#初めにRのQCAパッケージを導入

install.packages("QCA", dependencies = TRUE)

#QCAを起動する

library(QCA)

#dataの読み込み。

LR<-LIP

LR

#csQCAsa

#すべての項目をthresholdを決めて、DEV, ~DEV(not DEV)のように２分する

#データフレームとして取り出したいので、列番号号で指定する。

data<-LR[1]

data

plot(data)

#総当たりの距離行列を作る。

edist<-dist(data)

edist

#階層的クラスター分析（Ward法やってみる。）

edc<-hclust(edist,method="ward.D2")

edc

plot(edc,hang=-1,main="metod ward")

#樹形図にしたがって２分する

result<-cutree(edc,k=2)

result

#最長距離法でもやってみる。

edc2<-hclust(edist,method="complete")

plot(edc2,hang=-1,main="metod complete")

#樹形図にしたがって２分する

result2<-cutree(edc2,k=2)

result2

#kmeans法によるクラスター分析。

km<-kmeans(data,2)

km

#RのQCAパケージにもthresholdを提案する機能があるのでやってみる。

findTh(LR$DEV)

#すべての項目について、上記の操作を行う。

#以上の分析結果と既往の知見から、分析者の判断で、閾値（threshold)を決めて２分する。

#閾値を決めて、TRUE＝１，FALSE=0の表を作る。デフォルトがfuzzyなので、csQCAの場合は、type="crisp", threshold値を入力

DEV<-calibrate(LR$DEV, type = "crisp", thresholds = 550)

URB<-calibrate(LR$URB, type = "crisp", thresholds = 50)

LIT<-calibrate(LR$LIT, type = "crisp", thresholds = 75)

IND<-calibrate(LR$IND, type = "crisp", thresholds = 40)

STB<-calibrate(LR$STB, type = "crisp", thresholds = 9.5)

SURV<-calibrate(LR$SURV, type = "crisp", thresholds = 0)

dfc<-data.frame(DEV,URB,LIT,IND,STB,SURV)

#項目名（列名）を入力

rownames(dfc)<-c("AU","BE","CZ","EE","FI","FR","GE","GR","Hu","IE","IT","NL","PL","PT","RO","ES","SE","UK")

#確認

dfc

#真理表を作る。

truthTable(dfc, outcome = "SURV", complete = TRUE, show.cases = TRUE)

truthTable(dfc, outcome = "SURV", conditions = "DEV,URB,LIT,IND,STB", incl.cut = 1, n.cut = 1, pri.cut = 0, exclude = NULL, complete = FALSE, show.cases=TRUE)

#csQCAを実施

#心理表をTTBCPCに格納

TTBCPC<-truthTable(dfc, outcome = "SURV", complete = TRUE, show.cases = TRUE)

#最節約解

minimize(TTBCPC,include="?", details = TRUE)

minimize(TTBCPC, details = TRUE)

minimize(TTBCPC,details=TRUE)$PIchart

superSubset(dfc, outcome= SURV,conditions="DEV,URB,LIT,IND,STB")

SSCP<-superSubset(dfc,outcome= "SURV",incl.cut=0.9, ron.cut=0.6)

#DEV,LIT,STBについて確認

truthTable(dfc, outcome = "SURV", complete = TRUE, conditions = "DEV,LIT,STB", show.cases = TRUE)

TTBCPC1<-truthTable(dfc, outcome = "SURV", conditions = "DEV,LIT,STB", complete = TRUE, show.cases = TRUE)

minimize(TTBCPC1,include="?", details = TRUE)

minimize(TTBCPC1, details = TRUE)

minimize(TTBCPC1,details=TRUE)$PIchart

superSubset(dfc, outcome= SURV,conditions="DEV,LIT,STB")

SSCP1<-superSubset(dfc,outcome= "SURV",incl.cut=0.9, ron.cut=0.6)

#~SURV(not SURV)となるケースについての真理表を作る。

truthTable(dfc, outcome = ~SURV, complete = TRUE, show.cases = TRUE)

TTBCNC<-truthTable(dfc, outcome = ~SURV, complete = TRUE, show.cases = TRUE)

truthTable(dfc, outcome = ~SURV, conditions = "DEV,URB,LIT,IND,STB", incl.cut = 1, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

minimize(TTBCNC,include="?", details = TRUE)

minimize(TTBCNC, details = TRUE)

minimize(TTBCNC,details=TRUE)$PIchart

superSubset(dfc,outcome=~SURV,incl.cut=0.9, ron.cut=0.6)

SSCN<-superSubset(dfc,outcome=~SURV,incl.cut=0.9, ron.cut=0.6)

#fsQCA

#メンバーシップ値の決定

#fsQCAでは、その集合に属する度合いを0-1の間の数値で表現する。

#メンバーシップ値が0ならば、その集合に属することは全くない。

#ならば、その集合の完全に属することを意味する。

#0.5はその集合に属する度合と属さない度合いが半分ずつで拮抗してることを表す。

#メンバーシップ値の決め方は、分析者にゆだねられている。

#分析者自身の知識・経験、データをを参考に、決めるというやり方もある。

recode(LR$DEV, cuts = "370, 450, 550, 600,750,900,1050", values = "0, 0.2, 0.4, 0.45, 0.55, 0.6, 0.8, 1")

#この方法は頼りない気もするが、それなりの根拠はある。

#少数データの場合、分布曲線がわからないから、この方法しかないかもしれない。

#しかし、データ数が多く、項目が多い場合、分析者の負担が大きい。

#操作上簡単なのは、既往の確率密度曲線に当てははめる方法である。

#QCApackageはcalibrateという関数を用意している。

#calibrate(データセット、type="",threshold="e=,C=,i=")と入力する。

#デフォルトはfuzzy setなので、typeの指定は不要

DEV<-calibrate(LR$DEV,thresholds = "e=400,c=550,i=900")

URB<-calibrate(LR$URB, thresholds = "e=25,c=50,i=65")

LIT<-calibrate(LR$LIT, thresholds = "e=50,c=75,i=95")

IND<-calibrate(LR$IND, thresholds = "e=30, c=40,i=50")

STB<-calibrate(LR$STB, thresholds = "e=15, c=9.5, i=5")

SURV<-calibrate(LR$SURV, thresholds = "e=-9, c=0, i=10")

dff<-data.frame(DEV,URB,LIT,IND,STB,SURV)

rownames(dff)<-c("AU","BE","CZ","EE","FI","FR","GE","GR","Hu","IE","IT","NL","PL","PT","RO","ES","SE","UK")

dff

#fsQCAの実行

#真理表を作る。

truthTable(dff, outcome = SURV, complete = TRUE, show.cases = TRUE)

#Complete＝FALSEにすれば、要約した真理表が出力される。

truthTable(dff, outcome = "SURV", exclude = NULL, complete = FALSE, show.cases=TRUE)

#真理表をTTBFPCに格納する

TTBFPC<-truthTable(dff, outcome = SURV,complete = FALSE, show.cases = TRUE)

#最節約解候補を提示させる。

minimize(TTBFPC,inclde="?")

#真理表を作り直す。

truthTable(dff, outcome = SURV,complete = FALSE, ,incl.cut=0.75, cov.cut=0.9, show.cases = TRUE)

TTBFPC<-truthTable(dff, outcome = SURV,complete = FALSE, ,incl.cut=0.75, cov.cut=0.5,show.cases = TRUE)

minimize(TTBFPC,inclde="?",details=TRUE)

minimize(TTBFPC,details=TRUE)

minimize(TTBFPC,include="?")$PIchart

superSubset(dff,outcome=SURV,incl.cut=0.75, ron.cut=0.6)

SSFP<-superSubset(dff,outcome=SURV,incl.cut=0.75, ron.cut=0.6)

#３条件（DEV,（DEV,LIT,STB)で、真理表を作り直す。

truthTable(dff,outcome=SURV,condition="DEV,LIT,STB",incl.cut=c(0.75,0.5), show.cases=TRUE)

TTBF<-truthTable(dff,outcome=SURV,conditions="DEV,LIT,STB",incl.cut=0.75, show.cases=TRUE)

minimize(TTBF,incllude="?",details=TRUE)

minimize(TTBF,include="?")$PIchart

minimize(TTBF,details=TRUE)

superSubset(dff,outcome=SURV,conditions ="DEV,LIT,STB",incl.cut=0.75, ron.cut=0.6)

SSFP1<-superSubset(dff,outcome=SURV,conditions ="DEV,LIT,STB",incl.cut=0.75, ron.cut=0.6)

#~SURV(not surv)について

truthTable(dff,outcome=~SURV,incl.cut=0.8,ccomplete=TRUE, show.cases=TRUE)

#省略形

truthTable(dff,outcome=~SURV,complete=FALSE,incl.cut=0.6, show.cases=TRUE)

#真理表をTTBNFCに格納

TTBFNC<-truthTable(dff,outcome=~SURV,incl.cut=0.6,complete=TRUE, show.cases=TRUE)

minimize(TTBFNC,include="?", incl.cut=0.6,details = TRUE)

minimize(TTBFNC, incl.cut=0.6,details = TRUE)

minimize(TTBFNC,incl.cut=0.6,details=TRUE)$PIchart

superSubset(dff,outcome=~SURV,incl.cut=0.6,cov.cut=0.5)

SSFN<-superSubset(dff,outcome=~SURV,incl.cut=0.8,cov.cut=0.5)

#2要因の組み合わせについて検討する。

#DEV,URB

truthTable(dff, outcome = "~SURV", conditions = "DEV,URB", incl.cut = 0.8, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC1<-truthTable(dff, outcome = "~SURV", conditions = "DEV,URB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = TRUE, show.cases=TRUE)

minimize(TTBFNC1,include="?", details = TRUE)

minimize(TTBFNC1, details = TRUE)

minimize(TTBFNC1,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, incl.cut=0.6, conditions="DEV,URB")

#DEV,LIT

truthTable(dff, outcome = "~SURV", conditions = "DEV,LIT", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC2<-truthTable(dff, outcome = "~SURV", conditions = "DEV,LIT", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = TRUE, show.cases=TRUE)

minimize(TTBFNC2,include="?", details = TRUE)

minimize(TTBFNC2, details = TRUE)

minimize(TTBFNC2,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="DEV,LIT", incl.cut=0.6, conditions="DEV,URB")

#DEV,IND

truthTable(dff, outcome = "~SURV", conditions = "DEV,IND", incl.cut =0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC3<-truthTable(dff, outcome = "~SURV", conditions = "DEV,IND", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

minimize(TTBFNC3,include="?",incl.cut=0.8,details = TRUE)

minimize(TTBFNC3,incl.cut=0.8,include="?", details = TRUE)

minimize(TTBFNC3,incl.cut=0.8,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="DEV,IND", incl.cut=0.6, conditions="DEV,URB")

#DEV,STB

truthTable(dff, outcome = "~SURV", conditions = "DEV,STB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC4<-truthTable(dff, outcome = "~SURV", conditions ="DEV,STB", complete=TRUE,show.cases=TRUE)

minimize(TTBFNC4,include="?", incl.cut=0.5,details = TRUE)

minimize(TTBFNC4, incl.cut= 0.5,details = TRUE)

minimize(TTBFNC4,incl.cut=0.5,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="DEV,STB", incl.cut=0.6)

#URB,LIT

truthTable(dff, outcome = "~SURV", conditions = "URB,LIT", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC5<-truthTable(dff, outcome = "~SURV", conditions = "URB,LIT", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = TRUE, show.cases=TRUE)

minimize(TTBFNC5,include="?", incl.cut=0.6,details = TRUE)

minimize(TTBFNC5, incl.cut= 0.6,details = TRUE)

minimize(TTBFNC5,incl.cut=0.6,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="URB,LIT", incl.cut = 0.6)

#URB,IND

truthTable(dff, outcome = "~SURV", conditions = "URB,IND", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC6<-truthTable(dff, outcome = "~SURV", conditions = "URB,IND", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = TRUE, show.cases=TRUE)

minimize(TTBFNC6,include="?", incl.cut=0.6,details = TRUE)

minimize(TTBFNC6, incl.cut= 0.6,details = TRUE)

minimize(TTBFNC6,incl.cut=0.6,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="URB,IND", incl.cut = 0.6)

#URB,STB

truthTable(dff, outcome = "~SURV", conditions = "URB,STB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC7<-truthTable(dff, outcome = "~SURV", conditions = "URB,STB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = TRUE, show.cases=TRUE)

minimize(TTBFNC7,include="?", incl.cut=0.6,details = TRUE)

minimize(TTBFNC7, incl.cut= 0.6,details = TRUE)

minimize(TTBFNC7,incl.cut=0.6,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="URB,STB", incl.cut = 0.6)

#LIT,IND

truthTable(dff, outcome = "~SURV", conditions = "LIT,IND", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC8<-truthTable(dff, outcome = "~SURV", conditions = "LIT,IND", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = TRUE, show.cases=TRUE)

minimize(TTBFNC8,include="?", incl.cut=0.6,details = TRUE)

minimize(TTBFNC8, incl.cut= 0.6,details = TRUE)

minimize(TTBFNC8,incl.cut=0.6,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="LIT,IND", incl.cut = 0.6)

#LIT,STB

truthTable(dff, outcome = "~SURV", conditions = "LIT,STB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC9<-truthTable(dff, outcome = "~SURV", conditions = "LIT,STB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = TRUE, show.cases=TRUE)

minimize(TTBFNC9,include="?", incl.cut=0.6,details = TRUE)

minimize(TTBFNC9, incl.cut= 0.6,details = TRUE)

minimize(TTBFNC9,incl.cut=0.6,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="LIT,STB", incl.cut = 0.6)

#IND,STB

truthTable(dff, outcome = "~SURV", conditions = "IND,STB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC10<-truthTable(dff, outcome = "~SURV", conditions = "IND,STB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = TRUE, show.cases=TRUE)

minimize(TTBFNC10,include="?", incl.cut=0.6,details = TRUE)

minimize(TTBFNC10, incl.cut= 0.6,details = TRUE)

minimize(TTBFNC10,incl.cut=0.6,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="IND,STB", incl.cut = 0.6)

#3条件（DEV,LIT,STB）について、検討する。

#DEV,LIT,STB

truthTable(dff, outcome = "~SURV", conditions = "DEV,LIT,STB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = FALSE, show.cases=TRUE)

TTBFNC11<-truthTable(dff, outcome = "~SURV", conditions = "DEV,LIT,STB", incl.cut = 0.6, n.cut = 1, pri.cut = 0,

 exclude = NULL, complete = TRUE, show.cases=TRUE)

minimize(TTBFNC11,include="?", incl.cut=0.6,details = TRUE)

minimize(TTBFNC11, incl.cut= 0.6,details = TRUE)

minimize(TTBFNC11,incl.cut=0.6,details=TRUE)$PIchart

superSubset(dff, outcome=~SURV, conditions="DEV,LIT,STB", incl.cut = 0.6)