Mississippi

October 31, 2019

Contents

1 Summary

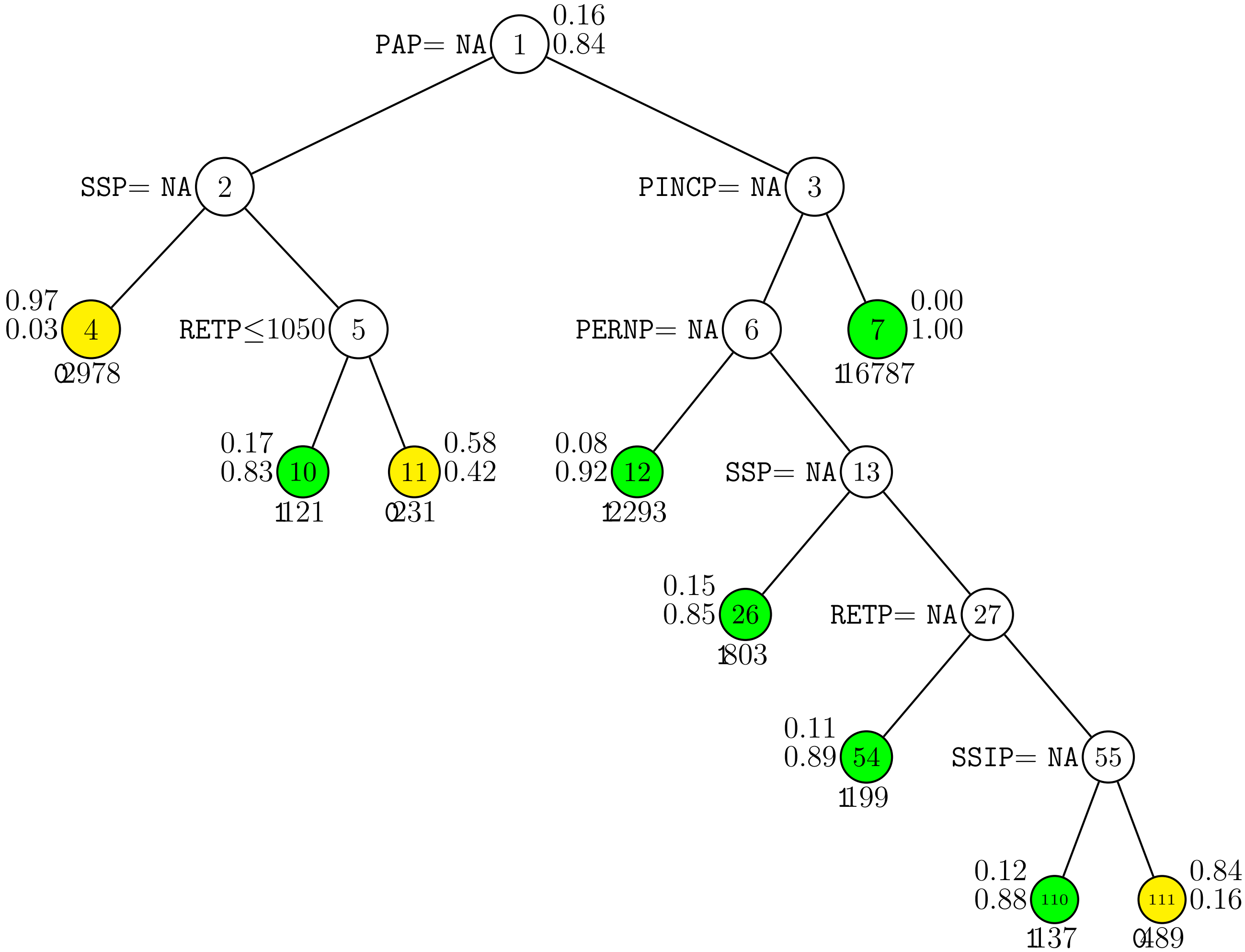
This article is trying to show estimate μ (state population mean)of INTP(interest, dividends,and net rental income past 12months)with sampling weight ω_i in variable PWGTP by using the PERSON RECORD variables of Mississippi. The method is that use GUIDE to estimate (probability of response), then use the inverse probability weighted (IPW) method to estimate μ. First, we need to do the data cleaning since there are 286 variables and over 27000 observations. Then we need to assign each variable with a proper index, which shows the type that the variable belongs to. After that, we can use GUIDE to output the classification tree. In addition, we use GUIDE to produce regression as well as linear and logistic regression in R in order to make comparison and discuss the result.

2 Data Cleaning

In order to use GUIDE to run classsificaion tree,we need to create a description file in advanced. The catogories are listed in the appendix

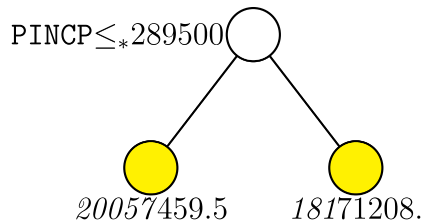
When we are constructing classification tree, we use INTP _ as dependent variable, while doing regression, we use INTP.

3 Classification Tree



GUIDE v.32.0 0.50-SE classification tree for predicting `INTP \_` using estimated priors and unit misclassification costs. Number of observations used to contruct tree is 24038. Maximum number of split levels is 30 and minimum node sample size is 120. At each split, an observation goes to the left branch if and only if the condition is satisfied. Predicted classes and sample sizes printed below terminal nodes; class proportions for `INTP \_` = `0` and `1` beside nodes. Second best split variable at root node is `OIP`.

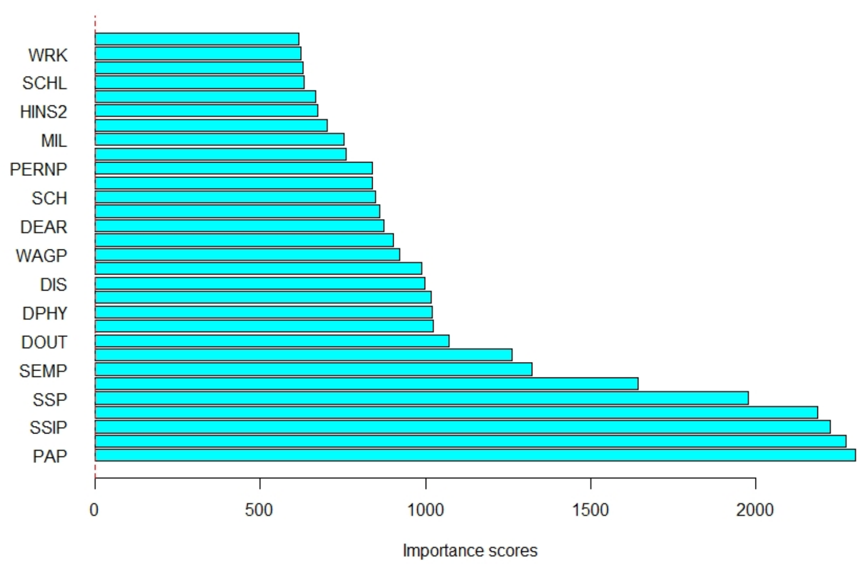
4 GUIDE Regression



GUIDE v.32.0 0.20-SE piecewise constant least-squares regression tree for predicting `INTP`. Number of observations used to contruct tree is 20238 (excluding observations with non-positive weight or with missing values in d, t, r or z variables). Maximum number of split levels is 30 and minimum node sample size is 101. At each split, an observation goes to the left branch if and only if the condition is satisfied. The symbol '$\leq_*$' stands for '$\leq$ or missing'. Sample size (*in italics*) and mean of `INTP` printed below nodes. Second best split variable at root node is `POVPIP`.

5 Logistic Regression in R

In the following two sections, logistic and linear regression will be shown. However before that, I run important score in GUIDE to determine how many variable are "important", so that we can simplified the model. The graph of important scores are shown below:



Belows are the summary of Logistic Regression:
Call:
glm(formula = INTP _ ., family = binomial(link = ”logit”), data = datLogistic)
Deviance Residuals:
Min 1Q Median 3Q Max
-3.5933 0.2853 0.3917 0.5251 2.4313
Coefficients: (3 not defined because of singularities)
Estimate Std. Error z value Pr(>|z|)
(Intercept) -2.314e+01 1.549e+00 -14.939 < 2e-16
DRAT1 -6.675e-02 5.263e-01 -0.127 0.89907
DRAT2 9.537e-01 3.853e-01 2.475 0.01332
DRAT3 5.950e-01 4.447e-01 1.338 0.18095
DRAT4 1.338e+00 5.978e-01 2.238 0.02521
DRAT5 1.869e-01 2.779e-01 0.673 0.50110
DRAT6 -7.219e-02 5.866e-01 -0.123 0.90205
HINS21 1.162e+00 9.110e-02 12.751 < 2e-16
HINS22 1.399e+00 9.792e-02 14.291 < 2e-16
HINS41 1.123e+00 1.038e-01 10.823 < 2e-16
HINS42 5.736e-01 1.106e-01 5.188 2.13e-07
HINS51 8.990e-01 1.560e-01 5.764 8.21e-09
HINS52 5.307e-01 1.782e-01 2.978 0.00290
HINS61 7.350e-01 1.748e-01 4.204 2.62e-05
HINS62 5.377e-01 1.990e-01 2.702 0.00689
HINS71 9.433e-02 4.094e-01 0.230 0.81779
HINS72 -1.530e-01 2.190e-01 -0.699 0.48472
MARHYP 1.143e-02 7.926e-04 14.422 < 2e-16
MLPE0 6.128e-01 1.293e+00 0.474 0.63549
MLPE1 -1.759e+00 1.699e+00 -1.035 0.30060
MLPFG0 4.642e-01 3.550e-01 1.308 0.19097
MLPFG1 NA NA NA NA
RETP 3.068e-05 4.250e-06 7.217 5.30e-13
SSP 1.073e-04 5.327e-06 20.138 < 2e-16
DECADE1 7.993e-01 1.147e+00 0.697 0.48581
DECADE2 -5.076e-01 5.173e-01 -0.981 0.32648
DECADE3 -1.112e-01 3.946e-01 -0.282 0.77815
DECADE4 8.664e-02 4.350e-01 0.199 0.84215
DECADE5 -1.824e-01 3.116e-01 -0.585 0.55843
DECADE6 3.839e-01 3.179e-01 1.208 0.22712

DECADE7 3.531e-01 3.063e-01 1.153 0.24898
DECADE8 4.979e-01 2.546e-01 1.955 0.05054
SCIENGRLP1 -1.722e-02 1.401e-01 -0.123 0.90218
SCIENGRLP2 1.502e-02 5.816e-02 0.258 0.79618
VPS1 -1.260e+00 1.263e+00 -0.997 0.31862
VPS2 -1.951e+00 1.270e+00 -1.537 0.12441
VPS3 1.784e+00 1.925e+00 0.927 0.35403
VPS4 -8.396e-01 1.270e+00 -0.661 0.50839
VPS5 3.624e-01 1.786e+00 0.203 0.83922
VPS6 1.073e+00 1.732e+00 0.620 0.53532
VPS7 9.051e-01 1.787e+00 0.507 0.61250
VPS8 NA NA NA NA
VPS9 -1.523e+00 1.270e+00 -1.200 0.23032
VPS10 -3.319e+00 1.590e+00 -2.087 0.03691
VPS11 -1.407e+00 1.309e+00 -1.075 0.28243
VPS12 -9.343e-01 1.262e+00 -0.740 0.45913
VPS13 -5.187e-01 1.316e+00 -0.394 0.69337
VPS14 NA NA NA NA
FHINS3C0 -7.390e-01 5.784e-02 -12.775 < 2e-16
FHINS3C1 -1.925e+00 1.558e-01 -12.358 < 2e-16

(Intercept) ***
DRAT1
DRAT2 *
DRAT3
DRAT4 *
DRAT5
DRAT6
HINS21 ***
HINS22 ***
HINS41 ***
HINS42 ***
HINS51 ***
HINS52 **
HINS61 ***
HINS62 **
HINS71
HINS72

MARHYP ***
MLPE0
MLPE1
MLPFG0
MLPFG1
RETP ***
SSP ***
DECADE1
DECADE2
DECADE3
DECADE4
DECADE5
DECADE6
DECADE7
DECADE8 .
SCIENGRLP1
SCIENGRLP2
VPS1
VPS2
VPS3
VPS4
VPS5
VPS6
VPS7
VPS8
VPS9
VPS10 *
VPS11
VPS12
VPS13
VPS14
FHINS3C0 ***
FHINS3C1 ***
— Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 20984 on 24037 degrees of freedom
Residual deviance: 15940 on 23991 degrees of freedom
AIC: 16034

Number of Fisher Scoring iterations: 6

20238
1000.062
0.8870538

6 Linear Regression in R

> summary(predict(a))
Min. 1st Qu. Median Mean 3rd Qu. Max.
-150882.4 -719.2 612.7 786.2 2468.0 171087.3

7 Comparison

In GUIDE classification: the mean of INTP is

> uclass
1086.261

In GUIDE regression: the mean of INTP is

> uregression
921.2957

In R logistic regression: the mean of INTP is

>rlogistic
1000.062

In R linear regression: the mean of INTP is

>rlinear
786.2

According to the code:

mu.gov = sum(rawdataG$PWGTP*rawdataG$INTP)/sum(rawdataG$PWGTP)

we have the mean of INTP
> mu.gov
1099.817

8 Conclusion

Comparing to mu.gov, we can see the classification has the closest estimation. And the regression in GUIDE has the second close to mu.gov. However, the linear regression does not fit the model well this may be caused by two factors. One is that we only use some ”important” variables rather than entire explanatory variables, this leads to some imformation lost. Another reason is that there are too many missing values and we have add some values not from the real record. Thus, the data can be non-linearity and the linear regression does not fit.

Appendices

9 Data Cleaning

RT x
SERIALNO x
DIVISION x
SPORDER x
PUMA x
REGION x
ST x
ADJINC x
PWGTP w
1AGEP n
CIT b
CITWP n
COW b
DDRS b
DEAR b
DEYE b
DOUT b
DPHY b
DRAT b
DRATX b
DREM b
ENG b
FER b
GCL b
GCM b
GCR b
HINS1 b
HINS2 b
HINS3 b
HINS4 b
HINS5 b
HINS6 b
HINS7 b

INTP x
JWMNP n
JWRIP n
JWTR b
LANX b
MAR b
MARHD b
MARHM b
MARHT b
MARHW b
MARHYP n
MIG b
MIL b
MLPA b
MLPB b
MLPCD b
MLPE b
MLPFG b
MLPH b
MLPI b
MLPJ b
MLPK b
NWAB b
NWAV b
NWLA b
NWLK b
NWRE b
OIP n
PAP n
RELP b
RETP n
SCH b
SCHG b
SCHL b
SEMP n
SEX b
SSIP n
SSP n

WAGP n
WKHP n
WKL b
WKW b
WRK b
YOEP n
ANC b
ANC1P b
ANC2P b
DECADE b
DIS b
DRIVESP b
ESP b
ESR b
FOD1P b
FOD2P b
HICOV b
HISP b
INDP b
JWAP p 286
JWDP p 151
LANP b
MIGPUMA b
MIGSP b
MSP b
NATIVITY b
NOP b
OC b
OCCP b
PAOC b
PERNP n
PINCP n
POBP b
POVPIP n
POWPUMA b
POWSP b
PRIVCOV b
PUBCOV b

QTRBIR b
RAC1P b
RAC2P b
RAC3P b
RACAIAN b
RACASN b
RACBLK b
RACNH b
RACNUM b
RACPI b
RACSOR b
RACWHT b
RC b
SCIENGP b
SCIENGRLP b
SFN b
SFR b
VPS b
WAOB b
FAGEP x
FANCP x
FCITP x
FCITWP x
FCOWP x
FDDRSP x
FDEARP x
FDEYEP x
FDISP x
FDOUTP x
FDPHYP x
FDRATP x
FDRATXP x
FDREMP x
FENGP x
FESRP x
FFERP x
FFODP b
FGCLP x

FGCMP x
FGCRP x
FHICOVP x
FHINS1P x
FHINS2P x
FHINS3C b
FHINS3P x
FHINS4C b
FHINS4P x
FHINS5C b
FHINS5P x
FHINS6P x
FHINS7P x
FHISP x
FINDP x
INTP x
FJWDP x
FJWMNP x
FJWRIP x
FJWTRP x
FLANP x
FLANXP x
FMARP x
FMARHDP x
FMARHMP x
FMARHTP x
FMARHWP x
FMARHYP x
FMIGP x
FMIGSP x
FMILPP b
FMILSP x
FOCCP x
FOIP x
FPAP x
FPERNP x
FPINCP x
FPOBP x

FPOWSP x
FPRIVCOVP x
FPUBCOVP x
FRACP x
FRELP x
FRETP x
FSCHGP x
FSCHLP x
FSCHP x
FSEMP x
FSEXP x
FSSIP x
FSSP x
FWAGP x
FWKHP x
FWKLP x
FWKWP x
FWRKP x
FYOEP x
PWGTP1 x
PWGTP2 x
PWGTP3 x
PWGTP4 x
PWGTP5 x
PWGTP6 x
PWGTP7 x
PWGTP8 x
PWGTP9 x
PWGTP10 x
PWGTP11 x
PWGTP12 x
PWGTP13 x
PWGTP14 x
PWGTP15 x
PWGTP16 x
PWGTP17 x
PWGTP18 x
PWGTP19 x

PWGTP20 x
PWGTP21 x
PWGTP22 x
PWGTP23 x
PWGTP24 x
PWGTP25 x
PWGTP26 x
PWGTP27 x
PWGTP28 x
PWGTP29 x
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PWGTP67 x
PWGTP68 x
PWGTP69 x
PWGTP70 x
PWGTP71 x
PWGTP72 x
PWGTP73 x
PWGTP74 x
PWGTP75 x
PWGTP76 x
PWGTP77 x
PWGTP78 x
PWGTP79 x
PWGTP80 x
INTP _ d

10 All R codes

```
rawdata = read.csv("psam_p28.csv", head = TRUE)
rawdataG = rawdata[-which(rawdata$AGEP<15),]
mu.gov = sum(rawdataG$PWGTP*rawdataG$INTP)/sum(rawdataG$PWGTP)
rawdataAl = rawdata
rawdataAl = rawdataAl[-which(rawdataAl$AGEP<15),]
Flagname = c()
for (i in (grep("FAGEP",colnames(rawdataAl)):grep("FYOEP",colnames(rawdataAl))))

Flagname[i+1-grep("FAGEP",colnames(rawdataAl))] = unlist(strsplit(colnames(rawdataAl[i]),split = "F",fixed = T))[2]  Flagname[17] = "FERP"
```

```
Flagname[18] = ”FODP”
Flagname1 = data.frame(Rawname = rep(NA,length(Flagname)),Flagname = rep(NA,length(Flagnam
= rep(0,length(Flagname)),Flagnum = c(grep(”FAGEP”,colnames(rawdataAl)):grep(”FYOEP”,colnam
for (i in 1:length(Flagname))
a = grep(Flagname[i],colnames(rawdataAl),value = T,fixed=T)
b = grep(Flagname[i],colnames(rawdataAl),fixed=T)
if(length(a) == 2)
Flagname1$Rawname[i] = a[1]
Flagname1$Flagname[i] = a[2] Flagname1$Rawnum[i] = b[1]
else if(length(a) == 1)
Flagname1$Rawname[i] = NA
Flagname1$Flagname[i] = a[1]
print(isTRUE(b[1]==Flagname1$Flagnum[i]))
elseprint(a)  Flagname1[which(Flagname1$Flagname==”FANCP”),1]=”ANC”
Flagname1[which(Flagname1$Flagname==”FCITP”),1]=”CIT”
Flagname1[which(Flagname1$Flagname==”FCOWP”),1]=”COW”
Flagname1[which(Flagname1$Flagname==”FDDRSP”),1]=”DDRS”
Flagname1[which(Flagname1$Flagname==”FDEARP”),1]=”DEAR”
Flagname1[which(Flagname1$Flagname==”FDEYEP”),1]=”DEYE”
Flagname1[which(Flagname1$Flagname==”FDISP”),1]=”DIS”
Flagname1[which(Flagname1$Flagname==”FDOUTP”),1]=”DOUT”
Flagname1[which(Flagname1$Flagname==”FDPHYP”),1]=”DPHY”
Flagname1[which(Flagname1$Flagname==”FDRATP”),1]=”DRAT”
Flagname1[which(Flagname1$Flagname==”FDRATXP”),1]=”DRATX”
Flagname1[which(Flagname1$Flagname==”FDREMP”),1]=”DREM”
Flagname1[which(Flagname1$Flagname==”FESRP”),1]=”ESR”
Flagname1[which(Flagname1$Flagname==”FFERP”),1]=”FER”
Flagname1[which(Flagname1$Flagname==”FGCLP”),1]=”GCL”
Flagname1[which(Flagname1$Flagname==”FGCMP”),1]=”GCM”
Flagname1[which(Flagname1$Flagname==”FGCRP”),1]=”GCR”
Flagname1[which(Flagname1$Flagname==”FHICOVP”),1]=”HICOV”
Flagname1[which(Flagname1$Flagname==”FHINS1P”),1]=”HINS1”
Flagname1[which(Flagname1$Flagname==”FHINS2P”),1]=”HINS2”
Flagname1[which(Flagname1$Flagname==”FHINS3P”),1]=”HINS3”
Flagname1[which(Flagname1$Flagname==”FHINS4P”),1]=”HINS4”
Flagname1[which(Flagname1$Flagname==”FHINS5P”),1]=”HINS5”
Flagname1[which(Flagname1$Flagname==”FHINS6P”),1]=”HINS6”
Flagname1[which(Flagname1$Flagname==”FHINS7P”),1]=”HINS7”
```

```
Flagname1[which(Flagname1$Flagname==”FJWTRP”),1]=”JWTR”
Flagname1[which(Flagname1$Flagname==”FLANXP”),1]=”LANX”
Flagname1[which(Flagname1$Flagname==”FMARP”),1]=”MAR”
Flagname1[which(Flagname1$Flagname==”FMARHDP”),1]=”MARHD”
Flagname1[which(Flagname1$Flagname==”FMARHMP”),1]=”MARHM”
Flagname1[which(Flagname1$Flagname==”FMARHTP”),1]=”MARHT”
Flagname1[which(Flagname1$Flagname==”FMARHWP”),1]=”MARHW”
Flagname1[which(Flagname1$Flagname==”FMILSP”),1]=”MIL”
Flagname1[which(Flagname1$Flagname==”FPRIVCOVP”),1]=”PRIVCOV”
Flagname1[which(Flagname1$Flagname==”FPUBCOVP”),1]=”PUBCOV”
Flagname1[which(Flagname1$Flagname==”FSCHGP”),1]=”SCHG”
Flagname1[which(Flagname1$Flagname==”FSCHLP”),1]=”SCHL”
Flagname1[which(Flagname1$Flagname==”FSCHP”),1]=”SCH”
Flagname1[which(Flagname1$Flagname==”FSEXP”),1]=”SEX”
Flagname1[which(Flagname1$Flagname==”FWKLP”),1]=”WKL”
Flagname1[which(Flagname1$Flagname==”FWKWP”),1]=”WKW”
Flagname1[which(Flagname1$Flagname==”FWRKP”),1]=”WRK”
for (i in 1:nrow(Flagname1))
if(i %in% c(18,25,27,29,50))next if(Flagname1$Rawname[i]%in% colnames(rawdataAl))Flagname1$Rav
which(colnames(rawdataAl)==Flagname1$Rawname[i])  for (i in 1:nrow(Flagname1))
if(i %in% c(18,25,27,29,50))next
for (j in 1:nrow(rawdataAl))
if(rawdataAl[j,Flagname1$Flagnum[i]]==1)
rawdataAl[j,Flagname1$Rawnum[i]] = NA
dat = rawdataAl
dat$INTP _ = ifelse(is.na(dat$INTP), 0, 1)
dat0 = dat
dat = dat[,-c(97,128)]
write.table(dat, file = ”model.txt”,row.names=F)
k = ncol(dat)
roles = rep(”n”,k)
b.vars =
c(”CIT”,”COW”,”DDRS”,”DEAR”,”DEYE”,”DOUT”,”DPHY”,”DRAT”,”DRATX”,”DREM”,”ENG”
”JWTR”,”LANX”,”MAR”,”MARHD”,”MARHM”,”MARHT”,”MARHW”,”MIG”,”MIL”,”MLPA”,”M
”NWRE”,”RELP”,”SCH”,”SCHG”,”SCHL”,”SEX”,”WKL”,”WKW”,”WRK”,”ANC”,”ANC1P”,”ANC
”LANP”,”MIGPUMA”,”MIGSP”,”MSP”,”NATIVITY”,”NOP”,”OC”,”OCCP”,”PAOC”,”POBP”,”PO
”RACAIAN”,”RACASN”,”RACBLK”,”RACNH”,”RACNUM”,”RACPI”,”RACSOR”,”RACWHT”,”R
”FMILPP”)
```

```
roles[names(dat) %in% b.vars] = "b"
n.vars = c("AGEP","CITWP","JWMNP","JWRIP","MARHYP","OIP","PAP","RETP","SEMP","S
roles[names(dat) %in% n.vars] = "n"
p.vars1 = "JWAP"
p.vars2 = "JWDP"
roles[names(dat) %in% p.vars1] = "p 286
roles[names(dat) %in% p.vars2] = "p 151"
i = c(1:80)
PWGTPX = paste("PWGTP",i,sep = "")
x.vars = c("SPORDER","PUMA","RT","SERIALNO","DIVISION","REGION","ST","ADJINC","IN
c(18,25,27,29,50),][,2],PWGTPX)
roles[names(dat) %in% x.vars] = "x"
d.var = "INTP _ "
roles[names(dat) %in% d.var] = "d"
w.var = "PWGTP"
roles[names(dat) %in% w.var] = "w"
write("model.txt",file="desc.txt")
write("NA",file="desc.txt",append=TRUE)
write("2",file="desc.txt",append=TRUE)
write.table(cbind(1:k,names(dat),roles),file="desc.txt",
row.names=FALSE,col.names=FALSE,quote=FALSE,append=TRUE)
exclude1 = c("SPORDER","PUMA","RT","SERIALNO","DIVISION","REGION","ST","ADJINC")
i = c(1:80)
exclude2 = paste("PWGTP",i,sep = "")
exclude3 = c("INDP","MIGPUMA","MIGSP","OCCP","POBP")
exclude = c(exclude1,exclude2,exclude3)
datR = dat[,-which(names(dat) %in% exclude)]
for (i in 1:ncol(datR))
index = which(is.na(datR[,i]))
datR[index,i]=min(datR[,i],na.rm = T)-1
a=lm(datR$INTP datR$FOD1P+datR$FOD2P+datR$ANC1P+datR$ANC2P+datR$VPS+datR$L
summary(a)
z0 <- read.table("imp.scr",header=TRUE)
par(mar=c(5,6,2,1),las=1)
barplot(z0$Score[1:30],names.arg=z0$Variable[1:30],col="cyan",horiz=TRUE,xlab="Importance
scores")
abline(v=1,col="red",lty=2)
v.score = as.character(z0$Variable[1:100])
```

```
v = c(v.score,"INTP _ ")
datLogistic = datR[,which(names(datR) %in% v)]
for(i in which(names(datLogistic) %in% v))
datLogistic[,i] = as.factor(datLogistic[,i])
model = glm(INTP _ .,
data=datLogistic,
family = binomial(link = "logit")
)
summary(model)
pifile=read.table("MS.FIT",header = T) regressionfile=read.table("regression.fit",header
= T)
regression=regressionfile$predicted[regressionfile$train=="n"]
na=0
nonna=0
pwgtpna=dat$PWGTP[is.na(dat$INTP)]
pwgtpnonna=dat$PWGTP[is.na(dat$INTP)==F]
intpnonna=dat$INTP[is.na(dat$INTP)==F]
for (i in 1:3800)
na=na+regression[i]*pwgtpna[i]
for (i in 1:20238)
nonna=nonna+intpnonna[i]*pwgtpnonna[i]
uregression=(na+nonna)/sum(dat$PWGTP)
pi=pifile$X1/(pifile$X1+pifile$X0)
divide=0
multi=0
for (i in which(is.na(dat$INTP)==F))
divide=divide+datR$PWGTP[i]/pi[i]
multi=multi+(datR$PWGTP[i]*datR$INTP[i])/pi[i]
uclass=multi/divide
```

11 Classification Input and Output Files

11.1 Input

GUIDE (do not edit this file unless you know what you are doing)
32.0 (version of GUIDE that generated this file)
1 (1=model fitting, 2=importance or DIF scoring, 3=data conversion)

"MS.out" (name of output file)
1 (1=one tree, 2=ensemble)
1 (1=classification, 2=regression, 3=propensity score grouping)
1 (1=simple model, 2=nearest-neighbor, 3=kernel)
1 (0=linear 1st, 1=univariate 1st, 2=skip linear, 3=skip linear and interaction)
1 (1=prune by CV, 2=by test sample, 3=no pruning)
"desc.txt" (name of data description file)
10 (number of cross-validations)
1 (1=mean-based CV tree, 2=median-based CV tree)
0.500 (SE number for pruning)
1 (1=estimated priors, 2=equal priors, 3=other priors)
1 (1=unit misclassification costs, 2=other)
2 (1=split point from quantiles, 2=use exhaustive search)
1 (1=default max. number of split levels, 2=specify no. in next line)
1 (1=default min. node size, 2=specify min. value in next line)
1 (1=write latex, 2=skip latex)
"MS.tex" (latex file name)
1 (1=include node numbers, 2=exclude)
1 (1=number all nodes, 2=only terminal nodes)
1 (1=color terminal nodes, 2=no colors)
1 (0=# errors, 1=class sizes in nodes, 2=nothing)
1 (1=no storage, 2=store fit and split variables, 3=store split variables and values)
2 (1=do not save fitted values and node IDs, 2=save in a file)
"MS.FIT" (file name for fitted values and node IDs)
2 (1=do not write R function, 2=write R function)
"MS.r" (R code file)
1 (rank of top variable to split root node)

11.2 Output

GGG U U I DDDD EEEE
G G U U I D D E
G U U I D D E
G GG U U I D D EEE
G G U U I D D E
G G U U I D D E
GGG UUU I DDDD EEEE

GUIDE Classification and Regression Trees and Forests
Version 32.0 (Build date: August 29, 2019)
Compiled with Visual Fortran 64 18.0.1.156 on Windows 10

This software is based upon work supported by the U.S. Army Research Office,
the National Science Foundation and the National Institutes of Health.

This job was started on 10/31/19 at 17:37
Classification tree
Pruning by cross-validation
Data description file: desc.txt
Training sample file: model.txt
Missing value code: NA
Records in data file start on line 2
Warning: N variables changed to S
Warning: B variables changed to C
Dependent variable is INTP _
Number of records in data file: 24038
Length of longest entry in data file: 13
Missing values found among categorical variables
Separate categories will be created for missing categorical variables
Number of classes: 2
Smallest and largest positive weights are 2.0000E+00 1.0510E+03
Training sample class proportions of D variable INTP _ :
Class #Cases Proportion
0 3800 0.15808304
1 20238 0.84191696
Summary information for training sample of size 24038
d=dependent, b=split and fit cat variable using indicator variables,
c=split-only categorical, i=fit-only categorical (via indicators),
s=split-only numerical, n=split and fit numerical, f=fit-only numerical,
m=missing-value flag variable, p=periodic variable, w=weight,
#Codes/
Levels/
Column Name Minimum Maximum Periods #Missing
9 PWGTP w 2.000 1051.
10 AGEP s 15.00 93.00 298
11 CIT c 5 1149

12 CITWP s 1939. 2017. 23823
13 COW c 9 10794
14 DDRS c 2 1727
15 DEAR c 2 1332
16 DEYE c 2 1412
17 DOUT c 2 1717
18 DPHY c 2 1717
19 DRAT c 6 23534
20 DRATX c 2 21748
21 DREM c 2 1695
22 ENG c 4 23186
23 FER c 2 18164
24 GCL c 2 5874
25 GCM c 5 23696
26 GCR c 2 23289
27 HINS1 c 2 2811
28 HINS2 c 2 2930
29 HINS3 c 2 2063
30 HINS4 c 2 3248
31 HINS5 c 2 3314
32 HINS6 c 2 3304
33 HINS7 c 2 3564
35 JWMNP s 1.000 160.0 14323
36 JWRIP s 1.000 10.00 14369
37 JWTR c 9 13554
38 LANX c 2 1542
39 MAR c 5 1173
40 MARHD c 2 8781
41 MARHM c 2 8589
42 MARHT c 3 8835
43 MARHW c 2 8793
44 MARHYP s 1940. 2017. 9791
45 MIG c 3
46 MIL c 4 2548
47 MLPA c 2 22089
48 MLPB c 2 22089
49 MLPCD c 2 22089
50 MLPE c 2 22089

51 MLPFG c 2 22089
52 MLPH c 2 22089
53 MLPI c 2 22089
54 MLPJ c 2 22089
55 MLPK c 1 22089
56 NWAB c 3 395
57 NWAV c 4 395
58 NWLA c 3 395
59 NWLK c 3 395
60 NWRE c 3 395
61 OIP s 0.000 0.6400E+05 3310
62 PAP s 0.000 0.3000E+05 3330
63 RELP c 18 295
64 RETP s 0.000 0.9400E+05 3527
65 SCH c 3 1439
66 SCHG c 9 21070
67 SCHL c 24 1782
68 SEMP s -6900. 0.2390E+06 2787
69 SEX c 2 33
70 SSIP s 0.000 0.3000E+05 3260
71 SSP s 0.000 0.5000E+05 3866
72 WAGP s 0.000 0.3090E+06 4519
73 WKHP s 1.000 99.00 12489
74 WKL c 3 2968
75 WKW c 6 12336
76 WRK c 2 3086
77 YOEP s 1926. 2017. 23401
78 ANC c 4
79 ANC1P c 147
80 ANC2P c 96
81 DECADE c 8 23296
82 DIS c 2 2197
83 DRIVESP c 6 13178
84 ESP c 8 22984
85 ESR c 6 2595
86 FOD1P c 161 19178
87 FOD2P c 92 23651
88 HICOV c 2 4003

89 HISP c 18 957
90 INDP c 257 10841
91 JWAP p 1.000 284.0 286 12779
92 JWDP p 1.000 150.0 151 14894
93 LANP c 48 23279
94 MIGPUMA c 88 21266
95 MIGSP c 58 21468
96 MSP c 6
97 NATIVITY c 2
98 NOP c 8 22984
99 OC c 2 1618
100 OCCP c 446 10973
101 PAOC c 4 12163
102 PERNP s -6900. 0.5480E+06 5062
103 PINCP s -6900. 0.8380E+06 7251
104 POBP c 139 2398
105 POVPIP s 0.000 501.0 1449
106 POWPUMA c 64 12494
107 POWSP c 37 13917
108 PRIVCOV c 2 3763
109 PUBCOV c 2 3761
110 QTRBIR c 4
111 RAC1P c 8
112 RAC2P c 34
113 RAC3P c 48
114 RACAIAN c 2
115 RACASN c 2
116 RACBLK c 2
117 RACNH c 2
118 RACNUM c 4
119 RACPI c 2 218
120 RACSOR c 2
121 RACWHT c 2
122 RC c 2 1618
123 SCIENGP c 2 19189
124 SCIENGRLP c 2 19178
125 SFN c 2 23463
126 SFR c 6 23463

127 VPS c 14 22089
128 WAOB c 8
146 FFODP c 2
153 FHINS3C c 2 17123
155 FHINS4C c 2 19799
157 FHINS5C c 2 22787
178 FMILPP c 2
285 INTP _ d 2

Total #cases w/ #missing
#cases miss. D ord. vals #X-var #N-var #F-var #S-var
24038 0 23972 160 0 0 17
#P-var #M-var #B-var #C-var #I-var
2 0 0 104 0
No. cases used for training: 24038
No. cases excluded due to 0 weight or missing D: 0
Univariate split highest priority
Interaction and linear splits 2nd and 3rd priorities
Pruning by v-fold cross-validation, with v = 10
Selected tree is based on mean of CV estimates
Number of SE's for pruned tree: .5000
Simple node models
Estimated priors
Unit misclassification costs
Warning: All positive weights treated as one
Split values for N and S variables based on exhaustive search
Maximum number of split levels: 30
Minimum node sample size: 120
Size and CV mean cost and SE of subtrees:
Tree #Tnodes Mean Cost SE(Mean) BSE(Mean) Median Cost BSE(Median)
1 39 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
2 38 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
3 37 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
4 34 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
5 33 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
6 26 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
7 25 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
8 24 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03

9 22 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
10 20 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
11 18 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
12 17 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
13 15 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
14 13 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
15 12 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
16 11 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
17 10 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
18** 9 2.766E-02 1.058E-03 9.317E-04 2.683E-02 1.042E-03
19 8 3.008E-02 1.102E-03 1.196E-03 2.891E-02 1.187E-03
20 7 3.008E-02 1.102E-03 1.196E-03 2.891E-02 1.187E-03
21 2 4.393E-02 1.322E-03 1.210E-03 4.389E-02 9.953E-04
22 1 1.581E-01 2.353E-03 2.128E-03 1.573E-01 2.350E-03

0-SE tree based on mean is marked with * and has 9 terminal nodes
0-SE tree based on median is marked with + and has 9 terminal nodes
Selected-SE tree based on mean using naive SE is marked with **
Selected-SE tree based on mean using bootstrap SE is marked with –
Selected-SE tree based on median and bootstrap SE is marked with ++
tree, ** tree, + tree, and ++ tree all the same

Following tree is based on mean CV with naive SE estimate (**).

Structure of final tree. Each terminal node is marked with a T.

Node cost is node misclassification cost divided by number of training cases
Node Total Train Predicted Node Split Interacting
label cases cases class cost variables variable
1 24038 24038 1 1.581E-01 PAP
2 3330 3330 0 8.799E-02 SSP
4T 2978 2978 0 3.257E-02 WKL
5 352 352 1 4.432E-01 RETP
10T 121 121 1 1.736E-01 -
11T 231 231 0 4.156E-01 -
3 20708 20708 1 3.685E-02 PINCP
6 3921 3921 1 1.946E-01 PERNP
12T 2293 2293 1 8.330E-02 SSP
13 1628 1628 1 3.514E-01 SSP
26T 803 803 1 1.544E-01 RETP
27 825 825 0 4.570E-01 RETP

54T 199 199 1 1.055E-01 -
55 626 626 0 3.179E-01 SSIP
110T 137 137 1 1.168E-01 -
111T 489 489 0 1.595E-01 PRIVCOV
7T 16787 16787 1 0.000E+00 -

Number of terminal nodes of final tree: 9
Total number of nodes of final tree: 17
Second best split variable (based on curvature test) at root node is OIP
Classification tree:
Node 1: PAP = NA
Node 2: SSP = NA
Node 4: 0
Node 2: SSP /= NA
Node 5: RETP <= 1050.0000
Node 10: 1
Node 5: RETP > 1050.0000 or NA
Node 11: 0
Node 1: PAP /= NA
Node 3: PINCP = NA
Node 6: PERNP = NA
Node 12: 1
Node 6: PERNP /= NA
Node 13: SSP = NA
Node 26: 1
Node 13: SSP /= NA
Node 27: RETP = NA
Node 54: 1
Node 27: RETP /= NA
Node 55: SSIP = NA
Node 110: 1
Node 55: SSIP /= NA
Node 111: 0
Node 3: PINCP /= NA
Node 7: 1

****

In the following the predictor node mean is weighted mean of complete cases.

Node 1: Intermediate node
A case goes into Node 2 if PAP = NA
PAP mean = 21.996130
Class Number Posterior
0 3800 0.15808
1 20238 0.84192
Number of training cases misclassified = 3800
Predicted class is 1
——————————-
Node 2: Intermediate node
A case goes into Node 4 if SSP = NA
SSP mean = 7490.1109
Class Number Posterior
0 3037 0.91201
1 293 0.08799
Number of training cases misclassified = 293
Predicted class is 0
——————————-
Node 4: Terminal node
Class Number Posterior
0 2881 0.96743
1 97 0.03257
Number of training cases misclassified = 97
Predicted class is 0
——————————-
Node 5: Intermediate node
A case goes into Node 10 if RETP <= 1050.0000
RETP mean = 5391.3474
Class Number Posterior
0 156 0.44318
1 196 0.55682
Number of training cases misclassified = 156
Predicted class is 1
——————————-
Node 10: Terminal node
Class Number Posterior
0 21 0.17355

1 100 0.82645
Number of training cases misclassified = 21
Predicted class is 1

———————————-

Node 11: Terminal node
Class Number Posterior
0 135 0.58442
1 96 0.41558
Number of training cases misclassified = 96
Predicted class is 0

———————————-

Node 3: Intermediate node
A case goes into Node 6 if PINCP = NA
PINCP mean = 28459.311
Class Number Posterior
0 763 0.03685
1 19945 0.96315
Number of training cases misclassified = 763
Predicted class is 1

———————————-

Node 6: Intermediate node
A case goes into Node 12 if PERNP = NA
PERNP mean = 7535.0888
Class Number Posterior
0 763 0.19459
1 3158 0.80541
Number of training cases misclassified = 763
Predicted class is 1

———————————-

Node 12: Terminal node
Class Number Posterior
0 191 0.08330
1 2102 0.91670
Number of training cases misclassified = 191
Predicted class is 1

———————————-

Node 13: Intermediate node
A case goes into Node 26 if SSP = NA

SSP mean = 4966.5869
Class Number Posterior
0 572 0.35135
1 1056 0.64865
Number of training cases misclassified = 572
Predicted class is 1
———————————-
Node 26: Terminal node
Class Number Posterior
0 124 0.15442
1 679 0.84558
Number of training cases misclassified = 124
Predicted class is 1
———————————-
Node 27: Intermediate node
A case goes into Node 54 if RETP = NA
RETP mean = 3506.8726
Class Number Posterior
0 448 0.54303
1 377 0.45697
Number of training cases misclassified = 377
Predicted class is 0
———————————-
Node 54: Terminal node
Class Number Posterior
0 21 0.10553
1 178 0.89447
Number of training cases misclassified = 21
Predicted class is 1
———————————-
Node 55: Intermediate node
A case goes into Node 110 if SSIP = NA
SSIP mean = 306.38262
Class Number Posterior
0 427 0.68211
1 199 0.31789
Number of training cases misclassified = 199
Predicted class is 0

—————————————-

Node 110: Terminal node
Class Number Posterior
0 16 0.11679
1 121 0.88321
Number of training cases misclassified = 16
Predicted class is 1

—————————————-

Node 111: Terminal node
Class Number Posterior
0 411 0.84049
1 78 0.15951
Number of training cases misclassified = 78
Predicted class is 0

—————————————-

Node 7: Terminal node
Class Number Posterior
0 0 0.00000
1 16787 1.00000
Number of training cases misclassified = 0
Predicted class is 1

—————————————-

Classification matrix for training sample:
Predicted True class
class 0 1
0 3427 271
1 373 19967
Total 3800 20238

Number of cases used for tree construction: 24038
Number misclassified: 644
Resubstitution est. of mean misclassification cost: .26790914E-01

Observed and fitted values are stored in MS.FIT
LaTeX code for tree is in MS.tex
R code is stored in MS.r
Elapsed time in seconds: 216.80

12 Regression Input and Output Files

12.1 Input

GUIDE (do not edit this file unless you know what you are doing)
32.0 (version of GUIDE that generated this file)
1 (1=model fitting, 2=importance or DIF scoring, 3=data conversion)
"regression.out" (name of output file)
1 (1=one tree, 2=ensemble)
2 (1=classification, 2=regression, 3=propensity score grouping)
1 (1=linear, 2=quantile, 3=Poisson, 4=hazard, 5=multi or itemresponse, 6=longitudinal with T vars, 7=logistic)
1 (1=least squares, 2=least median of squares)
3 (0=stepwise, 1=multiple linear, 2=simple polynomial, 3=constant, 4=ANCOVA)
1 (1=interaction tests, 2=skip them)
1 (1=prune by CV, 2=no pruning)
"desc.txt" (name of data description file)
10 (number of cross-validations)
1 (1=mean-based CV tree, 2=median-based CV tree)
0.200 (SE number for pruning)
2 (1=unweighted, 2=weighted error estimates during pruning)
2 (1=split point from quantiles, 2=use exhaustive search)
1 (1=default max. number of split levels, 2=specify no. in next line)
1 (1=default min. node size, 2=specify min. value in next line)
1 (1=write latex, 2=skip latex)
"regression.tex" (latex file name)
2 (1=include node numbers, 2=exclude)
6 (1=white,2=lightgray,3=gray,4=darkgray,5=black,6=yellow,7=red,8=blue,9=green,10=magenta,11=
3 (1=no storage, 2=store fit and split variables, 3=store split variables and values)
"regression.var" (split variable file name)
1 (1=do not save, 2=save regressor names in a file)
2 (1=do not save fitted values and node IDs, 2=save in a file)
"regression.fit" (file name for fitted values and node IDs)
1 (1=do not write R function, 2=write R function)
1 (rank of top variable to split root node)

12.2 Output

GGG U U I DDDD EEEE
G G U U I D D E
G U U I D D E
G GG U U I D D EEE
G G U U I D D E
G G U U I D D E
GGG UUU I DDDD EEEE

GUIDE Classification and Regression Trees and Forests
Version 32.0 (Build date: August 29, 2019)
Compiled with Visual Fortran 64 18.0.1.156 on Windows 10

This software is based upon work supported by the U.S. Army Research Office,
the National Science Foundation and the National Institutes of Health.
This job was started on 10/31/19 at 18:48
Least squares regression tree
Pruning by cross-validation
Data description file: desc.txt
Training sample file: model.txt
Missing value code: NA
Records in data file start on line 2
Warning: N variables changed to S
Warning: B variables changed to C
Dependent variable is INTP
Piecewise constant model
Number of records in data file: 24038
Length of longest entry in data file: 13
Missing values found among categorical variables
Separate categories will be created for missing categorical variables
Smallest and largest positive weights are 2.0000E+00 1.0510E+03

Summary information for training sample of size 20238 (excluding observations
with non-positive weight or missing values in d, e, t, r or z variables)
d=dependent, b=split and fit cat variable using indicator variables,
c=split-only categorical, i=fit-only categorical (via indicators),
s=split-only numerical, n=split and fit numerical, f=fit-only numerical,
m=missing-value flag variable, p=periodic variable, w=weight,

#Codes/
Levels/
Column Name Minimum Maximum Periods #Missing
9 PWGTP w 2.000 1051.
10 AGEP s 15.00 93.00 124
11 CIT c 5 66
12 CITWP s 1939. 2017. 20040
13 COW c 9 7904
14 DDRS c 2 204
15 DEAR c 2 98
16 DEYE c 2 143
17 DOUT c 2 171
18 DPHY c 2 203
19 DRAT c 6 19789
20 DRATX c 2 18212
21 DREM c 2 193
22 ENG c 4 19507
23 FER c 2 14811
24 GCL c 2 4945
25 GCM c 5 19918
26 GCR c 2 19541
27 HINS1 c 2 1118
28 HINS2 c 2 1197
29 HINS3 c 2 543
30 HINS4 c 2 1487
31 HINS5 c 2 1503
32 HINS6 c 2 1499
33 HINS7 c 2 1702
34 INTP d -1500. 0.2900E+06
35 JWMNP s 1.000 160.0 11302
36 JWRIP s 1.000 10.00 11405
37 JWTR c 9 10721
38 LANX c 2 187
39 MAR c 5 133
40 MARHD c 2 6580
41 MARHM c 2 6574
42 MARHT c 3 6642
43 MARHW c 2 6581

44 MARHYP s 1940. 2017. 7503
45 MIG c 3
46 MIL c 4 856
47 MLPA c 2 18631
48 MLPB c 2 18631
49 MLPCD c 2 18631
50 MLPE c 2 18631
51 MLPFG c 2 18631
52 MLPH c 2 18631
53 MLPI c 2 18631
54 MLPJ c 2 18631
55 MLPK c 1 18631
56 NWAB c 3 338
57 NWAV c 4 338
58 NWLA c 3 338
59 NWLK c 3 338
60 NWRE c 3 338
61 OIP s 0.000 0.6400E+05 316
62 PAP s 0.000 0.3000E+05 293
63 RELP c 18 125
64 RETP s 0.000 0.9400E+05 491
65 SCH c 3 164
66 SCHG c 9 17498
67 SCHL c 24 470
68 SEMP s -6900. 0.2390E+06 590
69 SEX c 2 7
70 SSIP s 0.000 0.3000E+05 314
71 SSP s 0.000 0.5000E+05 831
72 WAGP s 0.000 0.3090E+06 2019
73 WKHP s 1.000 99.00 9503
74 WKL c 3 730
75 WKW c 6 9367
76 WRK c 2 1336
77 YOEP s 1926. 2017. 19649
78 ANC c 4
79 ANC1P c 147
80 ANC2P c 96
81 DECADE c 8 19599

82 DIS c 2 475
83 DRIVESP c 6 11010
84 ESP c 8 19331
85 ESR c 6 692
86 FOD1P c 161 16047
87 FOD2P c 92 19914
88 HICOV c 2 2000
89 HISP c 18 338
90 INDP c 257 7920
91 JWAP p 1.000 284.0 286 10674
92 JWDP p 1.000 150.0 151 11809
93 LANP c 48 19535
94 MIGPUMA c 88 17785
95 MIGSP c 58 17894
96 MSP c 6
97 NATIVITY c 2
98 NOP c 8 19331
99 OC c 2 1535
100 OCCP c 446 8032
101 PAOC c 4 10321
102 PERNP s -6900. 0.5480E+06 2485
103 PINCP s -6900. 0.8380E+06 3451
104 POBP c 139 894
105 POVPIP s 0.000 501.0 1366
106 POWPUMA c 64 10427
107 POWSP c 37 10986
108 PRIVCOV c 2 1847
109 PUBCOV c 2 1812
110 QTRBIR c 4
111 RAC1P c 8
112 RAC2P c 34
113 RAC3P c 48
114 RACAIAN c 2
115 RACASN c 2
116 RACBLK c 2
117 RACNH c 2
118 RACNUM c 4
119 RACPI c 2 94

120 RACSOR c 2
121 RACWHT c 2
122 RC c 2 1535
123 SCIENGP c 2 16050
124 SCIENGRLP c 2 16047
125 SFN c 2 19764
126 SFR c 6 19764
127 VPS c 14 18631
128 WAOB c 8
146 FFODP c 2
153 FHINS3C c 2 14787
155 FHINS4C c 2 16763
157 FHINS5C c 2 19196
178 FMILPP c 2

Total #cases w/ #missing
#cases miss. D ord. vals #X-var #N-var #F-var #S-var
24038 3800 23972 160 0 0 17
#P-var #M-var #B-var #C-var #I-var
2 0 0 104 0
Weight variable in column: 9
No. cases used for training: 20238
No. cases excluded due to 0 weight or missing D: 3800

Nodewise interaction tests on all variables
Pruning by v-fold cross-validation, with v = 10
Selected tree is based on mean of CV estimates
Number of SE's for pruned tree: .2000

Weighted error estimates used for pruning
Split values for N and S variables based on exhaustive search
Maximum number of split levels: 30
Minimum node sample size: 101
Size and CV MSE and SE of subtrees:
Tree #Tnodes Mean MSE SE(Mean) BSE(Mean) Median MSE BSE(Median)
1 110 1.558E+10 1.935E+09 2.206E+09 1.461E+10 2.563E+09
2 109 1.558E+10 1.935E+09 2.206E+09 1.461E+10 2.563E+09
3 106 1.558E+10 1.935E+09 2.206E+09 1.461E+10 2.563E+09

4	105	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
5	104	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
6	102	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
7	101	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
8	100	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
9	99	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
10	96	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
11	95	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
12	93	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
13	92	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
14	91	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
15	89	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
16	88	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
17	87	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
18	86	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
19	83	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
20	82	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
21	78	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
22	77	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
23	74	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
24	73	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
25	72	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
26	71	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
27	68	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
28	67	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
29	66	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
30	65	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
31	64	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
32	63	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
33	58	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
34	53	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
35	52	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
36	51	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
37	50	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
38	49	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
39*	48	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
40	47	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09
41	41	1.558E+10	1.935E+09	2.206E+09	1.461E+10	2.563E+09

42 40 1.558E+10 1.935E+09 2.206E+09 1.461E+10 2.564E+09
43 39 1.558E+10 1.935E+09 2.206E+09 1.461E+10 2.564E+09
44 38 1.558E+10 1.935E+09 2.206E+09 1.461E+10 2.564E+09
45 32 1.558E+10 1.935E+09 2.206E+09 1.461E+10 2.564E+09
46 31 1.558E+10 1.935E+09 2.206E+09 1.461E+10 2.563E+09
47 29 1.558E+10 1.935E+09 2.205E+09 1.461E+10 2.561E+09
48 26 1.558E+10 1.935E+09 2.205E+09 1.461E+10 2.561E+09
49 20 1.558E+10 1.935E+09 2.206E+09 1.460E+10 2.561E+09
50+ 16 1.559E+10 1.935E+09 2.207E+09 1.460E+10 2.560E+09
51 10 1.559E+10 1.935E+09 2.207E+09 1.461E+10 2.560E+09
52 9 1.559E+10 1.935E+09 2.207E+09 1.461E+10 2.560E+09
53 8 1.562E+10 1.944E+09 2.211E+09 1.463E+10 2.564E+09
54 7 1.561E+10 1.945E+09 2.214E+09 1.465E+10 2.571E+09
55 6 1.564E+10 1.953E+09 2.226E+09 1.468E+10 2.563E+09
56 5 1.566E+10 1.957E+09 2.225E+09 1.479E+10 2.569E+09
57 4 1.567E+10 1.958E+09 2.227E+09 1.479E+10 2.557E+09
58** 2 1.568E+10 1.958E+09 2.236E+09 1.494E+10 2.533E+09
59 1 1.922E+10 2.849E+09 3.395E+09 1.845E+10 3.574E+09

0-SE tree based on mean is marked with * and has 48 terminal nodes
0-SE tree based on median is marked with + and has 16 terminal nodes
Selected-SE tree based on mean using naive SE is marked with **
Selected-SE tree based on mean using bootstrap SE is marked with –
Selected-SE tree based on median and bootstrap SE is marked with ++
* tree same as ++ tree
* tree same as – tree
++ tree same as – tree

Following tree is based on mean CV with naive SE estimate (**).

Structure of final tree. Each terminal node is marked with a T.
D-mean is weighted mean of INTP in the node
Cases fit give the number of cases used to fit node
MSE is residual sum of squares divided by number of cases in node
Node Total Cases Matrix Node Node Split Interacting
label cases fit rank D-mean MSE variable variable
1 20238 20238 1 9.918E+02 1.922E+10 PINCP
2T 20057 20057 1 4.595E+02 4.180E+09 PINCP

3T 181 181 1 7.121E+04 1.264E+12 -

Number of terminal nodes of final tree: 2
Total number of nodes of final tree: 3
Second best split variable (based on curvature test) at root node is POVPIP

Regression tree:

Node 1: PINCP <= 289500.00 or NA
Node 2: INTP-mean = 459.46349
Node 1: PINCP > 289500.00
Node 3: INTP-mean = 71207.895

****
In the following the predictor node mean is weighted mean of complete cases.

WARNING: p-values below not adjusted for split search. For a bootstrap solution see:

1. Loh et al. (2016), "Identification of subgroups with differential treatment effects
for longitudinal and multiresponse variables", Statistics in Medicine, v.35, 4837-4855.

2. Loh et al. (2019), "Subgroups from regression trees with adjustment for prognosti
c effects and post-selection inference", Statistics in Medicine, v.38, 545-557.

Node 1: Intermediate node
A case goes into Node 2 if PINCP <= 289500.00 or NA
PINCP mean = 28459.311
Coefficients of least squares regression function:
Regressor Coefficient t-stat p-value
Constant 991.83 7.7927 0.0000
Mean of INTP = 991.828
———————————-

Node 2: Terminal node
Coefficients of least squares regression functions:
Regressor Coefficient t-stat p-value

Constant 459.46 7.7078 0.19873E-13
Mean of INTP = 459.463
———————————-

Node 3: Terminal node
Coefficients of least squares regression functions:
Regressor Coefficient t-stat p-value
Constant 71208. 6.6519 0.33564E-09
Mean of INTP = 71207.9
———————————-

Proportion of variance (R-squared) explained by tree model: 0.1995

Observed and fitted values are stored in regression.fit
LaTeX code for tree is in regression.tex
Split and fit variable names are stored in regression.var
Elapsed time in seconds: 646.38