```

Model Validation and Evaluation Report:

Model	Classification Report	Accuracy	Confusion Matrix																														
Naive Bayes	<div>Classification Report (Naive bayes):</div> <table><tr><th></th><th>precision</th><th>recall</th><th>f1-score</th><th>support</th></tr><tr><td>0</td><td>0.68</td><td>0.72</td><td>0.70</td><td>68</td></tr><tr><td>1</td><td>0.84</td><td>0.81</td><td>0.82</td><td>122</td></tr><tr><td>accuracy</td><td></td><td></td><td>0.78</td><td>190</td></tr><tr><td>macro avg</td><td>0.76</td><td>0.77</td><td>0.76</td><td>190</td></tr><tr><td>weighted avg</td><td>0.78</td><td>0.78</td><td>0.78</td><td>190</td></tr></table>		precision	recall	f1-score	support	0	0.68	0.72	0.70	68	1	0.84	0.81	0.82	122	accuracy			0.78	190	macro avg	0.76	0.77	0.76	190	weighted avg	0.78	0.78	0.78	190	35.79 %	<div>Confusion Matrix (Naive bayes):</div> <div>[[49 19]</div> <div>[23 99]]</div>
	precision	recall	f1-score	support																													
0	0.68	0.72	0.70	68																													
1	0.84	0.81	0.82	122																													
accuracy			0.78	190																													
macro avg	0.76	0.77	0.76	190																													
weighted avg	0.78	0.78	0.78	190																													
Random Forest	<div>Classification Report ( Random Forest ):</div> <table><tr><th></th><th>precision</th><th>recall</th><th>f1-score</th><th>support</th></tr><tr><td>0</td><td>0.84</td><td>0.71</td><td>0.77</td><td>68</td></tr><tr><td>1</td><td>0.85</td><td>0.93</td><td>0.89</td><td>122</td></tr><tr><td>accuracy</td><td></td><td></td><td>0.85</td><td>190</td></tr><tr><td>macro avg</td><td>0.85</td><td>0.82</td><td>0.83</td><td>190</td></tr><tr><td>weighted avg</td><td>0.85</td><td>0.85</td><td>0.84</td><td>190</td></tr></table>		precision	recall	f1-score	support	0	0.84	0.71	0.77	68	1	0.85	0.93	0.89	122	accuracy			0.85	190	macro avg	0.85	0.82	0.83	190	weighted avg	0.85	0.85	0.84	190	73.16 %	<div>Confusion Matrix ( Random Forest ):</div> <div>[[ 48  20]</div> <div>[  9 113]]</div> <div>Classification Report ( Random Forest ):</div>
	precision	recall	f1-score	support																													
0	0.84	0.71	0.77	68																													
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Logistic Regression CV	<div>Classification Report (Logistic Regression CV):</div> <table><tr><th></th><th>precision</th><th>recall</th><th>f1-score</th><th>support</th></tr><tr><td>0</td><td>0.81</td><td>0.63</td><td>0.71</td><td>68</td></tr><tr><td>1</td><td>0.82</td><td>0.92</td><td>0.86</td><td>122</td></tr><tr><td>accuracy</td><td></td><td></td><td>0.82</td><td>190</td></tr><tr><td>macro avg</td><td>0.81</td><td>0.78</td><td>0.79</td><td>190</td></tr><tr><td>weighted avg</td><td>0.82</td><td>0.82</td><td>0.81</td><td>190</td></tr></table>		precision	recall	f1-score	support	0	0.81	0.63	0.71	68	1	0.82	0.92	0.86	122	accuracy			0.82	190	macro avg	0.81	0.78	0.79	190	weighted avg	0.82	0.82	0.81	190	73.16 %	<div>Confusion Matrix (Logistic Regression CV):</div> <div>[[ 43  25]</div> <div>[ 10 112]]</div>
	precision	recall	f1-score	support																													
0	0.81	0.63	0.71	68																													
1	0.82	0.92	0.86	122																													
accuracy			0.82	190																													
macro avg	0.81	0.78	0.79	190																													
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Ridge Classifier	<pre> Classification Report (Ridge Classifier):               precision    recall  f1-score   support        0       0.85      0.68      0.75         68       1       0.84      0.93      0.88        122     accuracy          0.84         190   macro avg       0.85      0.81      0.82         190  weighted avg     0.84      0.84      0.84         190 </pre>	35.79 %	<pre> Confusion Matrix (Ridge Classifier): [[ 46  22]  [  8 114]] </pre>
Support Vector Classifier	<pre> Classification Report (Support Vector Classifier):               precision    recall  f1-score   support        0       0.50      0.09      0.15         68       1       0.65      0.95      0.77        122     accuracy          0.64         190   macro avg       0.58      0.52      0.46         190  weighted avg     0.60      0.64      0.55         190 </pre>	35.79 %	<pre> Confusion Matrix (Support Vector Classifier): [[  6  62]  [  6 116]] </pre>
Logistic Regression	<pre> Classification Report (Logistic Regression):               precision    recall  f1-score   support        0       0.80      0.57      0.67         68       1       0.79      0.92      0.85        122     accuracy          0.79         190   macro avg       0.80      0.75      0.76         190  weighted avg     0.79      0.79      0.79         190 </pre>	74.21 %	<pre> Confusion Matrix (Logistic Regression): [[ 39  29]  [ 10 112]] </pre>
KNN	<pre> [[  7 115]] Classification Report (KNN):               precision    recall  f1-score   support        0       0.88      0.72      0.79         68       1       0.86      0.94      0.90        122     accuracy          0.86         190   macro avg       0.87      0.83      0.84         190  weighted avg     0.86      0.86      0.86         190 </pre>	86.32 %	<pre> Confusion Matrix (KNN): [[ 49  19]  [  7 115]] </pre>
XG Boost	<pre> Classification Report (XGBoost):               precision    recall  f1-score   support        0       0.83      0.71      0.76         68       1       0.85      0.92      0.88        122     accuracy          0.84         190   macro avg       0.84      0.81      0.82         190  weighted avg     0.84      0.84      0.84         190 </pre>	64.21 %	<pre> Confusion Matrix (XGBoost): [[ 48  20]  [ 10 112]] </pre>