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| Title: **Standard Operating Procedures**  **SOP: Decision Curve analysis** | | Author(s)  **Chenggong Yan** | **A b** |
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**Introduction**

Diagnostic and prognostic models are typically evaluated with measures of accuracy that do not address clinical consequences. Decision-analytic techniques allow assessment of clinical outcomes but often require collection of additional information and may be cumbersome to apply to models that yield a continuous result. Decision Curve analysis (DCA) is a method for evaluating and comparing prediction models that incorporates clinical consequences, requires only the data set on which the models are tested, and can be applied to models that have either continuous or dichotomous results.

In short, Decision curve analysis is a suitable method for evaluating alternative diagnostic and prognostic strategies that has advantages over other commonly used measures and techniques.

**Methods**

The authors describe decision curve analysis, a simple, novel method of evaluating predictive models. They start by assuming that the threshold probability of a disease or event at which a patient would opt for treatment is informative of how the patient weighs the relative harms of a false-positive and a false-negative prediction. This theoretical relationship is then used to derive the net benefit of the model across different threshold probabilities. Plotting net benefit against threshold probability yields the "decision curve." Decision curve analysis identified the range of threshold probabilities in which a model was of value, the magnitude of benefit, and which of several models was optimal.

The decision curve analysis can be performed by R language.

**#install packages#**

install.packages("rmda")

install.packages("devtools")

library(devtools)

install\_github("mdbrown/DecisionCurve")

?? DecisionCurve

??decision\_curve

**#CSV data reading# data MUST BE A DATA FRAME**

library(rmda)

Data<- read.csv('C:/Users/ Desktop/input.csv',sep = ',')

**#Radiomics model building#**

data(Data)

set.seed(123)

baseline.model <- decision\_curve(label~Radiscore,

data = Data,

thresholds = seq(0, 1, by = .005),

bootstraps = 10)

summary(baseline.model)

**#plot using the defaults#**

plot\_decision\_curve(baseline.model, curve.names = "baseline model")

**#Clinical-Radiological model building#**

set.seed(123)

full.model <- decision\_curve(label~Radiscore+Age+CEA,

data = Data,

thresholds = seq(0, 1, by = .005),

bootstraps = 10)

**# for lwd, the first two positions correspond to the decision curves, then 'all' and 'none'#**

plot\_decision\_curve( list(baseline.model, full.model),

curve.names = c("Baseline model", "Full model"),

col = c("blue", "red"),

lty = c(1,2),

lwd = c(3,2, 2, 1),

legend.position = "bottomright")

plot\_decision\_curve( list(baseline.model, full.model),

curve.names = c("Baseline model", "Full model"),

col = c("blue", "red"),

confidence.intervals = FALSE, #remove confidence intervals

cost.benefit.axis = FALSE, #remove cost benefit axis

legend.position = "none") #remove the legend

**#Set specific cost:benefit ratios#**

plot\_decision\_curve( list(baseline.model, full.model),

curve.names = c("Baseline model", "Full model"),

col = c("blue", "red"),

cost.benefits = c("1:1000", "1:4", "1:9", "2:3", "1:3"),

legend.position = "bottomright")

**#Plot net benefit instead of standardize net benefit#**

plot\_decision\_curve( list(baseline.model, full.model),

curve.names = c("Baseline model", "Full model"),

col = c("blue", "red"),

ylim = c(-0.05, 0.15), #set ylim

lty = c(2,1),

standardize = FALSE, #plot Net benefit instead of standardized net benefit

legend.position = "topright")

**Reference:**

# [Andrew J Vickers](https://pubmed.ncbi.nlm.nih.gov/?term=Vickers+AJ&cauthor_id=17099194), [Elena B Elkin](https://pubmed.ncbi.nlm.nih.gov/?term=Elkin+EB&cauthor_id=17099194) Decision curve analysis: a novel method for evaluating prediction models

DOI: [10.1177/0272989X06295361](https://doi.org/10.1177/0272989x06295361) Med Decis Making; Nov-Dec 2006;26(6):565-74.

FitzgeraldM, Saville BR, Lewis RJ Decision curve analysis. DOI: 10.1001/jama.2015.37 JAMA. Jan 2015; 313(4):409-10.

https://www.mskcc.org/departments/epidemiology-biostatistics/biostatistics/decision-curve-analysis