# Colon Cancer

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## Contents

# 1 RRPlot and the Colon data set

### 1.0.1 Libraries

```
library(survival)
library(FRESA.CAD)
```

```
## Loading required package: Rcpp

## Loading required package: stringr

## Loading required package: miscTools

## Loading required package: Hmisc

##
## Attaching package: 'Hmisc'

## The following objects are masked from 'package:base':
##
##     format.pval, units

## Loading required package: pROC

## Type 'citation("pROC")' for a citation.

##
## Attaching package: 'pROC'

## The following objects are masked from 'package:stats':
##
##     cov, smooth, var
```

```
#library(corrplot)
#source("~/GitHub/FRESA.CAD/R/RRPlot.R")
#source("~/GitHub/FRESA.CAD/R/PoissonEventRiskCalibration.R")
op <- par(no.readonly = TRUE)
pander::panderOptions('digits', 3)
```

```
#pander::panderOptions('table.split.table', 400)
pander::panderOptions('keep.trailing.zeros',TRUE)
```

## 1.1 The data set

```
data(cancer)
colon <- subset(colon,etype==1)
colon$etype <- NULL
rownames(colon) <- colon$id
colon$id <- NULL
colon <- colon[complete.cases(colon),]
time <- colon$time
status <- colon$status
data <- colon
data$time <- NULL
data$study <- NULL
table(data$status)
```

0 1 442 446

```
dataColon <- as.data.frame(model.matrix(status~.*age,data))
dataColon$`(Intercept)` <- NULL
dataColon$time <- time/365
dataColon$status <- status
colnames(dataColon) <-str_replace_all(colnames(dataColon),":","_")
colnames(dataColon) <-str_replace_all(colnames(dataColon),"\\.","_")
colnames(dataColon) <-str_replace_all(colnames(dataColon),"\\+","_")
data <- NULL

trainsamples <- sample(nrow(dataColon),0.7*nrow(dataColon))
dataColonTrain <- dataColon[trainsamples,]
dataColonTest <- dataColon[-trainsamples,]


pander::pander(table(dataColonTrain$status))
```

| 0 | 1 |
|---|---|
| 301 | 320 |

```
pander::pander(table(dataColonTest$status))
```

| 0 | 1 |
|---|---|
| 141 | 126 |

## 1.2 Modeling

```
ml <- BSWiMS.model(Surv(time,status)~1,data=dataColonTrain,NumberofRepeats = 10)
```

[+++++++++-+++++++++++-+++++-+++]..

```
sm <- summary(ml)
pander::pander(sm$coefficients)
```

Table 3: Table continues below

| | Estimate | lower | HR | upper | u.Accuracy |
|---|---|---|---|---|---|
| **age__nodes** | 0.000458 | 1.000 | 1.000 | 1.001 | 0.607 |
| **age** | -0.020172 | 0.973 | 0.980 | 0.987 | 0.502 |
| **age__node4** | 0.005125 | 1.003 | 1.005 | 1.007 | 0.614 |
| **age__extent** | 0.005018 | 1.003 | 1.005 | 1.007 | 0.536 |
| **extent** | 0.187439 | 1.107 | 1.206 | 1.314 | 0.580 |
| **node4** | 0.187704 | 1.100 | 1.206 | 1.323 | 0.614 |
| **rxLev__5FU__age** | -0.002388 | 0.996 | 0.998 | 0.999 | 0.586 |
| **rxLev__5FU** | -0.190602 | 0.748 | 0.826 | 0.913 | 0.586 |
| **adhere** | 0.432738 | 1.202 | 1.541 | 1.976 | 0.530 |
| **age__adhere** | -0.005721 | 0.990 | 0.994 | 0.998 | 0.530 |
| **nodes** | 0.018295 | 1.004 | 1.018 | 1.034 | 0.618 |

Table 4: Table continues below

| | r.Accuracy | full.Accuracy | u.AUC | r.AUC | full.AUC |
|---|---|---|---|---|---|
| **age__nodes** | 0.564 | 0.623 | 0.612 | 0.570 | 0.626 |
| **age** | 0.620 | 0.640 | 0.504 | 0.624 | 0.641 |
| **age__node4** | 0.624 | 0.640 | 0.621 | 0.622 | 0.641 |
| **age__extent** | 0.628 | 0.640 | 0.535 | 0.632 | 0.641 |
| **extent** | 0.622 | 0.658 | 0.569 | 0.627 | 0.658 |
| **node4** | 0.639 | 0.658 | 0.621 | 0.639 | 0.658 |
| **rxLev__5FU__age** | 0.630 | 0.658 | 0.581 | 0.636 | 0.658 |
| **rxLev__5FU** | 0.624 | 0.640 | 0.581 | 0.628 | 0.641 |
| **adhere** | 0.602 | 0.615 | 0.541 | 0.607 | 0.620 |
| **age__adhere** | 0.609 | 0.615 | 0.541 | 0.613 | 0.620 |
| **nodes** | 0.648 | 0.658 | 0.623 | 0.645 | 0.660 |

| | IDI | NRI | z.IDI | z.NRI | Delta.AUC | Frequency |
|---|---|---|---|---|---|---|
| **age__nodes** | 0.03263 | 0.379 | 6.04 | 5.11 | 0.05648 | 1.0 |
| **age** | 0.03251 | 0.272 | 5.22 | 3.42 | 0.01636 | 1.0 |
| **age__node4** | 0.02950 | 0.422 | 4.99 | 6.23 | 0.01836 | 1.0 |
| **age__extent** | 0.02683 | 0.277 | 4.56 | 4.80 | 0.00865 | 1.0 |
| **extent** | 0.02368 | 0.272 | 4.28 | 4.71 | 0.03110 | 1.0 |
| **node4** | 0.01870 | 0.398 | 4.07 | 5.97 | 0.01985 | 1.0 |
| **rxLev__5FU__age** | 0.01677 | 0.324 | 3.97 | 4.35 | 0.02218 | 1.0 |
| **rxLev__5FU** | 0.01463 | 0.324 | 3.75 | 4.35 | 0.01279 | 1.0 |
| **adhere** | 0.00951 | 0.367 | 3.41 | 6.52 | 0.01329 | 0.7 |
| **age__adhere** | 0.00664 | 0.486 | 2.88 | 6.63 | 0.00724 | 0.7 |
| **nodes** | 0.00570 | 0.158 | 2.43 | 2.04 | 0.01560 | 1.0 |

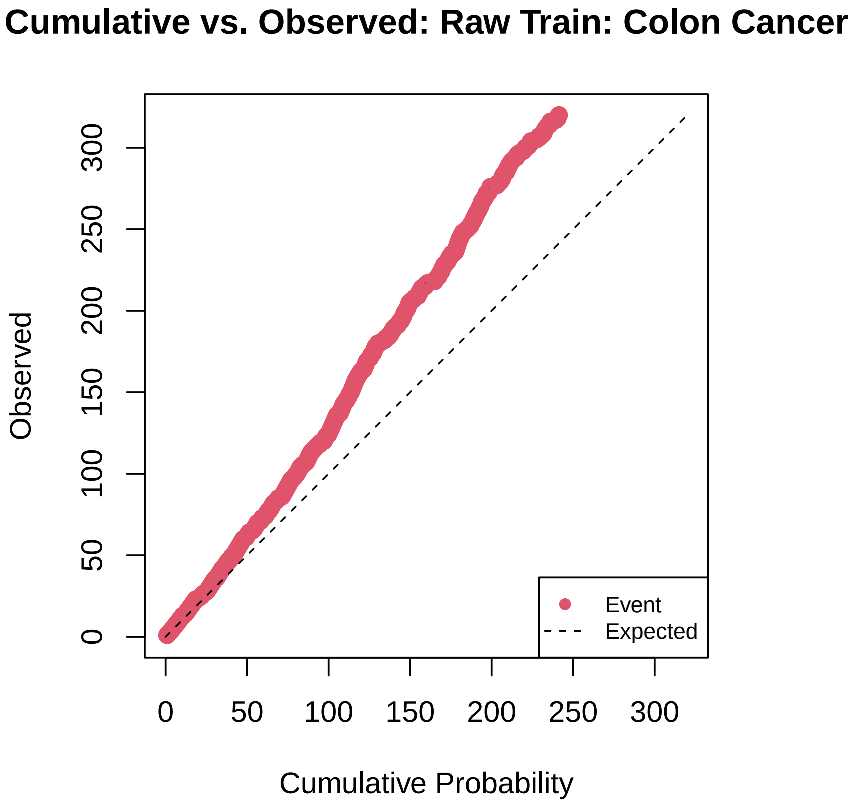
## 1.3 Cox Model Performance

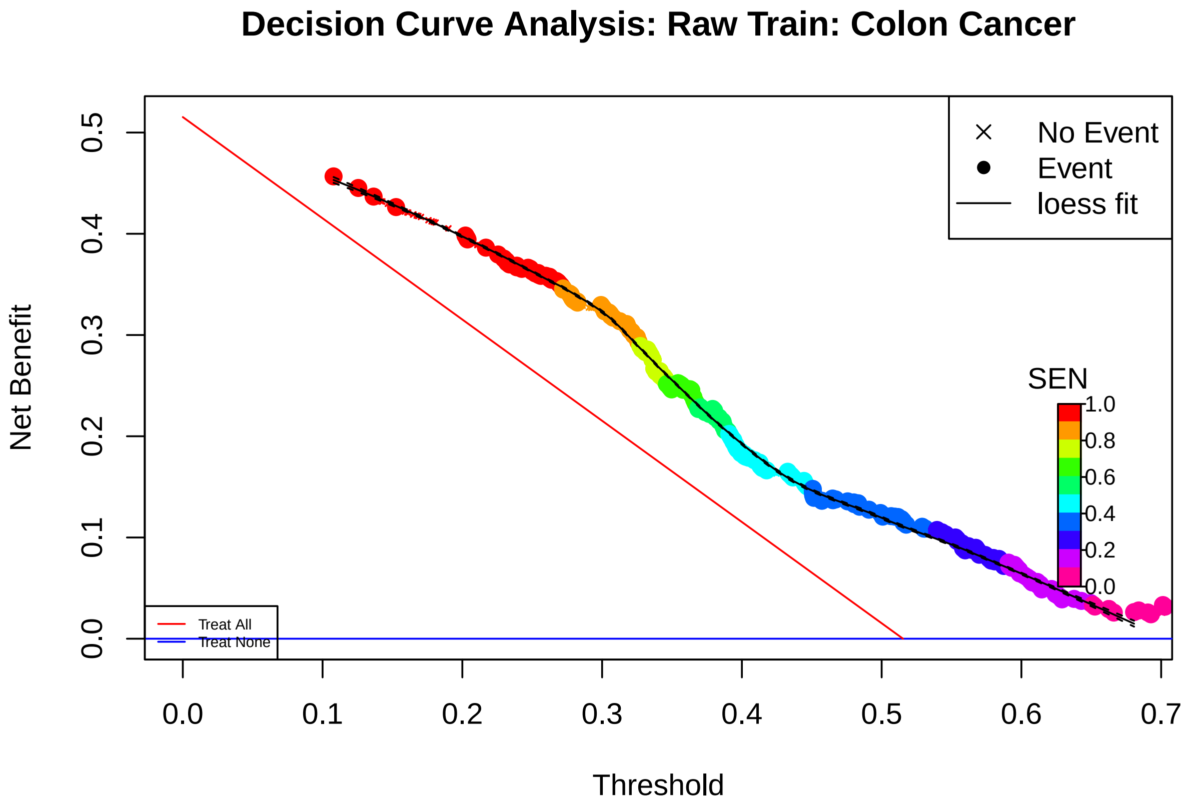
Here we evaluate the model using the RRPlot() function.

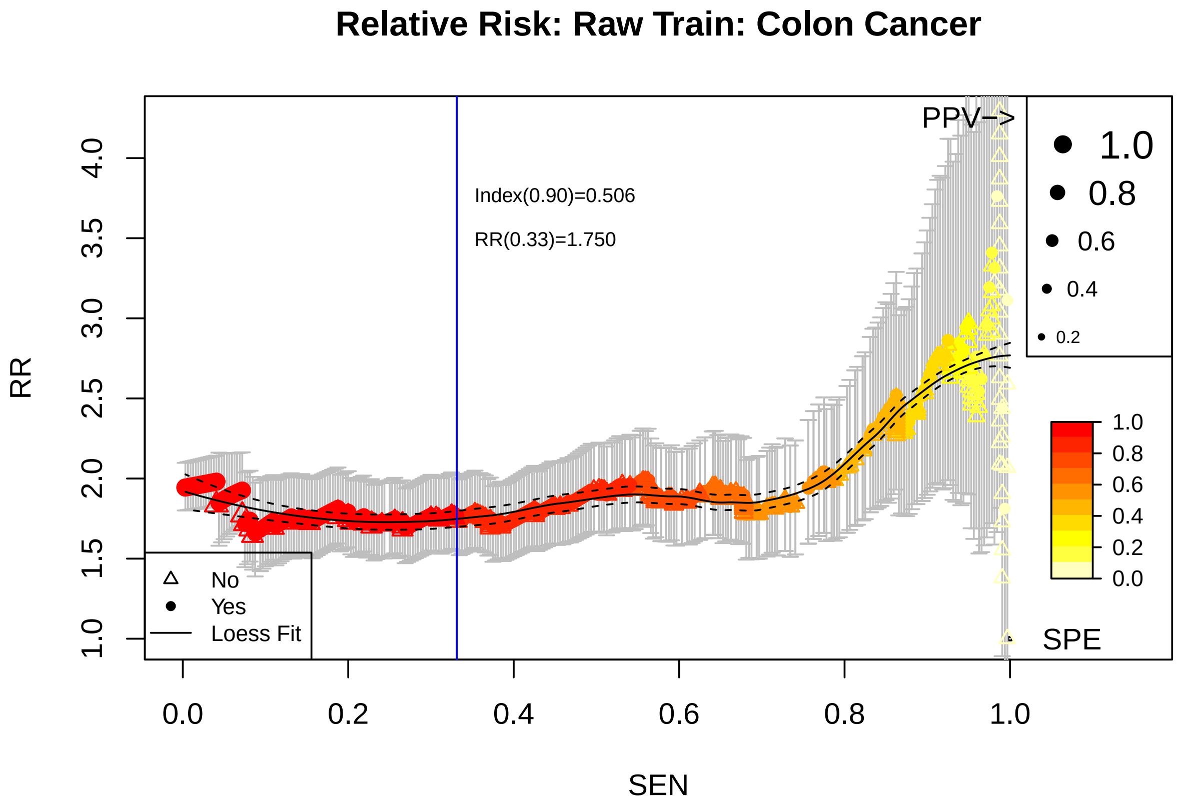
### 1.3.1 The evaluation of the raw Cox model with RRPlot()

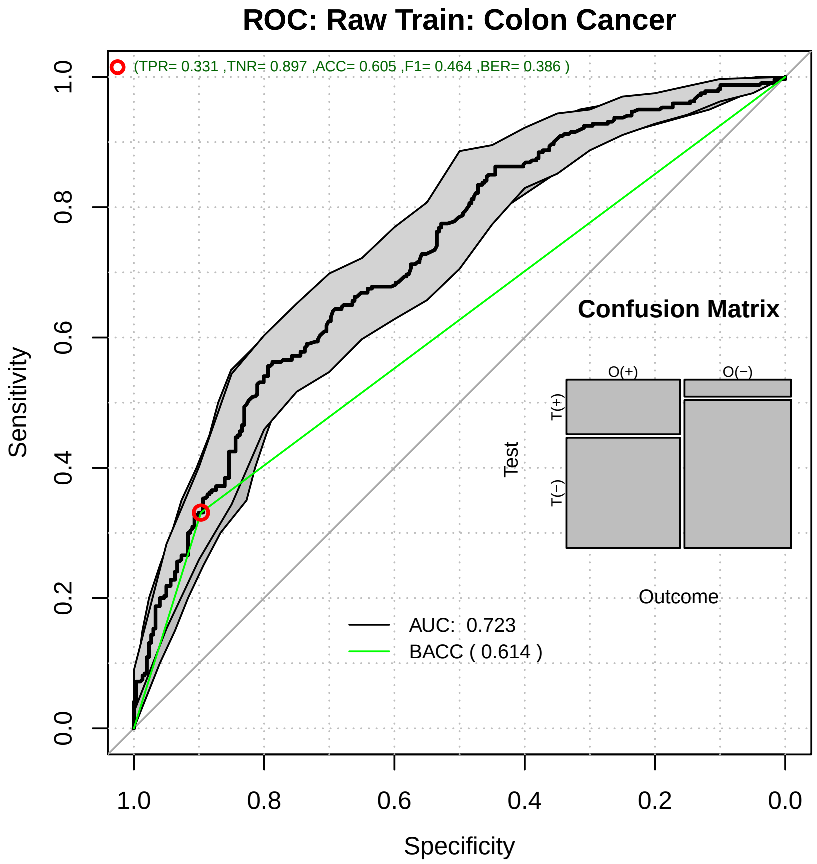
Here we will use the predicted event probability assuming a baseline hazard for events withing 5 years

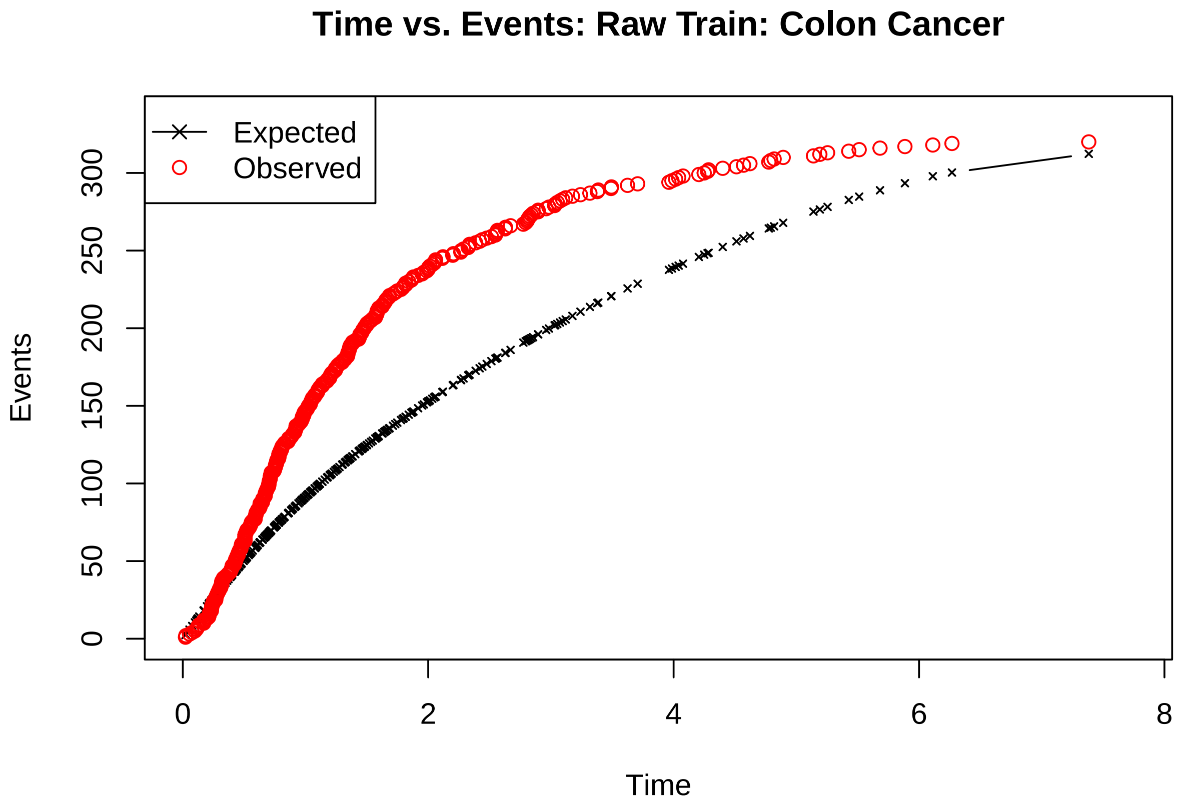
```
index <- predict(ml,dataColonTrain)
timeinterval <- 2*mean(subset(dataColonTrain,status==1)$time)

h0 <- sum(dataColonTrain$status & dataColonTrain$time <= timeinterval)
h0 <- h0/sum((dataColonTrain$time > timeinterval) | (dataColonTrain$status==1))

rdata <- cbind(dataColonTrain$status,ppoisGzero(index,h0))

rrAnalysisTrain <- RRPlot(rdata,atProb=c(0.90),
                     timetoEvent=dataColonTrain$time,
                     title="Raw Train: Colon Cancer",
                     ysurvlim=c(0.00,1.0),
                     riskTimeInterval=timeinterval)
```

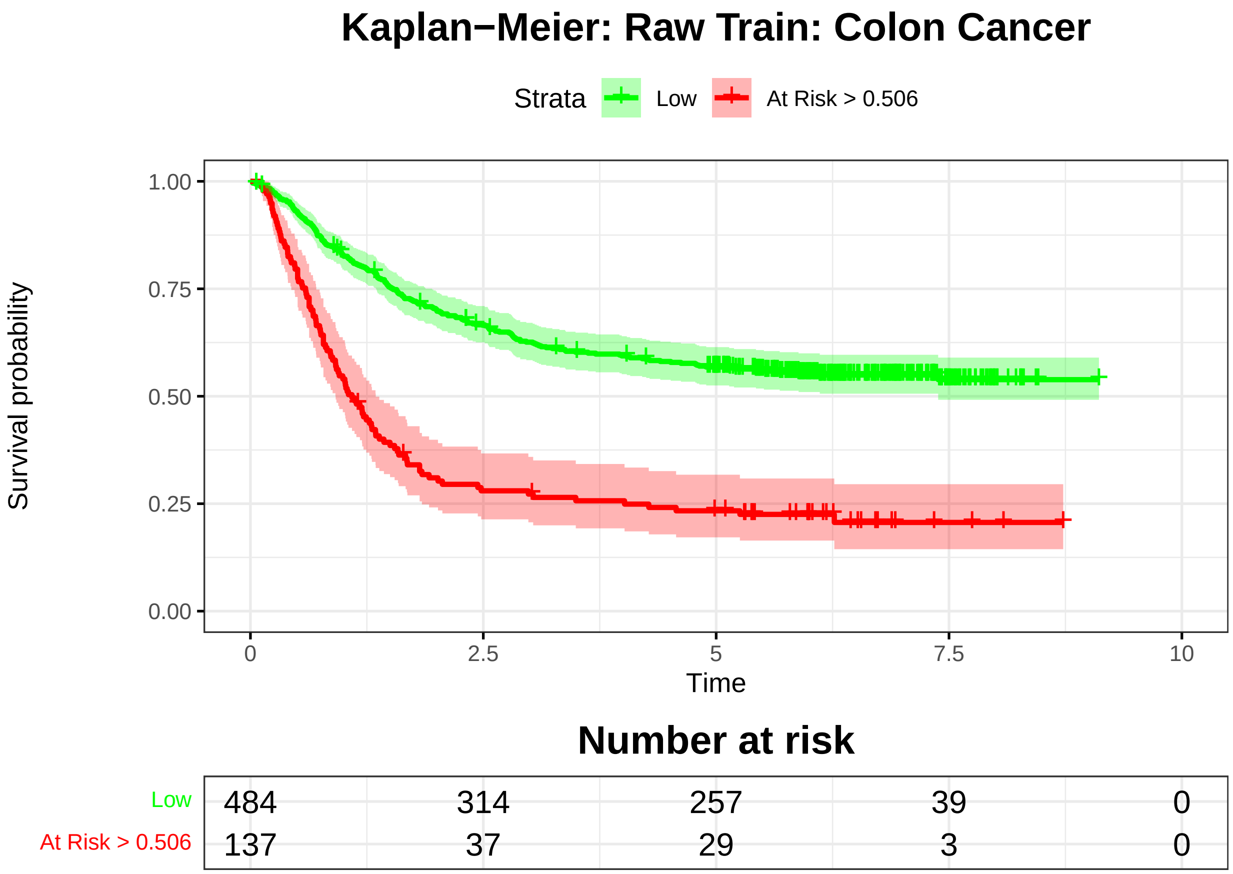



Decision Curve Analysis: Raw Train: Colon Cancer
Net Benefit
Threshold
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
No Event
Event
loess fit
SEN
1.0
0.8
0.6
0.4
0.2
0.0
Treat All
Treat None


Relative Risk: Raw Train: Colon Cancer
Index(0.90)=0.506
RR(0.33)=1.750
PPV->
1.0
0.8
0.6
0.4
0.2
SPE
1.0
0.8
0.6
0.4
0.2
0.0
No
Yes
Loess Fit
RR
1.0
1.5
2.0
2.5
3.0
3.5
4.0
0.0
0.2
0.4
0.6
0.8
1.0
SEN


ROC: Raw Train: Colon Cancer
(TPR= 0.331 ,TNR= 0.897 ,ACC= 0.605 ,F1= 0.464 ,BER= 0.386 )
Sensitivity
0.0
0.2
0.4
0.6
0.8
1.0
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
AUC: 0.723
BACC ( 0.614 )
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome


Time vs. Events: Raw Train: Colon Cancer
Expected
Observed
Events
0
50
100
150
200
250
300
Time
0
2
4
6
8



### 1.3.2 Uncalibrated Performance Report

```
pander::pander(t(rrAnalysisTrain$keyPoints),caption="Threshold values")
```

Table 6: Threshold values

| | @:0.9 | @MAX_BACC | @MAX_RR | @SPE100 | p(0.5) |
|---|---|---|---|---|---|
| **Thr** | 0.506 | 0.380 | 0.217 | 0.108 | 0.501 |
| **RR** | 1.750 | 1.990 | 3.410 | 1.000 | 1.750 |
| **SEN** | 0.331 | 0.556 | 0.978 | 1.000 | 0.338 |
| **SPE** | 0.897 | 0.794 | 0.123 | 0.000 | 0.894 |
| **BACC** | 0.614 | 0.675 | 0.551 | 0.500 | 0.616 |

```
pander::pander(t(rrAnalysisTrain$OERatio$estimate),caption="O/E Ratio")
```

Table 7: O/E Ratio

| O/E | Low | Upper | p.value |
|---|---|---|---|
| 1.02 | 0.915 | 1.14 | 0.651 |

```
pander::pander(t(rrAnalysisTrain$OE95ci),caption="O/E Mean")
```

Table 8: O/E Mean

| mean | 50% | 2.5% | 97.5% |
|---|---|---|---|
| 1.45 | 1.44 | 1.42 | 1.47 |

```
pander::pander(t(rrAnalysisTrain$OAcum95ci),caption="O/Acum Mean")
```

Table 9: O/Acum Mean

| mean | 50% | 2.5% | 97.5% |
|---|---|---|---|
| 1.32 | 1.32 | 1.32 | 1.33 |

```
pander::pander(rrAnalysisTrain$c.index$cstatCI,caption="C. Index")
```

| mean.C Index | median | lower | upper |
|---|---|---|---|
| 0.677 | 0.677 | 0.647 | 0.704 |

```
pander::pander(t(rrAnalysisTrain$ROCAnalysis$aucs),caption="ROC AUC")
```

Table 11: ROC AUC

| est | lower | upper |
|---|---|---|
| 0.723 | 0.684 | 0.763 |

```
pander::pander((rrAnalysisTrain$ROCAnalysis$sensitivity),caption="Sensitivity")
```

Table 12: Sensitivity

| est | lower | upper |
|---|---|---|
| 0.331 | 0.28 | 0.386 |

```
pander::pander((rrAnalysisTrain$ROCAnalysis$specificity),caption="Specificity")
```

Table 13: Specificity

| est | lower | upper |
|---|---|---|
| 0.897 | 0.857 | 0.929 |

```
pander::pander(t(rrAnalysisTrain$thr_atP),caption="Probability Thresholds")
```

Table 14: Probability Thresholds

| 90% |
|---|
| 0.506 |

```
pander::pander(t(rrAnalysisTrain$RR_atP),caption="Risk Ratio")
```

Table 15: Risk Ratio

| est | lower | upper |
|---|---|---|
| 1.75 | 1.53 | 2 |

```
pander::pander(rrAnalysisTrain$surdif,caption="Logrank test")
```

Table 16: Logrank test Chisq = 81.803097 on 1 degrees of freedom, p = 0.000000

|  | N | Observed | Expected | (O-E)^2/E | (O-E)^2/V |
|---|---|---|---|---|---|
| **class=0** | 484 | 214 | 271.6 | 12.2 | 81.8 |
| **class=1** | 137 | 106 | 48.4 | 68.5 | 81.8 |

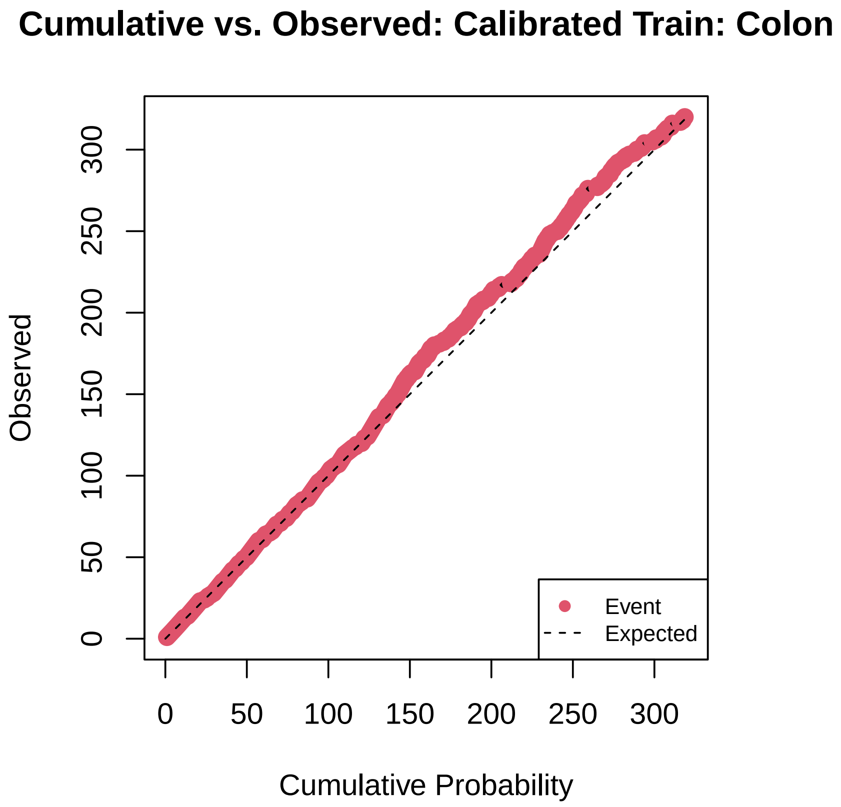
### 1.3.3 Cox Calibration

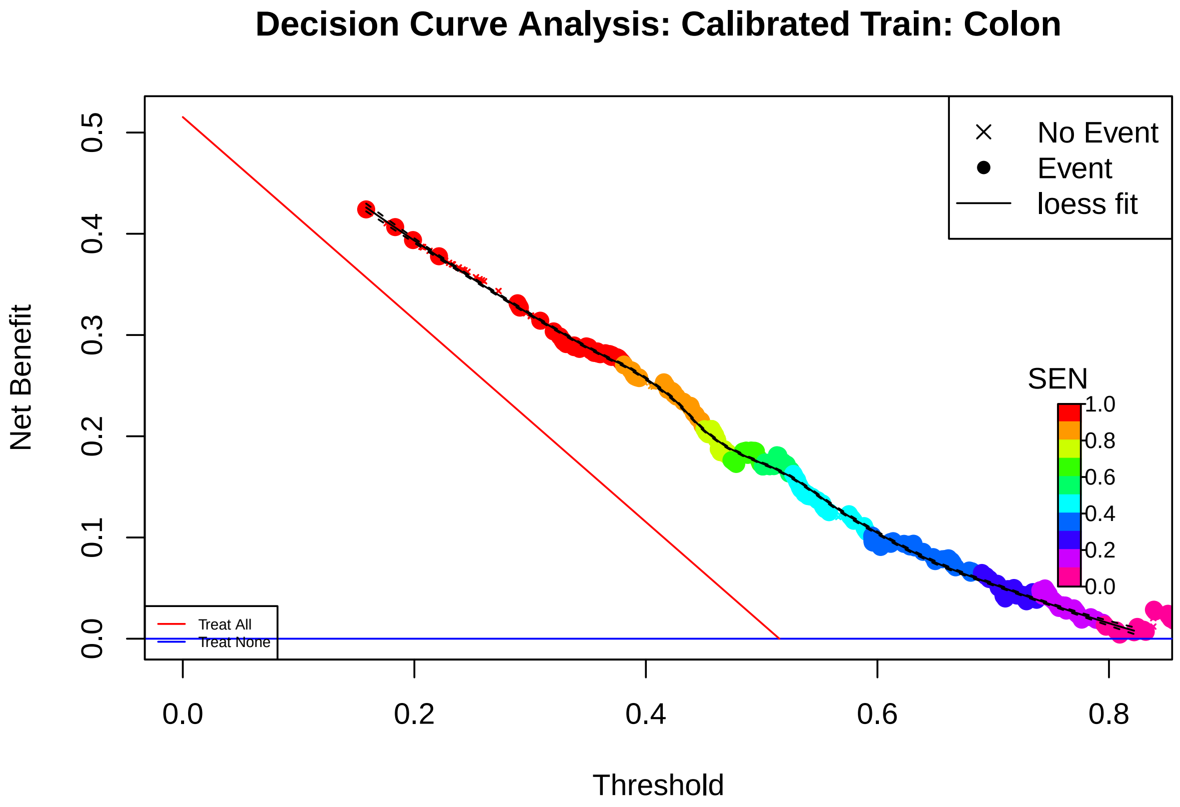
```
op <- par(no.readonly = TRUE)


calprob <- CoxRiskCalibration(ml,dataColonTrain,"status","time")

pander::pander(c(h0=calprob$h0,
                 Gain=calprob$hazardGain,
                 DeltaTime=calprob$timeInterval),
               caption="Cox Calibration Parameters")
```

| h0 | Gain | DeltaTime |
|---|---|---|
| 0.702 | 1.51 | 3.15 |

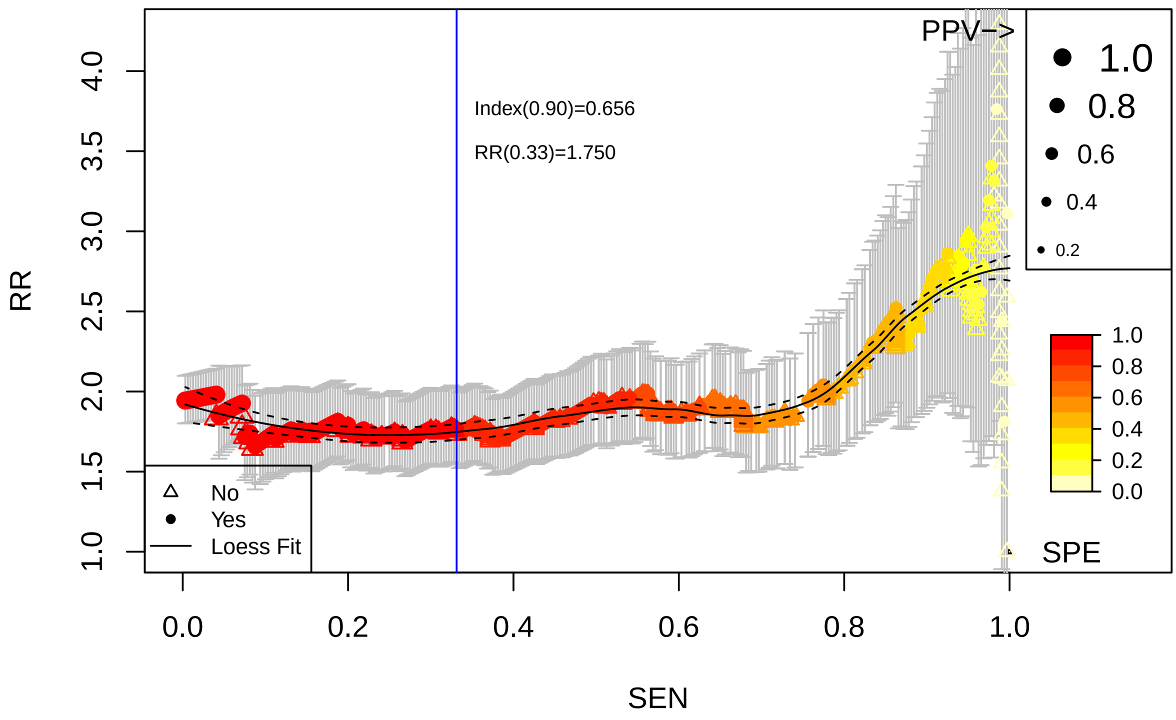
### 1.3.4 The RRplot() of the calibrated model

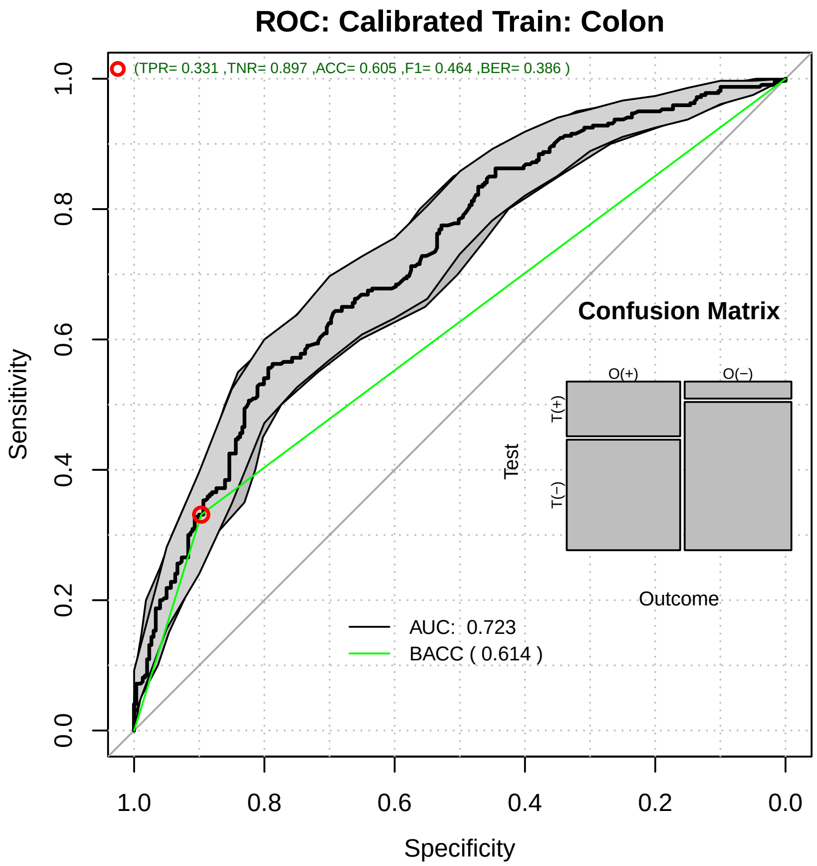
```
h0 <- calprob$h0
timeinterval <- calprob$timeInterval;

rdata <- cbind(dataColonTrain$status,calprob$prob)


rrAnalysisTrain <- RRPlot(rdata,atProb=c(0.90),
                     timetoEvent=dataColonTrain$time,
                     title="Calibrated Train: Colon",
                     ysurvlim=c(0.00,1.0),
                     riskTimeInterval=timeinterval)
```

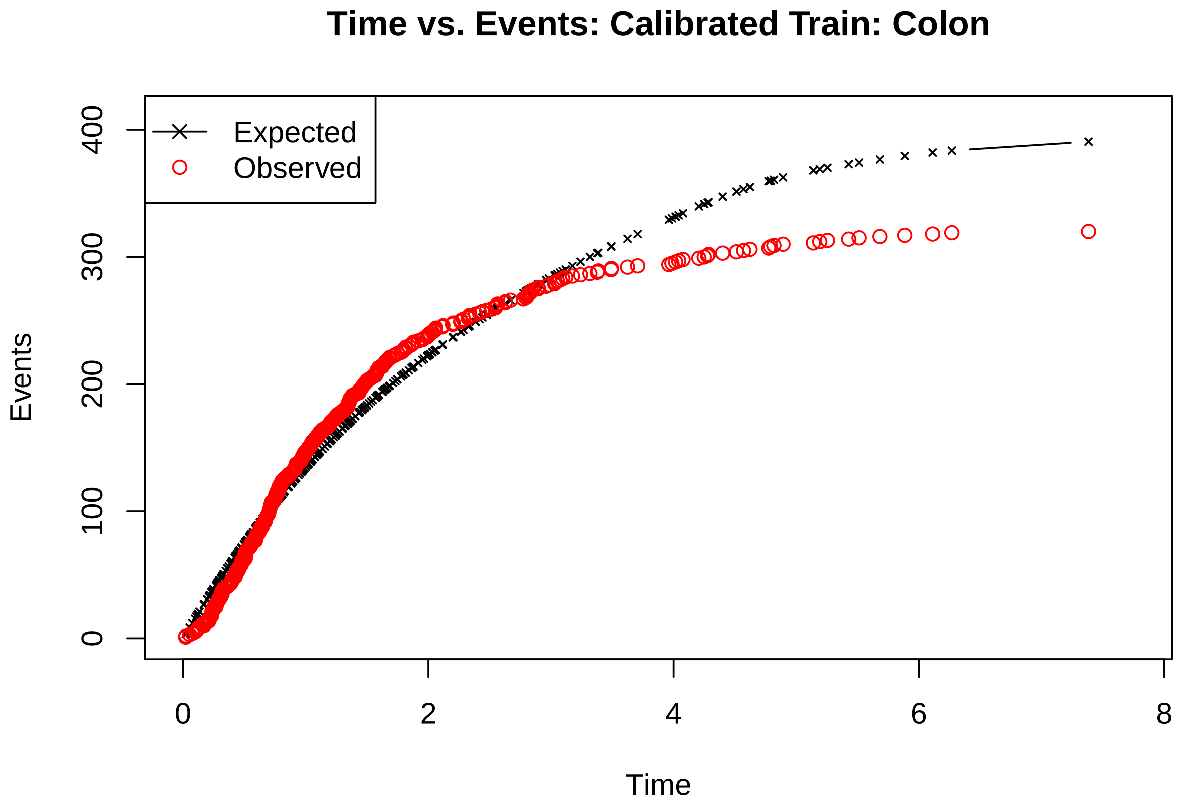

Cumulative vs. Observed: Calibrated Train: Colon
Observed
0
50
100
150
200
250
300
Cumulative Probability
0
50
100
150
200
250
300
● Event
- - - Expected

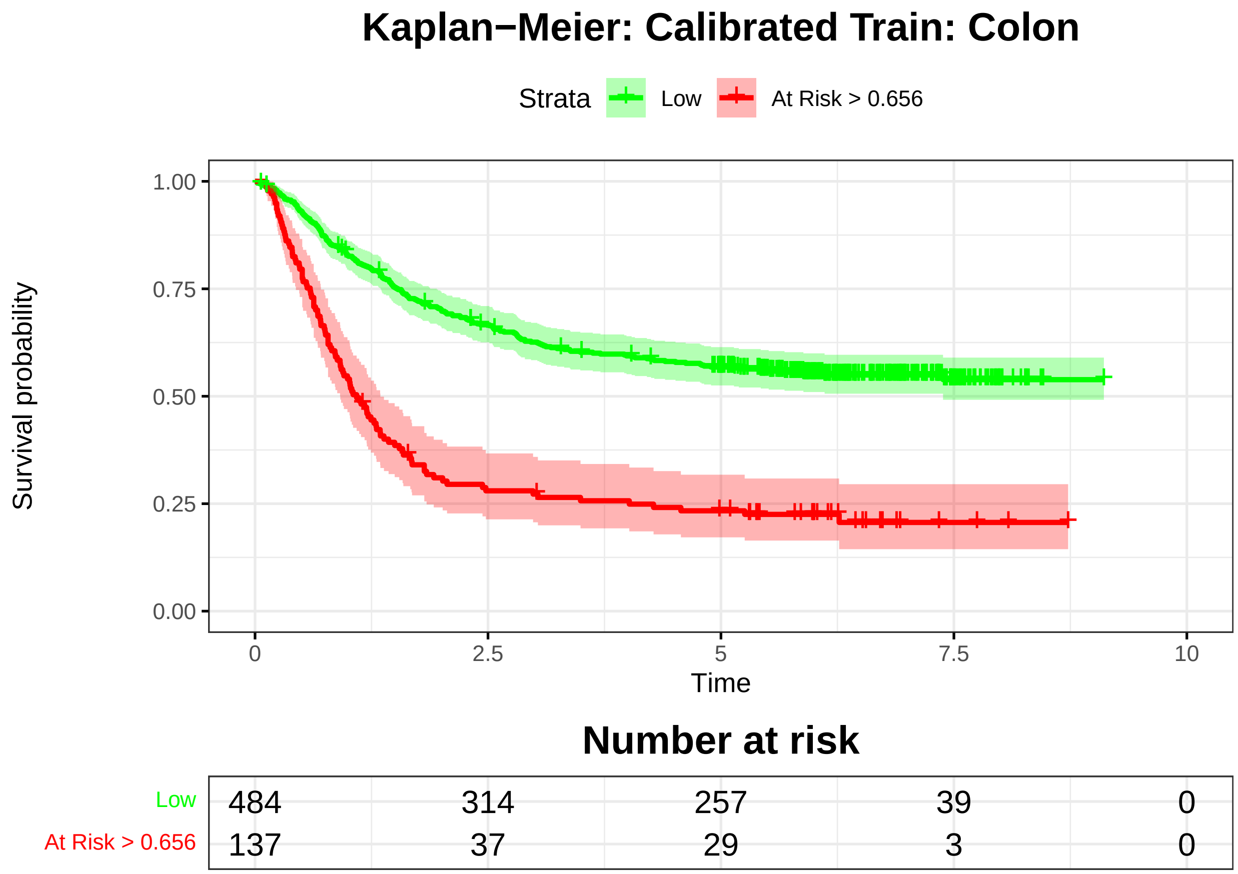

Decision Curve Analysis: Calibrated Train: Colon
Net Benefit
Threshold
0.0
0.1
0.2
0.3
0.4
0.5
0.0
0.2
0.4
0.6
0.8
× No Event
● Event
loess fit
SEN
1.0
0.8
0.6
0.4
0.2
0.0
Treat All
Treat None

## Relative Risk: Calibrated Train: Colon




ROC: Calibrated Train: Colon
(TPR= 0.331 ,TNR= 0.897 ,ACC= 0.605 ,F1= 0.464 ,BER= 0.386 )
Sensitivity
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome
AUC: 0.723
BACC ( 0.614 )


Time vs. Events: Calibrated Train: Colon
Expected
Observed
Events
0
100
200
300
400
0
2
4
6
8
Time



### 1.3.5 Calibrated Train Performance

```
pander::pander(t(rrAnalysisTrain$keyPoints),caption="Threshold values")
```

Table 18: Threshold values

| | @:0.9 | @MAX_BACC | @MAX_RR | @SPE100 | p(0.5) |
|---|---|---|---|---|---|
| **Thr** | 0.656 | 0.514 | 0.309 | 0.158 | 0.500 |
| **RR** | 1.750 | 1.990 | 3.410 | 1.000 | 1.863 |
| **SEN** | 0.331 | 0.556 | 0.978 | 1.000 | 0.603 |
| **SPE** | 0.897 | 0.794 | 0.123 | 0.000 | 0.714 |
| **BACC** | 0.614 | 0.675 | 0.551 | 0.500 | 0.659 |

```
pander::pander(t(rrAnalysisTrain$OERatio$estimate),caption="O/E Ratio")
```

Table 19: O/E Ratio

| O/E | Low | Upper | p.value |
|---|---|---|---|
| 0.819 | 0.732 | 0.914 | 0.000267 |

```
pander::pander(t(rrAnalysisTrain$OE95ci),caption="O/E Mean")
```

Table 20: O/E Mean

| mean | 50% | 2.5% | 97.5% |
|---|---|---|---|
| 0.994 | 0.994 | 0.981 | 1.01 |

```
pander::pander(t(rrAnalysisTrain$OAcum95ci),caption="O/Acum Mean")
```

Table 21: O/Acum Mean

| mean | 50% | 2.5% | 97.5% |
|---|---|---|---|
| 1.04 | 1.04 | 1.03 | 1.04 |

```
pander::pander(rrAnalysisTrain$c.index$cstatCI,caption="C. Index")
```

| mean.C Index | median | lower | upper |
|---|---|---|---|
| 0.677 | 0.677 | 0.649 | 0.705 |

```
pander::pander(t(rrAnalysisTrain$ROCAnalysis$aucs),caption="ROC AUC")
```

Table 23: ROC AUC

| est | lower | upper |
|---|---|---|
| 0.723 | 0.684 | 0.763 |

```
pander::pander((rrAnalysisTrain$ROCAnalysis$sensitivity),caption="Sensitivity")
```

Table 24: Sensitivity

| est | lower | upper |
|---|---|---|
| 0.331 | 0.28 | 0.386 |

```
pander::pander((rrAnalysisTrain$ROCAnalysis$specificity),caption="Specificity")
```

Table 25: Specificity

| est | lower | upper |
|---|---|---|
| 0.897 | 0.857 | 0.929 |

```
pander::pander(t(rrAnalysisTrain$thr_atP),caption="Probability Thresholds")
```

Table 26: Probability Thresholds

| 90% |
|---|
| 0.656 |

```
pander::pander(t(rrAnalysisTrain$RR_atP),caption="Risk Ratio")
```

Table 27: Risk Ratio

| est | lower | upper |
|---|---|---|
| 1.75 | 1.53 | 2 |

```
pander::pander(rrAnalysisTrain$surdif,caption="Logrank test")
```

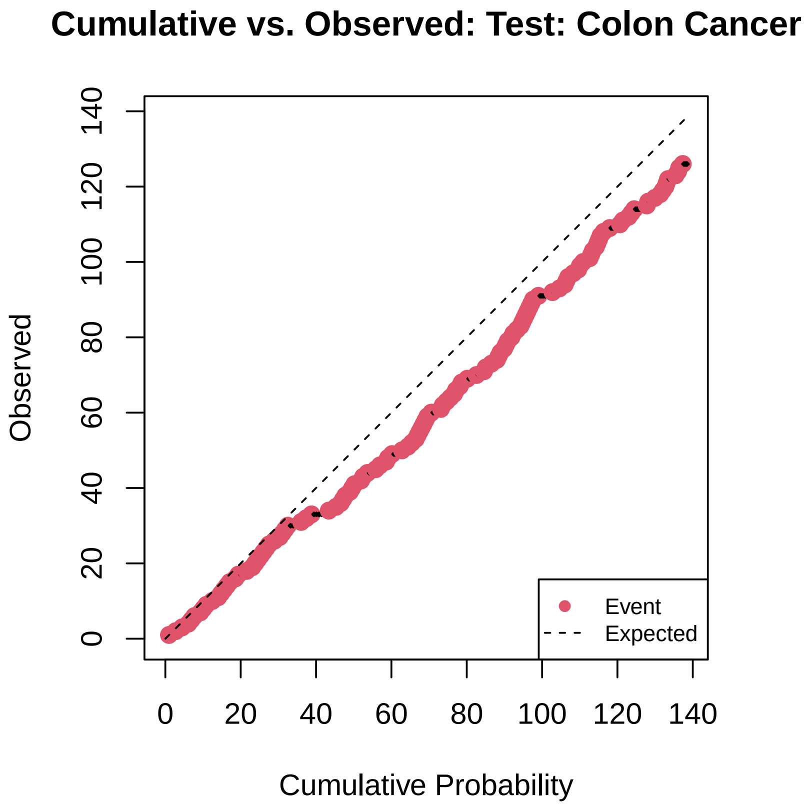
Table 28: Logrank test Chisq = 81.803097 on 1 degrees of freedom, p = 0.000000

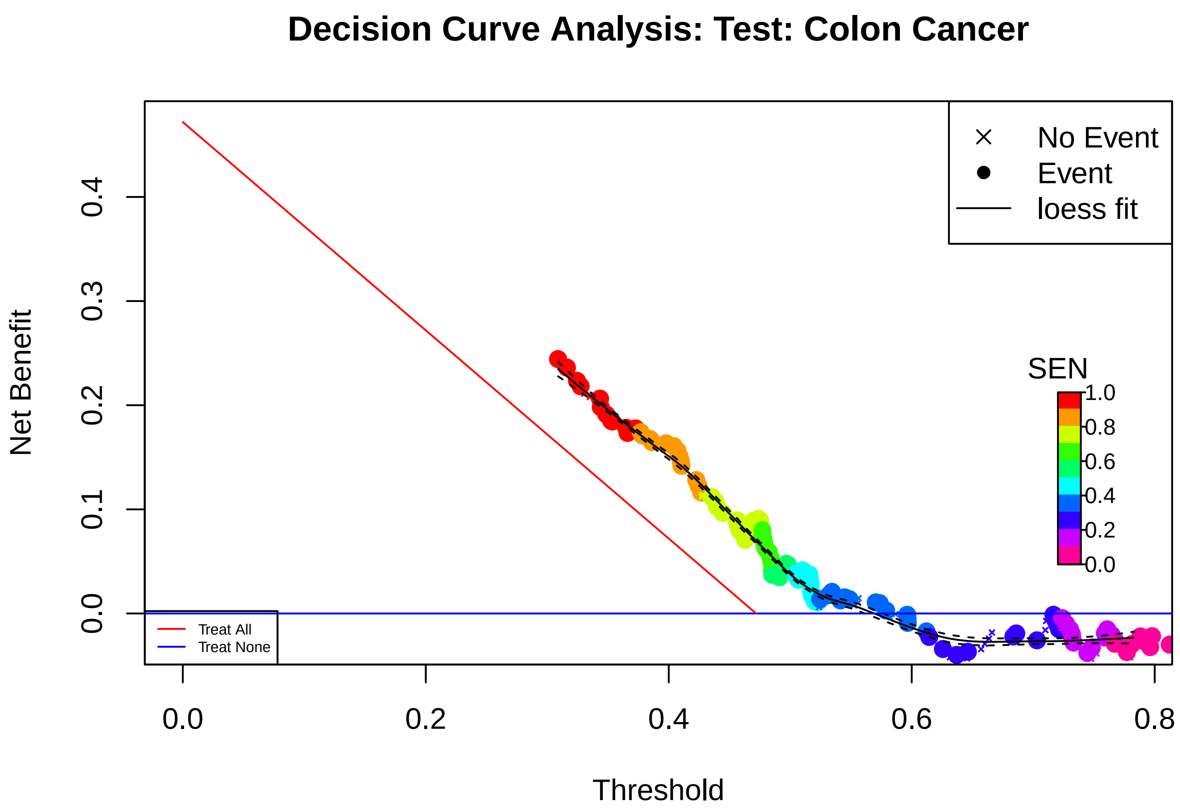
|  | N | Observed | Expected | (O-E)^2/E | (O-E)^2/V |
|---|---|---|---|---|---|
| **class=0** | 484 | 214 | 271.6 | 12.2 | 81.8 |
| **class=1** | 137 | 106 | 48.4 | 68.5 | 81.8 |

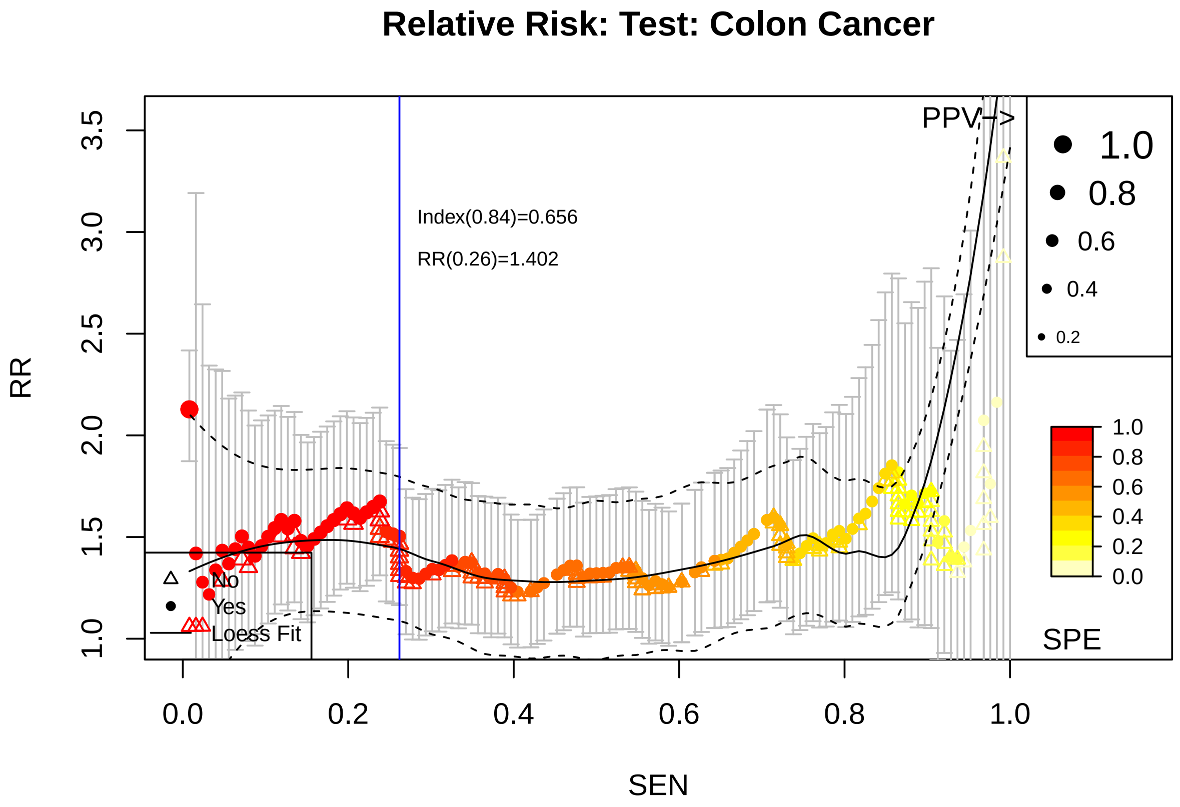
### 1.3.6 Evaluating on the test set

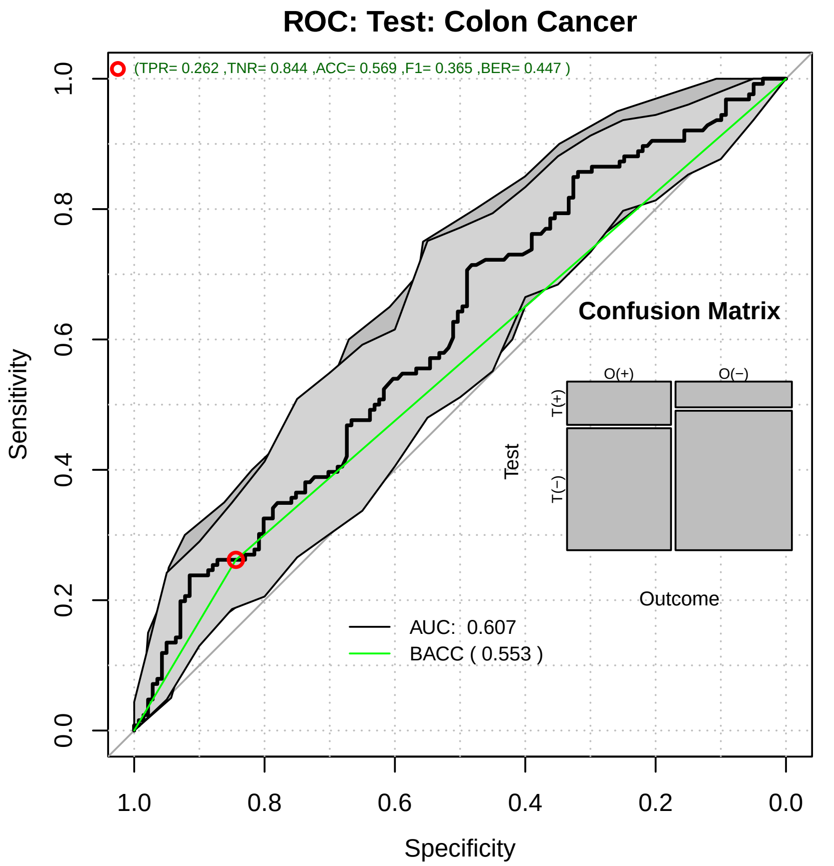
The calibrated h0 and timeinterval were estimated on the training set

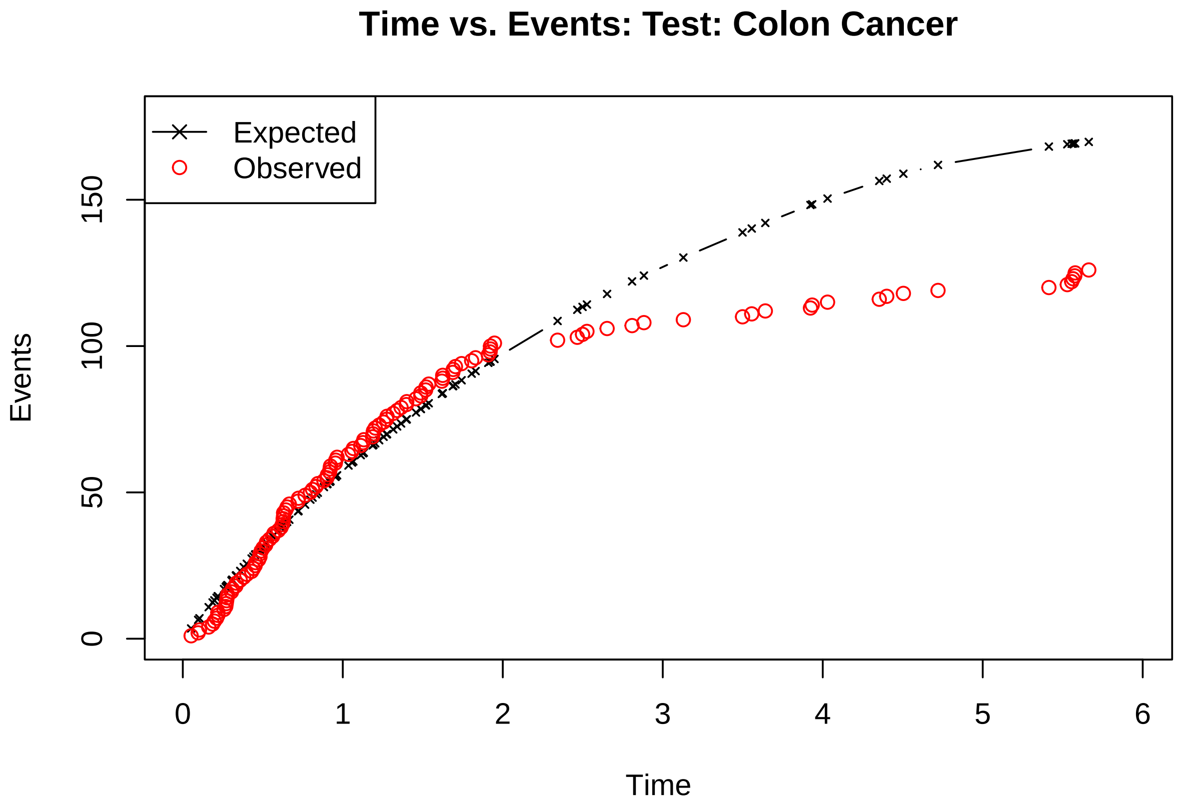
```
index <- predict(ml,dataColonTest)
rdata <- cbind(dataColonTest$status,ppoisGzero(index,h0))

rrAnalysisTest <- RRPlot(rdata,atThr = rrAnalysisTrain$thr_atP,
                     timetoEvent=dataColonTest$time,
                     title="Test: Colon Cancer",
                     ysurvlim=c(0.00,1.0),
                     riskTimeInterval=timeinterval)
```


Cumulative vs. Observed: Test: Colon Cancer
Observed
0
20
40
60
80
100
120
140
Cumulative Probability
0
20
40
60
80
100
120
140
● Event
- - - Expected

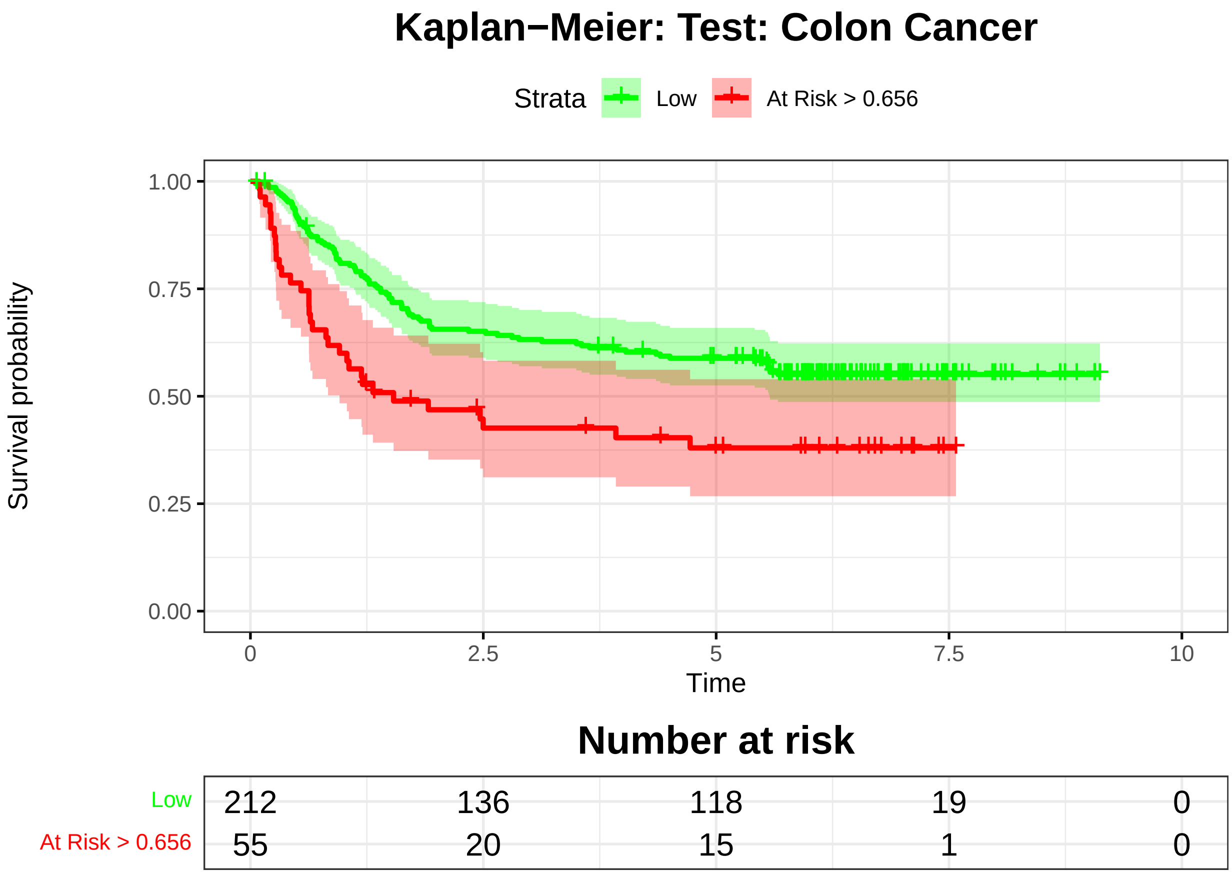

Decision Curve Analysis: Test: Colon Cancer
Net Benefit
Threshold
0.0
0.1
0.2
0.3
0.4
0.0
0.2
0.4
0.6
0.8
× No Event
● Event
loess fit
SEN
1.0
0.8
0.6
0.4
0.2
0.0
Treat All
Treat None


Relative Risk: Test: Colon Cancer
RR
SEN
1.0
1.5
2.0
2.5
3.0
3.5
0.0
0.2
0.4
0.6
0.8
1.0
Index(0.84)=0.656
RR(0.26)=1.402
PPV-->
1.0
0.8
0.6
0.4
0.2
SPE
1.0
0.8
0.6
0.4
0.2
0.0
△ No
● Yes
Loess Fit


ROC: Test: Colon Cancer
(TPR= 0.262 ,TNR= 0.844 ,ACC= 0.569 ,F1= 0.365 ,BER= 0.447 )
Sensitivity
0.0
0.2
0.4
0.6
0.8
1.0
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
AUC: 0.607
BACC ( 0.553 )
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome



Time vs. Events: Test: Colon Cancer
Expected
Observed
Events
0
50
100
150
Time
0
1
2
3
4
5
6



| | | | | | |
|---|---|---|---|---|---|
| Low | 212 | 136 | 118 | 19 | 0 |
| At Risk > 0.656 | 55 | 20 | 15 | 1 | 0 |

### 1.3.7 Test Performance

```
pander::pander(t(rrAnalysisTest$keyPoints),caption="Threshold values")
```

Table 29: Threshold values

| | @:0.66 | @MAX_BACC | @MAX_RR | @SPE100 | p(0.5) |
|---|---|---|---|---|---|
| **Thr** | 0.657 | 0.474 | 0.404 | 0.3089 | 0.500 |
| **RR** | 1.368 | 1.595 | 1.853 | 24.0458 | 1.325 |
| **SEN** | 0.262 | 0.714 | 0.857 | 1.0000 | 0.516 |
| **SPE** | 0.844 | 0.482 | 0.319 | 0.0355 | 0.617 |
| **BACC** | 0.553 | 0.598 | 0.588 | 0.5177 | 0.566 |

```
pander::pander(t(rrAnalysisTest$OERatio$estimate),caption="O/E Ratio")
```

Table 30: O/E Ratio

| O/E | Low | Upper | p.value |
|---|---|---|---|
| 0.742 | 0.618 | 0.884 | 0.000544 |

```
pander::pander(t(rrAnalysisTest$OE95ci),caption="O/E Mean")
```

Table 31: O/E Mean

| mean | 50% | 2.5% | 97.5% |
|---|---|---|---|
| 0.971 | 0.97 | 0.946 | 0.993 |

```
pander::pander(t(rrAnalysisTest$OAcum95ci),caption="O/Acum Mean")
```

Table 32: O/Acum Mean

| mean | 50% | 2.5% | 97.5% |
|---|---|---|---|
| 0.866 | 0.866 | 0.861 | 0.872 |

```
pander::pander(rrAnalysisTest$c.index$cstatCI,caption="C. Index")
```

| mean.C Index | median | lower | upper |
|---|---|---|---|
| 0.607 | 0.606 | 0.551 | 0.655 |

```
pander::pander(t(rrAnalysisTest$ROCAnalysis$aucs),caption="ROC AUC")
```

Table 34: ROC AUC

| est | lower | upper |
|---|---|---|
| 0.607 | 0.54 | 0.675 |

```
pander::pander((rrAnalysisTest$ROCAnalysis$sensitivity),caption="Sensitivity")
```

Table 35: Sensitivity

| est | lower | upper |
|---|---|---|
| 0.262 | 0.188 | 0.348 |

```
pander::pander((rrAnalysisTest$ROCAnalysis$specificity),caption="Specificity")
```

Table 36: Specificity

| est | lower | upper |
|---|---|---|
| 0.844 | 0.773 | 0.9 |

```
pander::pander(t(rrAnalysisTest$thr_atP),caption="Probability Thresholds")
```

Table 37: Probability Thresholds

| 90% |
|---|
| 0.656 |

```
pander::pander(t(rrAnalysisTest$RR_atP),caption="Risk Ratio")
```

Table 38: Risk Ratio

| est | lower | upper |
|---|---|---|
| 1.4 | 1.08 | 1.82 |

```
pander::pander(rrAnalysisTest$surdif,caption="Logrank test")
```

Table 39: Logrank test Chisq = 10.116219 on 1 degrees of freedom, p = 0.001470

| | N | Observed | Expected | (O-E)^2/E | (O-E)^2/V |
|---|---|---|---|---|---|
| **class=0** | 212 | 93 | 106 | 1.60 | 10.1 |
| **class=1** | 55 | 33 | 20 | 8.47 | 10.1 |

## 1.4 Cross-Validation

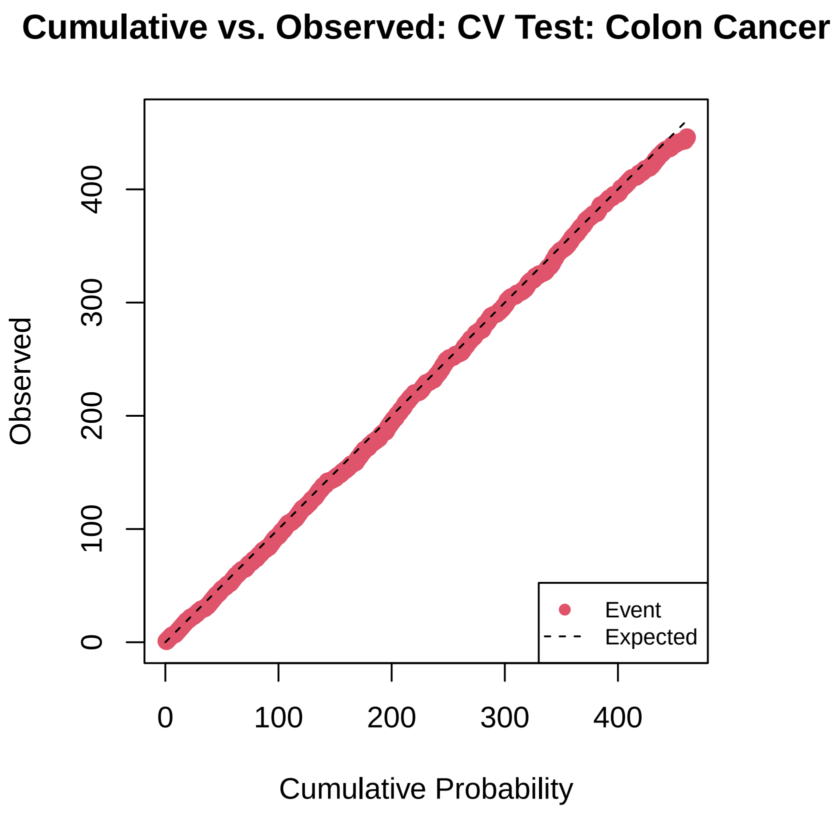
Here we will cross validate the training set and evaluate also on the testing set. The h0 and the timeinterval are the ones estimated on the calibration process

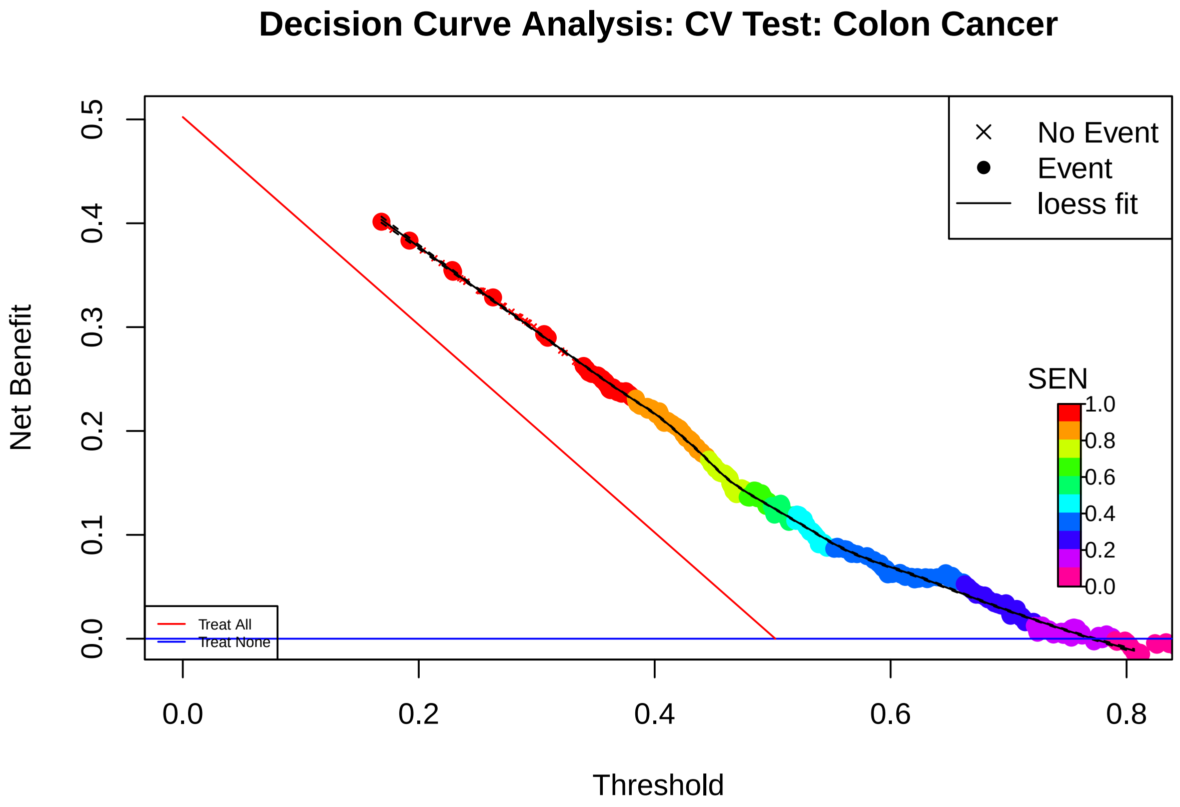
```
rcv <- randomCV(theData=dataColonTrain,
                theOutcome = Surv(time,status)~1,
                fittingFunction=BSWiMS.model,
                trainFraction = 0.75,
                repetitions=50,
                classSamplingType = "Pro",
                testingSet=dataColonTest
         )
```

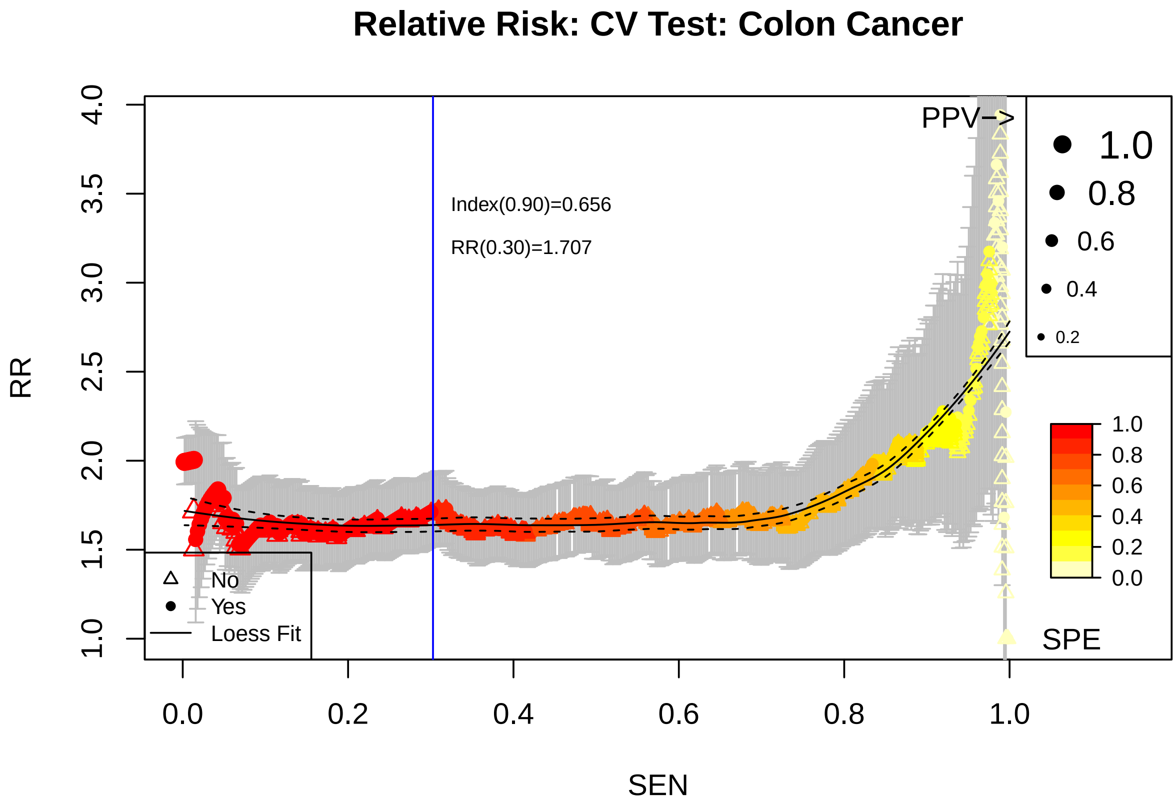
.[+++].[++++-].[+++-].[+++].[++].[++++-].[++++-].[++++].[+++-].[++++-]10 Tested: 854 Avg. Selected: 9.5 Min Tests: 1 Max Tests: 10 Mean Tests: 4.953162 . MAD: 0.4641621 .[+++].[++].[++++-].[++++].[++].[+++].[+++-].[++++-].[++++-].[+++-]20 Tested: 885 Avg. Selected: 9.2 Min Tests: 1 Max Tests: 20 Mean Tests: 9.559322 . MAD: 0.4660532 .[++–].[+++-].[++-].[+++-].[+++-].[+++-].[++++-].[+++].[++++].[++++]30 Tested: 888 Avg. Selected: 9.066667 Min Tests: 1 Max Tests: 30 Mean Tests: 14.29054 . MAD: 0.4659471 .[+++-].[+++].[+++-].[+++].[+++].[++++-].[+++-].[++–].[+++-].[+++]40 Tested: 888 Avg. Selected: 9.075 Min Tests: 3 Max Tests: 40 Mean Tests: 19.05405 . MAD: 0.4660608 .[++-].[++++-].[+++-].[++-].[+++].[++++-].[+++].[+++-].[+++-].[++–]50 Tested: 888 Avg. Selected: 8.94 Min Tests: 5 Max Tests: 50 Mean Tests: 23.81757 . MAD: 0.4661358

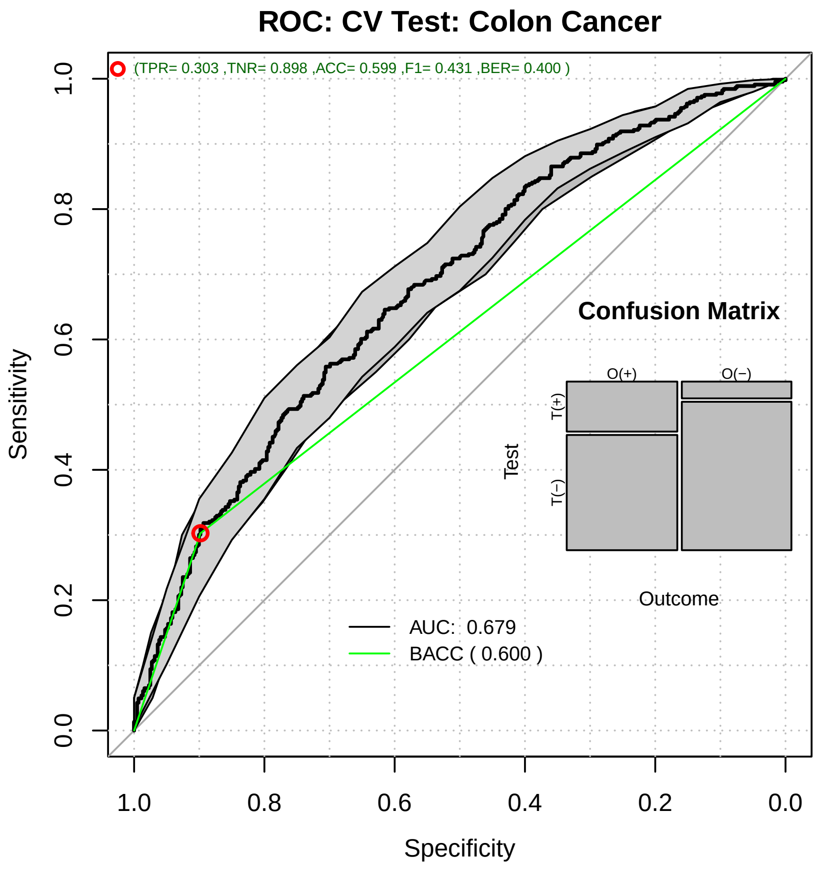
```
stp <- rcv$survTestPredictions
stp <- stp[!is.na(stp[,4]),]

bbx <- boxplot(unlist(stp[,1])~rownames(stp),plot=FALSE)
times <- bbx$stats[3,]
status <- boxplot(unlist(stp[,2])~rownames(stp),plot=FALSE)$stats[3,]
```

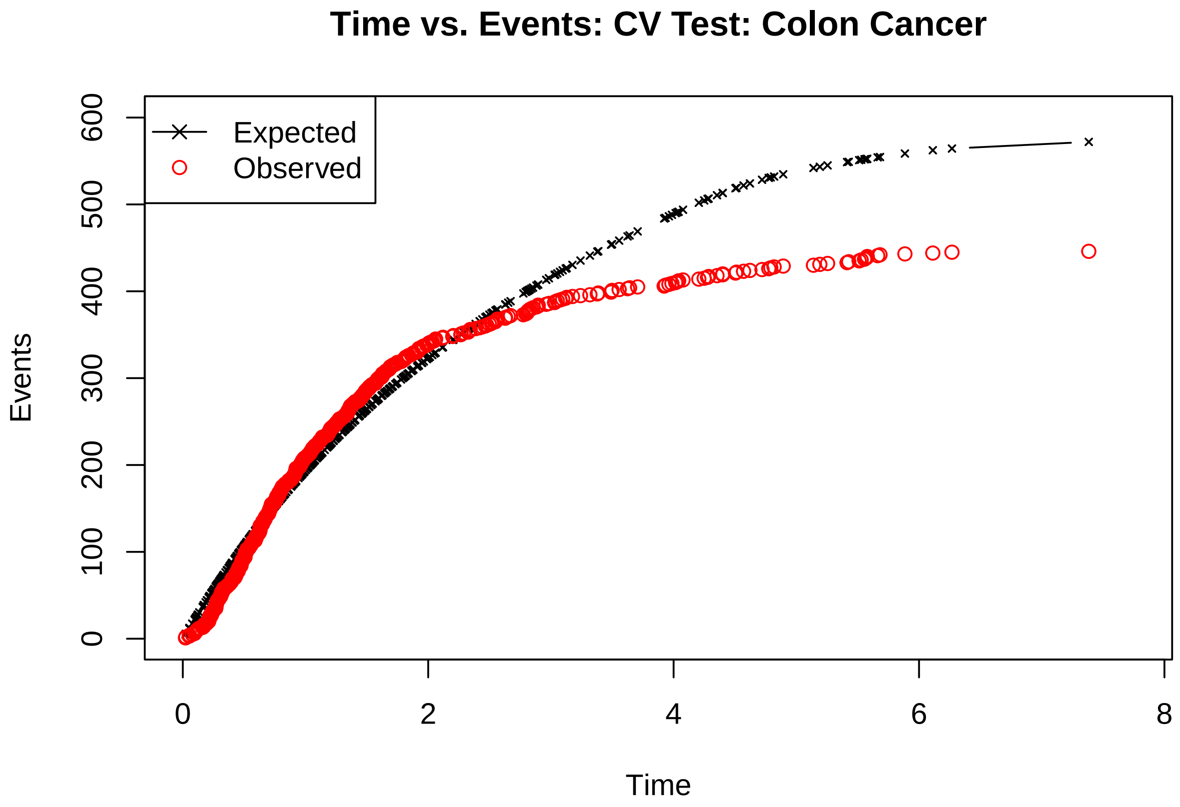
```r
prob <- ppoisGzero(boxplot(unlist(stp[,4])~rownames(stp),plot=FALSE)$stats[3,],h0)

rdatacv <- cbind(status,prob)
rownames(rdatacv) <- bbx$names
names(times) <- bbx$names

rrAnalysisCVTest <- RRPlot(rdatacv,atThr = rrAnalysisTrain$thr_atP,
                     timetoEvent=times,
                     title="CV Test: Colon Cancer",
                     ysurvlim=c(0.00,1.0),
                     riskTimeInterval=timeinterval)
```

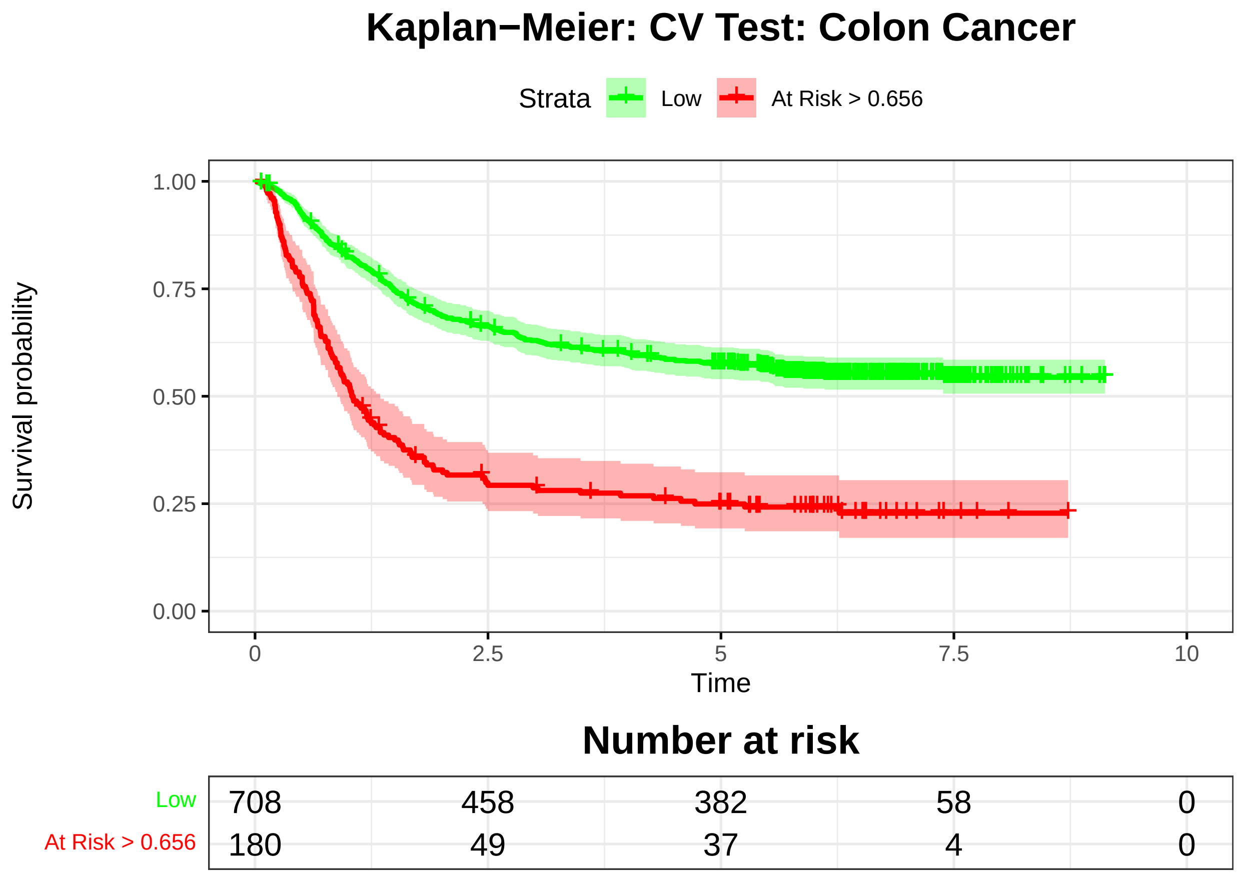



Decision Curve Analysis: CV Test: Colon Cancer
Net Benefit
Threshold
0.0
0.1
0.2
0.3
0.4
0.5
0.0
0.2
0.4
0.6
0.8
× No Event
● Event
loess fit
SEN
1.0
0.8
0.6
0.4
0.2
0.0
Treat All
Treat None


Relative Risk: CV Test: Colon Cancer
RR
4.0
3.5
3.0
2.5
2.0
1.5
1.0
SEN
0.0
0.2
0.4
0.6
0.8
1.0
Index(0.90)=0.656
RR(0.30)=1.707
PPV–>
SPE
● 1.0
● 0.8
● 0.6
● 0.4
● 0.2
1.0
0.8
0.6
0.4
0.2
0.0
△ No
● Yes
Loess Fit


ROC: CV Test: Colon Cancer
(TPR= 0.303 ,TNR= 0.898 ,ACC= 0.599 ,F1= 0.431 ,BER= 0.400 )
Sensitivity
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
Confusion Matrix
O(+)
O(−)
T(+)
T(−)
Test
Outcome
AUC: 0.679
BACC ( 0.600 )


Time vs. Events: CV Test: Colon Cancer
Expected
Observed
Events
0
100
200
300
400
500
600
Time
0
2
4
6
8



### 1.4.1 CV Test Performance

```
pander::pander(t(rrAnalysisCVTest$keyPoints),caption="Threshold values")
```

Table 40: Threshold values

| | @:0.66 | @MAX_BACC | @MAX_RR | @SPE100 | p(0.5) |
|---|---|---|---|---|---|
| **Thr** | 0.655 | 0.507 | 0.352 | 0.168 | 0.500 |
| **RR** | 1.714 | 1.698 | 3.175 | 1.000 | 1.639 |
| **SEN** | 0.305 | 0.558 | 0.975 | 1.000 | 0.594 |
| **SPE** | 0.898 | 0.706 | 0.124 | 0.000 | 0.652 |
| **BACC** | 0.602 | 0.632 | 0.550 | 0.500 | 0.623 |

```
pander::pander(t(rrAnalysisCVTest$OERatio$estimate),caption="O/E Ratio")
```

Table 41: O/E Ratio

| O/E | Low | Upper | p.value |
|---|---|---|---|
| 0.78 | 0.709 | 0.856 | 5.32e-08 |

```
pander::pander(t(rrAnalysisCVTest$OE95ci),caption="O/E Mean")
```

Table 42: O/E Mean

| mean | 50% | 2.5% | 97.5% |
|---|---|---|---|
| 0.973 | 0.973 | 0.962 | 0.984 |

```
pander::pander(t(rrAnalysisCVTest$OAcum95ci),caption="O/Acum Mean")
```

Table 43: O/Acum Mean

| mean | 50% | 2.5% | 97.5% |
|---|---|---|---|
| 0.977 | 0.977 | 0.976 | 0.979 |

```
pander::pander(rrAnalysisCVTest$c.index$cstatCI,caption="C. Index")
```

| mean.C Index | median | lower | upper |
|---|---|---|---|
| 0.652 | 0.652 | 0.627 | 0.677 |

```
pander::pander(t(rrAnalysisCVTest$ROCAnalysis$aucs),caption="ROC AUC")
```

Table 45: ROC AUC

| est | lower | upper |
|---|---|---|
| 0.679 | 0.645 | 0.714 |

```
pander::pander((rrAnalysisCVTest$ROCAnalysis$sensitivity),caption="Sensitivity")
```

Table 46: Sensitivity

| est | lower | upper |
|---|---|---|
| 0.303 | 0.26 | 0.348 |

```
pander::pander((rrAnalysisCVTest$ROCAnalysis$specificity),caption="Specificity")
```

Table 47: Specificity

| est | lower | upper |
|---|---|---|
| 0.898 | 0.866 | 0.925 |

```
pander::pander(t(rrAnalysisCVTest$thr_atP),caption="Probability Thresholds")
```

Table 48: Probability Thresholds

| 90% |
|---|
| 0.656 |

```
pander::pander(t(rrAnalysisCVTest$RR_atP),caption="Risk Ratio")
```

Table 49: Risk Ratio

| est | lower | upper |
|---|---|---|
| 1.71 | 1.52 | 1.92 |

```
pander::pander(rrAnalysisCVTest$surdif,caption="Logrank test")
```

Table 50: Logrank test Chisq = 102.535013 on 1 degrees of freedom, p = 0.000000

| | N | Observed | Expected | (O-E)^2/E | (O-E)^2/V |
|---|---|---|---|---|---|
| **class=0** | 708 | 311 | 384.4 | 14.0 | 103 |
| **class=1** | 180 | 135 | 61.6 | 87.4 | 103 |