Project 2 Final Version

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***Data cleaning***

options(scipen=999)  
  
data <- read.csv("https://raw.githubusercontent.com/anishkapeter/Stat-2-Project-2-/main/adult.data")  
  
# rename cols  
colnames(data) <- c("age", "workclass", "fnlwgt", "education", "education\_num",   
 "marital\_status", "occupation", "relationship", "race", "sex",   
 "capital\_gain", "capital\_loss", "hours\_per\_week", "native\_country", "income")  
  
#change ? data in workclass/occupation to UNKNOWN  
data$workclass <- ifelse(data$workclass == " ?", "UNKNOWN", data$workclass)  
data$occupation <- ifelse(data$occupation == " ?", "UNKNOWN", data$occupation)  
  
  
#Factoring Categoricals/Checking References  
data$workclass <- as.factor(data$workclass)  
levels(data$workclass)

## [1] " Federal-gov" " Local-gov" " Never-worked"   
## [4] " Private" " Self-emp-inc" " Self-emp-not-inc"  
## [7] " State-gov" " Without-pay" "UNKNOWN"

data$education <- as.factor(data$education)  
levels(data$education)

## [1] " 10th" " 11th" " 12th" " 1st-4th"   
## [5] " 5th-6th" " 7th-8th" " 9th" " Assoc-acdm"   
## [9] " Assoc-voc" " Bachelors" " Doctorate" " HS-grad"   
## [13] " Masters" " Preschool" " Prof-school" " Some-college"

data$marital\_status <- as.factor(data$marital\_status)  
levels(data$marital\_status)

## [1] " Divorced" " Married-AF-spouse" " Married-civ-spouse"   
## [4] " Married-spouse-absent" " Never-married" " Separated"   
## [7] " Widowed"

data$occupation <- as.factor(data$occupation)  
levels(data$occupation)

## [1] " Adm-clerical" " Armed-Forces" " Craft-repair"   
## [4] " Exec-managerial" " Farming-fishing" " Handlers-cleaners"  
## [7] " Machine-op-inspct" " Other-service" " Priv-house-serv"   
## [10] " Prof-specialty" " Protective-serv" " Sales"   
## [13] " Tech-support" " Transport-moving" "UNKNOWN"

data$relationship <- as.factor(data$relationship)  
levels(data$relationship)

## [1] " Husband" " Not-in-family" " Other-relative" " Own-child"   
## [5] " Unmarried" " Wife"

data$race <- as.factor(data$race)  
levels(data$race)

## [1] " Amer-Indian-Eskimo" " Asian-Pac-Islander" " Black"   
## [4] " Other" " White"

data$sex <- as.factor(data$sex)  
levels(data$sex)

## [1] " Female" " Male"

#Factor our response  
data$income <- as.factor(data$income)  
  
  
head(data)

## age workclass fnlwgt education education\_num marital\_status  
## 1 50 Self-emp-not-inc 83311 Bachelors 13 Married-civ-spouse  
## 2 38 Private 215646 HS-grad 9 Divorced  
## 3 53 Private 234721 11th 7 Married-civ-spouse  
## 4 28 Private 338409 Bachelors 13 Married-civ-spouse  
## 5 37 Private 284582 Masters 14 Married-civ-spouse  
## 6 49 Private 160187 9th 5 Married-spouse-absent  
## occupation relationship race sex capital\_gain capital\_loss  
## 1 Exec-managerial Husband White Male 0 0  
## 2 Handlers-cleaners Not-in-family White Male 0 0  
## 3 Handlers-cleaners Husband Black Male 0 0  
## 4 Prof-specialty Wife Black Female 0 0  
## 5 Exec-managerial Wife White Female 0 0  
## 6 Other-service Not-in-family Black Female 0 0  
## hours\_per\_week native\_country income  
## 1 13 United-States <=50K  
## 2 40 United-States <=50K  
## 3 40 United-States <=50K  
## 4 40 Cuba <=50K  
## 5 40 United-States <=50K  
## 6 16 Jamaica <=50K

# Display sum of "UNKNOWN" or " ?" in each variable  
cat\_vars <- c("age", "workclass", "fnlwgt", "education", "education\_num",   
 "marital\_status", "occupation", "relationship", "race", "sex",   
 "capital\_gain", "capital\_loss", "hours\_per\_week", "native\_country", "income")  
  
for (var in cat\_vars) {  
 unknown\_count <- sum(data[[var]] %in% c("UNKNOWN", " ?", "NA"))  
   
 cat(paste("Unknown count for", var, ":", unknown\_count, "\n"))  
 cat("----------------------------\n")  
}

## Unknown count for age : 0   
## ----------------------------  
## Unknown count for workclass : 1836   
## ----------------------------  
## Unknown count for fnlwgt : 0   
## ----------------------------  
## Unknown count for education : 0   
## ----------------------------  
## Unknown count for education\_num : 0   
## ----------------------------  
## Unknown count for marital\_status : 0   
## ----------------------------  
## Unknown count for occupation : 1843   
## ----------------------------  
## Unknown count for relationship : 0   
## ----------------------------  
## Unknown count for race : 0   
## ----------------------------  
## Unknown count for sex : 0   
## ----------------------------  
## Unknown count for capital\_gain : 0   
## ----------------------------  
## Unknown count for capital\_loss : 0   
## ----------------------------  
## Unknown count for hours\_per\_week : 0   
## ----------------------------  
## Unknown count for native\_country : 583   
## ----------------------------  
## Unknown count for income : 0   
## ----------------------------

GENERAL KEY FOR VARIABLES:

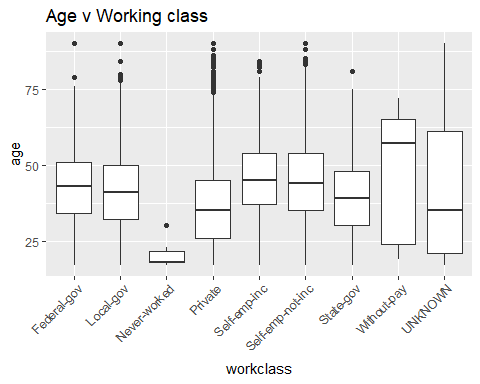
age: continuous. workclass: Private, Self-emp-not-inc, Self-emp-inc, Federal-gov, Local-gov, State-gov, Without-pay, Never-worked. fnlwgt: continuous. education: Bachelors, Some-college, 11th, HS-grad, Prof-school, Assoc-acdm, Assoc-voc, 9th, 7th-8th, 12th, Masters, 1st-4th, 10th, Doctorate, 5th-6th, Preschool. education\_num: continuous. marital\_status: Married-civ-spouse, Divorced, Never-married, Separated, Widowed, Married-spouse-absent, Married-AF-spouse. occupation: Tech-support, Craft-repair, Other-service, Sales, Exec-managerial, Prof-specialty, Handlers-cleaners, Machine-op-inspct, Adm-clerical, Farming-fishing, Transport-moving, Priv-house-serv, Protective-serv, Armed-Forces. relationship: Wife, Own-child, Husband, Not-in-family, Other-relative, Unmarried. race: White, Asian-Pac-Islander, Amer-Indian-Eskimo, Other, Black. sex: Female, Male. capital\_gain: continuous. capital\_loss: continuous. hours\_per\_week: continuous. native\_country: United-States, Cambodia, England, Puerto-Rico, Canada, Germany, Outlying-US(Guam-USVI-etc), India, Japan, Greece, South, China, Cuba, Iran, Honduras, Philippines, Italy, Poland, Jamaica, Vietnam, Mexico, Portugal, Ireland, France, Dominican-Republic, Laos, Ecuador, Taiwan, Haiti, Columbia, Hungary, Guatemala, Nicaragua, Scotland, Thailand, Yugoslavia, El-Salvador, Trinadad&Tobago, Peru, Hong, Holand-Netherlands. income: >50K, <=50K

***Objective 1 : EDA and Logistic Regression Model***

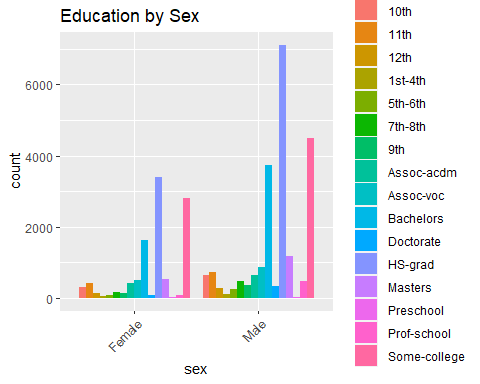
library(ggplot2)

## Warning: package 'ggplot2' was built under R version 4.1.3

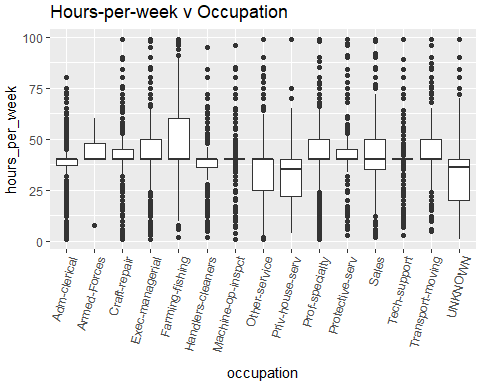
## General brief look at some of our variables  
  
# Age v Working class  
ggplot(data, aes(x = workclass, y = age)) +  
 geom\_boxplot() +  
 theme(axis.text.x = element\_text(angle = 45, hjust = 1)) + ggtitle("Age v Working class")



# Education by sex - Bar plot  
ggplot(data, aes(x = sex, fill = education)) +  
 geom\_bar(position = "dodge") +  
 theme(axis.text.x = element\_text(angle = 45, hjust = 1)) +  
 ggtitle("Education by Sex")



#hours-per-week by occupation  
ggplot(data, aes(x = occupation, y = hours\_per\_week)) +  
 geom\_boxplot() +  
 theme(axis.text.x = element\_text(angle = 75, hjust = 1),  
 plot.margin = margin(.1, .1, .1, .1, "cm"))+ ggtitle("Hours-per-week v Occupation")

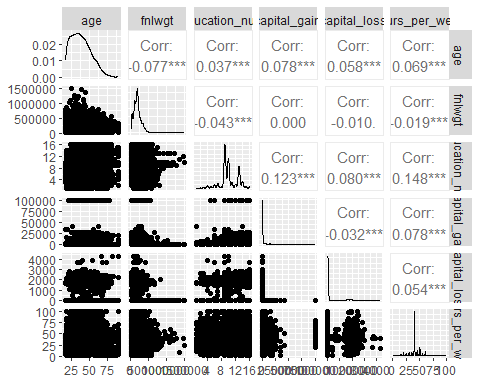


#High Cardinality of variables is leading to unreadable plots.   
library(GGally)

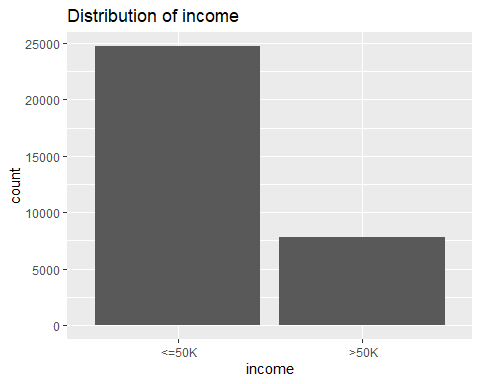
## Warning: package 'GGally' was built under R version 4.1.3

## Registered S3 method overwritten by 'GGally':  
## method from   
## +.gg ggplot2

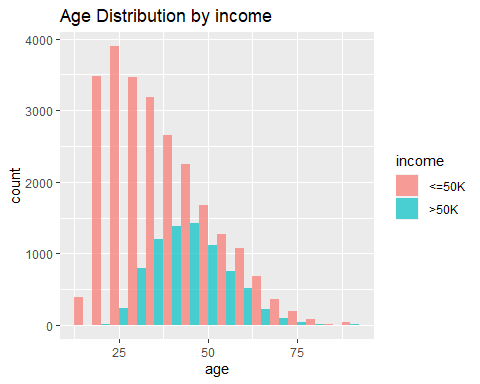
#ggpairs of numeric variables only  
ggpairs(data[, sapply(data, is.numeric)])



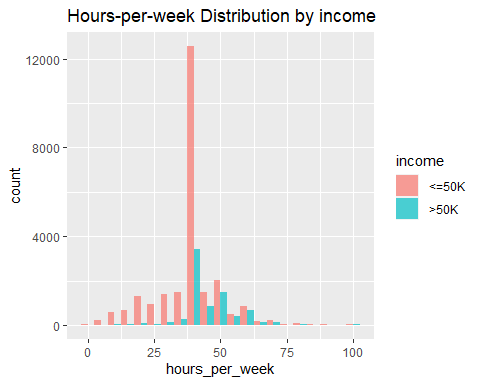
## Response EDA (income)  
  
library(ggplot2)  
  
#income distribution  
ggplot(data, aes(x = income)) +  
 geom\_bar() +  
 labs(title = "Distribution of income")



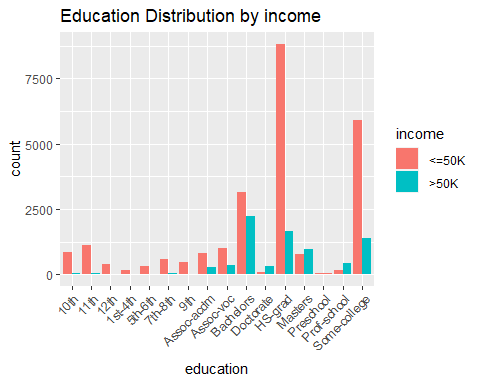
#numeric feature dist. by income  
ggplot(data, aes(x = age, fill = income)) +  
 geom\_histogram(binwidth = 5, position = "dodge", alpha = 0.7) +  
 labs(title = "Age Distribution by income")



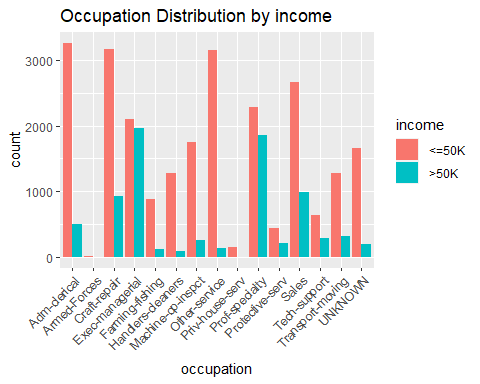
ggplot(data, aes(x = hours\_per\_week, fill = income)) +  
 geom\_histogram(binwidth = 5, position = "dodge", alpha = 0.7) +  
 labs(title = "Hours-per-week Distribution by income")



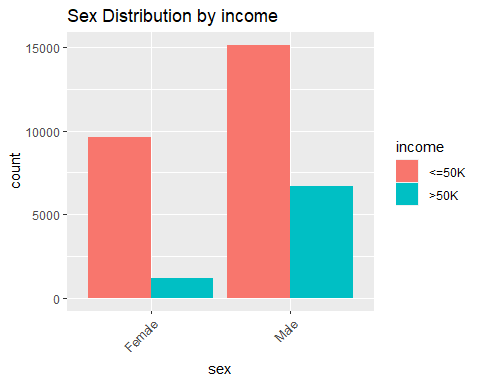
#Categorical feature distributions by income  
ggplot(data, aes(x = education, fill = income)) +  
 geom\_bar(position = "dodge") +  
 theme(axis.text.x = element\_text(angle = 45, hjust = 1)) +  
 labs(title = "Education Distribution by income")



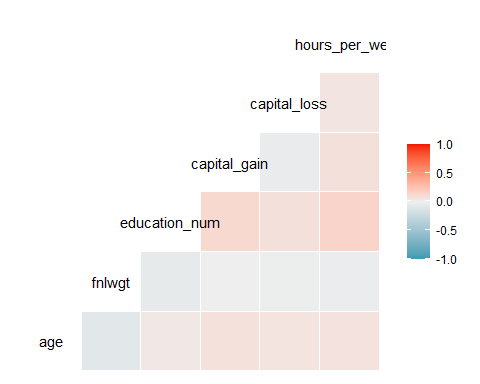
#Occupation v income  
ggplot(data, aes(x = occupation, fill = income)) +  
 geom\_bar(position = "dodge") +  
 theme(axis.text.x = element\_text(angle = 45, hjust = 1)) +  
 labs(title = "Occupation Distribution by income")



#Sex v Income  
ggplot(data, aes(x = sex, fill = income)) +  
 geom\_bar(position = "dodge") +  
 theme(axis.text.x = element\_text(angle = 45, hjust = 1)) +  
 labs(title = "Sex Distribution by income")



#Corr. with numeric features  
numeric\_columns <- c("age", "fnlwgt", "education\_num", "capital\_gain", "capital\_loss", "hours\_per\_week")  
  
# Filter the data to include only the specified numeric columns  
numeric\_data <- data[complete.cases(data[, numeric\_columns]), numeric\_columns]  
  
# Calculate the correlation matrix  
correlation\_matrix <- cor(numeric\_data)  
ggcorr(numeric\_data)



correlation\_matrix

## age fnlwgt education\_num capital\_gain  
## age 1.00000000 -0.0766461986 0.03652684 0.0776743857  
## fnlwgt -0.07664620 1.0000000000 -0.04315917 0.0004367429  
## education\_num 0.03652684 -0.0431591683 1.00000000 0.1226274073  
## capital\_gain 0.07767439 0.0004367429 0.12262741 1.0000000000  
## capital\_loss 0.05777479 -0.0102589747 0.07993215 -0.0316141086  
## hours\_per\_week 0.06875574 -0.0187699744 0.14812690 0.0784088050  
## capital\_loss hours\_per\_week  
## age 0.05777479 0.06875574  
## fnlwgt -0.01025897 -0.01876997  
## education\_num 0.07993215 0.14812690  
## capital\_gain -0.03161411 0.07840880  
## capital\_loss 1.00000000 0.05425617  
## hours\_per\_week 0.05425617 1.00000000

# Create a LOESS plot  
ggplot(data, aes(x = capital\_gain, y = income)) +  
 geom\_smooth(method = "loess", se = FALSE) +  
 geom\_line(aes(color = income)) +  
 labs(title = "LOESS Plot", x = "capital\_gain", y = "income")

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : at -206.55

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : radius 42663

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : all data on boundary of neighborhood. make span bigger

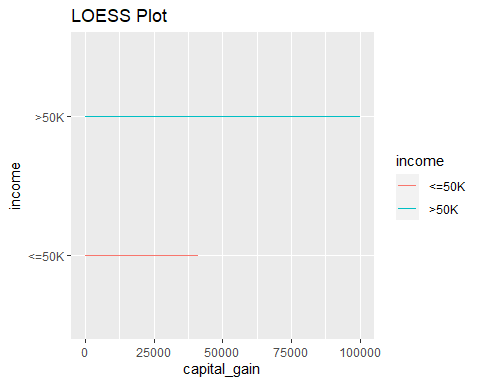
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : pseudoinverse used at -206.55

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : neighborhood radius 206.55

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : reciprocal condition number 1

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : zero-width neighborhood. make span bigger

## Warning: Computation failed in `stat\_smooth()`  
## Caused by error in `predLoess()`:  
## ! NA/NaN/Inf in foreign function call (arg 5)



ggplot(data, aes(x = capital\_loss, y = income)) +  
 geom\_smooth(method = "loess", se = FALSE) +  
 geom\_line(aes(color = income)) +  
 labs(title = "LOESS Plot", x = "capital\_loss", y = "income")

## `geom\_smooth()` using formula = 'y ~ x'

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : at -21.78

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : radius 474.37

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : all data on boundary of neighborhood. make span bigger

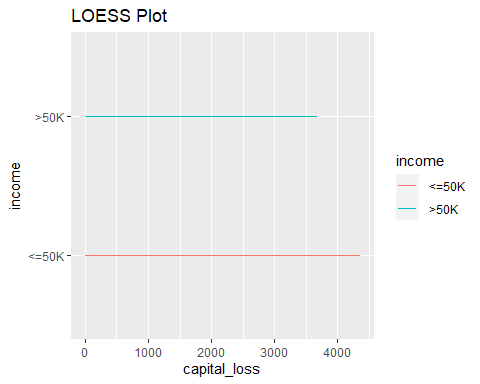
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : pseudoinverse used at -21.78

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : neighborhood radius 21.78

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : reciprocal condition number 1

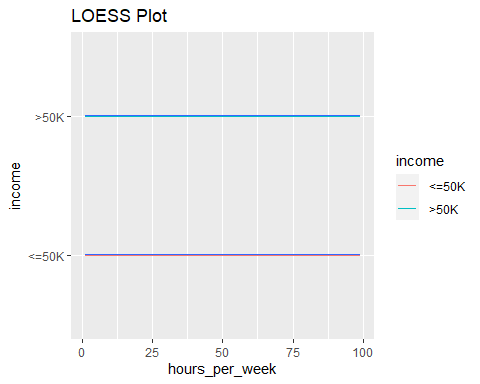
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  
## : zero-width neighborhood. make span bigger

## Warning: Computation failed in `stat\_smooth()`  
## Caused by error in `predLoess()`:  
## ! NA/NaN/Inf in foreign function call (arg 5)



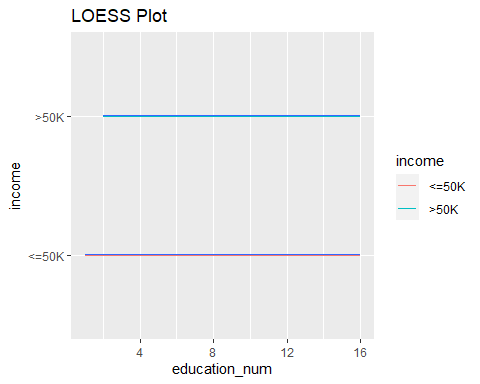
ggplot(data, aes(x = hours\_per\_week, y = income)) +  
 geom\_smooth(method = "loess", se = FALSE) +  
 geom\_line(aes(color = income)) +  
 labs(title = "LOESS Plot", x = "hours\_per\_week", y = "income")

## `geom\_smooth()` using formula = 'y ~ x'



ggplot(data, aes(x = education\_num, y = income)) +  
 geom\_smooth(method = "loess", se = FALSE) +  
 geom\_line(aes(color = income)) +  
 labs(title = "LOESS Plot", x = "education\_num", y = "income")

## `geom\_smooth()` using formula = 'y ~ x'



3 ***NUMERIC FEATURE SELECTION*** Here, LASSO is used against the numeric predictors to find the most applicable predictors for our future model. The first output here seems to suggest that all variables should be included in the model based on the LASSO regularization with the specified lambda value. The cvfit’s lambda min is extremely low which may suggest that we want to use a larger lambda value. Doing this will strengthen the regularization and drive coefficients to 0 a bit more aggressively.

With a specified lambda value of 0.09 (more aggressive, lambda selected as .08 excludes too much and .1 includes too little), we see the model reduce our numeric predictors to age, educational\_num, and capital\_gain. We can see some correlation between these specific variables in the prior correlation matrix and ggcorr plot as well, which may indicate strong relationships. Domain knowledge here makes sense with these findings too. Age, education, and capital gains are all very strong indicators of relative income. Excluding the final weight, capital loss, and hours per week

#numeric feature selection (LASSO Regularization)  
library(glmnet)

## Warning: package 'glmnet' was built under R version 4.1.3

## Loading required package: Matrix

## Warning: package 'Matrix' was built under R version 4.1.3

## Loaded glmnet 4.1-7

set.seed(123)  
  
#Nab the numeric predictors  
predictor\_variables <- c("age", "fnlwgt", "education\_num", "capital\_gain", "capital\_loss", "hours\_per\_week")  
  
# Subset the data to include only the predictor variables  
x <- as.matrix(data[, predictor\_variables])  
y <- as.factor(data$income)  
  
# Fit LASSO logistic regression model  
cvfit <- cv.glmnet(x, y, family = "binomial", alpha = 1)  
  
# Extract selected features and their coefficients  
selected\_features <- which(coef(cvfit, s = cvfit$lambda.min) != 0)  
selected\_coef <- coef(cvfit, s = cvfit$lambda.min)[selected\_features, "s1"]  
  
# Create a list of selected features and coefficients  
selected\_list <- data.frame(  
 Variable = predictor\_variables[selected\_features],  
 Coefficient = selected\_coef  
)  
#Give the list of selected predictors  
selected\_list

## Variable Coefficient  
## (Intercept) age -8.3732058169162  
## age fnlwgt 0.0429568432535  
## fnlwgt education\_num 0.0000005266779  
## education\_num capital\_gain 0.3207735279183  
## capital\_gain capital\_loss 0.0003075669362  
## capital\_loss hours\_per\_week 0.0006909640698  
## hours\_per\_week <NA> 0.0404754939578

#Min lambda check  
cvfit$lambda.min

## [1] 0.0004916441

#Take 2 with more regularization:  
specified\_lambda <- 0.09 #Adjustable lambda amount  
# Fit LASSO logistic regression model  
fit <- glmnet(x, y, family = "binomial", alpha = 1, lambda = specified\_lambda)  
  
# Extract selected features and their coefficients  
selected\_features <- which(coef(fit) != 0)  
selected\_coef <- coef(fit)[selected\_features]  
  
# Create a list of selected features and coefficients  
selected\_list <- data.frame(  
 Variable = predictor\_variables[selected\_features],  
 Coefficient = selected\_coef  
)  
  
selected\_list

## Variable Coefficient  
## 1 age -2.463548888  
## 2 fnlwgt 0.002956614  
## 3 capital\_gain 0.116818028

***CATEGORICAL FEATURE SELECTION*** Lasso again is used for our categorical feature selection. We are using dummy encoding to force these predictors into binary categories to allow for our feature selection to capture the impact of each category separately. This allows us to shrink coefficients associated with less significance on our predictions towards zero in subsets as opposed to the entire category itself. We can see from our output below that feature selection, from a very broad sense, took work\_class and education as our two main predictors of importance. As these are one-hot encoded, they are broken down even further to their specific levels which we can choose to include separately or not in our final model.

#categorical feature selection (LASSO Reg. with one-hot encoding/dummy encoding)  
library(glmnet)  
  
predictor\_variables <- c("workclass", "education", "marital\_status", "occupation", "relationship", "race", "sex", "native\_country")  
  
# Subset the data to include only the predictor variables  
x <- model.matrix(~ . - 1, data = data[, c(predictor\_variables)]) # -1 removes the intercept column  
y <- as.factor(data$income)  
  
specified\_lambda <- 0.05 #change penalty level  
  
# Fit the LASSO LRM with the specified lambda  
fit <- glmnet(x, y, family = "binomial", alpha = 1, lambda = specified\_lambda)  
  
# Extract selected features and their coefficients  
selected\_features <- which(coef(fit) != 0)  
selected\_coef <- coef(fit)[selected\_features]  
  
# Create a list of selected features and coefficients  
selected\_list <- data.frame(  
 Variable = colnames(x)[selected\_features],  
 Coefficient = selected\_coef  
)  
  
selected\_list

## Variable Coefficient  
## 1 workclass Federal-gov -2.21849599  
## 2 education Doctorate 0.18919182  
## 3 education Preschool 0.21153570  
## 4 education Some-college 0.06447534  
## 5 marital\_status Married-spouse-absent 1.59618912  
## 6 occupation Farming-fishing 0.45023763  
## 7 occupation Protective-serv 0.39665478

***Build the Model***

From our prior EDA, out of the 14 total predictors (excluding response), we can move forward with building a model from a subset of predictors that will include: 1. workclass (categorical) 2. education (categorical) 3. occupation (categorical) 4. marital\_status (categorical) 5. age (numeric) 6. fnlwgt (numeric) 7. capital\_gain (numeric)

We also would like to use domain knowledge and conversations among our group to include the following predictor:

1. sex (categorical)

#Building the LMR  
set.seed(123)  
#Holder for easy change of predictors given further EDA...  
selected\_predictors <- c("workclass", "education", "age", "fnlwgt", "capital\_gain", "occupation", "sex", "marital\_status")  
  
#subset of the data with the selected predictors  
subset\_data <- data[, c(selected\_predictors, "income")]  
  
#logistic regression model fit  
fit <- glm(income ~ ., data = subset\_data, family = "binomial")

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

summary(fit)

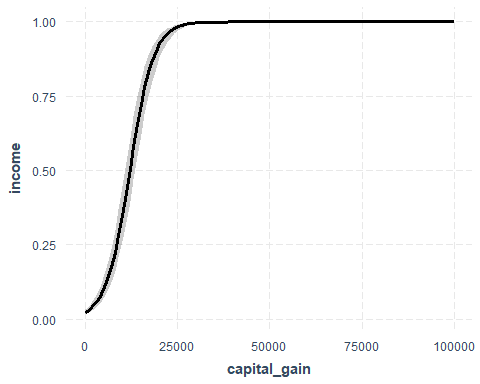
##   
## Call:  
## glm(formula = income ~ ., family = "binomial", data = subset\_data)  
##   
## Deviance Residuals:   
## Min 1Q Median 3Q Max   
## -5.0604 -0.5205 -0.2221 -0.0603 3.5750   
##   
## Coefficients: (1 not defined because of singularities)  
## Estimate Std. Error z value  
## (Intercept) -4.7333626790 0.2062021397 -22.955  
## workclass Local-gov -0.6774384667 0.1090158421 -6.214  
## workclass Never-worked -10.6191904635 178.8814500628 -0.059  
## workclass Private -0.4913452659 0.0906144660 -5.422  
## workclass Self-emp-inc -0.1426349418 0.1195665368 -1.193  
## workclass Self-emp-not-inc -0.9060601951 0.1062465311 -8.528  
## workclass State-gov -0.8923160130 0.1216645502 -7.334  
## workclass Without-pay -12.5193726355 120.4712087435 -0.104  
## workclassUNKNOWN -1.3836695325 0.1364912993 -10.137  
## education 11th 0.0169030962 0.2079068156 0.081  
## education 12th 0.4108210384 0.2602187770 1.579  
## education 1st-4th -0.8189610456 0.4639242844 -1.765  
## education 5th-6th -0.4115936753 0.3066105626 -1.342  
## education 7th-8th -0.5061112541 0.2279975998 -2.220  
## education 9th -0.3198204497 0.2584493196 -1.237  
## education Assoc-acdm 1.4123357347 0.1730023070 8.164  
## education Assoc-voc 1.3622407949 0.1665911635 8.177  
## education Bachelors 1.9942253978 0.1549360263 12.871  
## education Doctorate 3.1924982549 0.2104380146 15.171  
## education HS-grad 0.8418540372 0.1511844074 5.568  
## education Masters 2.3830532778 0.1648631153 14.455  
## education Preschool -24.3622938709 802.7683652734 -0.030  
## education Prof-school 2.9680617218 0.1970981260 15.059  
## education Some-college 1.1769085547 0.1532898113 7.678  
## age 0.0224666827 0.0015558669 14.440  
## fnlwgt 0.0000005155 0.0000001643 3.137  
## capital\_gain 0.0003116742 0.0000101039 30.847  
## occupation Armed-Forces -0.8260830741 1.2987173774 -0.636  
## occupation Craft-repair 0.0813385502 0.0769673805 1.057  
## occupation Exec-managerial 0.8970547166 0.0736210327 12.185  
## occupation Farming-fishing -0.7431489103 0.1342629245 -5.535  
## occupation Handlers-cleaners -0.7711916406 0.1395545926 -5.526  
## occupation Machine-op-inspct -0.3101141181 0.0989609742 -3.134  
## occupation Other-service -0.8997053323 0.1139344679 -7.897  
## occupation Priv-house-serv -4.0655093516 1.7679689055 -2.300  
## occupation Prof-specialty 0.5620149058 0.0778619980 7.218  
## occupation Protective-serv 0.6147847889 0.1221119553 5.035  
## occupation Sales 0.3468470268 0.0787674346 4.403  
## occupation Tech-support 0.6337456269 0.1071442153 5.915  
## occupation Transport-moving -0.0058541341 0.0958971176 -0.061  
## occupationUNKNOWN NA NA NA  
## sex Male 0.2677340420 0.0504789365 5.304  
## marital\_status Married-AF-spouse 2.8349516002 0.4721250792 6.005  
## marital\_status Married-civ-spouse 2.0955005976 0.0650866261 32.196  
## marital\_status Married-spouse-absent -0.1048037495 0.2210862450 -0.474  
## marital\_status Never-married -0.6193645332 0.0808765611 -7.658  
## marital\_status Separated -0.2204084911 0.1585590468 -1.390  
## marital\_status Widowed -0.1437255636 0.1476001739 -0.974  
## Pr(>|z|)   
## (Intercept) < 0.0000000000000002 \*\*\*  
## workclass Local-gov 0.000000000516102347 \*\*\*  
## workclass Never-worked 0.95266   
## workclass Private 0.000000058813607744 \*\*\*  
## workclass Self-emp-inc 0.23290   
## workclass Self-emp-not-inc < 0.0000000000000002 \*\*\*  
## workclass State-gov 0.000000000000222997 \*\*\*  
## workclass Without-pay 0.91723   
## workclassUNKNOWN < 0.0000000000000002 \*\*\*  
## education 11th 0.93520   
## education 12th 0.11439   
## education 1st-4th 0.07751 .   
## education 5th-6th 0.17947   
## education 7th-8th 0.02643 \*   
## education 9th 0.21592   
## education Assoc-acdm 0.000000000000000325 \*\*\*  
## education Assoc-voc 0.000000000000000291 \*\*\*  
## education Bachelors < 0.0000000000000002 \*\*\*  
## education Doctorate < 0.0000000000000002 \*\*\*  
## education HS-grad 0.000000025710097676 \*\*\*  
## education Masters < 0.0000000000000002 \*\*\*  
## education Preschool 0.97579   
## education Prof-school < 0.0000000000000002 \*\*\*  
## education Some-college 0.000000000000016201 \*\*\*  
## age < 0.0000000000000002 \*\*\*  
## fnlwgt 0.00171 \*\*   
## capital\_gain < 0.0000000000000002 \*\*\*  
## occupation Armed-Forces 0.52473   
## occupation Craft-repair 0.29061   
## occupation Exec-managerial < 0.0000000000000002 \*\*\*  
## occupation Farming-fishing 0.000000031118043945 \*\*\*  
## occupation Handlers-cleaners 0.000000032744082691 \*\*\*  
## occupation Machine-op-inspct 0.00173 \*\*   
## occupation Other-service 0.000000000000002864 \*\*\*  
## occupation Priv-house-serv 0.02147 \*   
## occupation Prof-specialty 0.000000000000527228 \*\*\*  
## occupation Protective-serv 0.000000478848913286 \*\*\*  
## occupation Sales 0.000010655178713366 \*\*\*  
## occupation Tech-support 0.000000003321091422 \*\*\*  
## occupation Transport-moving 0.95132   
## occupationUNKNOWN NA   
## sex Male 0.000000113369060723 \*\*\*  
## marital\_status Married-AF-spouse 0.000000001917307004 \*\*\*  
## marital\_status Married-civ-spouse < 0.0000000000000002 \*\*\*  
## marital\_status Married-spouse-absent 0.63547   
## marital\_status Never-married 0.000000000000018864 \*\*\*  
## marital\_status Separated 0.16451   
## marital\_status Widowed 0.33018   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## (Dispersion parameter for binomial family taken to be 1)  
##   
## Null deviance: 35948 on 32559 degrees of freedom  
## Residual deviance: 21660 on 32513 degrees of freedom  
## AIC: 21754  
##   
## Number of Fisher Scoring iterations: 12

#Odds ratios for effect size interpretation  
coefficients <- coef(fit)  
odds\_ratios <- exp(coefficients)  
odds\_ratios

## (Intercept) workclass Local-gov   
## 0.00879684029818223 0.50791637215299612   
## workclass Never-worked workclass Private   
## 0.00002444241870513 0.61180280288279298   
## workclass Self-emp-inc workclass Self-emp-not-inc   
## 0.86707054236844971 0.40411321905624659   
## workclass State-gov workclass Without-pay   
## 0.40970576919025536 0.00000365515288903   
## workclassUNKNOWN education 11th   
## 0.25065706913001007 1.01704676181809517   
## education 12th education 1st-4th   
## 1.50805544841259143 0.44088948067999267   
## education 5th-6th education 7th-8th   
## 0.66259344943870047 0.60283529989838136   
## education 9th education Assoc-acdm   
## 0.72627942904787046 4.10553365083841015   
## education Assoc-voc education Bachelors   
## 3.90493366107116380 7.34651020003821031   
## education Doctorate education HS-grad   
## 24.34918198416968593 2.32066559089891555   
## education Masters education Preschool   
## 10.83794364981566716 0.00000000002627787   
## education Prof-school education Some-college   
## 19.45417542412271317 3.24432901819755415   
## age fnlwgt   
## 1.02272095926977413 1.00000051547845881   
## capital\_gain occupation Armed-Forces   
## 1.00031172281503755 0.43776060843900821   
## occupation Craft-repair occupation Exec-managerial   
## 1.08473807274891421 2.45236954073660085   
## occupation Farming-fishing occupation Handlers-cleaners   
## 0.47561388956646133 0.46246165176950393   
## occupation Machine-op-inspct occupation Other-service   
## 0.73336326141101582 0.40668948035776653   
## occupation Priv-house-serv occupation Prof-specialty   
## 0.01715424950316647 1.75420349661897856   
## occupation Protective-serv occupation Sales   
## 1.84925857570097341 1.41460031294077004   
## occupation Tech-support occupation Transport-moving   
## 1.88465659561642096 0.99416296795470249   
## occupationUNKNOWN sex Male   
## NA 1.30699948678651889   
## marital\_status Married-AF-spouse marital\_status Married-civ-spouse   
## 17.02957605170630373 8.12950956499324207   
## marital\_status Married-spouse-absent marital\_status Never-married   
## 0.90050122903050678 0.53828639205537043   
## marital\_status Separated marital\_status Widowed   
## 0.80219104312446321 0.86612541175771174

library(jtools)  
effect\_plot(fit, pred = capital\_gain, interval = TRUE, plot.points = FALSE, jitter = 0.01)

## Warning in predict.lm(object, newdata, se.fit, scale = residual.scale, type =  
## if (type == : prediction from a rank-deficient fit may be misleading



library(ResourceSelection)

## ResourceSelection 0.3-6 2023-06-27

hoslem.test(fit$y, fitted(fit), g=10)

##   
## Hosmer and Lemeshow goodness of fit (GOF) test  
##   
## data: fit$y, fitted(fit)  
## X-squared = 41.902, df = 8, p-value = 0.000001413

***Interpretation*** For interpretation, we will be focusing on a few groups in each predictor variable with the most statistical significance, magnitude of coefficients, effect sizes significantly above or below 1, and areas of interest for domain knowledge. Interpretation of statistical significance, as well as practical significance will be taken into account.

**Interpretations:**

*EDUCATION* -Bachelors Odds Ratio: 7.34 Interpretation: Individuals with a Bachelor’s education are estimated to have 7.34 times higher odds of making over $50K compared to those with a 10th grade education. This decent increase in odds displays the practical value of obtaining a Bachelor’s degree, signifying a meaningful impact on income levels.

-Professional School (Prof-School) Odds Ratio: 19.45 Interpretation: Individuals with a Professional School education are estimated to have 19.45 times higher odds of making over $50K compared to those with a 10th grade education. The odds ratio suggests a decent practical advantage for individuals with a Professional School education, indicating a correlation between this level of education and higher income.

-Masters Odds Ratio: 10.83 Interpretation: Individuals with a Master’s education are estimated to have 10.83 times higher odds of making over $50K compared to those with a 10th grade education. This significant increase in odds emphasizes the practical benefits of obtaining a Master’s degree, showcasing a positive impact on earning potential overall.

-Doctorate Odds Ratio: 24.35 Individuals with a Doctorate education are estimated to have 24.35 times higher odds of making over $50K compared to those with a 10th grade education. This substantial increase in odds suggests that pursuing a Doctorate education significantly contributes to the likelihood of achieving a higher income, indicating a practical advantage for individuals with this level of education.

Generally, we can see almost a direct correlation to each step of education returning a net increase, from 3.22, 7.30, 15.03, and finally 24.24 increased odds of making over $50,000 respectively. Practically, we can see positive increase in predicted earning odds as education increases.

*WORK CLASS*

-Self employed incorporated (Self-emp-inc) Odds Ratio: 0.86 Interpretation: Individuals in the Self-employed, incorporated category are estimated to have 0.86 times higher odds of making over $50K compared to those in working in the Federal government work class reference category. This suggests that choosing a self-employed, incorporated career path is associated with a practical advantage in achieving a higher income, potentially due to entrepreneurial opportunities and financial independence.

-Private Odds Ratio: 0.61 Interpretation: Individuals in the Private work class are estimated to have 0.61 times higher odds of making over $50K compared to those in working in the Federal government work class reference category. While the odds ratio is slightly lower than other categories, it still indicates a practical advantage for individuals in the private sector, reflecting the economic benefits associated with private employment.

*AGE* -Age Odds Ratio: 1.02 Interpretation: For each year increase in age, the odds of making over $50k are estimated to increase by a factor of 1.02. This implies that with each passing year, individuals experience a gradual but consistent improvement in the odds of achieving a higher income.

*SEX*

-Male Odds Ratio: 1.30 Interpretation: Men are estimated to have 1.30 times higher odds of making over $50k compared to females. This gender difference in income odds is a practical consideration, reflecting existing disparities and suggesting potential areas for addressing gender-based income gaps.

*MARITAL STATUS*

-Married-AF-spouse Odds Ratio: 17.02 Individuals married to a spouse in the armed forces are estimated to have 17.02 times higher odds of making over $50K compared to those who are divorced. The substantial odds ratio here may predict that those with military support have a much higher chance of making a steady income over $50k compared to those who are divorced.

-Married-civ-spouse Odds Ratio: 8.12 Individuals married to a civilian spouse are estimated to have 8.12 times higher odds of making over $50K compared to those who are divorced. The practical take here is that shared finances and stability associated with a married life may offer better chances of being over $50k than if divorced.

-Never-married Odds Ratio: 0.54 Individuals with the marital status “Never-married” are estimated to have 0.54 times the odds of making over $50K compared to those who are divorced. The odds ratio of 0.54 indicates a lower likelihood of achieving a higher income for individuals who are never-married. This might be influenced by various factors, such as career focus or economic independence.

***Objective 2***

**MORE EDA**

library(dplyr)

## Warning: package 'dplyr' was built under R version 4.1.3

##   
## Attaching package: 'dplyr'

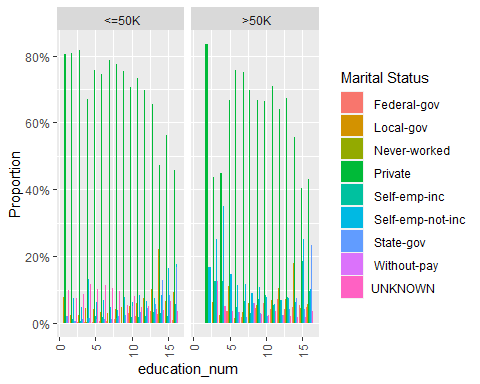
## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

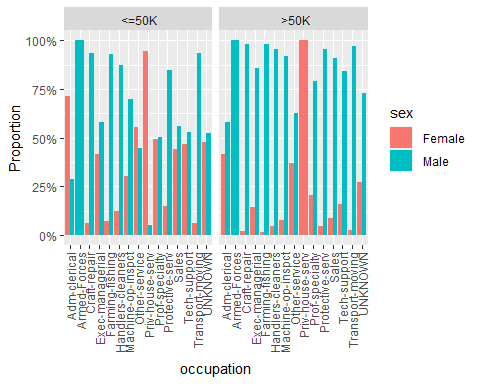
library(patchwork)

## Warning: package 'patchwork' was built under R version 4.1.3

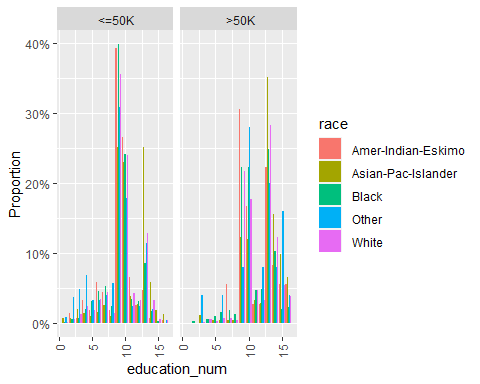
#Interaction1 : age : sex  
  
data\_proportions <- data %>%  
 group\_by(income, `age`) %>%  
 count(`sex`) %>%  
 mutate(proportion = n / sum(n)) %>%  
 ungroup()  
  
# Now, plot the proportions using ggplot2  
g1=ggplot(data\_proportions, aes(x = `age`, y = proportion, fill = `sex`)) +  
 geom\_bar(stat = "identity", position = "dodge") +  
 facet\_grid(~ income) +  
 scale\_y\_continuous(labels = scales::percent\_format()) +  
 theme(axis.text.x = element\_text(angle = 90, vjust = 0.5, hjust=1),legend.position = "none") +  
 labs(y = "Proportion", fill = "Sex")  
  
#Interaction2 work class :education\_num  
  
data\_proportions <- data %>%  
 group\_by(income, `education\_num`) %>%  
 count(`workclass`) %>%  
 mutate(proportion = n / sum(n)) %>%  
 ungroup()  
  
  
ggplot(data\_proportions, aes(x = `education\_num`, y = proportion, fill = `workclass`)) +  
 geom\_bar(stat = "identity", position = "dodge") +  
 facet\_grid(~ income) +  
 scale\_y\_continuous(labels = scales::percent\_format()) +  
 theme(axis.text.x = element\_text(angle = 90, vjust = 0.5, hjust=1)) +  
 labs(y = "Proportion", fill = "Marital Status")



#Interaction3 sex:education  
  
data\_proportions <- data %>%  
 group\_by(income, `education`) %>%  
 count(`sex`) %>%  
 mutate(proportion = n / sum(n)) %>%  
 ungroup()  
  
  
g2=ggplot(data\_proportions, aes(x = `education`, y = proportion, fill = `sex`)) +  
 geom\_bar(stat = "identity", position = "dodge") +  
 facet\_grid(~ income) +  
 scale\_y\_continuous(labels = scales::percent\_format()) +  
 theme(axis.text.x = element\_text(angle = 90, vjust = 0.5, hjust=1)) +  
 labs(y = "Proportion", fill = "sex")  
  
#There appears to be a difference in the proportion of males and females within each education level for both income brackets (<=50K and >50K). This could indicate that the effect of education on income may be different for males and females.  
  
  
  
  
  
#Interaction4 sex: occupation (not strong)  
  
data\_proportions <- data %>%  
 group\_by(income, `occupation`) %>%  
 count(`sex`) %>%  
 mutate(proportion = n / sum(n)) %>%  
 ungroup()  
  
  
 ggplot(data\_proportions, aes(x = `occupation`, y = proportion, fill = `sex`)) +  
 geom\_bar(stat = "identity", position = "dodge") +  
 facet\_grid(~ income) +  
 scale\_y\_continuous(labels = scales::percent\_format()) +  
 theme(axis.text.x = element\_text(angle = 90, vjust = 0.5, hjust=1)) +  
 labs(y = "Proportion", fill = "sex")



#There is a visible disparity in the proportion of males and females within certain occupations for both income brackets. This could indicate that the effect of occupation on income may be modulated by sex.  
  
#other interactions:  
#marital\_status :occupation  
#relationship: occupation  
#relationship: education\_num  
#race:education  
#race:age  
#race:education\_num  
#race:occupation  
  
  
data\_proportions <- data %>%  
 group\_by(income, `race`) %>%  
 count(`education\_num`) %>%  
 mutate(proportion = n / sum(n)) %>%  
 ungroup()  
  
ggplot(data\_proportions, aes(x = `education\_num`, y = proportion, fill = `race`)) +  
 geom\_bar(stat = "identity", position = "dodge") +  
 facet\_grid(~ income) +  
 scale\_y\_continuous(labels = scales::percent\_format()) +  
 theme(axis.text.x = element\_text(angle = 90, vjust = 0.5, hjust=1)) +  
 labs(y = "Proportion", fill = "race")



**COMPLEX MODEL**

library(caret)

## Warning: package 'caret' was built under R version 4.1.3

## Loading required package: lattice

# Assuming 'data' is your data frame with all the variables  
  
# Create a formula that includes all main effects and their two-way interactions  
variables <- c("workclass", "education", "age", "education\_num", "capital\_gain",   
 "marital\_status", "relationship", "race", "native\_country", "occupation", "sex")  
  
# Create a formula string with all two-way interactions  
formula\_string <- paste("income ~", paste(variables, collapse = " + "),   
 "+", paste0("age:sex + sex:education + sex:occupation + workclass:education\_num + race:education + race:age + race: education\_num + race : occupation + relationship: occupation + relationship:education\_num +marital\_status :occupation"))  
  
# Convert the string to a formula object  
formula <- as.formula(formula\_string)  
  
  
model <- glm(formula,data=data, family = "binomial")

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

summary(model)

##   
## Call:  
## glm(formula = formula, family = "binomial", data = data)  
##   
## Deviance Residuals:   
## Min 1Q Median 3Q Max   
## -8.49 -8.49 0.00 0.00 8.49   
##   
## Coefficients: (24 not defined because of singularities)  
## Estimate  
## (Intercept) 125154675725220.734375000  
## workclass Local-gov 2490.278171404  
## workclass Never-worked -5922993848842089.000000000  
## workclass Private 855.658528790  
## workclass Self-emp-inc -184.755064916  
## workclass Self-emp-not-inc -113289.382796867  
## workclass State-gov -5754.781648575  
## workclass Without-pay -4238565094318000.000000000  
## workclassUNKNOWN -2352881365919261.000000000  
## education 11th -125154676185730.625000000  
## education 12th -155954466797167.718750000  
## education 1st-4th -6354917854740023.000000000  
## education 5th-6th -3463490091980010.000000000  
## education 7th-8th -4784034987393310.000000000  
## education 9th -2675272392435674.500000000  
## education Assoc-acdm -125154676039970.953125000  
## education Assoc-voc -125154676187072.687500000  
## education Bachelors -125154676185038.203125000  
## education Doctorate -125154676185475.890625000  
## education HS-grad -125154676187323.421875000  
## education Masters -125154676184791.140625000  
## education Preschool -2637871182131953.000000000  
## education Prof-school 4378444330178885.500000000  
## education Some-college -125154676185884.015625000  
## age 15.658310449  
## education\_num NA  
## capital\_gain 0.002659556  
## marital\_status Married-AF-spouse -3602879562755185.500000000  
## marital\_status Married-civ-spouse 218574.903033042  
## marital\_status Married-spouse-absent 39.986298999  
## marital\_status Never-married -1397.402784181  
## marital\_status Separated -1315.780468674  
## marital\_status Widowed 479.434373047  
## relationship Not-in-family -2966452632.598312378  
## relationship Other-relative 120018.034323565  
## relationship Own-child 318790.694807068  
## relationship Unmarried 323248.971526623  
## relationship Wife 34560.706201438  
## race Asian-Pac-Islander -125154676072037.375000000  
## race Black -125154676044539.140625000  
## race Other -125154675946255.531250000  
## race White -125154676049916.265625000  
## native\_country Cambodia -1648527788915293.750000000  
## native\_country Canada 166.330903201  
## native\_country China 256.997316280  
## native\_country Columbia 2215.194851625  
## native\_country Cuba 590.071024229  
## native\_country Dominican-Republic 61208.486970774  
## native\_country Ecuador 1710.938848694  
## native\_country El-Salvador 330.908206596  
## native\_country England -10.920330905  
## native\_country France -2309.800293021  
## native\_country Germany -129.773232743  
## native\_country Greece -3898.199020501  
## native\_country Guatemala -2982687493113848.000000000  
## native\_country Haiti -182153.687663972  
## native\_country Holand-Netherlands -920149848816725.125000000  
## native\_country Honduras -1229.950693951  
## native\_country Hong -472.462339357  
## native\_country Hungary -844.917501070  
## native\_country India 615.969916214  
## native\_country Iran 1816.310803575  
## native\_country Ireland 990.528458797  
## native\_country Italy 2679.529580094  
## native\_country Jamaica -581.218662999  
## native\_country Japan 5.055892945  
## native\_country Laos -1009.301337321  
## native\_country Mexico -449.840319782  
## native\_country Nicaragua 508.455578411  
## native\_country Outlying-US(Guam-USVI-etc) -30327843198998.050781250  
## native\_country Peru -485.722216516  
## native\_country Philippines -238.417499008  
## native\_country Poland -363.878494872  
## native\_country Portugal 266.066020009  
## native\_country Puerto-Rico 1629.285568562  
## native\_country Scotland 1178.767308454  
## native\_country South -292.681488809  
## native\_country Taiwan 660.173449029  
## native\_country Thailand 418.326192719  
## native\_country Trinadad&Tobago 2966776486.963071346  
## native\_country United-States -176.661943369  
## native\_country Vietnam 687.106877425  
## native\_country Yugoslavia -236.364782104  
## occupation Armed-Forces 6394118083729413.000000000  
## occupation Craft-repair 461668.492624803  
## occupation Exec-managerial 461988.735387328  
## occupation Farming-fishing -5657530617652019.000000000  
## occupation Handlers-cleaners -3926513658523692.000000000  
## occupation Machine-op-inspct 1742264174297980.500000000  
## occupation Other-service 462382.607969890  
## occupation Priv-house-serv -1161034368590336.500000000  
## occupation Prof-specialty 460482.847448896  
## occupation Protective-serv 1190802670685090.500000000  
## occupation Sales 461060.914631617  
## occupation Tech-support -10255303423278788.000000000  
## occupation Transport-moving 57344717372.959381104  
## occupationUNKNOWN NA  
## sex Male 3146.571300923  
## age:sex Male -43.814655336  
## education 11th:sex Male -3753.637387393  
## education 12th:sex Male 33429089585081.441406250  
## education 1st-4th:sex Male 2432148990727742.500000000  
## education 5th-6th:sex Male 3202017481840525.000000000  
## education 7th-8th:sex Male 2987360074507845.000000000  
## education 9th:sex Male 559185880274271.000000000  
## education Assoc-acdm:sex Male -3482.406222938  
## education Assoc-voc:sex Male -2614.624406960  
## education Bachelors:sex Male -3557.435015973  
## education Doctorate:sex Male -3805.342199709  
## education HS-grad:sex Male -1661.629509211  
## education Masters:sex Male -2950.925916092  
## education Preschool:sex Male 1963097991545444.750000000  
## education Prof-school:sex Male -5987.998126405  
## education Some-college:sex Male -2504.990213384  
## occupation Armed-Forces:sex Male NA  
## occupation Craft-repair:sex Male 286.151402417  
## occupation Exec-managerial:sex Male 1540.335878101  
## occupation Farming-fishing:sex Male 475364106984899.437500000  
## occupation Handlers-cleaners:sex Male 3926513658986438.000000000  
## occupation Machine-op-inspct:sex Male -614.721736767  
## occupation Other-service:sex Male -518.470138806  
## occupation Priv-house-serv:sex Male 203462340184912.718750000  
## occupation Prof-specialty:sex Male 1370.040694146  
## occupation Protective-serv:sex Male 1220.146081764  
## occupation Sales:sex Male 999.027925384  
## occupation Tech-support:sex Male 432100827957951.062500000  
## occupation Transport-moving:sex Male 39047.472121974  
## occupationUNKNOWN:sex Male 1767749898233571.500000000  
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## workclass Never-worked:education\_num 457599459427500.000000000  
## workclass Private:education\_num -76.529934661  
## workclass Self-emp-inc:education\_num -21.061536743  
## workclass Self-emp-not-inc:education\_num 7866.683154642  
## workclass State-gov:education\_num 439.148238288  
## workclass Without-pay:education\_num 251591640550490.625000000  
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## education Assoc-voc:race Asian-Pac-Islander 125154676189150.984375000  
## education Bachelors:race Asian-Pac-Islander 125154676187501.453125000  
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## education Prof-school:race Asian-Pac-Islander -4378444330174961.000000000  
## education Some-college:race Asian-Pac-Islander 125154676186862.046875000  
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## education 12th:race Black -3305990552122122.000000000  
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## education Doctorate:race White 125154676187685.234375000  
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## age:race Black -22.353884248  
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## age:race White 35.738368787  
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## race Black:occupation Exec-managerial -141871.862137923  
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## race Black:occupation Handlers-cleaners -141540.504433274  
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## race Black:occupation Priv-house-serv -517258983984026.750000000  
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## relationship Other-relative:occupation Craft-repair -121800.745110834  
## relationship Own-child:occupation Craft-repair -315525.297028567  
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## relationship Wife:occupation Craft-repair -28806.954243519  
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## relationship Other-relative:occupation Exec-managerial -121816.949949480  
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## relationship Wife:occupation Sales -27925.141080850  
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## marital\_status Married-civ-spouse:occupation Armed-Forces NA  
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## native\_country Trinadad&Tobago 1638.973221780  
## native\_country United-States 0.310447494  
## native\_country Vietnam 2.230680172  
## native\_country Yugoslavia 1.523649084  
## occupation Armed-Forces 106130412.759334788  
## occupation Craft-repair 94.344650317  
## occupation Exec-managerial 94.285702816  
## occupation Farming-fishing 37509310.518575504  
## occupation Handlers-cleaners 6089500.122570551  
## occupation Machine-op-inspct 23001983.621968865  
## occupation Other-service 94.298865747  
## occupation Priv-house-serv 40475448.671298571  
## occupation Prof-specialty 94.272361422  
## occupation Protective-serv 32354413.953044552  
## occupation Sales 94.555925591  
## occupation Tech-support 38643462.791059010  
## occupation Transport-moving 131446.855313694  
## occupationUNKNOWN NA  
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## education 11th:sex Male 1.510686594  
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## education 1st-4th:sex Male 12083522.896503257  
## education 5th-6th:sex Male 7590182.812789141  
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## occupation Exec-managerial:sex Male 2.823024708  
## occupation Farming-fishing:sex Male 10792913.521898819  
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## occupation Machine-op-inspct:sex Male 2.836423924  
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## workclass Self-emp-inc:education\_num 0.132252502  
## workclass Self-emp-not-inc:education\_num 0.971706835  
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## education Bachelors:race Other 17030882.361083198  
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## education Prof-school:race Other 60561957.321797140  
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## education 9th:race White 34663852.522988752  
## education Assoc-acdm:race White 17030882.361232821  
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## education Bachelors:race White 17030882.361081034  
## education Doctorate:race White 17030882.362925302  
## education HS-grad:race White 17030882.361080781  
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## education Preschool:race White NA  
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## race Other:occupation Farming-fishing 30510953.730993595  
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## race Asian-Pac-Islander:occupation Handlers-cleaners 80.152869411  
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## race White:occupation Handlers-cleaners 77.663225420  
## race Asian-Pac-Islander:occupation Machine-op-inspct 15773624.620436629  
## race Black:occupation Machine-op-inspct 15773624.620424196  
## race Other:occupation Machine-op-inspct 15773624.620469209  
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## race Other:occupation Transport-moving 2529.924314014  
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## relationship Other-relative:occupation Armed-Forces 82219613.749336004  
## relationship Own-child:occupation Armed-Forces 82219613.749322578  
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## relationship Wife:occupation Armed-Forces NA  
## relationship Not-in-family:occupation Craft-repair 1639.257112900  
## relationship Other-relative:occupation Craft-repair 27.073975963  
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## relationship Unmarried:occupation Craft-repair 53.458950817  
## relationship Wife:occupation Craft-repair 26.571876037  
## relationship Not-in-family:occupation Exec-managerial 1639.256880561  
## relationship Other-relative:occupation Exec-managerial 27.063544749  
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## relationship Unmarried:occupation Exec-managerial 53.454094618  
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## relationship Not-in-family:occupation Farming-fishing 26902411.458124358  
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## relationship Wife:occupation Handlers-cleaners 6089500.121895931  
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## relationship Other-relative:occupation Other-service 27.080958887  
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## relationship Unmarried:occupation Other-service 53.465915342  
## relationship Wife:occupation Other-service 26.552612265  
## relationship Not-in-family:occupation Priv-house-serv 38874198.703131042  
## relationship Other-relative:occupation Priv-house-serv 35050768.005878963  
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## relationship Wife:occupation Priv-house-serv NA  
## relationship Not-in-family:occupation Prof-specialty 1639.257013657  
## relationship Other-relative:occupation Prof-specialty 27.039537094  
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## relationship Wife:occupation Tech-support 11409072.812089344  
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## marital\_status Married-civ-spouse:occupation Armed-Forces NA  
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## marital\_status Separated:occupation Armed-Forces NA  
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## education Assoc-acdm -7348690.067  
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## education HS-grad -7348690.076  
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## education Prof-school 86844997.597  
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## relationship Other-relative 4423.077  
## relationship Own-child 5966.522  
## relationship Unmarried 6050.361  
## relationship Wife 1301.491  
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## native\_country Cambodia -105149167.210  
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## native\_country Nicaragua 176.581  
## native\_country Outlying-US(Guam-USVI-etc) -1690740.826  
## native\_country Peru -288.916  
## native\_country Philippines -372.037  
## native\_country Poland -557.163  
## native\_country Portugal 160.231  
## native\_country Puerto-Rico 1104.926  
## native\_country Scotland 572.622  
## native\_country South -355.705  
## native\_country Taiwan 659.507  
## native\_country Thailand 148.260  
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## native\_country Vietnam 308.026  
## native\_country Yugoslavia -155.131  
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## occupation Handlers-cleaners -644800653.500  
## occupation Machine-op-inspct 75744083.768  
## occupation Other-service 4903.374  
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## occupation Prof-specialty 4884.601  
## occupation Protective-serv 36804952.561  
## occupation Sales 4876.066  
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## occupation Transport-moving 436257.811  
## occupationUNKNOWN NA  
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## race Black:occupation Handlers-cleaners -1823.039  
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## race Black:occupation Machine-op-inspct -17282414.901  
## race Other:occupation Machine-op-inspct -17282414.907  
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## race White:occupation Protective-serv -1734.360  
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## race Other:occupationUNKNOWN -3561.729  
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## relationship Own-child:occupation Craft-repair -5901.833  
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## relationship Wife:occupation Craft-repair -1084.114  
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## relationship Other-relative:occupation Exec-managerial -4501.145  
## relationship Own-child:occupation Exec-managerial -5889.770  
## relationship Unmarried:occupation Exec-managerial -5950.560  
## relationship Wife:occupation Exec-managerial -1051.123  
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## relationship Unmarried:occupation Priv-house-serv -14374947.310  
## relationship Wife:occupation Priv-house-serv NA  
## relationship Not-in-family:occupation Prof-specialty 1809630.692  
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## relationship Unmarried:occupation Prof-specialty -5931.554  
## relationship Wife:occupation Prof-specialty -1009.248  
## relationship Not-in-family:occupation Protective-serv -36804860.814  
## relationship Other-relative:occupation Protective-serv -162703382.595  
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## relationship Wife:occupation Protective-serv -928.243  
## relationship Not-in-family:occupation Sales 1809632.391  
## relationship Other-relative:occupation Sales -4492.808  
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## relationship Unmarried:occupation Sales -5944.931  
## relationship Wife:occupation Sales -1051.493  
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## marital\_status Married-civ-spouse:occupation Armed-Forces NA  
## marital\_status Married-spouse-absent:occupation Armed-Forces NA  
## marital\_status Never-married:occupation Armed-Forces NA  
## marital\_status Separated:occupation Armed-Forces NA  
## marital\_status Widowed:occupation Armed-Forces NA  
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## occupation Priv-house-serv < 0.0000000000000002  
## occupation Prof-specialty < 0.0000000000000002  
## occupation Protective-serv < 0.0000000000000002  
## occupation Sales < 0.0000000000000002  
## occupation Tech-support < 0.0000000000000002  
## occupation Transport-moving < 0.0000000000000002  
## occupationUNKNOWN NA  
## sex Male < 0.0000000000000002  
## age:sex Male < 0.0000000000000002  
## education 11th:sex Male < 0.0000000000000002  
## education 12th:sex Male < 0.0000000000000002  
## education 1st-4th:sex Male < 0.0000000000000002  
## education 5th-6th:sex Male < 0.0000000000000002  
## education 7th-8th:sex Male < 0.0000000000000002  
## education 9th:sex Male < 0.0000000000000002  
## education Assoc-acdm:sex Male < 0.0000000000000002  
## education Assoc-voc:sex Male < 0.0000000000000002  
## education Bachelors:sex Male < 0.0000000000000002  
## education Doctorate:sex Male < 0.0000000000000002  
## education HS-grad:sex Male < 0.0000000000000002  
## education Masters:sex Male < 0.0000000000000002  
## education Preschool:sex Male < 0.0000000000000002  
## education Prof-school:sex Male < 0.0000000000000002  
## education Some-college:sex Male < 0.0000000000000002  
## occupation Armed-Forces:sex Male NA  
## occupation Craft-repair:sex Male < 0.0000000000000002  
## occupation Exec-managerial:sex Male < 0.0000000000000002  
## occupation Farming-fishing:sex Male < 0.0000000000000002  
## occupation Handlers-cleaners:sex Male < 0.0000000000000002  
## occupation Machine-op-inspct:sex Male < 0.0000000000000002  
## occupation Other-service:sex Male < 0.0000000000000002  
## occupation Priv-house-serv:sex Male < 0.0000000000000002  
## occupation Prof-specialty:sex Male < 0.0000000000000002  
## occupation Protective-serv:sex Male < 0.0000000000000002  
## occupation Sales:sex Male < 0.0000000000000002  
## occupation Tech-support:sex Male < 0.0000000000000002  
## occupation Transport-moving:sex Male < 0.0000000000000002  
## occupationUNKNOWN:sex Male < 0.0000000000000002  
## workclass Local-gov:education\_num < 0.0000000000000002  
## workclass Never-worked:education\_num < 0.0000000000000002  
## workclass Private:education\_num < 0.0000000000000002  
## workclass Self-emp-inc:education\_num < 0.0000000000000002  
## workclass Self-emp-not-inc:education\_num < 0.0000000000000002  
## workclass State-gov:education\_num < 0.0000000000000002  
## workclass Without-pay:education\_num < 0.0000000000000002  
## workclassUNKNOWN:education\_num < 0.0000000000000002  
## education 11th:race Asian-Pac-Islander < 0.0000000000000002  
## education 12th:race Asian-Pac-Islander < 0.0000000000000002  
## education 1st-4th:race Asian-Pac-Islander < 0.0000000000000002  
## education 5th-6th:race Asian-Pac-Islander < 0.0000000000000002  
## education 7th-8th:race Asian-Pac-Islander < 0.0000000000000002  
## education 9th:race Asian-Pac-Islander < 0.0000000000000002  
## education Assoc-acdm:race Asian-Pac-Islander < 0.0000000000000002  
## education Assoc-voc:race Asian-Pac-Islander < 0.0000000000000002  
## education Bachelors:race Asian-Pac-Islander < 0.0000000000000002  
## education Doctorate:race Asian-Pac-Islander < 0.0000000000000002  
## education HS-grad:race Asian-Pac-Islander < 0.0000000000000002  
## education Masters:race Asian-Pac-Islander < 0.0000000000000002  
## education Preschool:race Asian-Pac-Islander < 0.0000000000000002  
## education Prof-school:race Asian-Pac-Islander < 0.0000000000000002  
## education Some-college:race Asian-Pac-Islander < 0.0000000000000002  
## education 11th:race Black < 0.0000000000000002  
## education 12th:race Black < 0.0000000000000002  
## education 1st-4th:race Black < 0.0000000000000002  
## education 5th-6th:race Black < 0.0000000000000002  
## education 7th-8th:race Black < 0.0000000000000002  
## education 9th:race Black < 0.0000000000000002  
## education Assoc-acdm:race Black < 0.0000000000000002  
## education Assoc-voc:race Black < 0.0000000000000002  
## education Bachelors:race Black < 0.0000000000000002  
## education Doctorate:race Black < 0.0000000000000002  
## education HS-grad:race Black < 0.0000000000000002  
## education Masters:race Black < 0.0000000000000002  
## education Preschool:race Black < 0.0000000000000002  
## education Prof-school:race Black < 0.0000000000000002  
## education Some-college:race Black < 0.0000000000000002  
## education 11th:race Other < 0.0000000000000002  
## education 12th:race Other < 0.0000000000000002  
## education 1st-4th:race Other < 0.0000000000000002  
## education 5th-6th:race Other < 0.0000000000000002  
## education 7th-8th:race Other < 0.0000000000000002  
## education 9th:race Other < 0.0000000000000002  
## education Assoc-acdm:race Other < 0.0000000000000002  
## education Assoc-voc:race Other < 0.0000000000000002  
## education Bachelors:race Other < 0.0000000000000002  
## education Doctorate:race Other < 0.0000000000000002  
## education HS-grad:race Other < 0.0000000000000002  
## education Masters:race Other < 0.0000000000000002  
## education Preschool:race Other < 0.0000000000000002  
## education Prof-school:race Other < 0.0000000000000002  
## education Some-college:race Other < 0.0000000000000002  
## education 11th:race White < 0.0000000000000002  
## education 12th:race White < 0.0000000000000002  
## education 1st-4th:race White < 0.0000000000000002  
## education 5th-6th:race White < 0.0000000000000002  
## education 7th-8th:race White < 0.0000000000000002  
## education 9th:race White < 0.0000000000000002  
## education Assoc-acdm:race White < 0.0000000000000002  
## education Assoc-voc:race White < 0.0000000000000002  
## education Bachelors:race White < 0.0000000000000002  
## education Doctorate:race White < 0.0000000000000002  
## education HS-grad:race White < 0.0000000000000002  
## education Masters:race White < 0.0000000000000002  
## education Preschool:race White NA  
## education Prof-school:race White < 0.0000000000000002  
## education Some-college:race White < 0.0000000000000002  
## age:race Asian-Pac-Islander < 0.0000000000000002  
## age:race Black < 0.0000000000000002  
## age:race Other < 0.0000000000000002  
## age:race White < 0.0000000000000002  
## education\_num:race Asian-Pac-Islander NA  
## education\_num:race Black NA  
## education\_num:race Other NA  
## education\_num:race White NA  
## race Asian-Pac-Islander:occupation Armed-Forces NA  
## race Black:occupation Armed-Forces < 0.0000000000000002  
## race Other:occupation Armed-Forces NA  
## race White:occupation Armed-Forces < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Craft-repair < 0.0000000000000002  
## race Black:occupation Craft-repair < 0.0000000000000002  
## race Other:occupation Craft-repair < 0.0000000000000002  
## race White:occupation Craft-repair < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Exec-managerial < 0.0000000000000002  
## race Black:occupation Exec-managerial < 0.0000000000000002  
## race Other:occupation Exec-managerial < 0.0000000000000002  
## race White:occupation Exec-managerial < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Farming-fishing < 0.0000000000000002  
## race Black:occupation Farming-fishing < 0.0000000000000002  
## race Other:occupation Farming-fishing < 0.0000000000000002  
## race White:occupation Farming-fishing < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Handlers-cleaners < 0.0000000000000002  
## race Black:occupation Handlers-cleaners < 0.0000000000000002  
## race Other:occupation Handlers-cleaners < 0.0000000000000002  
## race White:occupation Handlers-cleaners < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Machine-op-inspct < 0.0000000000000002  
## race Black:occupation Machine-op-inspct < 0.0000000000000002  
## race Other:occupation Machine-op-inspct < 0.0000000000000002  
## race White:occupation Machine-op-inspct < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Other-service < 0.0000000000000002  
## race Black:occupation Other-service < 0.0000000000000002  
## race Other:occupation Other-service < 0.0000000000000002  
## race White:occupation Other-service < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Priv-house-serv < 0.0000000000000002  
## race Black:occupation Priv-house-serv < 0.0000000000000002  
## race Other:occupation Priv-house-serv < 0.0000000000000002  
## race White:occupation Priv-house-serv NA  
## race Asian-Pac-Islander:occupation Prof-specialty < 0.0000000000000002  
## race Black:occupation Prof-specialty < 0.0000000000000002  
## race Other:occupation Prof-specialty < 0.0000000000000002  
## race White:occupation Prof-specialty < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Protective-serv < 0.0000000000000002  
## race Black:occupation Protective-serv < 0.0000000000000002  
## race Other:occupation Protective-serv < 0.0000000000000002  
## race White:occupation Protective-serv < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Sales < 0.0000000000000002  
## race Black:occupation Sales < 0.0000000000000002  
## race Other:occupation Sales < 0.0000000000000002  
## race White:occupation Sales < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Tech-support < 0.0000000000000002  
## race Black:occupation Tech-support < 0.0000000000000002  
## race Other:occupation Tech-support < 0.0000000000000002  
## race White:occupation Tech-support < 0.0000000000000002  
## race Asian-Pac-Islander:occupation Transport-moving < 0.0000000000000002  
## race Black:occupation Transport-moving < 0.0000000000000002  
## race Other:occupation Transport-moving < 0.0000000000000002  
## race White:occupation Transport-moving < 0.0000000000000002  
## race Asian-Pac-Islander:occupationUNKNOWN < 0.0000000000000002  
## race Black:occupationUNKNOWN < 0.0000000000000002  
## race Other:occupationUNKNOWN < 0.0000000000000002  
## race White:occupationUNKNOWN < 0.0000000000000002  
## relationship Not-in-family:occupation Armed-Forces < 0.0000000000000002  
## relationship Other-relative:occupation Armed-Forces < 0.0000000000000002  
## relationship Own-child:occupation Armed-Forces < 0.0000000000000002  
## relationship Unmarried:occupation Armed-Forces NA  
## relationship Wife:occupation Armed-Forces NA  
## relationship Not-in-family:occupation Craft-repair < 0.0000000000000002  
## relationship Other-relative:occupation Craft-repair < 0.0000000000000002  
## relationship Own-child:occupation Craft-repair < 0.0000000000000002  
## relationship Unmarried:occupation Craft-repair < 0.0000000000000002  
## relationship Wife:occupation Craft-repair < 0.0000000000000002  
## relationship Not-in-family:occupation Exec-managerial < 0.0000000000000002  
## relationship Other-relative:occupation Exec-managerial < 0.0000000000000002  
## relationship Own-child:occupation Exec-managerial < 0.0000000000000002  
## relationship Unmarried:occupation Exec-managerial < 0.0000000000000002  
## relationship Wife:occupation Exec-managerial < 0.0000000000000002  
## relationship Not-in-family:occupation Farming-fishing < 0.0000000000000002  
## relationship Other-relative:occupation Farming-fishing < 0.0000000000000002  
## relationship Own-child:occupation Farming-fishing < 0.0000000000000002  
## relationship Unmarried:occupation Farming-fishing < 0.0000000000000002  
## relationship Wife:occupation Farming-fishing < 0.0000000000000002  
## relationship Not-in-family:occupation Handlers-cleaners < 0.0000000000000002  
## relationship Other-relative:occupation Handlers-cleaners < 0.0000000000000002  
## relationship Own-child:occupation Handlers-cleaners < 0.0000000000000002  
## relationship Unmarried:occupation Handlers-cleaners < 0.0000000000000002  
## relationship Wife:occupation Handlers-cleaners < 0.0000000000000002  
## relationship Not-in-family:occupation Machine-op-inspct < 0.0000000000000002  
## relationship Other-relative:occupation Machine-op-inspct < 0.0000000000000002  
## relationship Own-child:occupation Machine-op-inspct < 0.0000000000000002  
## relationship Unmarried:occupation Machine-op-inspct < 0.0000000000000002  
## relationship Wife:occupation Machine-op-inspct < 0.0000000000000002  
## relationship Not-in-family:occupation Other-service < 0.0000000000000002  
## relationship Other-relative:occupation Other-service < 0.0000000000000002  
## relationship Own-child:occupation Other-service < 0.0000000000000002  
## relationship Unmarried:occupation Other-service < 0.0000000000000002  
## relationship Wife:occupation Other-service < 0.0000000000000002  
## relationship Not-in-family:occupation Priv-house-serv < 0.0000000000000002  
## relationship Other-relative:occupation Priv-house-serv < 0.0000000000000002  
## relationship Own-child:occupation Priv-house-serv < 0.0000000000000002  
## relationship Unmarried:occupation Priv-house-serv < 0.0000000000000002  
## relationship Wife:occupation Priv-house-serv NA  
## relationship Not-in-family:occupation Prof-specialty < 0.0000000000000002  
## relationship Other-relative:occupation Prof-specialty < 0.0000000000000002  
## relationship Own-child:occupation Prof-specialty < 0.0000000000000002  
## relationship Unmarried:occupation Prof-specialty < 0.0000000000000002  
## relationship Wife:occupation Prof-specialty < 0.0000000000000002  
## relationship Not-in-family:occupation Protective-serv < 0.0000000000000002  
## relationship Other-relative:occupation Protective-serv < 0.0000000000000002  
## relationship Own-child:occupation Protective-serv < 0.0000000000000002  
## relationship Unmarried:occupation Protective-serv < 0.0000000000000002  
## relationship Wife:occupation Protective-serv < 0.0000000000000002  
## relationship Not-in-family:occupation Sales < 0.0000000000000002  
## relationship Other-relative:occupation Sales < 0.0000000000000002  
## relationship Own-child:occupation Sales < 0.0000000000000002  
## relationship Unmarried:occupation Sales < 0.0000000000000002  
## relationship Wife:occupation Sales < 0.0000000000000002  
## relationship Not-in-family:occupation Tech-support < 0.0000000000000002  
## relationship Other-relative:occupation Tech-support < 0.0000000000000002  
## relationship Own-child:occupation Tech-support < 0.0000000000000002  
## relationship Unmarried:occupation Tech-support < 0.0000000000000002  
## relationship Wife:occupation Tech-support < 0.0000000000000002  
## relationship Not-in-family:occupation Transport-moving < 0.0000000000000002  
## relationship Other-relative:occupation Transport-moving < 0.0000000000000002  
## relationship Own-child:occupation Transport-moving < 0.0000000000000002  
## relationship Unmarried:occupation Transport-moving < 0.0000000000000002  
## relationship Wife:occupation Transport-moving < 0.0000000000000002  
## relationship Not-in-family:occupationUNKNOWN < 0.0000000000000002  
## relationship Other-relative:occupationUNKNOWN < 0.0000000000000002  
## relationship Own-child:occupationUNKNOWN < 0.0000000000000002  
## relationship Unmarried:occupationUNKNOWN < 0.0000000000000002  
## relationship Wife:occupationUNKNOWN < 0.0000000000000002  
## education\_num:relationship Not-in-family < 0.0000000000000002  
## education\_num:relationship Other-relative < 0.0000000000000002  
## education\_num:relationship Own-child < 0.0000000000000002  
## education\_num:relationship Unmarried < 0.0000000000000002  
## education\_num:relationship Wife < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Armed-Forces NA  
## marital\_status Married-civ-spouse:occupation Armed-Forces NA  
## marital\_status Married-spouse-absent:occupation Armed-Forces NA  
## marital\_status Never-married:occupation Armed-Forces NA  
## marital\_status Separated:occupation Armed-Forces NA  
## marital\_status Widowed:occupation Armed-Forces NA  
## marital\_status Married-AF-spouse:occupation Craft-repair < 0.0000000000000002  
## marital\_status Married-civ-spouse:occupation Craft-repair < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Craft-repair 0.0000000852830  
## marital\_status Never-married:occupation Craft-repair < 0.0000000000000002  
## marital\_status Separated:occupation Craft-repair < 0.0000000000000002  
## marital\_status Widowed:occupation Craft-repair < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Exec-managerial < 0.0000000000000002  
## marital\_status Married-civ-spouse:occupation Exec-managerial < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Exec-managerial < 0.0000000000000002  
## marital\_status Never-married:occupation Exec-managerial < 0.0000000000000002  
## marital\_status Separated:occupation Exec-managerial < 0.0000000000000002  
## marital\_status Widowed:occupation Exec-managerial < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Farming-fishing < 0.0000000000000002  
## marital\_status Married-civ-spouse:occupation Farming-fishing < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Farming-fishing < 0.0000000000000002  
## marital\_status Never-married:occupation Farming-fishing < 0.0000000000000002  
## marital\_status Separated:occupation Farming-fishing < 0.0000000000000002  
## marital\_status Widowed:occupation Farming-fishing < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Handlers-cleaners NA  
## marital\_status Married-civ-spouse:occupation Handlers-cleaners < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Handlers-cleaners < 0.0000000000000002  
## marital\_status Never-married:occupation Handlers-cleaners < 0.0000000000000002  
## marital\_status Separated:occupation Handlers-cleaners < 0.0000000000000002  
## marital\_status Widowed:occupation Handlers-cleaners < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Machine-op-inspct NA  
## marital\_status Married-civ-spouse:occupation Machine-op-inspct < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Machine-op-inspct < 0.0000000000000002  
## marital\_status Never-married:occupation Machine-op-inspct < 0.0000000000000002  
## marital\_status Separated:occupation Machine-op-inspct 0.0000000000894  
## marital\_status Widowed:occupation Machine-op-inspct < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Other-service < 0.0000000000000002  
## marital\_status Married-civ-spouse:occupation Other-service < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Other-service < 0.0000000000000002  
## marital\_status Never-married:occupation Other-service < 0.0000000000000002  
## marital\_status Separated:occupation Other-service < 0.0000000000000002  
## marital\_status Widowed:occupation Other-service < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Priv-house-serv NA  
## marital\_status Married-civ-spouse:occupation Priv-house-serv < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Priv-house-serv < 0.0000000000000002  
## marital\_status Never-married:occupation Priv-house-serv < 0.0000000000000002  
## marital\_status Separated:occupation Priv-house-serv < 0.0000000000000002  
## marital\_status Widowed:occupation Priv-house-serv < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Prof-specialty < 0.0000000000000002  
## marital\_status Married-civ-spouse:occupation Prof-specialty < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Prof-specialty < 0.0000000000000002  
## marital\_status Never-married:occupation Prof-specialty < 0.0000000000000002  
## marital\_status Separated:occupation Prof-specialty < 0.0000000000000002  
## marital\_status Widowed:occupation Prof-specialty < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Protective-serv < 0.0000000000000002  
## marital\_status Married-civ-spouse:occupation Protective-serv < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Protective-serv 0.00729  
## marital\_status Never-married:occupation Protective-serv < 0.0000000000000002  
## marital\_status Separated:occupation Protective-serv < 0.0000000000000002  
## marital\_status Widowed:occupation Protective-serv < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Sales < 0.0000000000000002  
## marital\_status Married-civ-spouse:occupation Sales < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Sales < 0.0000000000000002  
## marital\_status Never-married:occupation Sales < 0.0000000000000002  
## marital\_status Separated:occupation Sales < 0.0000000000000002  
## marital\_status Widowed:occupation Sales < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Tech-support NA  
## marital\_status Married-civ-spouse:occupation Tech-support < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Tech-support < 0.0000000000000002  
## marital\_status Never-married:occupation Tech-support < 0.0000000000000002  
## marital\_status Separated:occupation Tech-support < 0.0000000000000002  
## marital\_status Widowed:occupation Tech-support < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupation Transport-moving < 0.0000000000000002  
## marital\_status Married-civ-spouse:occupation Transport-moving < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupation Transport-moving < 0.0000000000000002  
## marital\_status Never-married:occupation Transport-moving < 0.0000000000000002  
## marital\_status Separated:occupation Transport-moving < 0.0000000000000002  
## marital\_status Widowed:occupation Transport-moving < 0.0000000000000002  
## marital\_status Married-AF-spouse:occupationUNKNOWN < 0.0000000000000002  
## marital\_status Married-civ-spouse:occupationUNKNOWN < 0.0000000000000002  
## marital\_status Married-spouse-absent:occupationUNKNOWN < 0.0000000000000002  
## marital\_status Never-married:occupationUNKNOWN < 0.0000000000000002  
## marital\_status Separated:occupationUNKNOWN < 0.0000000000000002  
## marital\_status Widowed:occupationUNKNOWN < 0.0000000000000002  
##   
## (Intercept) \*\*\*  
## workclass Local-gov \*\*\*  
## workclass Never-worked \*\*\*  
## workclass Private \*\*\*  
## workclass Self-emp-inc \*\*\*  
## workclass Self-emp-not-inc \*\*\*  
## workclass State-gov \*\*\*  
## workclass Without-pay \*\*\*  
## workclassUNKNOWN \*\*\*  
## education 11th \*\*\*  
## education 12th \*\*\*  
## education 1st-4th \*\*\*  
## education 5th-6th \*\*\*  
## education 7th-8th \*\*\*  
## education 9th \*\*\*  
## education Assoc-acdm \*\*\*  
## education Assoc-voc \*\*\*  
## education Bachelors \*\*\*  
## education Doctorate \*\*\*  
## education HS-grad \*\*\*  
## education Masters \*\*\*  
## education Preschool \*\*\*  
## education Prof-school \*\*\*  
## education Some-college \*\*\*  
## age \*\*\*  
## education\_num   
## capital\_gain \*\*\*  
## marital\_status Married-AF-spouse \*\*\*  
## marital\_status Married-civ-spouse \*\*\*  
## marital\_status Married-spouse-absent \*\*\*  
## marital\_status Never-married \*\*\*  
## marital\_status Separated \*\*\*  
## marital\_status Widowed \*\*\*  
## relationship Not-in-family \*\*\*  
## relationship Other-relative \*\*\*  
## relationship Own-child \*\*\*  
## relationship Unmarried \*\*\*  
## relationship Wife \*\*\*  
## race Asian-Pac-Islander \*\*\*  
## race Black \*\*\*  
## race Other \*\*\*  
## race White \*\*\*  
## native\_country Cambodia \*\*\*  
## native\_country Canada \*\*\*  
## native\_country China \*\*\*  
## native\_country Columbia \*\*\*  
## native\_country Cuba \*\*\*  
## native\_country Dominican-Republic \*\*\*  
## native\_country Ecuador \*\*\*  
## native\_country El-Salvador \*\*\*  
## native\_country England \*\*\*  
## native\_country France \*\*\*  
## native\_country Germany \*\*\*  
## native\_country Greece \*\*\*  
## native\_country Guatemala \*\*\*  
## native\_country Haiti \*\*\*  
## native\_country Holand-Netherlands \*\*\*  
## native\_country Honduras \*\*\*  
## native\_country Hong \*\*\*  
## native\_country Hungary \*\*\*  
## native\_country India \*\*\*  
## native\_country Iran \*\*\*  
## native\_country Ireland \*\*\*  
## native\_country Italy \*\*\*  
## native\_country Jamaica \*\*\*  
## native\_country Japan \*\*\*  
## native\_country Laos \*\*\*  
## native\_country Mexico \*\*\*  
## native\_country Nicaragua \*\*\*  
## native\_country Outlying-US(Guam-USVI-etc) \*\*\*  
## native\_country Peru \*\*\*  
## native\_country Philippines \*\*\*  
## native\_country Poland \*\*\*  
## native\_country Portugal \*\*\*  
## native\_country Puerto-Rico \*\*\*  
## native\_country Scotland \*\*\*  
## native\_country South \*\*\*  
## native\_country Taiwan \*\*\*  
## native\_country Thailand \*\*\*  
## native\_country Trinadad&Tobago \*\*\*  
## native\_country United-States \*\*\*  
## native\_country Vietnam \*\*\*  
## native\_country Yugoslavia \*\*\*  
## occupation Armed-Forces \*\*\*  
## occupation Craft-repair \*\*\*  
## occupation Exec-managerial \*\*\*  
## occupation Farming-fishing \*\*\*  
## occupation Handlers-cleaners \*\*\*  
## occupation Machine-op-inspct \*\*\*  
## occupation Other-service \*\*\*  
## occupation Priv-house-serv \*\*\*  
## occupation Prof-specialty \*\*\*  
## occupation Protective-serv \*\*\*  
## occupation Sales \*\*\*  
## occupation Tech-support \*\*\*  
## occupation Transport-moving \*\*\*  
## occupationUNKNOWN   
## sex Male \*\*\*  
## age:sex Male \*\*\*  
## education 11th:sex Male \*\*\*  
## education 12th:sex Male \*\*\*  
## education 1st-4th:sex Male \*\*\*  
## education 5th-6th:sex Male \*\*\*  
## education 7th-8th:sex Male \*\*\*  
## education 9th:sex Male \*\*\*  
## education Assoc-acdm:sex Male \*\*\*  
## education Assoc-voc:sex Male \*\*\*  
## education Bachelors:sex Male \*\*\*  
## education Doctorate:sex Male \*\*\*  
## education HS-grad:sex Male \*\*\*  
## education Masters:sex Male \*\*\*  
## education Preschool:sex Male \*\*\*  
## education Prof-school:sex Male \*\*\*  
## education Some-college:sex Male \*\*\*  
## occupation Armed-Forces:sex Male   
## occupation Craft-repair:sex Male \*\*\*  
## occupation Exec-managerial:sex Male \*\*\*  
## occupation Farming-fishing:sex Male \*\*\*  
## occupation Handlers-cleaners:sex Male \*\*\*  
## occupation Machine-op-inspct:sex Male \*\*\*  
## occupation Other-service:sex Male \*\*\*  
## occupation Priv-house-serv:sex Male \*\*\*  
## occupation Prof-specialty:sex Male \*\*\*  
## occupation Protective-serv:sex Male \*\*\*  
## occupation Sales:sex Male \*\*\*  
## occupation Tech-support:sex Male \*\*\*  
## occupation Transport-moving:sex Male \*\*\*  
## occupationUNKNOWN:sex Male \*\*\*  
## workclass Local-gov:education\_num \*\*\*  
## workclass Never-worked:education\_num \*\*\*  
## workclass Private:education\_num \*\*\*  
## workclass Self-emp-inc:education\_num \*\*\*  
## workclass Self-emp-not-inc:education\_num \*\*\*  
## workclass State-gov:education\_num \*\*\*  
## workclass Without-pay:education\_num \*\*\*  
## workclassUNKNOWN:education\_num \*\*\*  
## education 11th:race Asian-Pac-Islander \*\*\*  
## education 12th:race Asian-Pac-Islander \*\*\*  
## education 1st-4th:race Asian-Pac-Islander \*\*\*  
## education 5th-6th:race Asian-Pac-Islander \*\*\*  
## education 7th-8th:race Asian-Pac-Islander \*\*\*  
## education 9th:race Asian-Pac-Islander \*\*\*  
## education Assoc-acdm:race Asian-Pac-Islander \*\*\*  
## education Assoc-voc:race Asian-Pac-Islander \*\*\*  
## education Bachelors:race Asian-Pac-Islander \*\*\*  
## education Doctorate:race Asian-Pac-Islander \*\*\*  
## education HS-grad:race Asian-Pac-Islander \*\*\*  
## education Masters:race Asian-Pac-Islander \*\*\*  
## education Preschool:race Asian-Pac-Islander \*\*\*  
## education Prof-school:race Asian-Pac-Islander \*\*\*  
## education Some-college:race Asian-Pac-Islander \*\*\*  
## education 11th:race Black \*\*\*  
## education 12th:race Black \*\*\*  
## education 1st-4th:race Black \*\*\*  
## education 5th-6th:race Black \*\*\*  
## education 7th-8th:race Black \*\*\*  
## education 9th:race Black \*\*\*  
## education Assoc-acdm:race Black \*\*\*  
## education Assoc-voc:race Black \*\*\*  
## education Bachelors:race Black \*\*\*  
## education Doctorate:race Black \*\*\*  
## education HS-grad:race Black \*\*\*  
## education Masters:race Black \*\*\*  
## education Preschool:race Black \*\*\*  
## education Prof-school:race Black \*\*\*  
## education Some-college:race Black \*\*\*  
## education 11th:race Other \*\*\*  
## education 12th:race Other \*\*\*  
## education 1st-4th:race Other \*\*\*  
## education 5th-6th:race Other \*\*\*  
## education 7th-8th:race Other \*\*\*  
## education 9th:race Other \*\*\*  
## education Assoc-acdm:race Other \*\*\*  
## education Assoc-voc:race Other \*\*\*  
## education Bachelors:race Other \*\*\*  
## education Doctorate:race Other \*\*\*  
## education HS-grad:race Other \*\*\*  
## education Masters:race Other \*\*\*  
## education Preschool:race Other \*\*\*  
## education Prof-school:race Other \*\*\*  
## education Some-college:race Other \*\*\*  
## education 11th:race White \*\*\*  
## education 12th:race White \*\*\*  
## education 1st-4th:race White \*\*\*  
## education 5th-6th:race White \*\*\*  
## education 7th-8th:race White \*\*\*  
## education 9th:race White \*\*\*  
## education Assoc-acdm:race White \*\*\*  
## education Assoc-voc:race White \*\*\*  
## education Bachelors:race White \*\*\*  
## education Doctorate:race White \*\*\*  
## education HS-grad:race White \*\*\*  
## education Masters:race White \*\*\*  
## education Preschool:race White   
## education Prof-school:race White \*\*\*  
## education Some-college:race White \*\*\*  
## age:race Asian-Pac-Islander \*\*\*  
## age:race Black \*\*\*  
## age:race Other \*\*\*  
## age:race White \*\*\*  
## education\_num:race Asian-Pac-Islander   
## education\_num:race Black   
## education\_num:race Other   
## education\_num:race White   
## race Asian-Pac-Islander:occupation Armed-Forces   
## race Black:occupation Armed-Forces \*\*\*  
## race Other:occupation Armed-Forces   
## race White:occupation Armed-Forces \*\*\*  
## race Asian-Pac-Islander:occupation Craft-repair \*\*\*  
## race Black:occupation Craft-repair \*\*\*  
## race Other:occupation Craft-repair \*\*\*  
## race White:occupation Craft-repair \*\*\*  
## race Asian-Pac-Islander:occupation Exec-managerial \*\*\*  
## race Black:occupation Exec-managerial \*\*\*  
## race Other:occupation Exec-managerial \*\*\*  
## race White:occupation Exec-managerial \*\*\*  
## race Asian-Pac-Islander:occupation Farming-fishing \*\*\*  
## race Black:occupation Farming-fishing \*\*\*  
## race Other:occupation Farming-fishing \*\*\*  
## race White:occupation Farming-fishing \*\*\*  
## race Asian-Pac-Islander:occupation Handlers-cleaners \*\*\*  
## race Black:occupation Handlers-cleaners \*\*\*  
## race Other:occupation Handlers-cleaners \*\*\*  
## race White:occupation Handlers-cleaners \*\*\*  
## race Asian-Pac-Islander:occupation Machine-op-inspct \*\*\*  
## race Black:occupation Machine-op-inspct \*\*\*  
## race Other:occupation Machine-op-inspct \*\*\*  
## race White:occupation Machine-op-inspct \*\*\*  
## race Asian-Pac-Islander:occupation Other-service \*\*\*  
## race Black:occupation Other-service \*\*\*  
## race Other:occupation Other-service \*\*\*  
## race White:occupation Other-service \*\*\*  
## race Asian-Pac-Islander:occupation Priv-house-serv \*\*\*  
## race Black:occupation Priv-house-serv \*\*\*  
## race Other:occupation Priv-house-serv \*\*\*  
## race White:occupation Priv-house-serv   
## race Asian-Pac-Islander:occupation Prof-specialty \*\*\*  
## race Black:occupation Prof-specialty \*\*\*  
## race Other:occupation Prof-specialty \*\*\*  
## race White:occupation Prof-specialty \*\*\*  
## race Asian-Pac-Islander:occupation Protective-serv \*\*\*  
## race Black:occupation Protective-serv \*\*\*  
## race Other:occupation Protective-serv \*\*\*  
## race White:occupation Protective-serv \*\*\*  
## race Asian-Pac-Islander:occupation Sales \*\*\*  
## race Black:occupation Sales \*\*\*  
## race Other:occupation Sales \*\*\*  
## race White:occupation Sales \*\*\*  
## race Asian-Pac-Islander:occupation Tech-support \*\*\*  
## race Black:occupation Tech-support \*\*\*  
## race Other:occupation Tech-support \*\*\*  
## race White:occupation Tech-support \*\*\*  
## race Asian-Pac-Islander:occupation Transport-moving \*\*\*  
## race Black:occupation Transport-moving \*\*\*  
## race Other:occupation Transport-moving \*\*\*  
## race White:occupation Transport-moving \*\*\*  
## race Asian-Pac-Islander:occupationUNKNOWN \*\*\*  
## race Black:occupationUNKNOWN \*\*\*  
## race Other:occupationUNKNOWN \*\*\*  
## race White:occupationUNKNOWN \*\*\*  
## relationship Not-in-family:occupation Armed-Forces \*\*\*  
## relationship Other-relative:occupation Armed-Forces \*\*\*  
## relationship Own-child:occupation Armed-Forces \*\*\*  
## relationship Unmarried:occupation Armed-Forces   
## relationship Wife:occupation Armed-Forces   
## relationship Not-in-family:occupation Craft-repair \*\*\*  
## relationship Other-relative:occupation Craft-repair \*\*\*  
## relationship Own-child:occupation Craft-repair \*\*\*  
## relationship Unmarried:occupation Craft-repair \*\*\*  
## relationship Wife:occupation Craft-repair \*\*\*  
## relationship Not-in-family:occupation Exec-managerial \*\*\*  
## relationship Other-relative:occupation Exec-managerial \*\*\*  
## relationship Own-child:occupation Exec-managerial \*\*\*  
## relationship Unmarried:occupation Exec-managerial \*\*\*  
## relationship Wife:occupation Exec-managerial \*\*\*  
## relationship Not-in-family:occupation Farming-fishing \*\*\*  
## relationship Other-relative:occupation Farming-fishing \*\*\*  
## relationship Own-child:occupation Farming-fishing \*\*\*  
## relationship Unmarried:occupation Farming-fishing \*\*\*  
## relationship Wife:occupation Farming-fishing \*\*\*  
## relationship Not-in-family:occupation Handlers-cleaners \*\*\*  
## relationship Other-relative:occupation Handlers-cleaners \*\*\*  
## relationship Own-child:occupation Handlers-cleaners \*\*\*  
## relationship Unmarried:occupation Handlers-cleaners \*\*\*  
## relationship Wife:occupation Handlers-cleaners \*\*\*  
## relationship Not-in-family:occupation Machine-op-inspct \*\*\*  
## relationship Other-relative:occupation Machine-op-inspct \*\*\*  
## relationship Own-child:occupation Machine-op-inspct \*\*\*  
## relationship Unmarried:occupation Machine-op-inspct \*\*\*  
## relationship Wife:occupation Machine-op-inspct \*\*\*  
## relationship Not-in-family:occupation Other-service \*\*\*  
## relationship Other-relative:occupation Other-service \*\*\*  
## relationship Own-child:occupation Other-service \*\*\*  
## relationship Unmarried:occupation Other-service \*\*\*  
## relationship Wife:occupation Other-service \*\*\*  
## relationship Not-in-family:occupation Priv-house-serv \*\*\*  
## relationship Other-relative:occupation Priv-house-serv \*\*\*  
## relationship Own-child:occupation Priv-house-serv \*\*\*  
## relationship Unmarried:occupation Priv-house-serv \*\*\*  
## relationship Wife:occupation Priv-house-serv   
## relationship Not-in-family:occupation Prof-specialty \*\*\*  
## relationship Other-relative:occupation Prof-specialty \*\*\*  
## relationship Own-child:occupation Prof-specialty \*\*\*  
## relationship Unmarried:occupation Prof-specialty \*\*\*  
## relationship Wife:occupation Prof-specialty \*\*\*  
## relationship Not-in-family:occupation Protective-serv \*\*\*  
## relationship Other-relative:occupation Protective-serv \*\*\*  
## relationship Own-child:occupation Protective-serv \*\*\*  
## relationship Unmarried:occupation Protective-serv \*\*\*  
## relationship Wife:occupation Protective-serv \*\*\*  
## relationship Not-in-family:occupation Sales \*\*\*  
## relationship Other-relative:occupation Sales \*\*\*  
## relationship Own-child:occupation Sales \*\*\*  
## relationship Unmarried:occupation Sales \*\*\*  
## relationship Wife:occupation Sales \*\*\*  
## relationship Not-in-family:occupation Tech-support \*\*\*  
## relationship Other-relative:occupation Tech-support \*\*\*  
## relationship Own-child:occupation Tech-support \*\*\*  
## relationship Unmarried:occupation Tech-support \*\*\*  
## relationship Wife:occupation Tech-support \*\*\*  
## relationship Not-in-family:occupation Transport-moving \*\*\*  
## relationship Other-relative:occupation Transport-moving \*\*\*  
## relationship Own-child:occupation Transport-moving \*\*\*  
## relationship Unmarried:occupation Transport-moving \*\*\*  
## relationship Wife:occupation Transport-moving \*\*\*  
## relationship Not-in-family:occupationUNKNOWN \*\*\*  
## relationship Other-relative:occupationUNKNOWN \*\*\*  
## relationship Own-child:occupationUNKNOWN \*\*\*  
## relationship Unmarried:occupationUNKNOWN \*\*\*  
## relationship Wife:occupationUNKNOWN \*\*\*  
## education\_num:relationship Not-in-family \*\*\*  
## education\_num:relationship Other-relative \*\*\*  
## education\_num:relationship Own-child \*\*\*  
## education\_num:relationship Unmarried \*\*\*  
## education\_num:relationship Wife \*\*\*  
## marital\_status Married-AF-spouse:occupation Armed-Forces   
## marital\_status Married-civ-spouse:occupation Armed-Forces   
## marital\_status Married-spouse-absent:occupation Armed-Forces   
## marital\_status Never-married:occupation Armed-Forces   
## marital\_status Separated:occupation Armed-Forces   
## marital\_status Widowed:occupation Armed-Forces   
## marital\_status Married-AF-spouse:occupation Craft-repair \*\*\*  
## marital\_status Married-civ-spouse:occupation Craft-repair \*\*\*  
## marital\_status Married-spouse-absent:occupation Craft-repair \*\*\*  
## marital\_status Never-married:occupation Craft-repair \*\*\*  
## marital\_status Separated:occupation Craft-repair \*\*\*  
## marital\_status Widowed:occupation Craft-repair \*\*\*  
## marital\_status Married-AF-spouse:occupation Exec-managerial \*\*\*  
## marital\_status Married-civ-spouse:occupation Exec-managerial \*\*\*  
## marital\_status Married-spouse-absent:occupation Exec-managerial \*\*\*  
## marital\_status Never-married:occupation Exec-managerial \*\*\*  
## marital\_status Separated:occupation Exec-managerial \*\*\*  
## marital\_status Widowed:occupation Exec-managerial \*\*\*  
## marital\_status Married-AF-spouse:occupation Farming-fishing \*\*\*  
## marital\_status Married-civ-spouse:occupation Farming-fishing \*\*\*  
## marital\_status Married-spouse-absent:occupation Farming-fishing \*\*\*  
## marital\_status Never-married:occupation Farming-fishing \*\*\*  
## marital\_status Separated:occupation Farming-fishing \*\*\*  
## marital\_status Widowed:occupation Farming-fishing \*\*\*  
## marital\_status Married-AF-spouse:occupation Handlers-cleaners   
## marital\_status Married-civ-spouse:occupation Handlers-cleaners \*\*\*  
## marital\_status Married-spouse-absent:occupation Handlers-cleaners \*\*\*  
## marital\_status Never-married:occupation Handlers-cleaners \*\*\*  
## marital\_status Separated:occupation Handlers-cleaners \*\*\*  
## marital\_status Widowed:occupation Handlers-cleaners \*\*\*  
## marital\_status Married-AF-spouse:occupation Machine-op-inspct   
## marital\_status Married-civ-spouse:occupation Machine-op-inspct \*\*\*  
## marital\_status Married-spouse-absent:occupation Machine-op-inspct \*\*\*  
## marital\_status Never-married:occupation Machine-op-inspct \*\*\*  
## marital\_status Separated:occupation Machine-op-inspct \*\*\*  
## marital\_status Widowed:occupation Machine-op-inspct \*\*\*  
## marital\_status Married-AF-spouse:occupation Other-service \*\*\*  
## marital\_status Married-civ-spouse:occupation Other-service \*\*\*  
## marital\_status Married-spouse-absent:occupation Other-service \*\*\*  
## marital\_status Never-married:occupation Other-service \*\*\*  
## marital\_status Separated:occupation Other-service \*\*\*  
## marital\_status Widowed:occupation Other-service \*\*\*  
## marital\_status Married-AF-spouse:occupation Priv-house-serv   
## marital\_status Married-civ-spouse:occupation Priv-house-serv \*\*\*  
## marital\_status Married-spouse-absent:occupation Priv-house-serv \*\*\*  
## marital\_status Never-married:occupation Priv-house-serv \*\*\*  
## marital\_status Separated:occupation Priv-house-serv \*\*\*  
## marital\_status Widowed:occupation Priv-house-serv \*\*\*  
## marital\_status Married-AF-spouse:occupation Prof-specialty \*\*\*  
## marital\_status Married-civ-spouse:occupation Prof-specialty \*\*\*  
## marital\_status Married-spouse-absent:occupation Prof-specialty \*\*\*  
## marital\_status Never-married:occupation Prof-specialty \*\*\*  
## marital\_status Separated:occupation Prof-specialty \*\*\*  
## marital\_status Widowed:occupation Prof-specialty \*\*\*  
## marital\_status Married-AF-spouse:occupation Protective-serv \*\*\*  
## marital\_status Married-civ-spouse:occupation Protective-serv \*\*\*  
## marital\_status Married-spouse-absent:occupation Protective-serv \*\*   
## marital\_status Never-married:occupation Protective-serv \*\*\*  
## marital\_status Separated:occupation Protective-serv \*\*\*  
## marital\_status Widowed:occupation Protective-serv \*\*\*  
## marital\_status Married-AF-spouse:occupation Sales \*\*\*  
## marital\_status Married-civ-spouse:occupation Sales \*\*\*  
## marital\_status Married-spouse-absent:occupation Sales \*\*\*  
## marital\_status Never-married:occupation Sales \*\*\*  
## marital\_status Separated:occupation Sales \*\*\*  
## marital\_status Widowed:occupation Sales \*\*\*  
## marital\_status Married-AF-spouse:occupation Tech-support   
## marital\_status Married-civ-spouse:occupation Tech-support \*\*\*  
## marital\_status Married-spouse-absent:occupation Tech-support \*\*\*  
## marital\_status Never-married:occupation Tech-support \*\*\*  
## marital\_status Separated:occupation Tech-support \*\*\*  
## marital\_status Widowed:occupation Tech-support \*\*\*  
## marital\_status Married-AF-spouse:occupation Transport-moving \*\*\*  
## marital\_status Married-civ-spouse:occupation Transport-moving \*\*\*  
## marital\_status Married-spouse-absent:occupation Transport-moving \*\*\*  
## marital\_status Never-married:occupation Transport-moving \*\*\*  
## marital\_status Separated:occupation Transport-moving \*\*\*  
## marital\_status Widowed:occupation Transport-moving \*\*\*  
## marital\_status Married-AF-spouse:occupationUNKNOWN \*\*\*  
## marital\_status Married-civ-spouse:occupationUNKNOWN \*\*\*  
## marital\_status Married-spouse-absent:occupationUNKNOWN \*\*\*  
## marital\_status Never-married:occupationUNKNOWN \*\*\*  
## marital\_status Separated:occupationUNKNOWN \*\*\*  
## marital\_status Widowed:occupationUNKNOWN \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## (Dispersion parameter for binomial family taken to be 1)  
##   
## Null deviance: 35948 on 32559 degrees of freedom  
## Residual deviance: 1063372 on 32165 degrees of freedom  
## AIC: 1064162  
##   
## Number of Fisher Scoring iterations: 25

library(caret)  
data\_test = read.csv("https://raw.githubusercontent.com/anishkapeter/Stat-2-Project-2-/main/adult.test",header=FALSE)  
data\_test <- data\_test[-1,]  
  
colnames(data\_test) <- c("age", "workclass", "fnlwgt", "education", "education\_num",   
 "marital\_status", "occupation", "relationship", "race", "sex",   
 "capital\_gain", "capital\_loss", "hours\_per\_week", "native\_country","income")  
  
  
# change age into int  
data\_test$age <- as.integer(data\_test$age)  
#change ? data in workclass/occupation to UNKNOWN  
data\_test$workclass <- ifelse(data\_test$workclass == " ?", "UNKNOWN", data\_test$workclass)  
data\_test$occupation <- ifelse(data\_test$occupation == " ?", "UNKNOWN", data\_test$occupation)  
  
  
#Factoring Categoricals/Checking References  
  
data\_test$workclass[data\_test$workclass == ""] <- "UNKNOWN"  
data\_test$workclass <- factor(data\_test$workclass, levels = levels(data$workclass))  
levels(data\_test$workclass)

## [1] " Federal-gov" " Local-gov" " Never-worked"   
## [4] " Private" " Self-emp-inc" " Self-emp-not-inc"  
## [7] " State-gov" " Without-pay" "UNKNOWN"

data\_test$education <- as.factor(data\_test$education)  
data\_test$education[data\_test$education == ""] <- NA  
data\_test$education <- droplevels(data\_test$education)  
levels(data\_test$education)

## [1] " 10th" " 11th" " 12th" " 1st-4th"   
## [5] " 5th-6th" " 7th-8th" " 9th" " Assoc-acdm"   
## [9] " Assoc-voc" " Bachelors" " Doctorate" " HS-grad"   
## [13] " Masters" " Preschool" " Prof-school" " Some-college"

data\_test$marital\_status <- as.factor(data\_test$marital\_status)  
data\_test$marital\_status[data\_test$marital\_status == ""] <- NA  
data\_test$marital\_status <- droplevels(data\_test$marital\_status)  
levels(data\_test$marital\_status)

## [1] " Divorced" " Married-AF-spouse" " Married-civ-spouse"   
## [4] " Married-spouse-absent" " Never-married" " Separated"   
## [7] " Widowed"

data\_test$occupation <- as.factor(data\_test$occupation)  
data\_test$occupation[data\_test$occupation == ""] <- NA  
data\_test$occupation <- droplevels(data\_test$occupation)  
levels(data\_test$occupation)

## [1] " Adm-clerical" " Armed-Forces" " Craft-repair"   
## [4] " Exec-managerial" " Farming-fishing" " Handlers-cleaners"  
## [7] " Machine-op-inspct" " Other-service" " Priv-house-serv"   
## [10] " Prof-specialty" " Protective-serv" " Sales"   
## [13] " Tech-support" " Transport-moving" "UNKNOWN"

data\_test$relationship <- as.factor(data\_test$relationship)  
data\_test$relationship[data\_test$relationship == ""] <- NA  
data\_test$relationship <- droplevels(data\_test$relationship)  
levels(data\_test$relationship)

## [1] " Husband" " Not-in-family" " Other-relative" " Own-child"   
## [5] " Unmarried" " Wife"

data\_test$race <- as.factor(data\_test$race)  
data\_test$race[data\_test$race == ""] <- NA  
data\_test$race <- droplevels(data\_test$race)  
levels(data\_test$race)

## [1] " Amer-Indian-Eskimo" " Asian-Pac-Islander" " Black"   
## [4] " Other" " White"

data\_test$sex <- as.factor(data\_test$sex)  
data\_test$sex[data\_test$sex == ""] <- NA  
data\_test$sex <- droplevels(data\_test$sex)  
levels(data\_test$sex)

## [1] " Female" " Male"

data\_test$native\_country <- as.factor(data\_test$native\_country)  
data\_test$native\_country[data\_test$native\_country == ""] <- NA  
data\_test$native\_country <- droplevels(data\_test$native\_country)  
levels(data\_test$native\_country)

## [1] " ?" " Cambodia"   
## [3] " Canada" " China"   
## [5] " Columbia" " Cuba"   
## [7] " Dominican-Republic" " Ecuador"   
## [9] " El-Salvador" " England"   
## [11] " France" " Germany"   
## [13] " Greece" " Guatemala"   
## [15] " Haiti" " Honduras"   
## [17] " Hong" " Hungary"   
## [19] " India" " Iran"   
## [21] " Ireland" " Italy"   
## [23] " Jamaica" " Japan"   
## [25] " Laos" " Mexico"   
## [27] " Nicaragua" " Outlying-US(Guam-USVI-etc)"  
## [29] " Peru" " Philippines"   
## [31] " Poland" " Portugal"   
## [33] " Puerto-Rico" " Scotland"   
## [35] " South" " Taiwan"   
## [37] " Thailand" " Trinadad&Tobago"   
## [39] " United-States" " Vietnam"   
## [41] " Yugoslavia"

data\_test$age=as.integer(data\_test$age)  
  
data\_test$income <- as.factor(ifelse(data\_test$income==" >50K."," >50K"," <=50K"))  
  
predictions = predict(model, data\_test, type = "response")

## Warning in predict.lm(object, newdata, se.fit, scale = 1, type = if (type == :  
## prediction from a rank-deficient fit may be misleading

threshold = 0.5  
  
  
  
class\_predictions = ifelse(predictions > threshold, " >50K", " <=50K")  
  
cm = table(Predicted = as.factor(class\_predictions), Actual = as.factor(data\_test$income))  
  
confusion\_matrix <- confusionMatrix(cm)  
  
print(confusion\_matrix)

## Confusion Matrix and Statistics  
##   
## Actual  
## Predicted <=50K >50K  
## <=50K 6750 1792  
## >50K 5685 2054  
##   
## Accuracy : 0.5408   
## 95% CI : (0.5331, 0.5484)   
## No Information Rate : 0.7638   
## P-Value [Acc > NIR] : 1   
##   
## Kappa : 0.057   
##   
## Mcnemar's Test P-Value : <0.0000000000000002  
##   
## Sensitivity : 0.5428   
## Specificity : 0.5341   
## Pos Pred Value : 0.7902   
## Neg Pred Value : 0.2654   
## Prevalence : 0.7638   
## Detection Rate : 0.4146   
## Detection Prevalence : 0.5247   
## Balanced Accuracy : 0.5384   
##   
## 'Positive' Class : <=50K   
##

**Evaluation**

sensitivity = 2409 / (2409 + 1437)  
  
specificity = 10696 / (10696 + 1739)  
  
prevalence = (2409 + 1437) / (10696 + 1437 + 1739 + 2409)  
  
ppv = 2409 / (2409 + 1739)  
  
npv = 10696 / (10696 + 1437)  
  
library(pROC)

## Warning: package 'pROC' was built under R version 4.1.3

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

##   
## Attaching package: 'pROC'

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

binary\_income = as.numeric(data\_test$income == " >50K") # Assuming " >50K" is the positive class  
  
auroc\_result = roc(response = binary\_income, predictor = predictions)

## Setting levels: control = 0, case = 1

## Setting direction: controls < cases

auroc = auroc\_result$auc  
plot(auroc\_result,print.thres="best")  
text(x = 0.6, y = 0.4, labels = paste("AUC =", round(auroc, 4)))

