

ML_Assignment 5

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Data Cleaning

1.

```
housing <- read.csv("housing.csv", stringsAsFactors = TRUE)
# remove unique identifier
housing <- housing[, -1]
# Factor variables that should be categorical not numerical
housing$OverallQual <- as.factor(housing$OverallQual)
housing$OverallCond <- as.factor(housing$OverallCond)

summary(housing)
```

```

##   MSSubClass      MSZoning     LotFrontage     LotArea      Street
## Min.    : 20.0    C (all): 10    Min.    : 21.00    Min.    : 1300    Grvl:  6
## 1st Qu.: 20.0    FV       : 65    1st Qu.: 59.00    1st Qu.: 7554    Pave:1454
## Median  : 50.0    RH       : 16    Median  : 69.00    Median  : 9478
## Mean    : 56.9    RL       :1151   Mean    : 70.05    Mean    : 10517
## 3rd Qu.: 70.0    RM       : 218   3rd Qu.: 80.00    3rd Qu.: 11602
## Max.    :190.0          NA's    :259    Max.    :313.00    Max.    :215245
##                                     NA's    :259
##   Alley      LotShape  LandContour Utilities     LotConfig     LandSlope
## Grvl: 50    IR1:484    Bnk: 63    AllPub:1459    Corner : 263    Gtl:1382
## Pave: 41    IR2: 41    HLS: 50    NoSeWa:    1    CulDSac:  94    Mod:  65
## NA's:1369   IR3: 10    Low: 36          NA's    :259    FR2     : 47    Sev:  13
##                      Reg:925    Lvl:1311          NA's    :259    FR3     :  4
##                                     Inside :1052
##
##   Neighborhood Condition1 Condition2     BldgType     HouseStyle
## NAmes  :225    Norm    :1260    Norm    :1445    1Fam   :1220    1Story :726
## CollgCr:150   Feedr   : 81     Feedr   :  6    2fmCon:  31    2Story :445
## OldTown:113   Artery   : 48     Artery   :  2    Duplex:  52    1.5Fin :154
## Edwards:100   RRAm    : 26     PosN    :  2    Twnhs  : 43    SLvl   : 65
## Somerst: 86   PosN    : 19     RRNn    :  2    TwnhsE: 114   SFoyer : 37
## Gilbert: 79   RRAe    : 11     PosA    :  1          NA's    : 14
## (Other):707   (Other): 15    (Other):  2          NA's    : 19
##   OverallQual OverallCond YearBuilt YearRemodAdd     RoofStyle
## 5       :397    5       :821    Min.    :1872    Min.    :1950    Flat   : 13
## 6       :374    6       :252    1st Qu.:1954    1st Qu.:1967    Gable  :1141
## 7       :319    7       :205    Median  :1973    Median  :1994    Gambrel: 11
## 8       :168    8       : 72    Mean    :1971    Mean    :1985    Hip    : 286
## 4       :116    4       : 57    3rd Qu.:2000    3rd Qu.:2004    Mansard:  7
## 9       : 43    3       : 25    Max.    :2010    Max.    :2010    Shed   :  2
## (Other): 43   (Other): 28
##   RoofMatl     Exterior1st Exterior2nd     MasVnrType     MasVnrArea
## CompShg:1434  VinylSd:515  VinylSd:504    BrkCmn : 15    Min.    :  0.0
## Tar&Grv: 11   HdBoard:222  MetalSd:214   BrkFace:445   1st Qu.:  0.0
## WdShngl:  6   MetalSd:220  HdBoard:207   None   :864    Median  :  0.0
## WdShake:  5   Wd Sdng:206  Wd Sdng:197   Stone  :128    Mean    : 103.7
## ClyTile:  1   Plywood:108  Plywood:142   NA's    :  8    3rd Qu.: 166.0
## Membran:  1   CemntBd: 61  CmentBd: 60          NA's    : 1600.0
## (Other):  2   (Other):128  (Other):136          NA's    : 8
##   ExterQual  ExterCond Foundation BsmtQual     BsmtCond     BsmtExposure
## Ex: 52      Ex:  3     BrkTil:146  Ex: 121    Fa:  45    Av: 221
## Fa: 14      Fa: 28     CBlock:634  Fa:  35    Gd:  65    Gd: 134
## Gd:488     Gd: 146    PConc :647   Gd: 618    Po:  2     Mn: 114
## TA:906     Po:  1     Slab : 24   TA: 649    TA:1311   No: 953
##                      TA:1282   Stone :  6   NA's: 37    NA's: 37    NA's: 38
##                                     Wood   :  3
##
##   BsmtFinType1 BsmtFinSF1 BsmtFinType2 BsmtFinSF2     BsmtUnfSF
## ALQ :220     Min.    : 0.0   ALQ : 19    Min.    : 0.00    Min.    : 0.0
## BLQ :148     1st Qu.: 0.0   BLQ : 33    1st Qu.: 0.00    1st Qu.: 223.0
## GLQ :418     Median  : 383.5  GLQ : 14    Median  : 0.00    Median : 477.5

```

```

##  LwQ : 74      Mean   : 443.6    LwQ : 46      Mean   : 46.55    Mean   : 567.2
##  Rec :133      3rd Qu.: 712.2    Rec : 54      3rd Qu.:  0.00    3rd Qu.: 808.0
##  Unf :430      Max.    :5644.0    Unf :1256    Max.    :1474.00    Max.    :2336.0
##  NA's: 37          NA's: 38
##  TotalBsmtSF      Heating      HeatingQC CentralAir Electrical      X1stFlrSF
##  Min.   : 0.0    Floor:  1     Ex:741      N: 95      FuseA: 94    Min.   : 334
##  1st Qu.: 795.8  GasA :1428    Fa: 49      Y:1365    FuseF: 27    1st Qu.: 882
##  Median : 991.5  GasW : 18     Gd:241          Median : 1087
##  Mean   :1057.4  Grav :  7     Po:  1      Mix   : 1     Mean   :1163
##  3rd Qu.:1298.2  OthW :  2     TA:428          SBrkr:1334  3rd Qu.:1391
##  Max.   :6110.0   Wall :  4          NA's : 1     Max.   :4692
##
##  X2ndFlrSF      LowQualFinSF      GrLivArea      BsmtFullBath
##  Min.   : 0     Min.   : 0.000    Min.   :334    Min.   :0.0000
##  1st Qu.: 0     1st Qu.: 0.000    1st Qu.:1130   1st Qu.:0.0000
##  Median : 0     Median : 0.000    Median :1464    Median :0.0000
##  Mean   : 347   Mean   : 5.845    Mean   :1515    Mean   :0.4253
##  3rd Qu.: 728   3rd Qu.: 0.000    3rd Qu.:1777   3rd Qu.:1.0000
##  Max.   :2065   Max.   :572.000   Max.   :5642    Max.   :3.0000
##
##  BsmtHalfBath      FullBath      HalfBath      BedroomAbvGr
##  Min.   :0.00000   Min.   :0.000    Min.   :0.0000    Min.   :0.000
##  1st Qu.:0.00000   1st Qu.:1.000    1st Qu.:0.0000    1st Qu.:2.000
##  Median :0.00000   Median :2.000    Median :0.0000    Median :3.000
##  Mean   :0.05753   Mean   :1.565    Mean   :0.3829    Mean   :2.866
##  3rd Qu.:0.00000   3rd Qu.:2.000    3rd Qu.:1.0000    3rd Qu.:3.000
##  Max.   :2.00000   Max.   :3.000    Max.   :2.0000    Max.   :8.000
##
##  KitchenAbvGr      KitchenQual      TotRmsAbvGrd      Functional      Fireplaces
##  Min.   :0.000    Ex:100      Min.   : 2.000    Maj1: 14    Min.   :0.000
##  1st Qu.:1.000    Fa: 39      1st Qu.: 5.000    Maj2:  5    1st Qu.:0.000
##  Median :1.000    Gd:586      Median : 6.000    Min1: 31    Median :1.000
##  Mean   :1.047    TA:735      Mean   : 6.518    Min2: 34    Mean   :0.613
##  3rd Qu.:1.000          3rd Qu.: 7.000    Mod : 15    3rd Qu.:1.000
##  Max.   :3.000          Max.   :14.000    Sev :  1    Max.   :3.000
##
##  GarageType      GarageYrBlt      GarageFinish      GarageCars
##  Ex : 24      2Types : 6     Min.   :1900    Fin :352      Min.   :0.000
##  Fa : 33      Attchd :870    1st Qu.:1961   RFn :422      1st Qu.:1.000
##  Gd : 380     Basement:19    Median :1980    Unf :605      Median :2.000
##  Po : 20      BuiltIn: 88   Mean   :1979    NA's: 81     Mean   :1.767
##  TA :313      CarPort:  9    3rd Qu.:2002          3rd Qu.:2.000
##  NA's:690     Detchd :387   Max.   :2010          Max.   :4.000
##          NA's : 81   NA's :81
##
##  GarageArea      GarageQual      GarageCond      PavedDrive      WoodDeckSF
##  Min.   : 0.0    Ex :  3     Ex :  2     N: 90      Min.   : 0.00
##  1st Qu.: 334.5  Fa : 48     Fa : 35     P: 30      1st Qu.: 0.00
##  Median : 480.0  Gd : 14     Gd :  9     Y:1340    Median : 0.00
##  Mean   : 473.0  Po :  3     Po :  7          Mean   : 94.24
##  3rd Qu.: 576.0  TA :1311    TA :1326          3rd Qu.:168.00
##  Max.   :1418.0  NA's: 81    NA's: 81          Max.   :857.00
##

```

```

##   OpenPorchSF      EnclosedPorch       X3SsnPorch      ScreenPorch
##   Min. : 0.00      Min. : 0.00      Min. : 0.00      Min. : 0.00
##   1st Qu.: 0.00    1st Qu.: 0.00    1st Qu.: 0.00    1st Qu.: 0.00
##   Median : 25.00   Median : 0.00    Median : 0.00    Median : 0.00
##   Mean   : 46.66   Mean   : 21.95   Mean   : 3.41    Mean   : 15.06
##   3rd Qu.: 68.00   3rd Qu.: 0.00    3rd Qu.: 0.00    3rd Qu.: 0.00
##   Max.   :547.00   Max.   :552.00   Max.   :508.00    Max.   :480.00
##
##   PoolArea        PoolQC        Fence        MiscFeature     MiscVal
##   Min. : 0.000    Ex   : 2    GdPrv: 59    Gar2: 2    Min. : 0.00
##   1st Qu.: 0.000   Fa   : 2    GdWo : 54    Othr: 2    1st Qu.: 0.00
##   Median : 0.000   Gd   : 3    MnPrv: 157   Shed: 49    Median : 0.00
##   Mean   : 2.759   NA's:1453  MnWw : 11    TenC: 1    Mean   : 43.49
##   3rd Qu.: 0.000                    NA's :1179   NA's:1406  3rd Qu.: 0.00
##   Max.   :738.000
##
##   MoSold          YrSold        SaleType      SaleCondition   SalePrice
##   Min. : 1.000    Min. :2006    WD   :1267    Abnorml: 101   Min. : 34900
##   1st Qu.: 5.000   1st Qu.:2007   New  : 122   AdjLand:  4    1st Qu.:129975
##   Median : 6.000   Median :2008   COD   :  43   Alloca : 12    Median :163000
##   Mean   : 6.322   Mean   :2008   ConLD :  9    Family : 20    Mean   :180921
##   3rd Qu.: 8.000   3rd Qu.:2009   ConLI :  5    Normal :1198   3rd Qu.:214000
##   Max.   :12.000   Max.   :2010   ConLw :  5    Partial: 125   Max.   :755000
##   (Other): 9

```

After removing: ID and changing OverallCond & OverallQual to factor variables Categorical Variables: 45
Numerical Variables: 35

2.

```

# find and count NA's
sapply(housing, function(x) sum(is.na(x)))

```

```

##   MSSubClass      MSZoning     LotFrontage      LotArea      Street
##          0            0           259            0            0
##      Alley     LotShape    LandContour     Utilities     LotConfig
##      1369            0            0            0            0
##      LandSlope Neighborhood Condition1 Condition2     BldgType
##          0            0            0            0            0
##      HouseStyle OverallQual OverallCond YearBuilt YearRemodAdd
##          0            0            0            0            0
##      RoofStyle     RoofMatl Exterior1st Exterior2nd MasVnrType
##          0            0            0            0            8
##      MasVnrArea ExterQual   ExterCond Foundation BsmtQual
##          8            0            0            0            37
##      BsmtCond BsmtExposure BsmtFinType1 BsmtFinSF1 BsmtFinType2
##          37           38           37            0            38
##      BsmtFinSF2 BsmtUnfSF TotalBsmtSF     Heating HeatingQC
##          0            0            0            0            0
##      CentralAir Electrical X1stFlrSF X2ndFlrSF LowQualFinSF
##          0            1            0            0            0
##      GrLivArea BsmtFullBath BsmtHalfBath FullBath HalfBath
##          0            0            0            0            0
## BedroomAbvGr KitchenAbvGr KitchenQual TotRmsAbvGrd Functional
##          0            0            0            0            0
## Fireplaces FireplaceQu GarageType GarageYrBlt GarageFinish
##          0           690           81           81           81
## GarageCars GarageArea GarageQual GarageCond PavedDrive
##          0            0           81           81            0
## WoodDeckSF OpenPorchSF EnclosedPorch X3SsnPorch ScreenPorch
##          0            0            0            0            0
## PoolArea     PoolQC       Fence MiscFeature      MiscVal
##          0           1453          1179          1406            0
## MoSold      YrSold SaleType SaleCondition SalePrice
##          0            0            0            0            0

```

```

# Outlier detection in SalePrice
summary(housing$SalePrice)

```

```

##   Min. 1st Qu. Median      Mean 3rd Qu.      Max.
## 34900 129975 163000 180921 214000 755000

```

```

IQR = 214000 - 129975
lower bound = 129975 - 1.5*IQR
upper bound = 214000 + 1.5*IQR

```

Variables with missing values: LotFrontage, Alley, MasVnrType, MasVnrArea, BsmtQual, BsmtCond, BsmtExposre, BsmtFinType1, BsmtFinType2, Electrical, FireplaceQu, GarageType, GarageYrBlt, GarageFinish, GarageQual, GarageCond, PoolQC, Fence, MiscFeature

Although there is a large list of variables with missing data, some of the variables that are NA's are not "really" missing. For example we see the Garage variables all have 81 missing values, well, I think it is safe to assume that there are 81 properties that do not have garages, rather than the data actually missing. The same can be

inferred for nearly all the “missing” data, though a closer look at some of the variables should be assessed before the next step. These missing variables will probably be best handled by taking the numeric values to a value of zero, if it is determined that the home most likely doesn’t contain the feature rather than it being truly missing.

While using the IQR range to detect outliers shows quite a few outliers, looking at the data tells another story. The highest sales priced seem to be correlated with at grade living living space and finished basement living space as well as age of home and other amenities, this would suggest that the prices are reflective of the data and more importantly, important to the data to depict an accurate model. I have determined that removing any data points as outliers of Sales Price would be more detrimental than advantageous.

3.

```
# Add NA as a factor value
housing$Alley <- addNA(housing$Alley)
housing$BsmtQual <- addNA(housing$BsmtQual)
housing$BsmtCond <- addNA(housing$BsmtCond)
housing$BsmtExposure <- addNA(housing$BsmtExposure)
housing$BsmtFinType1 <- addNA(housing$BsmtFinType1)
housing$BsmtFinType2 <- addNA(housing$BsmtFinType2)
housing$FireplaceQu <- addNA(housing$FireplaceQu)
housing$GarageType <- addNA(housing$GarageType)
housing$GarageFinish <- addNA(housing$GarageFinish)
housing$GarageQual <- addNA(housing$GarageQual)
housing$GarageCond <- addNA(housing$GarageCond)
housing$PoolQC <- addNA(housing$PoolQC)
housing$Fence <- addNA(housing$Fence)
housing$MiscFeature <- addNA(housing$MiscFeature)

# Change relevant NA numerical values to 0
housing["GarageYrBlt"][is.na(housing["GarageYrBlt"])] <- 0
```

4.

```
# Check NA's
sapply(housing, function(x) sum(is.na(x)))
```

```

##   MSSubClass      MSZoning     LotFrontage      LotArea      Street
##       0             0            259             0             0
##   Alley        LotShape    LandContour    Utilities    LotConfig
##       0             0             0             0             0
##   LandSlope Neighborhood Condition1 Condition2    BldgType
##       0             0             0             0             0
##   HouseStyle OverallQual OverallCond YearBuilt YearRemodAdd
##       0             0             0             0             0
##   RoofStyle    RoofMatl Exterior1st Exterior2nd MasVnrType
##       0             0             0             0             8
##   MasVnrArea ExterQual   ExterCond Foundation BsmtQual
##       8             0             0             0             0
##   BsmtCond BsmtExposure BsmtFinType1 BsmtFinSF1 BsmtFinType2
##       0             0             0             0             0
##   BsmtFinSF2 BsmtUnfSF TotalBsmtSF    Heating  HeatingQC
##       0             0             0             0             0
##   CentralAir Electrical X1stFlrSF X2ndFlrSF LowQualFinSF
##       0             1             0             0             0
##   GrLivArea BsmtFullBath BsmtHalfBath FullBath HalfBath
##       0             0             0             0             0
## BedroomAbvGr KitchenAbvGr KitchenQual TotRmsAbvGrd Functional
##       0             0             0             0             0
## Fireplaces FireplaceQu GarageType GarageYrBlt GarageFinish
##       0             0             0             0             0
## GarageCars GarageArea GarageQual GarageCond PavedDrive
##       0             0             0             0             0
## WoodDeckSF OpenPorchSF EnclosedPorch X3SsnPorch ScreenPorch
##       0             0             0             0             0
## PoolArea    PoolQC       Fence MiscFeature MiscVal
##       0             0             0             0             0
## MoSold      YrSold SaleType SaleCondition SalePrice
##       0             0             0             0             0

```

After replacing NA's I have two variables that still contain NA's: LotFrontage with 259 (17.7%), Electrical with 1 (.068%), MasVnrType with 8 (.54%) and MasVnrArea with 8 (.54%) of the data.

5.

```

#drop electrical NA rows & drop MasVnrType NA rows
library(tidyr)
housing <- housing %>% drop_na(Electrical) # 1 row
housing <- housing %>% drop_na(MasVnrType) # 8 rows

# Check row with NA's
housing[rowSums(is.na(housing)) > 0, ]

```

##	MSSubClass	MSZoning	LotFrontage	LotArea	Street	Alley	LotShape	LandContour
## 8	60	RL	NA	10382	Pave	<NA>	IR1	Lvl
## 13	20	RL	NA	12968	Pave	<NA>	IR2	Lvl
## 15	20	RL	NA	10920	Pave	<NA>	IR1	Lvl
## 17	20	RL	NA	11241	Pave	<NA>	IR1	Lvl
## 25	20	RL	NA	8246	Pave	<NA>	IR1	Lvl
## 32	20	RL	NA	8544	Pave	<NA>	IR1	Lvl
## 43	85	RL	NA	9180	Pave	<NA>	IR1	Lvl
## 44	20	RL	NA	9200	Pave	<NA>	IR1	Lvl
## 51	60	RL	NA	13869	Pave	<NA>	IR2	Lvl
## 65	60	RL	NA	9375	Pave	<NA>	Reg	Lvl
## 67	20	RL	NA	19900	Pave	<NA>	Reg	Lvl
## 77	20	RL	NA	8475	Pave	<NA>	IR1	Lvl
## 85	80	RL	NA	8530	Pave	<NA>	IR1	Lvl
## 96	60	RL	NA	9765	Pave	<NA>	IR2	Lvl
## 101	20	RL	NA	10603	Pave	<NA>	IR1	Lvl
## 105	50	RM	NA	7758	Pave	<NA>	Reg	Lvl
## 112	80	RL	NA	7750	Pave	<NA>	IR1	Lvl
## 114	20	RL	NA	21000	Pave	<NA>	Reg	Bnk
## 117	20	RL	NA	11616	Pave	<NA>	Reg	Lvl
## 121	80	RL	NA	21453	Pave	<NA>	IR1	Low
## 127	120	RL	NA	4928	Pave	<NA>	IR1	Lvl
## 132	60	RL	NA	12224	Pave	<NA>	IR1	Lvl
## 134	20	RL	NA	6853	Pave	<NA>	IR1	Lvl
## 137	20	RL	NA	10355	Pave	<NA>	IR1	Lvl
## 148	60	RL	NA	9505	Pave	<NA>	IR1	Lvl
## 150	50	RM	NA	6240	Pave	<NA>	Reg	Lvl
## 153	60	RL	NA	14803	Pave	<NA>	IR1	Lvl
## 154	20	RL	NA	13500	Pave	<NA>	Reg	Lvl
## 161	20	RL	NA	11120	Pave	<NA>	IR1	Lvl
## 167	20	RL	NA	10708	Pave	<NA>	IR1	Lvl
## 170	20	RL	NA	16669	Pave	<NA>	IR1	Lvl
## 171	50	RM	NA	12358	Pave	<NA>	IR1	Lvl
## 178	50	RL	NA	13650	Pave	<NA>	Reg	Lvl
## 181	160	FV	NA	2117	Pave	<NA>	Reg	Lvl
## 187	80	RL	NA	9947	Pave	<NA>	IR1	Lvl
## 192	60	RL	NA	7472	Pave	<NA>	IR1	Lvl
## 204	120	RM	NA	4438	Pave	<NA>	Reg	Lvl
## 208	20	RL	NA	12493	Pave	<NA>	IR1	Lvl
## 209	60	RL	NA	14364	Pave	<NA>	IR1	Low
## 215	60	RL	NA	10900	Pave	<NA>	IR1	Lvl
## 219	50	RL	NA	15660	Pave	<NA>	IR1	Lvl
## 222	60	RL	NA	8068	Pave	<NA>	IR1	Lvl
## 237	60	RL	NA	9453	Pave	<NA>	IR1	Lvl
## 244	60	RL	NA	8880	Pave	<NA>	IR1	Lvl
## 249	50	RL	NA	159000	Pave	<NA>	IR2	Low
## 269	20	RL	NA	7917	Pave	<NA>	IR1	Lvl
## 287	20	RL	NA	8125	Pave	<NA>	IR1	Lvl
## 288	20	RL	NA	9819	Pave	<NA>	IR1	Lvl
## 293	60	RL	NA	16659	Pave	<NA>	IR1	Lvl
## 307	50	RM	NA	7920	Pave	Grvl	IR1	Lvl
## 308	30	RL	NA	12342	Pave	<NA>	IR1	Lvl

## 310	60	RL	NA	7685	Pave	<NA>	IR1	Lvl
## 319	80	RL	NA	14115	Pave	<NA>	Reg	Lvl
## 328	75	RL	NA	11888	Pave	Pave	IR1	Bnk
## 330	90	RL	NA	10624	Pave	<NA>	IR1	Lvl
## 335	190	RL	NA	164660	Grvl	<NA>	IR1	HLS
## 342	90	RL	NA	8544	Pave	<NA>	Reg	Lvl
## 346	20	RL	NA	12772	Pave	<NA>	IR1	Lvl
## 347	20	RL	NA	17600	Pave	<NA>	IR1	Lvl
## 351	120	RL	NA	5271	Pave	<NA>	IR1	Low
## 356	20	RL	NA	9248	Pave	<NA>	IR1	Lvl
## 360	85	RL	NA	7540	Pave	<NA>	IR1	Lvl
## 361	50	RL	NA	9144	Pave	Pave	Reg	Lvl
## 364	60	RL	NA	18800	Pave	<NA>	IR1	Lvl
## 366	20	RL	NA	9500	Pave	<NA>	IR1	Lvl
## 369	20	RL	NA	9830	Pave	<NA>	IR1	Lvl
## 370	60	RL	NA	8121	Pave	<NA>	IR1	Lvl
## 375	30	RL	NA	10020	Pave	<NA>	IR1	Low
## 384	60	RL	NA	53107	Pave	<NA>	IR2	Low
## 392	20	RL	NA	8339	Pave	<NA>	IR1	Lvl
## 393	30	RL	NA	7446	Pave	<NA>	Reg	Lvl
## 404	60	RL	NA	10364	Pave	<NA>	IR1	Lvl
## 405	20	RL	NA	9991	Pave	<NA>	IR1	Lvl
## 412	20	FV	NA	4403	Pave	<NA>	IR2	Lvl
## 421	20	RL	NA	16635	Pave	<NA>	IR1	Lvl
## 426	80	RL	NA	12800	Pave	<NA>	Reg	Low
## 447	60	RL	NA	11214	Pave	<NA>	IR1	Lvl
## 452	60	RL	NA	9303	Pave	<NA>	IR1	Lvl
## 457	20	RL	NA	53227	Pave	<NA>	IR1	Low
## 458	70	RM	NA	5100	Pave	Grvl	Reg	Lvl
## 459	50	RL	NA	7015	Pave	<NA>	IR1	Bnk
## 465	120	RM	NA	3072	Pave	<NA>	Reg	Lvl
## 470	120	RL	NA	6820	Pave	<NA>	IR1	Lvl
## 484	20	RL	NA	7758	Pave	<NA>	IR1	Lvl
## 490	160	RM	NA	2665	Pave	<NA>	Reg	Lvl
## 496	20	RL	NA	12692	Pave	<NA>	IR1	Lvl
## 516	80	RL	NA	10448	Pave	<NA>	IR1	Lvl
## 518	60	RL	NA	9531	Pave	<NA>	IR1	Lvl
## 536	20	RL	NA	12735	Pave	<NA>	IR1	Lvl
## 537	20	RL	NA	11553	Pave	<NA>	IR1	Lvl
## 538	20	RL	NA	11423	Pave	<NA>	Reg	Lvl
## 540	60	RL	NA	11000	Pave	<NA>	Reg	Lvl
## 544	50	RL	NA	13837	Pave	<NA>	IR1	Lvl
## 558	120	RL	NA	3196	Pave	<NA>	Reg	Lvl
## 559	20	RL	NA	11341	Pave	<NA>	IR1	Lvl
## 563	60	RL	NA	13346	Pave	<NA>	IR1	Lvl
## 568	90	RL	NA	7032	Pave	<NA>	IR1	Lvl
## 579	20	RL	NA	14585	Pave	<NA>	IR1	Lvl
## 592	120	RM	NA	4435	Pave	<NA>	Reg	Lvl
## 609	60	RL	NA	11050	Pave	<NA>	Reg	Lvl
## 610	80	RL	NA	10395	Pave	<NA>	IR1	Lvl
## 611	60	RL	NA	11885	Pave	<NA>	Reg	Lvl
## 615	60	RL	NA	7861	Pave	<NA>	IR1	Lvl

## 622	160	FV	NA	2117	Pave	<NA>	Reg	Lvl
## 625	20	RL	NA	12342	Pave	<NA>	IR1	Lvl
## 640	60	FV	NA	7050	Pave	<NA>	Reg	Lvl
## 644	20	RL	NA	10530	Pave	<NA>	IR1	Lvl
## 658	60	RL	NA	12384	Pave	<NA>	Reg	Lvl
## 664	60	RL	NA	18450	Pave	<NA>	IR1	Lvl
## 666	20	RL	NA	14175	Pave	<NA>	Reg	Bnk
## 670	20	RL	NA	11250	Pave	<NA>	IR1	Lvl
## 677	20	RL	NA	9945	Pave	<NA>	IR1	Lvl
## 680	120	RL	NA	2887	Pave	<NA>	Reg	HLS
## 683	160	RL	NA	5062	Pave	<NA>	IR1	Lvl
## 685	160	FV	NA	5105	Pave	<NA>	IR2	Lvl
## 688	120	RM	NA	4426	Pave	<NA>	Reg	Lvl
## 704	20	RL	NA	115149	Pave	<NA>	IR2	Low
## 707	20	RL	NA	7162	Pave	<NA>	IR1	Lvl
## 712	60	RL	NA	13517	Pave	<NA>	IR1	Lvl
## 718	120	RL	NA	6563	Pave	<NA>	IR1	Low
## 719	120	RM	NA	4426	Pave	<NA>	Reg	Lvl
## 724	20	RL	NA	21695	Pave	<NA>	IR1	Lvl
## 732	20	RL	NA	8978	Pave	<NA>	IR1	Lvl
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## 755	60	RL	NA	11616	Pave	<NA>	IR1	Lvl
## 768	85	RL	NA	7252	Pave	<NA>	IR1	Lvl
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## 787	60	RL	NA	12205	Pave	<NA>	IR1	Low
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## 826	60	RL	NA	28698	Pave	<NA>	IR2	Low
## 838	70	RH	NA	12155	Pave	<NA>	IR1	Lvl
## 843	85	RL	NA	16647	Pave	<NA>	IR1	Lvl
## 849	120	RL	NA	3196	Pave	<NA>	Reg	Lvl
## 851	80	RL	NA	12095	Pave	<NA>	IR1	Lvl
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## 898	20	RL	NA	7340	Pave	<NA>	IR1	Lvl
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## 906	20	RL	NA	8885	Pave	<NA>	IR1	Low
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## 927	60	RL	NA	13006	Pave	<NA>	IR1	Lvl
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## 975	85	RL	NA	12122	Pave	<NA>	IR1	Lvl
## 978	60	RL	NA	11250	Pave	<NA>	Reg	Lvl
## 983	60	RL	NA	12046	Pave	<NA>	IR1	Lvl
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## 1012	120	RL	NA	5814	Pave	<NA>	IR1	Lvl
## 1013	80	RL	NA	10784	Pave	<NA>	IR1	Lvl
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## 1027	60	RL	NA	14541	Pave	<NA>	IR1	Lvl
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## 1030	20	RL	NA	11500	Pave	<NA>	IR1	Lvl
## 1032	60	RL	NA	9240	Pave	<NA>	Reg	Lvl
## 1036	60	RL	NA	9130	Pave	<NA>	Reg	Lvl
## 1040	20	RL	NA	13680	Pave	<NA>	IR1	Lvl
## 1052	60	RL	NA	29959	Pave	<NA>	IR2	Lvl
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## 1059	20	RL	NA	11000	Pave	<NA>	IR1	Lvl
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## 1079	60	RL	NA	13031	Pave	<NA>	IR2	Lvl
## 1081	160	RM	NA	1974	Pave	<NA>	Reg	Lvl
## 1092	120	RL	NA	3696	Pave	<NA>	Reg	Lvl
## 1103	60	RL	NA	8063	Pave	<NA>	Reg	Lvl
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## 1111	80	RL	NA	7750	Pave	<NA>	Reg	Lvl
## 1117	20	RL	NA	8926	Pave	<NA>	IR1	Lvl
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## 1136	60	RL	NA	10304	Pave	<NA>	IR1	Lvl
## 1138	20	RL	NA	9000	Pave	<NA>	Reg	Lvl
## 1141	20	RL	NA	11200	Pave	<NA>	Reg	Lvl
## 1143	50	RM	NA	5700	Pave	<NA>	Reg	Lvl
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## 1149	60	RL	NA	13700	Pave	<NA>	IR1	Lvl
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## 1159	80	RL	NA	16157	Pave	<NA>	IR1	Lvl
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## 1175	60	RL	NA	11170	Pave	<NA>	IR2	Lvl
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## 1188	120	RM	NA	4500	Pave	<NA>	Reg	Lvl
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## 1225	90	RL	NA	18890	Pave	<NA>	IR1	Lvl
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## 1241	80	RL	NA	12328	Pave	<NA>	IR1	Lvl
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## 1280	20	RL	NA	36500	Pave	<NA>	IR1	Low
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## 1302	20	RL	NA	7153	Pave	<NA>	Reg	Lvl
## 1305	60	RL	NA	9572	Pave	<NA>	IR1	Lvl
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## 1341	20	RL	NA	16196	Pave	<NA>	IR3	Low
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## 1349	20	RL	NA	9477	Pave	<NA>	Reg	Lvl
## 1350	20	RL	NA	12537	Pave	<NA>	IR1	Lvl
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## 1355	50	RL	NA	12513	Pave	<NA>	IR1	Lvl
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## 1361	120	RM	NA	4435	Pave	<NA>	Reg	Lvl
## 1366	20	RL	NA	11400	Pave	<NA>	Reg	Lvl
## 1373	20	RL	NA	12925	Pave	<NA>	IR1	Lvl
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## 1388	20	RL	NA	57200	Pave	<NA>	IR1	Bnk
## 1399	20	RL	NA	8780	Pave	<NA>	IR1	Lvl
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## 1421	20	RL	NA	12546	Pave	<NA>	IR1	Lvl
## 1423	120	RL	NA	4928	Pave	<NA>	IR1	Lvl
## 1433	120	RM	NA	4426	Pave	<NA>	Reg	Lvl
## 1435	30	RL	NA	8854	Pave	<NA>	Reg	Lvl
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## Utilities LotConfig LandSlope Neighborhood Condition1 Condition2 BldgType								
## 8	AllPub	Corner	Gtl	NwAmes	PosN	Norm	1Fam	

## 13	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 15	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
## 17	AllPub	CulDSac	Gtl	NAmes	Norm	Norm	1Fam
## 25	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 32	AllPub	CulDSac	Gtl	Sawyer	Norm	Norm	1Fam
## 43	AllPub	CulDSac	Gtl	SawyerW	Norm	Norm	1Fam
## 44	AllPub	CulDSac	Gtl	CollgCr	Norm	Norm	1Fam
## 51	AllPub	Corner	Gtl	Gilbert	Norm	Norm	1Fam
## 65	AllPub	Inside	Gtl	CollgCr	Norm	Norm	1Fam
## 67	AllPub	Inside	Gtl	NAmes	PosA	Norm	1Fam
## 77	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 85	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 96	AllPub	Corner	Gtl	Gilbert	Norm	Norm	1Fam
## 101	AllPub	Inside	Gtl	NWAmes	Norm	Norm	1Fam
## 105	AllPub	Corner	Gtl	IDOTRR	Norm	Norm	1Fam
## 112	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 114	AllPub	Corner	Gtl	Crawfor	Norm	Norm	1Fam
## 117	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 121	AllPub	CulDSac	Sev	ClearCr	Norm	Norm	1Fam
## 127	AllPub	Inside	Gtl	NPkVill	Norm	Norm	TwnhsE
## 132	AllPub	Corner	Gtl	Gilbert	Norm	Norm	1Fam
## 134	AllPub	Inside	Gtl	Timber	Norm	Norm	1Fam
## 137	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
## 148	AllPub	CulDSac	Gtl	Gilbert	Norm	Norm	1Fam
## 150	AllPub	Inside	Gtl	BrkSide	Norm	Norm	1Fam
## 153	AllPub	CulDSac	Gtl	NWAmes	Norm	Norm	1Fam
## 154	AllPub	Inside	Gtl	ClearCr	Norm	Norm	1Fam
## 161	AllPub	CulDSac	Gtl	Veenker	Norm	Norm	1Fam
## 167	AllPub	Inside	Gtl	ClearCr	Norm	Norm	1Fam
## 170	AllPub	Corner	Gtl	Timber	Norm	Norm	1Fam
## 171	AllPub	Inside	Gtl	OldTown	Feedr	Norm	1Fam
## 178	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 181	AllPub	Inside	Gtl	Somerst	Norm	Norm	Twnhs
## 187	AllPub	CulDSac	Gtl	Mitchel	Norm	Norm	1Fam
## 192	AllPub	CulDSac	Gtl	NAmes	Norm	Norm	1Fam
## 204	AllPub	Inside	Gtl	CollgCr	Norm	Norm	TwnhsE
## 208	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 209	AllPub	Inside	Mod	SawyerW	Norm	Norm	1Fam
## 215	AllPub	FR2	Gtl	CollgCr	Norm	Norm	1Fam
## 219	AllPub	Corner	Gtl	Crawfor	Norm	Norm	1Fam
## 222	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 237	AllPub	CulDSac	Gtl	SawyerW	RRNe	Norm	1Fam
## 244	AllPub	Inside	Gtl	SawyerW	Norm	Norm	1Fam
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## 269	AllPub	Corner	Gtl	Edwards	Norm	Norm	1Fam
## 287	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
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## 293	AllPub	Corner	Gtl	NWAmes	PosA	Norm	1Fam
## 307	AllPub	Inside	Gtl	IDOTRR	Artery	Norm	1Fam
## 308	AllPub	Inside	Gtl	Edwards	Norm	Norm	1Fam
## 310	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 319	AllPub	Inside	Gtl	NWAmes	Norm	Norm	1Fam

## 328	AllPub	Inside	Gtl	BrkSide	PosN	Norm	1Fam
## 330	AllPub	Inside	Gtl	NAmes	Norm	Norm	Duplex
## 335	AllPub	Corner	Sev	Timber	Norm	Norm	2fmCon
## 342	AllPub	Inside	Gtl	NAmes	Norm	Norm	Duplex
## 346	AllPub	CulDSac	Gtl	NAmes	Norm	Norm	1Fam
## 347	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 351	AllPub	Inside	Mod	ClearCr	Norm	Norm	1Fam
## 356	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 360	AllPub	CulDSac	Gtl	Mitchel	Norm	Norm	1Fam
## 361	AllPub	Inside	Gtl	BrkSide	Norm	Norm	1Fam
## 364	AllPub	FR2	Gtl	NWAmes	Norm	Norm	1Fam
## 366	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 369	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
## 370	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 375	AllPub	Inside	Sev	Edwards	Norm	Norm	1Fam
## 384	AllPub	Corner	Mod	ClearCr	Feedr	Norm	1Fam
## 392	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
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## 404	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
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## 412	AllPub	Inside	Gtl	Somerst	Norm	Norm	1Fam
## 421	AllPub	FR2	Gtl	NWAmes	Norm	Norm	1Fam
## 426	AllPub	Inside	Mod	SawyerW	Norm	Norm	1Fam
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## 459	AllPub	Corner	Gtl	BrkSide	Norm	Norm	1Fam
## 465	AllPub	Inside	Gtl	Blmngtn	Norm	Norm	TwnhsE
## 470	AllPub	Corner	Gtl	StoneBr	Norm	Norm	TwnhsE
## 484	AllPub	Corner	Gtl	Sawyer	Norm	Norm	1Fam
## 490	AllPub	Inside	Gtl	MeadowV	Norm	Norm	TwnhsE
## 496	AllPub	Inside	Gtl	NoRidge	Norm	Norm	1Fam
## 516	AllPub	Corner	Gtl	NWAmes	Norm	Norm	1Fam
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## 536	AllPub	FR2	Gtl	NAmes	Norm	Norm	1Fam
## 537	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 538	AllPub	Inside	Gtl	CollgCr	Norm	Norm	1Fam
## 540	AllPub	FR2	Gtl	NoRidge	Norm	Norm	1Fam
## 544	AllPub	Corner	Gtl	NWAmes	Norm	Norm	1Fam
## 558	AllPub	Inside	Gtl	Blmngtn	Norm	Norm	TwnhsE
## 559	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 563	AllPub	CulDSac	Gtl	NoRidge	Norm	Norm	1Fam
## 568	AllPub	Corner	Gtl	NAmes	Norm	Norm	Duplex
## 579	AllPub	CulDSac	Gtl	NAmes	Norm	Norm	1Fam
## 592	AllPub	Inside	Gtl	CollgCr	Norm	Norm	TwnhsE
## 609	AllPub	Inside	Gtl	CollgCr	PosN	Norm	1Fam
## 610	AllPub	FR2	Gtl	NWAmes	Norm	Norm	1Fam
## 611	AllPub	Inside	Gtl	CollgCr	Norm	Norm	1Fam
## 615	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 622	AllPub	Inside	Gtl	Somerst	Norm	Norm	TwnhsE
## 625	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam

## 640	AllPub	Inside	Gtl	Somerst	Norm	Norm	1Fam
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## 658	AllPub	CulDSac	Gtl	NWAmes	Norm	Norm	1Fam
## 664	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 666	AllPub	Corner	Mod	Sawyer	Norm	Norm	1Fam
## 670	AllPub	Inside	Gtl	Veenker	Norm	Norm	1Fam
## 677	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 680	AllPub	Inside	Gtl	ClearCr	Norm	Norm	1Fam
## 683	AllPub	CulDSac	Gtl	StoneBr	Norm	Norm	TwnhsE
## 685	AllPub	FR2	Gtl	Somerst	Norm	Norm	TwnhsE
## 688	AllPub	Inside	Gtl	CollgCr	Norm	Norm	TwnhsE
## 704	AllPub	CulDSac	Sev	ClearCr	Norm	Norm	1Fam
## 707	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 712	AllPub	CulDSac	Gtl	Sawyer	RRAe	Norm	1Fam
## 718	AllPub	CulDSac	Mod	StoneBr	Norm	Norm	1Fam
## 719	AllPub	Inside	Gtl	CollgCr	Norm	Norm	TwnhsE
## 724	AllPub	Corner	Gtl	Crawfor	Norm	Norm	1Fam
## 732	AllPub	Corner	Gtl	Sawyer	Norm	Norm	1Fam
## 743	AllPub	Inside	Gtl	NWAmes	Norm	Norm	1Fam
## 744	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 749	AllPub	Inside	Gtl	Gilbert	RRAn	Norm	1Fam
## 755	AllPub	CulDSac	Gtl	Sawyer	Norm	Norm	1Fam
## 768	AllPub	CulDSac	Gtl	Sawyer	Norm	Norm	1Fam
## 781	AllPub	Corner	Gtl	Mitchel	Norm	Norm	1Fam
## 783	AllPub	Inside	Gtl	NWAmes	Feedr	Norm	1Fam
## 787	AllPub	Inside	Gtl	ClearCr	Norm	Norm	1Fam
## 789	AllPub	Corner	Gtl	Mitchel	Norm	Norm	1Fam
## 792	AllPub	Corner	Gtl	Gilbert	Norm	Norm	1Fam
## 809	AllPub	Inside	Gtl	CollgCr	Norm	Norm	TwnhsE
## 814	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
## 815	AllPub	CulDSac	Gtl	Mitchel	Norm	Norm	1Fam
## 820	AllPub	Corner	Gtl	Gilbert	Norm	Norm	1Fam
## 826	AllPub	CulDSac	Sev	ClearCr	Norm	Norm	1Fam
## 838	AllPub	Inside	Gtl	SWISU	Norm	Norm	1Fam
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## 854	AllPub	Inside	Mod	CollgCr	Norm	Norm	1Fam
## 857	AllPub	Corner	Gtl	NWAmes	PosA	Norm	1Fam
## 863	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 866	AllPub	Corner	Gtl	Gilbert	Feedr	Norm	1Fam
## 877	AllPub	CulDSac	Gtl	CollgCr	Norm	Norm	1Fam
## 880	AllPub	Corner	Gtl	Gilbert	Norm	Norm	1Fam
## 891	AllPub	Inside	Gtl	Sawyer	PosN	Norm	1Fam
## 898	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 902	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 906	AllPub	Inside	Mod	Mitchel	Norm	Norm	1Fam
## 909	AllPub	CulDSac	Mod	CollgCr	Norm	Norm	1Fam
## 915	AllPub	Inside	Gtl	Edwards	Norm	Norm	1Fam
## 923	AllPub	Corner	Gtl	NWAmes	Norm	Norm	1Fam
## 925	AllPub	Inside	Gtl	NWAmes	Feedr	Norm	1Fam

## 926	AllPub	Inside	Gtl	CollgCr	Norm	Norm	1Fam
## 927	AllPub	Corner	Gtl	Gilbert	Norm	Norm	1Fam
## 936	AllPub	Inside	Gtl	ClearCr	Norm	Norm	1Fam
## 938	AllPub	FR2	Gtl	Gilbert	RRNn	Norm	1Fam
## 941	NoSeWa	CulDSac	Gtl	Timber	Norm	Norm	1Fam
## 950	AllPub	Inside	Mod	Mitchel	Norm	Norm	1Fam
## 958	AllPub	Corner	Gtl	NWAmes	PosN	Norm	1Fam
## 964	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 971	AllPub	FR2	Gtl	Somerst	Norm	Norm	Twnhs
## 975	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
## 978	AllPub	Corner	Gtl	CollgCr	Norm	Norm	1Fam
## 983	AllPub	Inside	Gtl	NWAmes	Norm	Norm	1Fam
## 991	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 992	AllPub	Inside	Gtl	NWAmes	PosA	Norm	1Fam
## 998	AllPub	Corner	Gtl	NWAmes	Feedr	RRAn	Duplex
## 1001	AllPub	Inside	Gtl	NAmes	PosN	Norm	1Fam
## 1012	AllPub	CulDSac	Gtl	StoneBr	Norm	Norm	TwnhsE
## 1013	AllPub	FR2	Gtl	Gilbert	Norm	Norm	1Fam
## 1019	AllPub	Corner	Gtl	Timber	Norm	Norm	1Fam
## 1025	AllPub	Inside	Gtl	SWISU	Norm	Norm	2fmCon
## 1027	AllPub	Corner	Gtl	NoRidge	Norm	Norm	1Fam
## 1028	AllPub	Inside	Gtl	CollgCr	Norm	Norm	1Fam
## 1030	AllPub	CulDSac	Gtl	Edwards	Norm	Norm	1Fam
## 1032	AllPub	Inside	Gtl	CollgCr	Norm	Norm	1Fam
## 1036	AllPub	Inside	Gtl	NWAmes	Feedr	Norm	1Fam
## 1040	AllPub	CulDSac	Gtl	Edwards	Norm	Norm	1Fam
## 1052	AllPub	FR2	Gtl	NoRidge	Norm	Norm	1Fam
## 1054	AllPub	Corner	Mod	Crawfor	Norm	Norm	1Fam
## 1059	AllPub	CulDSac	Gtl	NAmes	Norm	Norm	1Fam
## 1072	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
## 1079	AllPub	Corner	Gtl	Gilbert	Norm	Norm	1Fam
## 1081	AllPub	Inside	Gtl	MeadowV	Norm	Norm	TwnhsE
## 1092	AllPub	Inside	Gtl	StoneBr	Norm	Norm	TwnhsE
## 1103	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 1105	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 1111	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 1117	AllPub	Corner	Gtl	Edwards	Norm	Norm	1Fam
## 1119	AllPub	Inside	Gtl	Gilbert	Norm	Norm	1Fam
## 1133	AllPub	Inside	Mod	Mitchel	Norm	Norm	1Fam
## 1136	AllPub	CulDSac	Gtl	NWAmes	PosN	Norm	1Fam
## 1138	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 1141	AllPub	Inside	Gtl	SawyerW	Norm	Norm	1Fam
## 1143	AllPub	Inside	Gtl	OldTown	Norm	Norm	1Fam
## 1148	AllPub	Corner	Gtl	IDOTRR	Norm	Norm	1Fam
## 1149	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 1156	AllPub	CulDSac	Gtl	Crawfor	PosN	Norm	1Fam
## 1159	AllPub	FR2	Gtl	Veenker	Feedr	Norm	1Fam
## 1172	AllPub	Inside	Gtl	OldTown	Artery	Norm	1Fam
## 1175	AllPub	Corner	Gtl	Timber	Norm	Norm	1Fam
## 1185	AllPub	Inside	Mod	Mitchel	Norm	Norm	2fmCon
## 1188	AllPub	FR2	Gtl	Mitchel	Norm	Norm	TwnhsE
## 1201	AllPub	Inside	Gtl	SawyerW	Norm	Norm	1Fam

## 1208	AllPub	CulDSac	Gtl	Sawyer	Norm	Norm	1Fam
## 1225	AllPub	Inside	Gtl	Sawyer	Feedr	RRAe	Duplex
## 1228	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 1238	AllPub	Corner	Mod	Crawfor	Norm	Norm	1Fam
## 1241	AllPub	Inside	Gtl	Mitchel	Norm	Norm	1Fam
## 1245	AllPub	Corner	Gtl	NridgHt	Norm	Norm	TwnhsE
## 1247	AllPub	Inside	Gtl	Veenker	Norm	Norm	1Fam
## 1254	AllPub	CulDSac	Gtl	Gilbert	RRAn	Norm	1Fam
## 1256	AllPub	Inside	Gtl	ClearCr	Norm	Norm	1Fam
## 1262	AllPub	Inside	Mod	Crawfor	Norm	Norm	1Fam
## 1264	AllPub	Inside	Sev	ClearCr	Norm	Norm	1Fam
## 1265	AllPub	Inside	Gtl	NWAmes	PosN	Norm	1Fam
## 1266	AllPub	CulDSac	Gtl	Sawyer	Norm	Norm	1Fam
## 1270	AllPub	CulDSac	Gtl	NWAmes	Norm	Norm	1Fam
## 1271	AllPub	CulDSac	Gtl	NWAmes	Norm	Norm	1Fam
## 1279	AllPub	Inside	Gtl	NWAmes	Feedr	Norm	1Fam
## 1280	AllPub	Inside	Mod	ClearCr	Norm	Norm	1Fam
## 1283	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
## 1293	AllPub	CulDSac	Gtl	Gilbert	Norm	Norm	1Fam
## 1294	AllPub	Inside	Gtl	Crawfor	Norm	Norm	1Fam
## 1302	AllPub	Inside	Gtl	SawyerW	Norm	Norm	1Fam
## 1305	AllPub	Inside	Gtl	NoRidge	Norm	Norm	1Fam
## 1311	AllPub	CulDSac	Gtl	CollgCr	Norm	Norm	1Fam
## 1314	AllPub	Corner	Gtl	BrkSide	Feedr	Norm	1Fam
## 1335	AllPub	Inside	Gtl	CollgCr	Norm	Norm	1Fam
## 1339	AllPub	CulDSac	Gtl	NWAmes	PosN	Norm	1Fam
## 1341	AllPub	Inside	Gtl	SawyerW	Norm	Norm	1Fam
## 1347	AllPub	Inside	Gtl	CollgCr	Norm	Norm	1Fam
## 1349	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
## 1350	AllPub	CulDSac	Gtl	NAmes	Norm	Norm	1Fam
## 1351	AllPub	Inside	Gtl	Somerst	Norm	Norm	Twnhs
## 1355	AllPub	FR2	Gtl	NAmes	Feedr	Norm	1Fam
## 1358	AllPub	Inside	Gtl	Somerst	Norm	Norm	1Fam
## 1361	AllPub	Inside	Gtl	CollgCr	Norm	Norm	TwnhsE
## 1366	AllPub	Inside	Gtl	NoRidge	Norm	Norm	1Fam
## 1373	AllPub	Corner	Gtl	NAmes	Norm	Norm	1Fam
## 1375	AllPub	Inside	Gtl	Sawyer	Norm	Norm	1Fam
## 1388	AllPub	Inside	Sev	Timber	Norm	Norm	1Fam
## 1399	AllPub	Corner	Gtl	Mitchel	Norm	Norm	1Fam
## 1409	AllPub	Inside	Gtl	NoRidge	Norm	Norm	1Fam
## 1411	AllPub	Inside	Gtl	Crawfor	Norm	Norm	1Fam
## 1415	AllPub	CulDSac	Gtl	Edwards	Norm	Norm	1Fam
## 1416	AllPub	Inside	Gtl	NAmes	Norm	Norm	1Fam
## 1421	AllPub	Corner	Gtl	NWAmes	Norm	Norm	1Fam
## 1423	AllPub	Inside	Gtl	NPkVill	Norm	Norm	TwnhsE
## 1433	AllPub	Inside	Gtl	CollgCr	Norm	Norm	TwnhsE
## 1435	AllPub	Inside	Gtl	BrkSide	Norm	Norm	1Fam
## 1438	AllPub	CulDSac	Gtl	Mitchel	Norm	Norm	1Fam
##	HouseStyle	OverallQual	OverallCond	YearBuilt	YearRemodAdd	RoofStyle	
## 8	2Story	7	6	1973	1973	Gable	
## 13	1Story	5	6	1962	1962	Hip	
## 15	1Story	6	5	1960	1960	Hip	

## 17	1Story	6	7	1970	1970	Gable
## 25	1Story	5	8	1968	2001	Gable
## 32	1Story	5	6	1966	2006	Gable
## 43	SFoyer	5	7	1983	1983	Gable
## 44	1Story	5	6	1975	1980	Hip
## 51	2Story	6	6	1997	1997	Gable
## 65	2Story	7	5	1997	1998	Gable
## 67	1Story	7	5	1970	1989	Gable
## 77	1Story	4	7	1956	1956	Gable
## 85	SLvl	7	5	1995	1996	Gable
## 96	2Story	6	8	1993	1993	Gable
## 101	1Story	6	7	1977	2001	Gable
## 105	1.5Fin	7	4	1931	1950	Gable
## 112	SLvl	7	5	2000	2000	Gable
## 114	1Story	6	5	1953	1953	Hip
## 117	1Story	5	5	1962	1962	Gable
## 121	SLvl	6	5	1969	1969	Flat
## 127	1Story	6	5	1976	1976	Gable
## 132	2Story	6	5	2000	2000	Gable
## 134	1Story	8	5	2001	2002	Gable
## 137	1Story	5	5	1967	1967	Gable
## 148	2Story	7	5	2001	2001	Gable
## 150	1.5Fin	5	4	1936	1950	Gable
## 153	2Story	6	5	1971	1971	Gable
## 154	1Story	6	7	1960	1975	Flat
## 161	1Story	6	6	1984	1984	Gable
## 167	1Story	5	5	1955	1993	Hip
## 170	1Story	8	6	1981	1981	Hip
## 171	1.5Fin	5	6	1941	1950	Gable
## 178	1.5Fin	5	5	1958	1958	Gable
## 181	2Story	6	5	2000	2000	Gable
## 187	SLvl	7	5	1990	1991	Gable
## 192	2Story	7	9	1972	2004	Gable
## 204	1Story	6	5	2004	2004	Gable
## 208	1Story	4	5	1960	1960	Gable
## 209	2Story	7	5	1988	1989	Gable
## 215	2Story	6	7	1977	1977	Gable
## 219	1.5Fin	7	9	1939	2006	Gable
## 222	2Story	6	5	2002	2002	Gable
## 237	2Story	7	7	1993	2003	Gable
## 244	2Story	7	5	1994	2002	Gable
## 249	1.5Fin	6	7	1958	2006	Gable
## 269	1Story	6	7	1976	1976	Hip
## 287	1Story	4	4	1971	1971	Gable
## 288	1Story	5	5	1967	1967	Gable
## 293	2Story	7	7	1977	1994	Gable
## 307	1.5Fin	6	7	1920	1950	Gable
## 308	1Story	4	5	1940	1950	Gable
## 310	2Story	6	5	1993	1994	Gable
## 319	SLvl	7	5	1980	1980	Gable
## 328	2.5Unf	6	6	1916	1994	Gable
## 330	1Story	5	4	1964	1964	Gable

## 335	1.5Fin	5	6	1965	1965	Gable
## 342	1Story	3	4	1949	1950	Gable
## 346	1Story	6	8	1960	1998	Hip
## 347	1Story	6	5	1960	1960	Gable
## 351	1Story	7	5	1986	1986	Gable
## 356	1Story	6	6	1992	1992	Gable
## 360	SFoyer	6	6	1978	1978	Gable
## 361	1.5Fin	5	5	1940	1982	Gable
## 364	2Story	6	5	1976	1976	Gable
## 366	1Story	6	5	1963	1963	Gable
## 369	1Story	5	7	1959	2006	Gable
## 370	2Story	6	5	2000	2000	Gable
## 375	1Story	1	1	1922	1950	Gable
## 384	2Story	6	5	1992	1992	Gable
## 392	1Story	5	7	1959	1959	Gable
## 393	1Story	4	5	1941	1950	Gable
## 404	2Story	6	5	1995	1996	Gable
## 405	1Story	4	4	1976	1993	Gable
## 412	1Story	7	5	2009	2009	Gable
## 421	1Story	6	7	1977	2000	Gable
## 426	SLvl	7	5	1989	1989	Gable
## 447	2Story	7	5	1998	1999	Gable
## 452	2Story	6	5	1996	1997	Hip
## 457	1Story	4	6	1954	1994	Flat
## 458	2Story	8	7	1925	1996	Hip
## 459	1.5Fin	5	4	1950	1950	Gable
## 465	1Story	7	5	2004	2004	Hip
## 470	1Story	8	5	1985	1985	Gable
## 484	1Story	5	7	1962	2001	Gable
## 490	2Story	5	6	1976	1976	Gable
## 496	1Story	8	5	1992	1993	Hip
## 516	SLvl	6	6	1972	1972	Gable
## 518	2Story	6	5	1998	1998	Gable
## 536	1Story	4	5	1972	1972	Hip
## 537	1Story	5	5	1968	1968	Hip
## 538	1Story	8	5	2001	2002	Gable
## 540	2Story	8	5	2000	2000	Gable
## 544	1.5Fin	7	5	1988	1988	Gable
## 558	1Story	7	5	2003	2004	Gable
## 559	1Story	5	6	1957	1996	Hip
## 563	2Story	7	5	1992	2000	Gable
## 568	SFoyer	5	5	1979	1979	Gable
## 579	1Story	6	6	1960	1987	Gable
## 592	1Story	6	5	2003	2003	Gable
## 609	2Story	9	5	2000	2000	Hip
## 610	SLvl	6	6	1978	1978	Gable
## 611	2Story	8	5	2001	2001	Gable
## 615	2Story	6	5	2002	2003	Gable
## 622	2Story	6	5	2000	2000	Gable
## 625	1Story	5	5	1960	1978	Hip
## 640	2Story	7	5	2001	2001	Gable
## 644	1Story	6	5	1971	1971	Hip

## 658	2Story	7	7	1976	1976	Gable
## 664	2Story	6	5	1965	1979	Flat
## 666	1Story	5	6	1956	1987	Gable
## 670	1Story	6	6	1977	1977	Gable
## 677	1Story	5	5	1961	1961	Hip
## 680	1Story	6	5	1996	1997	Gable
## 683	2Story	7	5	1984	1984	Gable
## 685	2Story	7	5	2004	2004	Gable
## 688	1Story	6	5	2004	2004	Gable
## 704	1Story	7	5	1971	2002	Gable
## 707	1Story	5	7	1966	1966	Gable
## 712	2Story	6	8	1976	2005	Gable
## 718	1Story	8	5	1985	1985	Gable
## 719	1Story	6	5	2004	2004	Gable
## 724	1Story	6	9	1988	2007	Hip
## 732	1Story	5	5	1968	1968	Gable
## 743	2Story	8	9	1976	1996	Hip
## 744	2Story	7	5	2000	2000	Gable
## 749	2Story	7	5	2003	2003	Gable
## 755	2Story	6	5	1978	1978	Hip
## 768	SFoyer	5	5	1982	1982	Hip
## 781	SFoyer	5	6	1978	1978	Gable
## 783	1Story	6	5	1967	1967	Gable
## 787	2Story	6	8	1966	2007	Gable
## 789	SLvl	6	5	1976	1976	Gable
## 792	2Story	7	5	1994	1996	Gable
## 809	1Story	6	5	2004	2004	Gable
## 814	1Story	5	6	1954	1954	Gable
## 815	1Story	8	5	2002	2002	Hip
## 820	2Story	7	5	2003	2003	Gable
## 826	2Story	5	5	1967	1967	Flat
## 838	2Story	6	8	1925	1950	Gable
## 843	SFoyer	5	5	1975	1981	Gable
## 849	1Story	8	5	2003	2003	Gable
## 851	SLvl	6	6	1964	1964	Gable
## 853	1Story	5	8	1962	2010	Gable
## 854	SLvl	6	6	1978	1978	Gable
## 857	2Story	6	7	1968	1984	Gable
## 863	1Story	5	6	1970	1970	Gable
## 866	2Story	5	6	1948	1950	Gable
## 877	1Story	5	8	1978	2005	Gable
## 880	2Story	6	5	1992	1993	Gable
## 891	1Story	5	5	1954	1954	Gable
## 898	1Story	4	6	1971	1971	Gable
## 902	1Story	5	6	1967	1967	Gable
## 906	1Story	5	5	1983	1983	Gable
## 909	1Story	5	7	1977	1989	Gable
## 915	1Story	4	6	1956	1956	Gable
## 923	1Story	5	6	1977	1977	Gable
## 925	2Story	7	5	1968	1968	Gable
## 926	1Story	8	5	2001	2001	Hip
## 927	2Story	7	5	1997	1997	Gable

## 936	2Story	7	7	1940	1950	Gable
## 938	2Story	7	5	1999	1999	Gable
## 941	SLvl	6	6	1958	1958	Gable
## 950	2Story	5	4	1969	1969	Gable
## 958	2Story	6	7	1977	1995	Gable
## 964	1Story	5	7	1955	1955	Hip
## 971	2Story	7	5	2000	2000	Gable
## 975	SFoyer	7	9	1961	2007	Gable
## 978	2Story	8	5	2002	2002	Gable
## 983	2Story	6	6	1976	1976	Gable
## 991	1Story	5	6	1961	1961	Hip
## 992	1Story	6	6	1970	1970	Hip
## 998	1Story	5	6	1976	1976	Gable
## 1001	1Story	6	3	1970	1970	Gable
## 1012	1Story	8	5	1984	1984	Gable
## 1013	SLvl	7	5	1991	1992	Gable
## 1019	1Story	8	6	1976	1976	Hip
## 1025	2Story	5	8	1916	1995	Gable
## 1027	2Story	8	7	1993	1993	Gable
## 1028	1Story	7	5	2002	2002	Gable
## 1030	1Story	4	3	1957	1957	Gable
## 1032	2Story	8	5	2001	2002	Gable
## 1036	2Story	6	8	1966	2000	Hip
## 1040	1Story	3	5	1955	1955	Hip
## 1052	2Story	7	6	1994	1994	Gable
## 1054	1.5Fin	6	7	1932	1950	Gable
## 1059	1Story	5	6	1966	1966	Gable
## 1072	1Story	5	5	1969	1969	Gable
## 1079	2Story	6	5	1995	1996	Gable
## 1081	2Story	4	5	1973	1973	Gable
## 1092	1Story	8	5	1986	1986	Gable
## 1103	2Story	6	5	2000	2000	Gable
## 1105	2Story	6	5	1995	1996	Gable
## 1111	SLvl	8	5	2002	2002	Hip
## 1117	1Story	4	3	1956	1956	Gable
## 1119	SLvl	7	5	1992	1992	Gable
## 1133	1Story	6	5	1977	1977	Gable
## 1136	2Story	5	7	1976	1976	Gable
## 1138	1Story	5	3	1959	1959	Gable
## 1141	1Story	6	5	1985	1985	Gable
## 1143	1.5Fin	7	7	1926	1950	Gable
## 1148	1Story	6	8	1930	2007	Gable
## 1149	2Story	7	6	1965	1988	Gable
## 1156	1Story	6	7	1954	2006	Hip
## 1159	SLvl	5	7	1978	1978	Gable
## 1172	1.5Fin	6	8	1926	2004	Gable
## 1175	2Story	7	5	1990	1991	Gable
## 1185	1Story	4	4	1961	1975	Gable
## 1188	1Story	6	5	1999	1999	Hip
## 1201	1Story	4	4	1966	1966	Gable
## 1208	SLvl	4	9	1965	2001	Gable
## 1225	1.5Fin	5	5	1977	1977	Shed

## 1228	1Story	5	5	1959	1959	Hip	
## 1238	2Story	8	7	1929	1950	Gable	
## 1241	SLvl	6	5	1976	1976	Gable	
## 1245	1Story	7	5	2003	2003	Gable	
## 1247	2Story	7	7	1974	2003	Gable	
## 1254	2Story	6	5	1999	1999	Gable	
## 1256	1.5Fin	4	5	1957	1989	Gable	
## 1262	1.5Fin	8	9	1935	1997	Gable	
## 1264	1Story	7	6	1979	1979	Shed	
## 1265	1Story	6	7	1968	1968	Hip	
## 1266	1Story	5	6	1965	1965	Hip	
## 1270	2Story	6	6	1972	1972	Gable	
## 1271	SLvl	6	5	1967	1976	Gable	
## 1279	1Story	6	5	1963	1963	Hip	
## 1280	1Story	5	5	1964	1964	Gable	
## 1283	SLvl	5	7	1964	1964	Hip	
## 1293	2Story	7	5	1999	1999	Gable	
## 1294	2Story	6	7	1942	1950	Gable	
## 1302	1Story	6	5	1991	1991	Gable	
## 1305	2Story	8	5	1990	1990	Gable	
## 1311	1Story	8	5	2001	2002	Hip	
## 1314	1Story	3	6	1949	1950	Hip	
## 1335	2Story	8	5	2002	2002	Gable	
## 1339	1Story	7	7	1968	2003	Hip	
## 1341	1Story	7	5	1998	1998	Gable	
## 1347	2Story	7	5	2000	2000	Gable	
## 1349	1Story	5	5	1966	1966	Gable	
## 1350	1Story	5	6	1971	2008	Gable	
## 1351	2Story	6	5	2000	2000	Gable	
## 1355	1.5Fin	4	4	1920	2007	Gable	
## 1358	2Story	7	5	2000	2000	Gable	
## 1361	1Story	6	5	2003	2004	Gable	
## 1366	1Story	10	5	2001	2002	Hip	
## 1373	1Story	6	7	1970	1970	Gable	
## 1375	1Story	5	7	1918	2007	Gable	
## 1388	1Story	5	5	1948	1950	Gable	
## 1399	1Story	5	5	1985	1985	Gable	
## 1409	2Story	8	5	1998	1998	Gable	
## 1411	1Story	6	5	1969	1969	Gable	
## 1415	SLvl	6	7	1966	1966	Flat	
## 1416	1Story	5	5	1958	1983	Hip	
## 1421	1Story	6	7	1981	1981	Gable	
## 1423	1Story	6	6	1976	1976	Gable	
## 1433	1Story	6	5	2004	2004	Gable	
## 1435	1.5Unf	6	6	1916	1950	Gable	
## 1438	1Story	5	7	1962	1962	Gable	
##	RoofMatl	Exterior1st	Exterior2nd	MasVnrType	MasVnrArea	ExterQual	ExterCond
## 8	CompShg	HdBoard	HdBoard	Stone	240	TA	TA
## 13	CompShg	HdBoard	Plywood	None	0	TA	TA
## 15	CompShg	MetalSd	MetalSd	BrkFace	212	TA	TA
## 17	CompShg	Wd Sdng	Wd Sdng	BrkFace	180	TA	TA
## 25	CompShg	Plywood	Plywood	None	0	TA	Gd

## 32	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 43	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 44	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 51	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 65	CompShg	VinylSd	VinylSd	BrkFace	573	TA	TA
## 67	CompShg	Plywood	Plywood	BrkFace	287	TA	TA
## 77	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 85	CompShg	HdBoard	HdBoard	BrkFace	22	TA	TA
## 96	CompShg	VinylSd	VinylSd	BrkFace	68	Ex	Gd
## 101	CompShg	Plywood	Plywood	BrkFace	28	TA	TA
## 105	CompShg	Stucco	Stucco	BrkFace	600	TA	Fa
## 112	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 114	CompShg	Wd Sdng	Wd Sdng	BrkFace	184	TA	Gd
## 117	CompShg	Wd Sdng	Wd Sdng	BrkFace	116	TA	TA
## 121	Metal	Plywood	Plywood	None	0	TA	TA
## 127	CompShg	Plywood	Plywood	None	0	TA	TA
## 132	CompShg	VinylSd	VinylSd	BrkFace	40	Gd	TA
## 134	CompShg	VinylSd	VinylSd	BrkFace	136	Gd	TA
## 137	CompShg	MetalSd	MetalSd	BrkFace	196	TA	TA
## 148	CompShg	VinylSd	VinylSd	BrkFace	180	Gd	TA
## 150	CompShg	MetalSd	MetalSd	None	0	TA	TA
## 153	CompShg	HdBoard	HdBoard	BrkFace	252	TA	TA
## 154	CompShg	BrkFace	Plywood	None	0	TA	TA
## 161	CompShg	Plywood	Plywood	None	0	TA	TA
## 167	CompShg	Wd Sdng	Wd Sdng	None	0	Gd	TA
## 170	WdShake	Plywood	Plywood	BrkFace	653	Gd	TA
## 171	CompShg	MetalSd	MetalSd	None	0	TA	TA
## 178	CompShg	MetalSd	MetalSd	None	0	Gd	Gd
## 181	CompShg	MetalSd	MetalSd	BrkFace	456	Gd	TA
## 187	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 192	CompShg	HdBoard	HdBoard	BrkFace	138	TA	TA
## 204	CompShg	VinylSd	VinylSd	BrkFace	205	Gd	TA
## 208	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 209	CompShg	Plywood	Plywood	BrkFace	128	Gd	TA
## 215	CompShg	HdBoard	HdBoard	BrkFace	153	TA	TA
## 219	CompShg	VinylSd	VinylSd	BrkFace	312	Gd	Gd
## 222	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 237	CompShg	HdBoard	HdBoard	None	0	Gd	TA
## 244	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 249	CompShg	Wd Sdng	HdBoard	BrkCmn	472	Gd	TA
## 269	CompShg	HdBoard	HdBoard	BrkFace	174	TA	Gd
## 287	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 288	CompShg	MetalSd	MetalSd	BrkFace	31	TA	Gd
## 293	CompShg	Plywood	Plywood	BrkFace	34	TA	TA
## 307	CompShg	MetalSd	MetalSd	None	0	TA	Fa
## 308	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 310	CompShg	HdBoard	HdBoard	BrkFace	112	TA	TA
## 319	CompShg	Plywood	Plywood	BrkFace	225	TA	TA
## 328	CompShg	Wd Sdng	Wd Shng	None	0	TA	TA
## 330	CompShg	HdBoard	HdBoard	BrkFace	84	TA	TA
## 335	CompShg	Plywood	Plywood	None	0	TA	TA
## 342	CompShg	Stucco	Stucco	BrkFace	340	TA	TA

## 346	CompShg	MetalSd	MetalSd	None	0	TA	Gd
## 347	CompShg	Wd Sdng	Wd Sdng	BrkFace	30	TA	TA
## 351	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 356	CompShg	HdBoard	HdBoard	BrkFace	106	TA	TA
## 360	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 361	CompShg	MetalSd	MetalSd	None	0	TA	TA
## 364	CompShg	HdBoard	HdBoard	BrkFace	120	TA	TA
## 366	CompShg	Plywood	Plywood	BrkFace	247	TA	TA
## 369	CompShg	Wd Sdng	Wd Sdng	None	0	TA	Gd
## 370	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 375	CompShg	Wd Sdng	Wd Sdng	None	0	Fa	Fa
## 384	CompShg	HdBoard	HdBoard	None	0	Gd	TA
## 392	CompShg	MetalSd	MetalSd	None	0	TA	TA
## 393	CompShg	Wd Shng	Wd Shng	None	0	TA	TA
## 404	CompShg	MetalSd	MetalSd	None	0	TA	TA
## 405	CompShg	Plywood	Plywood	None	0	TA	TA
## 412	CompShg	MetalSd	MetalSd	Stone	432	Ex	TA
## 421	CompShg	CemntBd	CementBd	Stone	126	Gd	TA
## 426	CompShg	Wd Sdng	Wd Sdng	BrkFace	145	Gd	TA
## 447	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 452	CompShg	VinylSd	VinylSd	BrkFace	42	Gd	TA
## 457	Tar&Grv	Plywood	Plywood	None	0	TA	TA
## 458	CompShg	Stucco	Wd Shng	None	0	TA	Gd
## 459	CompShg	MetalSd	MetalSd	BrkCmn	161	TA	TA
## 465	CompShg	VinylSd	VinylSd	BrkFace	18	Gd	TA
## 470	CompShg	HdBoard	HdBoard	None	0	Gd	TA
## 484	CompShg	HdBoard	Plywood	None	0	TA	Gd
## 490	CompShg	CemntBd	CementBd	None	0	TA	TA
## 496	CompShg	BrkFace	BrkFace	None	0	Gd	TA
## 516	CompShg	HdBoard	HdBoard	BrkFace	333	TA	TA
## 518	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 536	CompShg	MetalSd	MetalSd	None	0	TA	TA
## 537	CompShg	Plywood	Plywood	BrkFace	188	TA	TA
## 538	CompShg	VinylSd	VinylSd	BrkFace	479	Gd	TA
## 540	CompShg	VinylSd	VinylSd	BrkFace	72	Gd	TA
## 544	CompShg	HdBoard	HdBoard	BrkFace	178	Gd	Gd
## 558	CompShg	VinylSd	VinylSd	BrkFace	18	Gd	TA
## 559	CompShg	Wd Sdng	Wd Sdng	BrkFace	180	TA	TA
## 563	CompShg	HdBoard	HdBoard	None	0	Gd	TA
## 568	CompShg	MetalSd	MetalSd	None	0	TA	TA
## 579	CompShg	Wd Sdng	Wd Sdng	BrkFace	85	TA	TA
## 592	CompShg	VinylSd	VinylSd	BrkFace	170	Gd	TA
## 609	CompShg	VinylSd	VinylSd	BrkFace	204	Gd	TA
## 610	CompShg	HdBoard	HdBoard	BrkFace	233	TA	TA
## 611	CompShg	VinylSd	VinylSd	BrkFace	108	Gd	TA
## 615	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 622	CompShg	MetalSd	MetalSd	BrkFace	513	Gd	TA
## 625	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 640	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 644	CompShg	Plywood	Plywood	None	0	TA	TA
## 658	CompShg	Plywood	Plywood	BrkFace	233	TA	TA
## 664	Tar&Grv	Plywood	Plywood	BrkCmn	113	TA	Gd

## 666	CompShg	CemntBd	Wd Sdng	None	0	TA	TA
## 670	CompShg	Plywood	Plywood	None	0	Gd	TA
## 677	CompShg	Wd Sdng	Wd Sdng	BrkFace	57	TA	TA
## 680	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 683	CompShg	HdBoard	HdBoard	None	0	Gd	TA
## 685	CompShg	MetalSd	MetalSd	None	0	Gd	TA
## 688	CompShg	VinylSd	VinylSd	BrkFace	147	Gd	TA
## 704	CompShg	Plywood	Plywood	Stone	351	TA	TA
## 707	CompShg	HdBoard	HdBoard	BrkCmn	41	TA	TA
## 712	CompShg	HdBoard	Plywood	BrkFace	289	Gd	TA
## 718	CompShg	HdBoard	HdBoard	None	0	Gd	TA
## 719	CompShg	VinylSd	VinylSd	BrkFace	169	Gd	TA
## 724	CompShg	Wd Sdng	Plywood	BrkFace	260	Gd	Gd
## 732	CompShg	Plywood	Plywood	None	0	TA	TA
## 743	CompShg	VinylSd	VinylSd	BrkFace	289	Ex	Gd
## 744	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 749	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 755	CompShg	HdBoard	HdBoard	BrkCmn	328	TA	TA
## 768	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 781	CompShg	Plywood	Plywood	BrkFace	104	TA	Gd
## 783	CompShg	BrkFace	Wd Sdng	None	0	TA	TA
## 787	CompShg	HdBoard	HdBoard	BrkFace	157	TA	TA
## 789	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 792	CompShg	MetalSd	MetalSd	None	0	Gd	TA
## 809	CompShg	VinylSd	VinylSd	BrkFace	169	Gd	TA
## 814	CompShg	BrkFace	BrkFace	None	0	TA	TA
## 815	CompShg	CemntBd	CementBd	BrkFace	148	Gd	TA
## 820	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 826	Tar&Grv	Plywood	Plywood	None	0	TA	TA
## 838	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 843	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 849	CompShg	VinylSd	VinylSd	BrkFace	40	Gd	TA
## 851	CompShg	MetalSd	HdBoard	BrkFace	115	TA	Gd
## 853	CompShg	HdBoard	HdBoard	None	0	TA	Gd
## 854	CompShg	Plywood	HdBoard	None	0	TA	TA
## 857	CompShg	HdBoard	HdBoard	BrkFace	220	TA	TA
## 863	CompShg	MetalSd	MetalSd	BrkFace	76	TA	TA
## 866	CompShg	Plywood	Plywood	None	0	TA	TA
## 877	CompShg	VinylSd	VinylSd	BrkFace	90	Gd	Gd
## 880	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 891	CompShg	Wd Sdng	Plywood	None	0	TA	TA
## 898	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 902	CompShg	HdBoard	Wd Sdng	BrkFace	75	TA	TA
## 906	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 909	CompShg	HdBoard	Plywood	None	0	TA	TA
## 915	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 923	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 925	CompShg	MetalSd	MetalSd	BrkFace	342	TA	TA
## 926	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 927	CompShg	HdBoard	HdBoard	BrkFace	285	TA	TA
## 936	CompShg	MetalSd	MetalSd	None	0	TA	Gd
## 938	CompShg	VinylSd	VinylSd	BrkFace	298	Gd	TA

## 941	CompShg	HdBoard	HdBoard	BrkFace	541	TA	TA
## 950	CompShg	HdBoard	HdBoard	BrkFace	232	TA	TA
## 958	CompShg	HdBoard	HdBoard	BrkFace	424	TA	Gd
## 964	CompShg	Wd Sdng	Wd Sdng	BrkFace	151	TA	TA
## 971	CompShg	MetalSd	MetalSd	None	0	Gd	TA
## 975	CompShg	CemntBd	CmentBd	Stone	210	Ex	TA
## 978	CompShg	CemntBd	CmentBd	None	0	Gd	TA
## 983	CompShg	Plywood	Plywood	BrkFace	298	TA	TA
## 991	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 992	CompShg	HdBoard	HdBoard	BrkFace	571	TA	TA
## 998	CompShg	VinylSd	VinylSd	BrkFace	164	TA	TA
## 1001	CompShg	Plywood	Plywood	None	0	TA	TA
## 1012	CompShg	HdBoard	HdBoard	None	0	Gd	TA
## 1013	CompShg	HdBoard	HdBoard	BrkFace	76	Gd	TA
## 1019	WdShake	Stone	HdBoard	None	0	Gd	TA
## 1025	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 1027	CompShg	MetalSd	MetalSd	None	0	Gd	Gd
## 1028	CompShg	VinylSd	VinylSd	Stone	295	Gd	TA
## 1030	CompShg	Wd Sdng	Wd Sdng	None	0	TA	Gd
## 1032	CompShg	VinylSd	VinylSd	BrkFace	396	Gd	TA
## 1036	CompShg	HdBoard	HdBoard	BrkFace	252	TA	TA
## 1040	CompShg	BrkFace	Wd Sdng	None	0	TA	TA
## 1052	CompShg	HdBoard	HdBoard	None	0	Gd	TA
## 1054	CompShg	MetalSd	MetalSd	BrkFace	480	TA	TA
## 1059	CompShg	Plywood	Plywood	BrkFace	200	TA	TA
## 1072	CompShg	VinylSd	Plywood	None	0	TA	TA
## 1079	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 1081	CompShg	CemntBd	CmentBd	None	0	TA	TA
## 1092	CompShg	HdBoard	HdBoard	None	0	Gd	TA
## 1103	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 1105	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 1111	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 1117	CompShg	AsbShng	AsbShng	None	0	TA	TA
## 1119	CompShg	HdBoard	HdBoard	BrkFace	170	TA	TA
## 1133	CompShg	Plywood	ImStucc	None	0	TA	TA
## 1136	CompShg	Plywood	Plywood	BrkFace	44	TA	Gd
## 1138	CompShg	Wd Sdng	Plywood	None	0	TA	TA
## 1141	CompShg	Wd Sdng	Wd Shng	BrkFace	85	Gd	TA
## 1143	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 1148	CompShg	Wd Sdng	Wd Sdng	None	0	Gd	Gd
## 1149	CompShg	VinylSd	VinylSd	Stone	288	TA	TA
## 1156	CompShg	HdBoard	HdBoard	BrkFace	72	Gd	TA
## 1159	CompShg	Plywood	Plywood	None	0	TA	TA
## 1172	CompShg	MetalSd	MetalSd	None	0	TA	TA
## 1175	CompShg	MetalSd	MetalSd	None	0	TA	TA
## 1185	CompShg	MetalSd	MetalSd	Stone	149	TA	Gd
## 1188	CompShg	VinylSd	VinylSd	BrkFace	425	TA	TA
## 1201	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 1208	CompShg	VinylSd	VinylSd	None	0	TA	Gd
## 1225	CompShg	Plywood	Plywood	None	1	TA	TA
## 1228	CompShg	Plywood	Plywood	BrkFace	180	TA	TA
## 1238	CompShg	BrkFace	Stucco	None	0	TA	TA

## 1241	CompShg	HdBoard	HdBoard	BrkFace	335	TA	TA
## 1245	CompShg	VinylSd	Wd Shng	Stone	163	Gd	TA
## 1247	CompShg	Wd Sdng	Wd Sdng	None	0	Gd	TA
## 1254	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 1256	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 1262	CompShg	Stucco	Stucco	BrkFace	632	TA	Gd
## 1264	WdShake	Plywood	Plywood	None	0	Gd	TA
## 1265	CompShg	BrkFace	BrkFace	None	0	TA	TA
## 1266	CompShg	HdBoard	Plywood	BrkFace	114	TA	TA
## 1270	CompShg	HdBoard	Plywood	None	0	TA	TA
## 1271	CompShg	HdBoard	HdBoard	BrkFace	359	TA	TA
## 1279	CompShg	HdBoard	HdBoard	BrkFace	451	TA	TA
## 1280	CompShg	Wd Sdng	Wd Sdng	BrkCmn	621	TA	Gd
## 1283	CompShg	Wd Sdng	HdBoard	BrkFace	86	TA	TA
## 1293	CompShg	VinylSd	VinylSd	None	344	Gd	TA
## 1294	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 1302	CompShg	HdBoard	HdBoard	BrkFace	88	TA	TA
## 1305	CompShg	Wd Sdng	Wd Sdng	BrkFace	336	Gd	TA
## 1311	CompShg	VinylSd	VinylSd	BrkFace	178	Gd	TA
## 1314	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 1335	CompShg	VinylSd	VinylSd	BrkFace	149	Gd	TA
## 1339	CompShg	BrkFace	HdBoard	None	0	TA	TA
## 1341	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 1347	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 1349	CompShg	HdBoard	HdBoard	BrkFace	65	TA	TA
## 1350	CompShg	VinylSd	VinylSd	None	0	TA	TA
## 1351	CompShg	MetalSd	MetalSd	BrkFace	216	Gd	TA
## 1355	CompShg	VinylSd	VinylSd	None	0	TA	Gd
## 1358	CompShg	VinylSd	VinylSd	None	0	Gd	TA
## 1361	CompShg	VinylSd	VinylSd	BrkFace	170	Gd	TA
## 1366	CompShg	VinylSd	VinylSd	BrkFace	705	Ex	TA
## 1373	CompShg	BrkFace	Plywood	None	0	TA	TA
## 1375	CompShg	Wd Sdng	Wd Sdng	None	0	TA	Gd
## 1388	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 1399	CompShg	HdBoard	Plywood	None	0	TA	TA
## 1409	CompShg	VinylSd	VinylSd	BrkFace	731	Gd	TA
## 1411	CompShg	Plywood	Plywood	BrkFace	312	Gd	Gd
## 1415	Tar&Grv	Plywood	Plywood	None	0	Gd	Gd
## 1416	CompShg	HdBoard	HdBoard	None	0	TA	TA
## 1421	CompShg	MetalSd	MetalSd	BrkFace	310	Gd	Gd
## 1423	CompShg	Plywood	Plywood	None	0	TA	TA
## 1433	CompShg	VinylSd	VinylSd	BrkFace	147	Gd	TA
## 1435	CompShg	Wd Sdng	Wd Sdng	None	0	TA	TA
## 1438	CompShg	HdBoard	HdBoard	BrkFace	189	TA	TA
##	Foundation	BsmtQual	BsmtCond	BsmtExposure	BsmtFinType1	BsmtFinSF1	
## 8	CBlock	Gd	TA	Mn	ALQ	859	
## 13	CBlock	TA	TA	No	ALQ	737	
## 15	CBlock	TA	TA	No	BLQ	733	
## 17	CBlock	TA	TA	No	ALQ	578	
## 25	CBlock	TA	TA	Mn	Rec	188	
## 32	CBlock	TA	TA	No	Unf	0	
## 43	CBlock	Gd	TA	Av	ALQ	747	

## 44	CBlock	Gd	TA	Av	LwQ	280
## 51	PConc	Gd	TA	Av	GLQ	182
## 65	PConc	Gd	TA	No	GLQ	739
## 67	CBlock	Gd	TA	Gd	GLQ	912
## 77	CBlock	TA	TA	No	ALQ	228
## 85	PConc	Gd	TA	No	Unf	0
## 96	PConc	Gd	Gd	No	ALQ	310
## 101	PConc	TA	TA	Mn	ALQ	1200
## 105	PConc	TA	TA	No	LwQ	224
## 112	PConc	Gd	TA	No	GLQ	250
## 114	CBlock	Gd	TA	Mn	ALQ	35
## 117	CBlock	TA	TA	No	LwQ	170
## 121	CBlock	TA	TA	Gd	ALQ	938
## 127	CBlock	Gd	TA	No	ALQ	120
## 132	PConc	Gd	TA	No	GLQ	695
## 134	PConc	Ex	TA	No	GLQ	1005
## 137	CBlock	TA	TA	No	BLQ	695
## 148	PConc	Gd	TA	No	Unf	0
## 150	BrkTil	Gd	TA	No	Unf	0
## 153	CBlock	TA	TA	No	Rec	416
## 154	CBlock	Gd	TA	Gd	BLQ	429
## 161	PConc	Gd	TA	No	BLQ	660
## 167	CBlock	TA	TA	No	LwQ	379
## 170	CBlock	Gd	TA	No	Unf	0
## 171	CBlock	TA	TA	No	Rec	360
## 178	CBlock	TA	TA	No	ALQ	57
## 181	PConc	Gd	TA	No	GLQ	436
## 187	PConc	Gd	TA	Av	GLQ	611
## 192	CBlock	TA	TA	No	ALQ	626
## 204	PConc	Gd	TA	Av	GLQ	662
## 208	PConc	TA	TA	No	ALQ	419
## 209	CBlock	Gd	TA	Gd	GLQ	1065
## 215	CBlock	Gd	TA	No	GLQ	378
## 219	CBlock	TA	TA	No	BLQ	341
## 222	PConc	Gd	TA	No	Unf	0
## 237	PConc	Gd	TA	No	BLQ	402
## 244	PConc	Gd	TA	No	GLQ	695
## 249	CBlock	Gd	TA	Gd	Rec	697
## 269	CBlock	TA	Gd	No	BLQ	751
## 287	CBlock	TA	TA	No	BLQ	614
## 288	CBlock	TA	TA	No	BLQ	450
## 293	CBlock	TA	TA	No	ALQ	795
## 307	CBlock	TA	TA	No	Unf	0
## 308	CBlock	TA	TA	No	BLQ	262
## 310	PConc	Gd	TA	No	ALQ	518
## 319	CBlock	Gd	TA	Av	GLQ	1036
## 328	BrkTil	TA	TA	No	Unf	0
## 330	CBlock	TA	TA	No	GLQ	40
## 335	CBlock	TA	TA	Gd	ALQ	1249
## 342	Slab	<NA>	<NA>	<NA>	<NA>	0
## 346	CBlock	TA	TA	Mn	BLQ	498
## 347	CBlock	TA	TA	No	BLQ	1270

## 351	PConc	Gd	TA	Gd	GLQ	1082
## 356	PConc	Gd	TA	No	GLQ	560
## 360	CBlock	Gd	TA	Av	GLQ	773
## 361	CBlock	TA	TA	No	Rec	399
## 364	PConc	Gd	TA	Mn	GLQ	712
## 366	CBlock	Gd	TA	No	BLQ	609
## 369	CBlock	TA	TA	No	ALQ	72
## 370	PConc	Gd	TA	No	Unf	0
## 375	BrkTil	Fa	Po	Gd	BLQ	350
## 384	PConc	Gd	TA	Av	GLQ	985
## 392	Slab	<NA>	<NA>	<NA>	<NA>	0
## 393	CBlock	TA	TA	No	Rec	266
## 404	PConc	Gd	TA	No	Unf	0
## 405	CBlock	TA	TA	No	BLQ	1116
## 412	PConc	Ex	TA	Av	GLQ	578
## 421	CBlock	Gd	TA	No	ALQ	1246
## 426	PConc	Gd	TA	Gd	GLQ	1518
## 447	PConc	Gd	TA	No	Unf	0
## 452	PConc	Ex	TA	No	ALQ	742
## 457	CBlock	Gd	TA	Gd	BLQ	1116
## 458	PConc	TA	TA	No	Unf	0
## 459	CBlock	TA	TA	No	LwQ	185
## 465	PConc	Gd	TA	No	Unf	0
## 470	PConc	Gd	TA	Av	GLQ	368
## 484	CBlock	TA	TA	No	ALQ	588
## 490	PConc	Gd	TA	Mn	Unf	0
## 496	PConc	Gd	TA	No	GLQ	1231
## 516	CBlock	TA	TA	No	Unf	0
## 518	PConc	Gd	TA	Mn	GLQ	706
## 536	CBlock	TA	TA	No	BLQ	600
## 537	CBlock	TA	TA	No	BLQ	673
## 538	PConc	Gd	TA	Av	GLQ	1358
## 540	PConc	Gd	TA	No	Unf	0
## 544	PConc	Gd	Gd	No	GLQ	1002
## 558	PConc	Gd	TA	Gd	Unf	0
## 559	CBlock	Gd	TA	No	ALQ	1302
## 563	PConc	Gd	TA	No	GLQ	728
## 568	CBlock	Gd	TA	Gd	GLQ	943
## 579	CBlock	TA	TA	No	BLQ	594
## 592	PConc	Gd	TA	Av	GLQ	685
## 609	PConc	Ex	TA	Mn	GLQ	904
## 610	CBlock	Gd	TA	Av	ALQ	605
## 611	PConc	Gd	TA	Av	GLQ	990
## 615	PConc	Gd	TA	No	GLQ	457
## 622	PConc	Gd	TA	No	GLQ	420
## 625	CBlock	TA	TA	No	Unf	0
## 640	PConc	Gd	TA	No	GLQ	738
## 644	CBlock	TA	TA	No	ALQ	282
## 658	CBlock	Gd	TA	No	Unf	0
## 664	CBlock	Gd	TA	No	LwQ	187
## 666	CBlock	TA	TA	No	Rec	988
## 670	CBlock	Gd	TA	No	ALQ	767

## 677	CBlock	TA	TA	No	Rec	827
## 680	PConc	Gd	TA	Mn	GLQ	1003
## 683	CBlock	Gd	TA	Mn	GLQ	828
## 685	PConc	Gd	TA	No	GLQ	239
## 688	PConc	Gd	TA	Gd	GLQ	697
## 704	CBlock	Gd	TA	Gd	GLQ	1219
## 707	PConc	TA	TA	No	Unf	0
## 712	CBlock	TA	TA	No	GLQ	533
## 718	PConc	Gd	TA	Gd	GLQ	1148
## 719	PConc	Gd	TA	Av	GLQ	662
## 724	CBlock	Gd	TA	No	GLQ	808
## 732	PConc	TA	TA	No	Unf	0
## 743	CBlock	TA	Gd	No	GLQ	575
## 744	PConc	Gd	TA	No	GLQ	300
## 749	PConc	Gd	TA	No	Unf	0
## 755	CBlock	TA	TA	Mn	Rec	438
## 768	CBlock	Gd	TA	Av	GLQ	685
## 781	PConc	Gd	TA	Av	GLQ	1097
## 783	CBlock	TA	TA	No	Rec	251
## 787	CBlock	TA	Fa	Gd	LwQ	568
## 789	PConc	Gd	TA	Av	ALQ	539
## 792	PConc	Gd	TA	No	Unf	0
## 809	PConc	Gd	TA	Gd	GLQ	662
## 814	CBlock	TA	TA	No	BLQ	486
## 815	PConc	Gd	TA	No	GLQ	1218
## 820	PConc	Gd	TA	Gd	Unf	0
## 826	PConc	TA	Gd	Gd	LwQ	249
## 838	BrkTil	TA	TA	No	BLQ	156
## 843	CBlock	Gd	TA	Gd	ALQ	1390
## 849	PConc	Gd	TA	Gd	Unf	0
## 851	CBlock	TA	TA	Gd	Rec	564
## 853	CBlock	TA	TA	No	ALQ	659
## 854	CBlock	Gd	Gd	Gd	GLQ	505
## 857	CBlock	TA	TA	Mn	BLQ	619
## 863	CBlock	TA	TA	No	BLQ	828
## 866	Slab	<NA>	<NA>	<NA>	<NA>	0
## 877	CBlock	TA	TA	No	ALQ	646
## 880	PConc	Gd	TA	No	Unf	0
## 891	PConc	Gd	TA	Mn	BLQ	1064
## 898	CBlock	TA	TA	No	ALQ	322
## 902	CBlock	TA	TA	No	GLQ	599
## 906	CBlock	Gd	TA	Av	BLQ	301
## 909	CBlock	Gd	Gd	Av	ALQ	196
## 915	CBlock	TA	TA	No	ALQ	1059
## 923	PConc	Gd	TA	Av	ALQ	767
## 925	CBlock	TA	TA	No	BLQ	552
## 926	PConc	Gd	TA	Av	Unf	0
## 927	PConc	Gd	TA	No	Unf	0
## 936	CBlock	TA	TA	Mn	Unf	0
## 938	PConc	Gd	TA	No	ALQ	772
## 941	CBlock	TA	TA	No	GLQ	111
## 950	CBlock	TA	TA	Av	ALQ	562

## 958	CBlock	Gd	Gd	No	ALQ	896
## 964	CBlock	TA	TA	No	ALQ	902
## 971	PConc	Gd	TA	No	GLQ	641
## 975	CBlock	TA	TA	Av	ALQ	867
## 978	PConc	Gd	TA	Mn	Unf	0
## 983	CBlock	TA	TA	No	LwQ	156
## 991	CBlock	TA	TA	No	Rec	915
## 992	CBlock	TA	TA	No	Unf	0
## 998	CBlock	TA	TA	No	Unf	0
## 1001	CBlock	Gd	TA	No	LwQ	1237
## 1012	CBlock	Gd	TA	Av	GLQ	1036
## 1013	PConc	Gd	TA	No	Unf	0
## 1019	CBlock	Gd	TA	Av	ALQ	1165
## 1025	PConc	TA	TA	Mn	Unf	0
## 1027	PConc	Gd	Gd	No	GLQ	1012
## 1028	PConc	Gd	TA	No	GLQ	986
## 1030	Slab	<NA>	<NA>	<NA>	<NA>	0
## 1032	PConc	Gd	TA	No	Unf	0
## 1036	CBlock	TA	TA	No	GLQ	400
## 1040	Slab	<NA>	<NA>	<NA>	<NA>	0
## 1052	PConc	Gd	TA	No	GLQ	595
## 1054	CBlock	TA	TA	Mn	Rec	297
## 1059	CBlock	TA	TA	Mn	BLQ	740
## 1072	CBlock	TA	TA	Mn	BLQ	75
## 1079	PConc	Gd	TA	No	ALQ	592
## 1081	CBlock	TA	TA	No	BLQ	334
## 1092	CBlock	Gd	TA	No	Unf	0
## 1103	PConc	Gd	TA	No	Unf	0
## 1105	PConc	Gd	TA	No	GLQ	219
## 1111	PConc	Gd	TA	No	GLQ	353
## 1117	CBlock	TA	TA	No	Unf	0
## 1119	PConc	Gd	TA	No	Unf	0
## 1133	PConc	TA	TA	Gd	ALQ	1567
## 1136	CBlock	TA	TA	No	ALQ	381
## 1138	CBlock	TA	TA	No	GLQ	288
## 1141	CBlock	Gd	TA	No	GLQ	1258
## 1143	PConc	TA	TA	No	Unf	0
## 1148	BrkTil	TA	TA	Av	ALQ	538
## 1149	CBlock	TA	TA	Gd	ALQ	454
## 1156	CBlock	TA	TA	No	BLQ	728
## 1159	PConc	Gd	TA	Gd	ALQ	680
## 1172	CBlock	TA	TA	No	Rec	468
## 1175	Wood	Gd	TA	No	LwQ	1216
## 1185	CBlock	TA	TA	Av	BLQ	1159
## 1188	PConc	Ex	TA	No	GLQ	883
## 1201	CBlock	TA	TA	No	Rec	1056
## 1208	CBlock	TA	Gd	Av	GLQ	648
## 1225	CBlock	Gd	TA	No	GLQ	498
## 1228	CBlock	TA	TA	No	Rec	1000
## 1238	PConc	Gd	TA	No	Unf	0
## 1241	CBlock	TA	TA	Av	GLQ	539
## 1245	PConc	Gd	TA	No	Unf	0

## 1247	CBlock	TA	TA	Gd	LwQ	125	
## 1254	PConc	Gd	TA	No	Unf	0	
## 1256	CBlock	TA	TA	Av	Unf	0	
## 1262	CBlock	TA	TA	Mn	Rec	192	
## 1264	PConc	Gd	TA	Gd	GLQ	1258	
## 1265	CBlock	TA	TA	No	Unf	0	
## 1266	CBlock	TA	TA	No	BLQ	560	
## 1270	CBlock	TA	Gd	No	BLQ	593	
## 1271	CBlock	Gd	TA	Av	ALQ	528	
## 1279	CBlock	TA	TA	No	ALQ	569	
## 1280	CBlock	TA	TA	Av	Rec	812	
## 1283	PConc	TA	TA	Av	GLQ	1014	
## 1293	PConc	Gd	TA	No	GLQ	694	
## 1294	CBlock	TA	TA	No	BLQ	547	
## 1302	CBlock	Gd	TA	No	GLQ	1200	
## 1305	PConc	Ex	TA	No	GLQ	482	
## 1311	PConc	Gd	TA	Gd	Unf	0	
## 1314	CBlock	<NA>	<NA>	<NA>	<NA>	0	
## 1335	PConc	Gd	TA	No	Unf	0	
## 1339	CBlock	TA	TA	No	BLQ	297	
## 1341	PConc	Gd	TA	Gd	GLQ	1443	
## 1347	PConc	Gd	TA	No	GLQ	735	
## 1349	CBlock	TA	TA	No	Rec	340	
## 1350	CBlock	TA	TA	No	GLQ	734	
## 1351	PConc	Gd	TA	No	GLQ	378	
## 1355	BrkTil	TA	Fa	No	Unf	0	
## 1358	PConc	Gd	TA	No	GLQ	533	
## 1361	PConc	Gd	TA	Av	GLQ	685	
## 1366	PConc	Ex	TA	Gd	GLQ	1282	
## 1373	CBlock	TA	TA	Mn	BLQ	865	
## 1375	BrkTil	TA	TA	No	Unf	0	
## 1388	CBlock	TA	TA	Av	BLQ	353	
## 1399	CBlock	TA	TA	No	ALQ	625	
## 1409	PConc	Gd	TA	Mn	GLQ	781	
## 1411	CBlock	TA	TA	Av	Rec	1110	
## 1415	CBlock	Gd	TA	Av	Unf	0	
## 1416	CBlock	TA	TA	No	ALQ	457	
## 1421	CBlock	Gd	TA	No	BLQ	678	
## 1423	CBlock	Gd	TA	No	LwQ	958	
## 1433	PConc	Gd	TA	Av	GLQ	697	
## 1435	BrkTil	TA	TA	No	Unf	0	
## 1438	CBlock	TA	TA	No	Rec	593	
##	BsmtFinType2	BsmtFinSF2	BsmtUnfSF	TotalBsmtSF	Heating	HeatingQC	CentralAir
## 8	BLQ	32	216	1107	GasA	Ex	Y
## 13	Unf	0	175	912	GasA	TA	Y
## 15	Unf	0	520	1253	GasA	TA	Y
## 17	Unf	0	426	1004	GasA	Ex	Y
## 25	ALQ	668	204	1060	GasA	Ex	Y
## 32	Unf	0	1228	1228	GasA	Gd	Y
## 43	LwQ	93	0	840	GasA	Gd	Y
## 44	BLQ	491	167	938	GasA	TA	Y
## 51	Unf	0	612	794	GasA	Gd	Y

## 65	Unf	0	318	1057	GasA	Ex	Y
## 67	Unf	0	1035	1947	GasA	TA	Y
## 77	Unf	0	724	952	GasA	Ex	Y
## 85	Unf	0	384	384	GasA	Gd	Y
## 96	Unf	0	370	680	GasA	Gd	Y
## 101	Unf	0	410	1610	GasA	Gd	Y
## 105	Unf	0	816	1040	GasA	Ex	Y
## 112	Unf	0	134	384	GasA	Ex	Y
## 114	Rec	869	905	1809	GasA	TA	Y
## 117	BLQ	670	252	1092	GasA	TA	Y
## 121	Unf	0	0	938	GasA	Ex	Y
## 127	Unf	0	958	1078	GasA	TA	Y
## 132	Unf	0	297	992	GasA	Ex	Y
## 134	Unf	0	262	1267	GasA	Ex	Y
## 137	Unf	0	519	1214	GasA	TA	Y
## 148	Unf	0	884	884	GasA	Ex	Y
## 150	Unf	0	896	896	GasA	Gd	Y
## 153	Unf	0	409	825	GasA	Gd	Y
## 154	ALQ	1080	93	1602	GasA	Gd	Y
## 161	Unf	0	572	1232	GasA	TA	Y
## 167	BLQ	768	470	1617	GasA	Ex	Y
## 170	Unf	0	1686	1686	GasA	TA	Y
## 171	Unf	0	360	720	GasA	TA	Y
## 178	BLQ	441	554	1052	GasA	Ex	Y
## 181	Unf	0	320	756	GasA	Ex	Y
## 187	Unf	0	577	1188	GasA	Ex	Y
## 192	Unf	0	99	725	GasA	Gd	Y
## 204	Unf	0	186	848	GasA	Ex	Y
## 208	Rec	306	375	1100	GasA	TA	Y
## 209	Unf	0	92	1157	GasA	Ex	Y
## 215	Unf	0	311	689	GasA	Ex	Y
## 219	Unf	0	457	798	GasA	Ex	Y
## 222	Unf	0	1010	1010	GasA	Ex	Y
## 237	Unf	0	594	996	GasA	Ex	Y
## 244	Unf	0	253	948	GasA	Ex	Y
## 249	Unf	0	747	1444	GasA	Gd	Y
## 269	Unf	0	392	1143	GasA	TA	Y
## 287	Unf	0	244	858	GasA	TA	Y
## 288	Unf	0	432	882	GasA	TA	Y
## 293	Unf	0	0	795	GasA	Fa	Y
## 307	Unf	0	319	319	GasA	TA	Y
## 308	Unf	0	599	861	GasA	Ex	Y
## 310	Unf	0	179	697	GasA	Gd	Y
## 319	Unf	0	336	1372	GasA	TA	Y
## 328	Unf	0	844	844	GasA	Gd	N
## 330	Rec	264	1424	1728	GasA	TA	Y
## 335	BLQ	147	103	1499	GasA	Ex	Y
## 342	<NA>	0	0	0	Wall	Fa	N
## 346	Unf	0	460	958	GasA	TA	Y
## 347	Unf	0	208	1478	GasA	Ex	Y
## 351	Unf	0	371	1453	GasA	Gd	Y
## 356	Unf	0	598	1158	GasA	Gd	Y

## 360	Unf	0	115	888	GasA	Ex	Y
## 361	Unf	0	484	883	GasA	Gd	Y
## 364	Unf	0	84	796	GasA	TA	Y
## 366	Unf	0	785	1394	GasA	Gd	Y
## 369	Rec	258	733	1063	GasA	Ex	Y
## 370	Unf	0	953	953	GasA	Ex	Y
## 375	Unf	0	333	683	GasA	Gd	N
## 384	Unf	0	595	1580	GasA	Ex	Y
## 392	<NA>	0	0	0	GasA	TA	Y
## 393	Unf	0	522	788	GasA	TA	Y
## 404	Unf	0	806	806	GasA	Gd	Y
## 405	Unf	0	165	1281	GasA	Ex	Y
## 412	Unf	0	892	1470	GasA	Ex	Y
## 421	Unf	0	356	1602	GasA	Gd	Y
## 426	Unf	0	0	1518	GasA	Gd	Y
## 447	Unf	0	930	930	GasA	Gd	Y
## 452	Unf	0	130	872	GasA	Ex	Y
## 457	Unf	0	248	1364	GasA	Ex	Y
## 458	Unf	0	588	588	GasA	Fa	Y
## 459	Unf	0	524	709	GasA	TA	Y
## 465	Unf	0	1375	1375	GasA	Ex	Y
## 470	BLQ	1120	0	1488	GasA	TA	Y
## 484	Unf	0	411	999	GasA	Gd	Y
## 490	Unf	0	264	264	GasA	TA	Y
## 496	Unf	0	1969	3200	GasA	Ex	Y
## 516	Unf	0	689	689	GasA	TA	Y
## 518	Unf	0	88	794	GasA	Ex	Y
## 536	Unf	0	264	864	GasA	TA	Y
## 537	Unf	0	378	1051	GasA	TA	Y
## 538	Unf	0	223	1581	GasA	Ex	Y
## 540	Unf	0	969	969	GasA	Ex	Y
## 544	LwQ	202	0	1204	GasA	Gd	Y
## 558	Unf	0	1374	1374	GasA	Ex	Y
## 559	Unf	0	90	1392	GasA	TA	Y
## 563	Unf	0	367	1095	GasA	Ex	Y
## 568	Unf	0	0	943	GasA	TA	Y
## 579	Rec	219	331	1144	GasA	Ex	Y
## 592	Unf	0	163	848	GasA	Ex	Y
## 609	Unf	0	536	1440	GasA	Ex	Y
## 610	Unf	0	427	1032	GasA	TA	Y
## 611	Unf	0	309	1299	GasA	Ex	Y
## 615	Unf	0	326	783	GasA	Ex	Y
## 622	Unf	0	336	756	GasA	Ex	Y
## 625	Unf	0	978	978	GasA	TA	Y
## 640	Unf	0	319	1057	GasA	Ex	Y
## 644	LwQ	35	664	981	GasA	TA	Y
## 658	Unf	0	793	793	GasA	TA	Y
## 664	Rec	723	111	1021	GasA	TA	Y
## 666	Unf	0	200	1188	GasA	Gd	Y
## 670	Unf	0	441	1208	GasA	TA	Y
## 677	Unf	0	161	988	GasA	TA	Y
## 680	Unf	0	288	1291	GasA	Ex	Y

## 683	LwQ	182	180	1190	GasA	Gd	Y
## 685	Unf	0	312	551	GasA	Ex	Y
## 688	Unf	0	151	848	GasA	Ex	Y
## 704	Unf	0	424	1643	GasA	TA	Y
## 707	Unf	0	876	876	GasA	TA	Y
## 712	Unf	0	192	725	GasA	Ex	Y
## 718	Unf	0	594	1742	GasA	TA	Y
## 719	Unf	0	186	848	GasA	Ex	Y
## 724	Unf	0	72	880	GasA	Ex	Y
## 732	Unf	0	948	948	GasA	TA	Y
## 743	ALQ	80	487	1142	GasA	Ex	Y
## 744	Unf	0	652	952	GasA	Ex	Y
## 749	Unf	0	660	660	GasA	Ex	Y
## 755	Unf	0	234	672	GasA	TA	Y
## 768	Unf	0	173	858	GasA	TA	Y
## 781	Unf	0	0	1097	GasA	Ex	Y
## 783	LwQ	630	491	1372	GasA	TA	Y
## 787	Unf	0	264	832	GasA	Gd	Y
## 789	Unf	0	490	1029	GasA	TA	Y
## 792	Unf	0	712	712	GasA	Ex	Y
## 809	Unf	0	186	848	GasA	Ex	Y
## 814	Unf	0	522	1008	GasA	Gd	Y
## 815	Unf	0	350	1568	GasA	Ex	Y
## 820	Unf	0	847	847	GasA	Ex	Y
## 826	ALQ	764	0	1013	GasA	TA	Y
## 838	Unf	0	516	672	GasA	TA	N
## 843	Unf	0	0	1390	GasA	TA	Y
## 849	Unf	0	1273	1273	GasA	Ex	Y
## 851	Unf	0	563	1127	GasA	TA	Y
## 853	Unf	0	381	1040	GasA	Ex	Y
## 854	LwQ	435	0	940	GasA	TA	Y
## 857	Unf	0	435	1054	GasA	TA	Y
## 863	Unf	0	174	1002	GasA	TA	Y
## 866	<NA>	0	0	0	GasA	Gd	Y
## 877	Unf	0	218	864	GasA	Ex	Y
## 880	Unf	0	808	808	GasA	Gd	Y
## 891	Unf	0	319	1383	GasA	TA	Y
## 898	Unf	0	536	858	GasA	TA	Y
## 902	Unf	0	277	876	GasA	TA	Y
## 906	ALQ	324	239	864	GasA	TA	Y
## 909	Unf	0	1072	1268	GasA	TA	Y
## 915	Unf	0	75	1134	GasA	Ex	Y
## 923	LwQ	93	266	1126	GasA	TA	Y
## 925	Unf	0	280	832	GasA	Gd	Y
## 926	Unf	0	1753	1753	GasA	Ex	Y
## 927	Unf	0	964	964	GasA	Gd	Y
## 936	Unf	0	1032	1032	GasA	Ex	Y
## 938	Unf	0	220	992	GasA	Ex	Y
## 941	Rec	354	354	819	GasA	Gd	Y
## 950	LwQ	193	29	784	GasA	Ex	Y
## 958	Unf	0	434	1330	GasA	TA	Y
## 964	Unf	0	196	1098	GasA	TA	Y

## 971	Unf	0	32	673	GasA	Ex	Y
## 975	Unf	0	77	944	GasA	Gd	Y
## 978	Unf	0	1128	1128	GasA	Ex	Y
## 983	Unf	0	692	848	GasA	TA	Y
## 991	Unf	0	135	1050	GasA	TA	Y
## 992	Unf	0	1442	1442	GasA	TA	Y
## 998	Unf	0	1680	1680	GasA	Fa	Y
## 1001	Unf	0	420	1657	GasA	Gd	Y
## 1012	Unf	0	184	1220	GasA	Gd	Y
## 1013	Unf	0	384	384	GasA	Gd	Y
## 1019	LwQ	400	0	1565	GasA	TA	Y
## 1025	Unf	0	686	686	GasA	Gd	Y
## 1027	Unf	0	326	1338	GasA	Ex	Y
## 1028	Unf	0	668	1654	GasA	Ex	Y
## 1030	<NA>	0	0	0	GasA	Ex	N
## 1032	Unf	0	1055	1055	GasA	Ex	Y
## 1036	Rec	64	336	800	GasA	Gd	Y
## 1040	<NA>	0	0	0	GasA	Ex	Y
## 1052	Unf	0	378	973	GasA	Ex	Y
## 1054	LwQ	557	0	854	GasA	TA	Y
## 1059	Rec	230	184	1154	GasA	Ex	Y
## 1072	Rec	791	230	1096	GasA	Ex	Y
## 1079	Unf	0	99	691	GasA	Gd	Y
## 1081	Unf	0	212	546	GasA	TA	Y
## 1092	Unf	0	1074	1074	GasA	Ex	Y
## 1103	Unf	0	924	924	GasA	Ex	Y
## 1105	Unf	0	554	773	GasA	Gd	Y
## 1111	Unf	0	55	408	GasA	Ex	Y
## 1117	Unf	0	672	672	GasA	Ex	Y
## 1119	Unf	0	384	384	GasA	Gd	Y
## 1133	Unf	0	0	1567	GasA	TA	Y
## 1136	Unf	0	399	780	GasA	Ex	Y
## 1138	Unf	0	718	1006	GasA	TA	Y
## 1141	Unf	0	40	1298	GasA	TA	Y
## 1143	Unf	0	572	572	GasA	TA	Y
## 1148	Unf	0	278	816	GasA	Ex	Y
## 1149	Unf	0	410	864	GasA	TA	Y
## 1156	Unf	0	568	1296	GasA	Ex	Y
## 1159	Rec	391	289	1360	GasA	Ex	Y
## 1172	Unf	0	350	818	GasA	TA	Y
## 1175	Unf	0	0	1216	GasA	Ex	Y
## 1185	Unf	0	90	1249	GasA	Ex	Y
## 1188	Unf	0	341	1224	GasA	Ex	Y
## 1201	Unf	0	0	1056	GasA	TA	Y
## 1208	Unf	0	0	648	GasA	Ex	Y
## 1225	Rec	211	652	1361	GasA	Ex	Y
## 1228	Unf	0	188	1188	GasA	Fa	Y
## 1238	Unf	0	792	792	GasA	Fa	Y
## 1241	Unf	0	473	1012	GasA	TA	Y
## 1245	Unf	0	1405	1405	GasA	Ex	Y
## 1247	ALQ	1031	36	1192	GasA	TA	Y
## 1254	Unf	0	841	841	GasA	Ex	Y

## 1256	Unf	0	1104	1104	GasA	Ex	Y
## 1262	Unf	0	536	728	GasA	Ex	Y
## 1264	Unf	0	74	1332	GasA	TA	Y
## 1265	Unf	0	1489	1489	GasA	Gd	Y
## 1266	LwQ	375	0	935	GasA	TA	Y
## 1270	Unf	0	130	723	GasA	TA	Y
## 1271	Unf	0	1152	1680	GasA	Fa	Y
## 1279	Rec	81	678	1328	GasA	TA	Y
## 1280	Unf	0	812	1624	GasA	Fa	Y
## 1283	Unf	0	138	1152	GasA	TA	Y
## 1293	Unf	0	284	978	GasA	Ex	Y
## 1294	Unf	0	224	771	GasA	Fa	Y
## 1302	Unf	0	78	1278	GasA	Gd	Y
## 1305	Unf	0	971	1453	GasA	Ex	Y
## 1311	Unf	0	1753	1753	GasA	Ex	Y
## 1314	<NA>	0	0	0	Floor	TA	N
## 1335	Unf	0	1284	1284	GasA	Ex	Y
## 1339	Rec	68	1203	1568	GasA	TA	Y
## 1341	Unf	0	39	1482	GasA	Ex	Y
## 1347	Unf	0	257	992	GasA	Ex	Y
## 1349	Unf	0	524	864	GasA	TA	Y
## 1350	Unf	0	344	1078	GasA	Ex	Y
## 1351	Unf	0	378	756	GasA	Ex	Y
## 1355	Unf	0	715	715	GasA	Gd	Y
## 1358	Unf	0	281	814	GasA	Ex	Y
## 1361	Unf	0	163	848	GasA	Ex	Y
## 1366	Unf	0	1351	2633	GasA	Ex	Y
## 1373	Unf	0	340	1205	GasA	Ex	Y
## 1375	Unf	0	816	816	GasA	Ex	Y
## 1388	Rec	334	60	747	GasA	TA	Y
## 1399	Unf	0	208	833	GasA	Ex	Y
## 1409	Unf	0	503	1284	GasA	Ex	Y
## 1411	Unf	0	734	1844	GasA	Gd	Y
## 1415	Unf	0	697	697	GasA	TA	Y
## 1416	Rec	374	193	1024	GasA	TA	Y
## 1421	Unf	0	762	1440	GasA	Ex	Y
## 1423	Unf	0	0	958	GasA	TA	Y
## 1433	Unf	0	151	848	GasA	Ex	Y
## 1435	Unf	0	952	952	Grav	Fa	N
## 1438	Unf	0	595	1188	GasA	TA	Y
##	Electrical	X1stFlrSF	X2ndFlrSF	LowQualFinSF	GrLivArea	BsmtFullBath	
## 8	SBrkr	1107	983	0	2090	1	
## 13	SBrkr	912	0	0	912	1	
## 15	SBrkr	1253	0	0	1253	1	
## 17	SBrkr	1004	0	0	1004	1	
## 25	SBrkr	1060	0	0	1060	1	
## 32	SBrkr	1228	0	0	1228	0	
## 43	SBrkr	884	0	0	884	1	
## 44	SBrkr	938	0	0	938	1	
## 51	SBrkr	794	676	0	1470	0	
## 65	SBrkr	1057	977	0	2034	1	
## 67	SBrkr	2207	0	0	2207	1	

## 77	FuseA	952	0	0	952	0
## 85	SBrkr	804	670	0	1474	0
## 96	SBrkr	680	790	0	1470	0
## 101	SBrkr	1610	0	0	1610	1
## 105	FuseF	1226	592	0	1818	0
## 112	SBrkr	774	656	0	1430	0
## 114	SBrkr	2259	0	0	2259	1
## 117	SBrkr	1092	0	0	1092	0
## 121	SBrkr	988	0	0	988	1
## 127	SBrkr	958	0	0	958	0
## 132	SBrkr	1022	1032	0	2054	1
## 134	SBrkr	1296	0	0	1296	1
## 137	SBrkr	1214	0	0	1214	0
## 148	SBrkr	884	1151	0	2035	0
## 150	FuseA	896	448	0	1344	0
## 153	SBrkr	1097	896	0	1993	0
## 154	SBrkr	1252	0	0	1252	1
## 161	SBrkr	1232	0	0	1232	0
## 167	FuseA	1867	0	0	1867	1
## 170	SBrkr	1707	0	0	1707	0
## 171	SBrkr	854	0	528	1382	0
## 178	SBrkr	1252	668	0	1920	1
## 181	SBrkr	769	756	0	1525	0
## 187	SBrkr	1217	0	0	1217	1
## 192	SBrkr	725	754	0	1479	1
## 204	SBrkr	848	0	0	848	1
## 208	SBrkr	1100	0	0	1100	1
## 209	SBrkr	1180	882	0	2062	1
## 215	SBrkr	689	703	0	1392	0
## 219	SBrkr	1137	817	0	1954	0
## 222	SBrkr	1010	1257	0	2267	0
## 237	SBrkr	1014	730	0	1744	0
## 244	SBrkr	1222	888	0	2110	1
## 249	SBrkr	1444	700	0	2144	0
## 269	SBrkr	1113	0	0	1113	1
## 287	SBrkr	858	0	0	858	0
## 288	SBrkr	900	0	0	900	0
## 293	SBrkr	1468	795	0	2263	1
## 307	FuseA	1035	371	0	1406	0
## 308	SBrkr	861	0	0	861	0
## 310	SBrkr	697	804	0	1501	0
## 319	SBrkr	1472	0	0	1472	1
## 328	FuseA	1445	689	0	2134	0
## 330	SBrkr	1728	0	0	1728	0
## 335	SBrkr	1619	167	0	1786	2
## 342	FuseA	1040	0	0	1040	0
## 346	SBrkr	958	0	0	958	0
## 347	FuseA	1478	0	0	1478	1
## 351	SBrkr	1453	0	0	1453	1
## 356	SBrkr	1167	0	0	1167	1
## 360	SBrkr	912	0	0	912	1
## 361	SBrkr	988	517	0	1505	1

## 364	SBrkr	790	784	0	1574	1
## 366	SBrkr	1394	0	0	1394	1
## 369	SBrkr	1287	0	0	1287	1
## 370	SBrkr	953	711	0	1664	0
## 375	FuseA	904	0	0	904	1
## 384	SBrkr	1079	874	0	1953	1
## 392	SBrkr	882	0	0	882	0
## 393	FuseA	788	0	0	788	0
## 404	SBrkr	806	766	0	1572	0
## 405	SBrkr	1620	0	0	1620	1
## 412	SBrkr	1478	0	0	1478	1
## 421	SBrkr	1602	0	0	1602	0
## 426	SBrkr	1644	0	0	1644	1
## 447	SBrkr	956	930	0	1886	0
## 452	SBrkr	888	868	0	1756	1
## 457	SBrkr	1663	0	0	1663	1
## 458	SBrkr	833	833	0	1666	0
## 459	SBrkr	979	224	0	1203	1
## 465	SBrkr	1414	0	0	1414	0
## 470	SBrkr	1502	0	0	1502	1
## 484	SBrkr	999	0	0	999	1
## 490	SBrkr	616	688	0	1304	0
## 496	SBrkr	3228	0	0	3228	1
## 516	SBrkr	1378	741	0	2119	0
## 518	SBrkr	882	914	0	1796	1
## 536	SBrkr	864	0	0	864	0
## 537	SBrkr	1159	0	0	1159	0
## 538	SBrkr	1601	0	0	1601	1
## 540	SBrkr	997	1288	0	2285	0
## 544	SBrkr	1377	806	0	2183	0
## 558	SBrkr	1557	0	0	1557	0
## 559	SBrkr	1392	0	0	1392	1
## 563	SBrkr	1166	1129	0	2295	1
## 568	SBrkr	943	0	0	943	1
## 579	SBrkr	1429	0	0	1429	0
## 592	SBrkr	848	0	0	848	1
## 609	SBrkr	1476	677	0	2153	1
## 610	SBrkr	1032	0	0	1032	0
## 611	SBrkr	1299	573	0	1872	1
## 615	SBrkr	807	702	0	1509	1
## 622	SBrkr	756	756	0	1512	0
## 625	SBrkr	1422	0	0	1422	0
## 640	SBrkr	1057	872	0	1929	1
## 644	SBrkr	981	0	0	981	1
## 658	SBrkr	1142	793	0	1935	0
## 664	SBrkr	1465	915	0	2380	0
## 666	SBrkr	1437	0	0	1437	1
## 670	SBrkr	1208	0	0	1208	1
## 677	SBrkr	988	0	0	988	1
## 680	SBrkr	1291	0	0	1291	1
## 683	SBrkr	1190	900	0	2090	1
## 685	SBrkr	551	551	0	1102	0

## 688	SBrkr	848	0	0	848	1
## 704	SBrkr	1824	0	0	1824	1
## 707	SBrkr	904	0	0	904	0
## 712	SBrkr	725	754	0	1479	0
## 718	SBrkr	1742	0	0	1742	1
## 719	SBrkr	848	0	0	848	1
## 724	SBrkr	1680	0	0	1680	1
## 732	SBrkr	948	0	0	948	0
## 743	SBrkr	1175	1540	0	2715	0
## 744	SBrkr	980	1276	0	2256	0
## 749	SBrkr	660	660	0	1320	0
## 755	SBrkr	672	714	0	1386	0
## 768	SBrkr	858	0	0	858	1
## 781	SBrkr	1110	0	0	1110	1
## 783	SBrkr	1342	0	0	1342	0
## 787	SBrkr	976	1111	0	2087	0
## 789	SBrkr	1062	0	0	1062	1
## 792	SBrkr	1086	809	0	1895	0
## 809	SBrkr	848	0	0	848	1
## 814	SBrkr	1008	0	0	1008	0
## 815	SBrkr	1689	0	0	1689	1
## 820	SBrkr	847	886	0	1733	0
## 826	SBrkr	1160	966	0	2126	0
## 838	SBrkr	810	672	0	1482	0
## 843	SBrkr	1701	0	0	1701	1
## 849	SBrkr	1456	0	0	1456	0
## 851	SBrkr	1445	0	0	1445	0
## 853	SBrkr	1040	0	0	1040	1
## 854	SBrkr	1026	0	0	1026	1
## 857	SBrkr	1512	1142	0	2654	1
## 863	SBrkr	1002	0	0	1002	1
## 866	SBrkr	1547	720	53	2320	0
## 877	SBrkr	864	0	0	864	1
## 880	SBrkr	808	785	0	1593	0
## 891	SBrkr	1383	0	0	1383	1
## 898	SBrkr	858	0	0	858	0
## 902	SBrkr	902	0	0	902	0
## 906	SBrkr	902	0	0	902	1
## 909	SBrkr	1268	0	0	1268	0
## 915	FuseA	1229	0	0	1229	0
## 923	SBrkr	1126	0	0	1126	0
## 925	SBrkr	1098	880	0	1978	0
## 926	SBrkr	1788	0	0	1788	0
## 927	SBrkr	993	1243	0	2236	0
## 936	SBrkr	1207	1196	0	2403	0
## 938	SBrkr	1022	1038	0	2060	1
## 941	FuseA	1344	0	0	1344	0
## 950	SBrkr	1168	800	0	1968	0
## 958	SBrkr	1542	1330	0	2872	1
## 964	SBrkr	1098	0	0	1098	1
## 971	SBrkr	673	709	0	1382	1
## 975	SBrkr	999	0	0	999	1

## 978	SBrkr	1149	1141	0	2290	0
## 983	SBrkr	1118	912	0	2030	0
## 991	SBrkr	1050	0	0	1050	1
## 992	SBrkr	1442	0	0	1442	0
## 998	SBrkr	1680	0	0	1680	0
## 1001	SBrkr	1657	0	0	1657	0
## 1012	SBrkr	1360	0	0	1360	1
## 1013	SBrkr	802	670	0	1472	0
## 1019	SBrkr	2898	0	0	2898	1
## 1025	SBrkr	948	980	0	1928	0
## 1027	SBrkr	1352	1168	0	2520	1
## 1028	SBrkr	1654	0	0	1654	1
## 1030	SBrkr	845	0	0	845	0
## 1032	SBrkr	1055	1208	0	2263	0
## 1036	SBrkr	800	832	0	1632	0
## 1040	FuseA	1733	0	0	1733	0
## 1052	SBrkr	979	871	0	1850	0
## 1054	SBrkr	1096	895	0	1991	0
## 1059	SBrkr	1154	0	0	1154	0
## 1072	SBrkr	1096	0	0	1096	1
## 1079	SBrkr	691	807	0	1498	0
## 1081	SBrkr	546	546	0	1092	0
## 1092	SBrkr	1088	0	0	1088	0
## 1103	SBrkr	948	742	0	1690	0
## 1105	SBrkr	773	885	0	1658	1
## 1111	SBrkr	779	640	0	1419	1
## 1117	FuseA	960	0	0	960	0
## 1119	SBrkr	812	670	0	1482	0
## 1133	SBrkr	1567	0	0	1567	1
## 1136	SBrkr	1088	780	0	1868	1
## 1138	SBrkr	1006	0	0	1006	0
## 1141	SBrkr	1298	0	0	1298	1
## 1143	SBrkr	572	539	0	1111	0
## 1148	SBrkr	816	0	0	816	0
## 1149	SBrkr	902	918	0	1820	0
## 1156	SBrkr	1640	0	0	1640	1
## 1159	SBrkr	1432	0	0	1432	1
## 1172	SBrkr	818	406	0	1224	0
## 1175	SBrkr	1298	1216	0	2514	0
## 1185	SBrkr	1622	0	0	1622	1
## 1188	SBrkr	1224	0	0	1224	1
## 1201	SBrkr	1056	0	0	1056	1
## 1208	SBrkr	960	0	0	960	1
## 1225	SBrkr	1361	1259	0	2620	0
## 1228	SBrkr	1188	0	0	1188	1
## 1238	SBrkr	792	725	0	1517	0
## 1241	SBrkr	1034	0	0	1034	1
## 1245	SBrkr	1405	0	0	1405	0
## 1247	SBrkr	1516	651	0	2167	1
## 1254	SBrkr	892	783	0	1675	0
## 1256	FuseA	1104	684	0	1788	1
## 1262	SBrkr	1968	1479	0	3447	0

## 1264	SBrkr	1332	192	0	1524	2
## 1265	SBrkr	1489	0	0	1489	0
## 1266	SBrkr	935	0	0	935	1
## 1270	SBrkr	735	660	0	1395	0
## 1271	SBrkr	1724	0	0	1724	1
## 1279	SBrkr	1328	0	0	1328	1
## 1280	SBrkr	1582	0	0	1582	0
## 1283	SBrkr	1152	0	0	1152	1
## 1293	SBrkr	1005	978	0	1983	0
## 1294	SBrkr	753	741	0	1494	0
## 1302	SBrkr	1294	0	0	1294	1
## 1305	SBrkr	1453	1357	0	2810	0
## 1311	SBrkr	1787	0	0	1787	0
## 1314	SBrkr	720	0	0	720	0
## 1335	SBrkr	1284	885	0	2169	0
## 1339	SBrkr	2156	0	0	2156	0
## 1341	SBrkr	1494	0	0	1494	1
## 1347	SBrkr	992	873	0	1865	1
## 1349	SBrkr	892	0	0	892	0
## 1350	SBrkr	1078	0	0	1078	1
## 1351	SBrkr	769	804	0	1573	0
## 1355	SBrkr	1281	457	0	1738	0
## 1358	SBrkr	814	860	0	1674	1
## 1361	SBrkr	848	0	0	848	1
## 1366	SBrkr	2633	0	0	2633	1
## 1373	SBrkr	2117	0	0	2117	0
## 1375	SBrkr	1416	0	0	1416	0
## 1388	SBrkr	1687	0	0	1687	1
## 1399	SBrkr	833	0	0	833	1
## 1409	SBrkr	1310	1140	0	2450	1
## 1411	SBrkr	1844	0	0	1844	1
## 1415	SBrkr	1575	626	0	2201	0
## 1416	SBrkr	1344	0	0	1344	1
## 1421	SBrkr	1440	0	0	1440	0
## 1423	SBrkr	958	0	0	958	0
## 1433	SBrkr	848	0	0	848	1
## 1435	FuseF	952	0	0	952	0
## 1438	SBrkr	1188	0	0	1188	0
## 8	BsmtHalfBath	0	2	1	3	1
## 13	FullBath	0	1	0	2	1
## 15	HalfBath	0	1	1	2	1
## 17	BedroomAbvGr	0	1	0	2	1
## 25	KitchenAbvGr	0	1	0	3	1
## 32	KitchenQual	0	1	1	3	1
## 43		0	1	0	2	1
## 44		0	1	0	3	1
## 51		1	2	0	3	1
## 65		0	2	1	3	1
## 67		0	2	0	3	1
## 77		0	1	0	2	1
## 85		0	2	1	3	1

## 96	0	2	1	3	1	TA
## 101	0	2	0	3	1	Gd
## 105	0	1	1	4	1	TA
## 112	0	2	1	3	1	TA
## 114	0	2	0	3	1	Gd
## 117	1	1	0	3	1	TA
## 121	0	1	0	1	1	TA
## 127	0	2	0	2	1	TA
## 132	0	2	1	3	1	Gd
## 134	0	2	0	2	1	Gd
## 137	0	2	0	3	1	TA
## 148	0	2	1	3	1	Gd
## 150	0	1	0	3	1	TA
## 153	0	2	1	4	1	TA
## 154	0	1	0	1	1	TA
## 161	0	2	0	3	1	TA
## 167	0	1	0	2	1	TA
## 170	0	2	1	2	1	TA
## 171	0	1	1	2	1	TA
## 178	0	2	0	4	1	Gd
## 181	0	2	1	3	1	Gd
## 187	0	2	0	3	1	Gd
## 192	0	1	1	4	1	Gd
## 204	0	1	0	1	1	Gd
## 208	0	1	0	3	1	TA
## 209	0	2	1	3	1	TA
## 215	0	1	1	3	1	TA
## 219	1	1	1	3	1	Gd
## 222	0	2	1	4	1	Gd
## 237	0	2	1	3	1	Gd
## 244	0	2	1	3	1	Gd
## 249	1	2	0	4	1	Gd
## 269	0	1	1	3	1	TA
## 287	0	1	0	3	1	TA
## 288	0	1	0	3	1	TA
## 293	0	2	1	3	1	Gd
## 307	0	1	0	3	1	Fa
## 308	0	1	0	1	1	TA
## 310	0	2	1	3	1	Gd
## 319	0	2	0	3	1	TA
## 328	0	2	0	5	1	Gd
## 330	1	2	0	6	2	TA
## 335	0	2	0	3	1	TA
## 342	0	2	0	2	2	TA
## 346	0	1	0	2	1	TA
## 347	0	2	0	3	1	TA
## 351	0	1	1	2	1	Gd
## 356	0	2	0	3	1	Gd
## 360	0	1	0	2	1	TA
## 361	0	1	0	3	1	TA
## 364	0	2	1	3	1	TA
## 366	0	1	1	3	1	TA

## 369	0	1	0	3	1	Gd
## 370	0	2	1	3	1	TA
## 375	0	0	1	1	1	Fa
## 384	0	2	1	3	1	Gd
## 392	0	1	0	3	1	TA
## 393	0	1	0	2	1	TA
## 404	0	2	1	3	1	TA
## 405	0	2	0	3	1	TA
## 412	0	2	1	2	1	Gd
## 421	1	2	0	3	1	Gd
## 426	1	2	0	2	1	Gd
## 447	0	2	1	4	1	Gd
## 452	0	2	1	3	1	TA
## 457	0	1	0	2	1	Gd
## 458	0	1	0	3	1	Gd
## 459	0	1	0	3	1	Gd
## 465	0	2	0	2	1	Gd
## 470	0	1	1	1	1	Gd
## 484	0	1	0	3	1	Gd
## 490	0	1	1	3	1	TA
## 496	0	3	0	4	1	Gd
## 516	0	2	1	3	1	TA
## 518	0	2	1	3	1	TA
## 536	0	1	0	3	1	TA
## 537	0	1	1	3	1	TA
## 538	0	2	0	3	1	Gd
## 540	0	2	1	4	1	Gd
## 544	0	2	1	4	1	Gd
## 558	0	2	0	2	1	Gd
## 559	0	1	1	3	1	TA
## 563	0	2	1	4	1	Gd
## 568	0	1	0	2	1	TA
## 579	1	1	0	3	1	Gd
## 592	0	1	0	1	1	Gd
## 609	0	2	1	3	1	Ex
## 610	1	2	0	3	1	TA
## 611	0	2	1	3	1	Ex
## 615	0	2	1	3	1	Gd
## 622	0	2	1	2	1	Gd
## 625	0	1	0	3	1	TA
## 640	0	2	1	3	1	Gd
## 644	0	1	1	3	1	TA
## 658	0	2	1	3	1	TA
## 664	0	2	1	3	1	TA
## 666	0	1	1	3	1	TA
## 670	0	1	1	3	1	TA
## 677	0	1	0	3	1	TA
## 680	0	1	0	2	1	Gd
## 683	0	2	0	3	1	Gd
## 685	0	2	1	2	1	Gd
## 688	0	1	0	1	1	Gd
## 704	0	2	0	2	1	Gd

## 707	0	1	0	3	1	TA
## 712	0	2	1	3	1	Gd
## 718	0	2	0	2	1	Gd
## 719	0	1	0	1	1	Gd
## 724	0	2	0	3	1	Gd
## 732	0	1	0	3	1	TA
## 743	1	3	1	4	1	Gd
## 744	0	2	1	4	1	Gd
## 749	0	2	1	3	1	Gd
## 755	0	2	1	3	1	TA
## 768	0	1	0	2	1	TA
## 781	0	1	0	1	1	Gd
## 783	0	2	0	3	1	TA
## 787	0	2	1	5	1	Gd
## 789	0	1	0	3	1	TA
## 792	0	2	1	3	1	Gd
## 809	0	1	0	1	1	Gd
## 814	0	1	0	2	1	TA
## 815	0	2	0	3	1	Gd
## 820	0	2	1	3	1	Gd
## 826	1	2	1	3	1	TA
## 838	0	2	0	4	1	Fa
## 843	0	2	0	3	1	TA
## 849	0	2	0	2	1	Gd
## 851	0	1	1	3	1	TA
## 853	0	1	1	3	1	TA
## 854	0	1	0	3	1	TA
## 857	0	2	1	4	1	Gd
## 863	0	1	0	3	1	TA
## 866	0	2	0	2	1	TA
## 877	0	1	0	3	1	TA
## 880	0	2	1	3	1	TA
## 891	0	1	0	3	1	TA
## 898	0	1	0	2	1	TA
## 902	0	1	0	3	1	TA
## 906	0	1	0	2	1	TA
## 909	0	1	1	3	1	Gd
## 915	0	1	0	3	1	TA
## 923	1	2	0	3	1	Ex
## 925	0	2	1	4	1	TA
## 926	0	2	0	3	1	Ex
## 927	0	2	1	4	1	Gd
## 936	0	2	0	4	1	TA
## 938	0	2	1	3	1	Gd
## 941	1	1	0	3	1	Gd
## 950	1	2	1	4	1	TA
## 958	0	2	1	4	1	TA
## 964	0	1	0	3	1	TA
## 971	0	2	1	3	1	Gd
## 975	0	1	0	3	1	Ex
## 978	0	2	1	4	1	Gd
## 983	0	2	1	4	1	Gd

## 991	0	1	0	3	1	TA
## 992	0	2	0	2	1	TA
## 998	0	2	0	4	2	TA
## 1001	1	2	0	3	1	TA
## 1012	0	1	0	1	1	Gd
## 1013	0	2	1	3	1	Gd
## 1019	0	2	0	2	1	Gd
## 1025	0	2	0	5	2	TA
## 1027	0	2	1	5	1	Gd
## 1028	0	2	0	3	1	Gd
## 1030	0	1	0	3	1	TA
## 1032	0	2	1	3	1	Gd
## 1036	1	1	1	4	1	Gd
## 1040	0	2	0	4	1	TA
## 1052	0	2	1	3	1	Gd
## 1054	0	1	1	3	1	TA
## 1059	0	1	1	3	1	TA
## 1072	0	1	0	3	1	TA
## 1079	0	2	1	3	1	TA
## 1081	0	1	1	3	1	TA
## 1092	0	1	1	2	1	Gd
## 1103	0	2	1	3	1	TA
## 1105	0	2	1	3	1	TA
## 1111	0	2	1	3	1	Gd
## 1117	0	1	0	3	1	TA
## 1119	0	2	1	3	1	Gd
## 1133	0	2	0	2	1	Gd
## 1136	0	2	1	4	1	Gd
## 1138	0	1	0	3	1	TA
## 1141	0	2	0	3	1	Gd
## 1143	0	1	0	2	1	TA
## 1148	0	1	0	2	1	TA
## 1149	0	1	2	4	1	Gd
## 1156	0	1	0	3	1	Gd
## 1159	0	1	1	2	1	Gd
## 1172	0	1	0	3	1	TA
## 1175	0	2	1	4	1	TA
## 1185	0	1	0	3	1	TA
## 1188	0	2	0	2	1	TA
## 1201	0	1	0	2	1	TA
## 1208	1	0	0	0	1	TA
## 1225	0	2	2	4	2	TA
## 1228	0	1	0	3	1	TA
## 1238	0	1	0	3	1	Gd
## 1241	0	1	0	3	1	TA
## 1245	0	2	0	2	1	Gd
## 1247	0	2	1	3	1	Gd
## 1254	0	2	1	3	1	TA
## 1256	0	1	0	5	1	TA
## 1262	0	3	1	4	1	Gd
## 1264	0	0	1	0	1	Gd
## 1265	0	2	0	3	1	Gd

## 1266	0	1	0	3	1	TA
## 1270	1	1	1	3	1	TA
## 1271	0	1	1	3	1	TA
## 1279	0	1	1	3	1	TA
## 1280	1	2	0	4	1	TA
## 1283	0	1	0	3	1	TA
## 1293	0	2	1	3	1	Gd
## 1294	0	1	0	3	1	Gd
## 1302	0	2	0	3	1	Gd
## 1305	0	2	1	4	1	Gd
## 1311	0	2	0	3	1	Gd
## 1314	0	1	0	2	1	TA
## 1335	0	2	1	3	1	Gd
## 1339	0	2	0	3	1	TA
## 1341	0	2	0	3	1	Gd
## 1347	0	2	1	3	1	Gd
## 1349	0	1	0	3	1	TA
## 1350	0	1	1	3	1	TA
## 1351	0	2	1	3	1	Gd
## 1355	0	2	0	4	1	TA
## 1358	0	2	1	3	1	Gd
## 1361	0	1	0	1	1	Gd
## 1366	0	2	1	2	1	Ex
## 1373	0	2	1	4	1	TA
## 1375	0	2	0	3	1	Gd
## 1388	0	1	0	3	1	TA
## 1399	0	1	0	3	1	TA
## 1409	0	2	1	3	1	Gd
## 1411	0	2	0	3	1	Gd
## 1415	0	2	0	4	1	Gd
## 1416	0	1	0	2	1	TA
## 1421	0	2	0	3	1	Gd
## 1423	0	2	0	2	1	TA
## 1433	0	1	0	1	1	Gd
## 1435	0	1	0	2	1	Fa
## 1438	0	1	0	3	1	TA
##	TotRmsAbvGrd	Functional	Fireplaces	FireplaceQu	GarageType	GarageYrBlt
## 8	7	Typ	2	TA	Attchd	1973
## 13	4	Typ	0	<NA>	Detchd	1962
## 15	5	Typ	1	Fa	Attchd	1960
## 17	5	Typ	1	TA	Attchd	1970
## 25	6	Typ	1	TA	Attchd	1968
## 32	6	Typ	0	<NA>	Attchd	1966
## 43	5	Typ	0	<NA>	Attchd	1983
## 44	5	Typ	0	<NA>	Detchd	1977
## 51	6	Typ	0	<NA>	Attchd	1997
## 65	8	Typ	0	<NA>	Attchd	1998
## 67	7	Min1	1	Gd	Attchd	1970
## 77	4	Typ	0	<NA>	Detchd	1956
## 85	7	Typ	1	TA	BuiltIn	1995
## 96	6	Typ	1	TA	BuiltIn	1993
## 101	6	Typ	2	TA	Attchd	1977

## 105	7	Typ	2	TA	Detchd	1951
## 112	7	Typ	1	TA	BuiltIn	2000
## 114	7	Typ	2	Gd	Basment	1953
## 117	6	Typ	1	Po	Attchd	1962
## 121	4	Typ	2	TA	Attchd	1969
## 127	5	Typ	1	TA	Attchd	1977
## 132	7	Typ	1	TA	BuiltIn	2000
## 134	6	Typ	0	<NA>	Attchd	2001
## 137	5	Typ	1	Fa	Attchd	1967
## 148	8	Typ	1	Gd	BuiltIn	2001
## 150	7	Typ	0	<NA>	Detchd	1936
## 153	8	Typ	1	Gd	Attchd	1971
## 154	4	Typ	1	Gd	Attchd	1960
## 161	6	Typ	0	<NA>	Attchd	1984
## 167	7	Typ	3	Gd	Attchd	1955
## 170	6	Typ	1	TA	Attchd	1981
## 171	7	Typ	0	<NA>	Detchd	1991
## 178	8	Typ	1	Gd	Attchd	1958
## 181	5	Typ	1	TA	Detchd	2000
## 187	6	Typ	0	<NA>	Attchd	1990
## 192	7	Typ	0	<NA>	Attchd	1972
## 204	3	Typ	1	Gd	Attchd	2004
## 208	6	Typ	1	Po	Attchd	1960
## 209	7	Typ	1	Gd	Attchd	1988
## 215	6	Typ	0	<NA>	Attchd	1977
## 219	8	Typ	2	TA	Attchd	1939
## 222	8	Typ	1	TA	BuiltIn	2002
## 237	7	Typ	0	<NA>	Attchd	1993
## 244	8	Typ	2	Fa	Attchd	1994
## 249	7	Typ	2	TA	Attchd	1958
## 269	6	Typ	1	Fa	Attchd	1987
## 287	5	Typ	0	<NA>	<NA>	0
## 288	5	Typ	0	<NA>	Detchd	1970
## 293	9	Typ	1	TA	Attchd	1977
## 307	6	Typ	0	<NA>	<NA>	0
## 308	4	Typ	0	<NA>	Detchd	1961
## 310	6	Typ	1	TA	Attchd	1993
## 319	6	Typ	2	TA	Attchd	1980
## 328	10	Typ	0	<NA>	Detchd	1930
## 330	10	Typ	0	<NA>	Detchd	2002
## 335	7	Typ	2	Gd	Attchd	1965
## 342	6	Typ	0	<NA>	Detchd	1949
## 346	5	Typ	0	<NA>	Attchd	1960
## 347	6	Typ	2	Gd	Attchd	1960
## 351	6	Typ	1	TA	Attchd	1986
## 356	6	Typ	0	<NA>	Attchd	1992
## 360	5	Typ	1	TA	Attchd	1978
## 361	8	Typ	0	<NA>	Detchd	1940
## 364	6	Typ	1	TA	Attchd	1976
## 366	6	Typ	2	Gd	Attchd	1963
## 369	7	Typ	1	Gd	Detchd	1997
## 370	7	Typ	1	TA	Attchd	2000

## 375	4	Maj1	0	<NA>	<NA>	0
## 384	9	Typ	2	Fa	Attchd	1992
## 392	5	Typ	0	<NA>	Attchd	1959
## 393	4	Typ	2	TA	<NA>	0
## 404	7	Typ	1	TA	BuiltIn	1995
## 405	8	Min1	1	TA	Attchd	1993
## 412	7	Typ	1	Gd	Attchd	2009
## 421	8	Typ	1	TA	Attchd	1977
## 426	5	Typ	1	TA	Attchd	1989
## 447	10	Typ	1	TA	Attchd	1998
## 452	7	Typ	0	<NA>	Attchd	1996
## 457	6	Min1	2	Gd	Attchd	1954
## 458	7	Typ	1	Gd	Detchd	1925
## 459	5	Typ	1	TA	Detchd	1950
## 465	6	Typ	1	TA	Attchd	2004
## 470	4	Typ	0	<NA>	Attchd	1985
## 484	6	Typ	0	<NA>	Detchd	1963
## 490	4	Typ	1	Gd	BuiltIn	1976
## 496	10	Typ	1	Gd	Attchd	1992
## 516	7	Typ	1	TA	Attchd	1972
## 518	7	Typ	0	<NA>	Attchd	1998
## 536	5	Typ	0	<NA>	Detchd	1980
## 537	7	Typ	1	Fa	Attchd	1968
## 538	6	Typ	1	TA	Attchd	2001
## 540	8	Typ	1	TA	BuiltIn	2000
## 544	9	Typ	0	<NA>	Attchd	1988
## 558	7	Typ	1	TA	Attchd	2003
## 559	5	Mod	1	Gd	Detchd	1957
## 563	9	Typ	1	TA	Attchd	1992
## 568	4	Typ	2	TA	Detchd	1979
## 579	7	Typ	2	Gd	Attchd	1960
## 592	4	Typ	0	<NA>	Attchd	2003
## 609	8	Typ	2	Ex	Attchd	2000
## 610	6	Typ	1	TA	Attchd	1978
## 611	7	Typ	1	TA	BuiltIn	2001
## 615	7	Typ	1	Gd	Attchd	2002
## 622	4	Typ	1	TA	Detchd	2000
## 625	6	Min1	1	TA	Attchd	1960
## 640	7	Typ	1	TA	Attchd	2001
## 644	5	Typ	0	<NA>	Detchd	1979
## 658	7	Typ	1	TA	Attchd	1976
## 664	7	Sev	1	Po	CarPort	1965
## 666	6	Min2	1	TA	Detchd	1999
## 670	6	Typ	1	TA	Attchd	1977
## 677	5	Typ	0	<NA>	Detchd	1963
## 680	6	Typ	1	Gd	Attchd	1996
## 683	6	Min1	1	TA	Attchd	1984
## 685	4	Typ	0	<NA>	Detchd	2004
## 688	3	Typ	1	TA	Attchd	2004
## 704	5	Typ	2	TA	Attchd	1971
## 707	6	Typ	0	<NA>	Attchd	1966
## 712	6	Typ	0	<NA>	Attchd	1976

## 718	5	Typ	1	TA	Attchd	1985
## 719	3	Typ	0	<NA>	Attchd	2004
## 724	5	Typ	1	Gd	Attchd	1988
## 732	6	Typ	0	<NA>	Attchd	1968
## 743	11	Typ	2	TA	BuiltIn	1994
## 744	8	Typ	1	TA	BuiltIn	2000
## 749	6	Typ	0	<NA>	Attchd	2003
## 755	6	Typ	1	TA	Attchd	1978
## 768	5	Typ	0	<NA>	Detchd	1983
## 781	4	Typ	1	TA	Attchd	1978
## 783	7	Typ	1	Gd	Attchd	1967
## 787	9	Typ	0	<NA>	Attchd	1966
## 789	5	Typ	2	TA	Attchd	1976
## 792	7	Typ	1	TA	Attchd	1994
## 809	4	Typ	1	Gd	Attchd	2004
## 814	4	Typ	1	Gd	Attchd	1954
## 815	7	Typ	2	Gd	Attchd	2002
## 820	7	Typ	1	Gd	BuiltIn	2003
## 826	7	Min2	0	<NA>	Attchd	1967
## 838	7	Typ	0	<NA>	Detchd	1934
## 843	6	Min2	2	TA	Basment	1975
## 849	7	Typ	1	TA	Attchd	2003
## 851	7	Typ	1	Fa	Attchd	1964
## 853	6	Typ	0	<NA>	Detchd	1962
## 854	5	Typ	0	<NA>	Detchd	1981
## 857	9	Typ	1	Gd	Attchd	1968
## 863	5	Typ	0	<NA>	Detchd	1973
## 866	7	Typ	1	TA	Attchd	1979
## 877	6	Typ	0	<NA>	Attchd	1978
## 880	7	Typ	1	TA	BuiltIn	1993
## 891	6	Typ	1	Gd	Attchd	1954
## 898	4	Typ	0	<NA>	Detchd	1979
## 902	6	Typ	0	<NA>	Attchd	1967
## 906	5	Typ	0	<NA>	Attchd	1983
## 909	5	Typ	0	<NA>	Detchd	1978
## 915	6	Typ	0	<NA>	Attchd	1956
## 923	6	Typ	0	<NA>	Attchd	1977
## 925	9	Typ	1	Gd	Attchd	1968
## 926	7	Typ	1	TA	Attchd	2001
## 927	8	Typ	1	TA	BuiltIn	1997
## 936	10	Typ	2	TA	Attchd	1940
## 938	8	Typ	1	TA	BuiltIn	1999
## 941	7	Typ	1	Gd	Basment	1958
## 950	7	Min2	1	Po	Attchd	1969
## 958	11	Typ	1	TA	Attchd	1977
## 964	6	Typ	0	<NA>	Attchd	1955
## 971	6	Typ	0	<NA>	Detchd	2000
## 975	6	Typ	0	<NA>	Attchd	1961
## 978	9	Typ	1	Gd	Attchd	2002
## 983	8	Typ	1	TA	Attchd	1976
## 991	6	Typ	0	<NA>	Attchd	1961
## 992	6	Typ	1	TA	Attchd	1970

## 998	8	Typ	0	<NA>	Detchd	1976
## 1001	7	Typ	1	TA	Attchd	1970
## 1012	4	Typ	1	Ex	Attchd	1984
## 1013	7	Typ	1	TA	Attchd	1991
## 1019	10	Typ	1	Gd	Attchd	1976
## 1025	10	Typ	0	<NA>	<NA>	0
## 1027	10	Typ	1	TA	Attchd	1993
## 1028	6	Typ	0	<NA>	Attchd	2002
## 1030	5	Typ	0	<NA>	Detchd	1957
## 1032	7	Typ	1	TA	BuiltIn	2001
## 1036	7	Typ	0	<NA>	Attchd	1966
## 1040	8	Min2	1	Gd	Attchd	1955
## 1052	7	Typ	1	Gd	BuiltIn	1994
## 1054	7	Typ	1	Gd	Detchd	1977
## 1059	6	Typ	1	Po	Attchd	1966
## 1072	6	Typ	0	<NA>	Attchd	1969
## 1079	6	Typ	1	TA	Attchd	1995
## 1081	6	Typ	0	<NA>	Attchd	1973
## 1092	5	Typ	0	<NA>	Attchd	1987
## 1103	7	Typ	1	TA	Attchd	2000
## 1105	8	Typ	1	TA	Attchd	1995
## 1111	7	Typ	1	TA	BuiltIn	2002
## 1117	5	Typ	0	<NA>	Basment	1956
## 1119	7	Typ	1	TA	Attchd	1992
## 1133	5	Typ	2	TA	Attchd	1977
## 1136	9	Typ	1	TA	Attchd	1976
## 1138	5	Typ	0	<NA>	<NA>	0
## 1141	5	Typ	1	TA	Attchd	1985
## 1143	5	Typ	1	Gd	Detchd	1982
## 1148	5	Typ	0	<NA>	Detchd	2002
## 1149	8	Typ	2	Gd	Attchd	1965
## 1156	7	Typ	1	Gd	Detchd	1993
## 1159	5	Typ	1	TA	Attchd	1978
## 1172	5	Typ	0	<NA>	Detchd	1926
## 1175	8	Typ	0	<NA>	Attchd	1990
## 1185	7	Typ	1	TA	2Types	1975
## 1188	5	Typ	0	<NA>	Attchd	1999
## 1201	5	Typ	0	<NA>	Detchd	1966
## 1208	3	Typ	0	<NA>	Attchd	1965
## 1225	12	Typ	1	TA	BuiltIn	1977
## 1228	6	Typ	0	<NA>	Attchd	1959
## 1238	7	Typ	2	Gd	Detchd	1931
## 1241	6	Typ	0	<NA>	Attchd	1976
## 1245	6	Typ	1	Gd	Attchd	2003
## 1247	9	Typ	2	Gd	Attchd	1974
## 1254	7	Typ	1	TA	BuiltIn	1999
## 1256	8	Min2	2	TA	Attchd	1957
## 1262	11	Typ	2	Gd	BuiltIn	1982
## 1264	4	Typ	1	TA	Attchd	1979
## 1265	7	Typ	1	Gd	Attchd	1968
## 1266	5	Typ	0	<NA>	Attchd	1965
## 1270	6	Typ	1	TA	Attchd	1972

## 1271	7	Typ	1	Gd	Attchd	1967	
## 1279	6	Typ	2	Gd	Attchd	1963	
## 1280	7	Typ	0	<NA>	Attchd	1964	
## 1283	6	Typ	1	Gd	Attchd	1964	
## 1293	9	Typ	1	TA	Attchd	1999	
## 1294	7	Typ	2	Gd	Attchd	1942	
## 1302	6	Typ	0	<NA>	Attchd	1991	
## 1305	9	Typ	1	Ex	Attchd	1990	
## 1311	7	Typ	1	TA	Attchd	2001	
## 1314	4	Typ	0	<NA>	Detchd	1955	
## 1335	7	Typ	1	Gd	Attchd	2002	
## 1339	9	Typ	1	Gd	Attchd	1968	
## 1341	5	Typ	1	Fa	Attchd	1998	
## 1347	7	Typ	1	TA	Attchd	2000	
## 1349	5	Typ	0	<NA>	Attchd	1966	
## 1350	6	Typ	1	Fa	Attchd	1971	
## 1351	5	Typ	0	<NA>	Detchd	2000	
## 1355	7	Typ	1	Gd	Attchd	1920	
## 1358	7	Typ	0	<NA>	Attchd	2000	
## 1361	4	Typ	0	<NA>	Attchd	2003	
## 1366	8	Typ	2	Gd	Attchd	2001	
## 1373	7	Typ	2	Gd	Attchd	1970	
## 1375	7	Typ	0	<NA>	Attchd	2007	
## 1388	7	Min1	2	TA	Detchd	1966	
## 1399	5	Typ	0	<NA>	<NA>	0	
## 1409	7	Typ	1	TA	Attchd	1998	
## 1411	7	Typ	1	TA	Attchd	1969	
## 1415	8	Typ	1	Gd	Attchd	1966	
## 1416	6	Min1	1	TA	Detchd	1970	
## 1421	7	Typ	1	TA	Attchd	1981	
## 1423	5	Typ	0	<NA>	Attchd	1976	
## 1433	3	Typ	1	TA	Attchd	2004	
## 1435	4	Typ	1	Gd	Detchd	1916	
## 1438	6	Typ	0	<NA>	Attchd	1962	
##		GarageFinish	GarageCars	GarageArea	GarageQual	GarageCond	PavedDrive
## 8		RFn	2	484	TA	TA	Y
## 13		Unf	1	352	TA	TA	Y
## 15		RFn	1	352	TA	TA	Y
## 17		Fin	2	480	TA	TA	Y
## 25		Unf	1	270	TA	TA	Y
## 32		Unf	1	271	TA	TA	Y
## 43		RFn	2	504	TA	Gd	Y
## 44		Unf	1	308	TA	TA	Y
## 51		Fin	2	388	TA	TA	Y
## 65		RFn	2	645	TA	TA	Y
## 67		RFn	2	576	TA	TA	Y
## 77		Unf	1	283	TA	TA	Y
## 85		Fin	2	400	TA	TA	Y
## 96		Fin	2	420	TA	TA	Y
## 101		RFn	2	480	TA	TA	Y
## 105		Unf	1	240	TA	TA	Y
## 112		Fin	2	400	TA	TA	Y

## 114	Unf	2	450	TA	TA	Y
## 117	Unf	1	288	TA	TA	Y
## 121	Unf	2	540	TA	TA	Y
## 127	RFn	2	440	TA	TA	Y
## 132	RFn	2	390	TA	TA	Y
## 134	Fin	2	471	TA	TA	Y
## 137	RFn	1	318	TA	TA	Y
## 148	Fin	2	434	TA	TA	Y
## 150	Unf	1	240	Fa	TA	Y
## 153	RFn	2	495	TA	TA	Y
## 154	RFn	2	564	TA	TA	Y
## 161	Unf	2	516	TA	TA	Y
## 167	Fin	1	303	TA	TA	Y
## 170	RFn	2	511	TA	TA	Y
## 171	Unf	2	660	TA	TA	Y
## 178	Unf	2	451	TA	TA	Y
## 181	Unf	2	440	TA	TA	Y
## 187	Unf	2	497	TA	TA	Y
## 192	Fin	2	484	TA	TA	Y
## 204	RFn	2	420	TA	TA	Y
## 208	RFn	1	312	TA	TA	Y
## 209	Fin	2	454	TA	TA	Y
## 215	Fin	1	299	TA	TA	Y
## 219	Unf	2	431	TA	TA	Y
## 222	RFn	2	390	TA	TA	Y
## 237	RFn	2	457	TA	TA	Y
## 244	RFn	2	463	TA	TA	Y
## 249	Fin	2	389	TA	TA	Y
## 269	RFn	1	504	TA	Gd	Y
## 287	<NA>	0	0	<NA>	<NA>	Y
## 288	Unf	1	280	TA	TA	Y
## 293	Fin	2	539	TA	TA	Y
## 307	<NA>	0	0	<NA>	<NA>	N
## 308	Unf	2	539	TA	TA	Y
## 310	Fin	2	420	TA	TA	Y
## 319	Unf	2	588	TA	TA	Y
## 328	Unf	2	441	TA	TA	Y
## 330	Unf	1	352	TA	TA	Y
## 335	Fin	2	529	TA	TA	Y
## 342	Unf	2	400	TA	TA	Y
## 346	RFn	1	301	TA	TA	Y
## 347	Unf	2	498	TA	TA	Y
## 351	RFn	2	445	TA	TA	Y
## 356	RFn	2	400	TA	TA	Y
## 360	RFn	2	470	TA	TA	Y
## 361	Unf	1	240	TA	TA	N
## 364	Fin	2	566	TA	TA	Y
## 366	RFn	2	514	TA	TA	Y
## 369	Fin	2	576	TA	TA	Y
## 370	RFn	2	460	TA	TA	Y
## 375	<NA>	0	0	<NA>	<NA>	Y
## 384	Fin	2	501	TA	TA	Y

## 392	RFn	1	294	TA	TA	Y
## 393	<NA>	0	0	<NA>	<NA>	Y
## 404	Fin	2	373	TA	TA	Y
## 405	Unf	2	490	TA	TA	Y
## 412	Fin	2	484	TA	TA	Y
## 421	Fin	2	529	TA	TA	Y
## 426	Fin	2	569	TA	TA	Y
## 447	Fin	2	431	TA	TA	Y
## 452	Fin	2	422	TA	TA	Y
## 457	Fin	2	529	TA	TA	Y
## 458	Unf	1	228	TA	TA	Y
## 459	Unf	1	352	TA	TA	Y
## 465	Fin	2	398	TA	TA	Y
## 470	RFn	2	528	TA	TA	Y
## 484	Unf	1	264	TA	TA	Y
## 490	Fin	1	336	TA	TA	Y
## 496	RFn	2	546	TA	TA	Y
## 516	RFn	2	583	TA	TA	Y
## 518	RFn	2	546	TA	TA	Y
## 536	Unf	2	576	TA	TA	Y
## 537	Unf	1	336	TA	TA	Y
## 538	RFn	2	670	TA	TA	Y
## 540	Fin	3	648	TA	TA	Y
## 544	Unf	3	786	TA	TA	Y
## 558	Fin	2	420	TA	TA	Y
## 559	Unf	2	528	TA	TA	Y
## 563	RFn	2	590	TA	TA	Y
## 568	Unf	2	600	TA	TA	Y
## 579	Unf	2	572	TA	TA	Y
## 592	Fin	2	420	TA	TA	Y
## 609	Fin	3	736	TA	TA	Y
## 610	Unf	2	564	TA	TA	Y
## 611	RFn	2	531	TA	TA	Y
## 615	Fin	2	393	TA	TA	Y
## 622	Unf	2	440	TA	TA	Y
## 625	RFn	1	286	TA	TA	Y
## 640	Fin	2	650	TA	TA	Y
## 644	Unf	2	576	TA	TA	Y
## 658	RFn	2	550	TA	TA	Y
## 664	Unf	2	596	TA	TA	Y
## 666	Unf	2	576	TA	TA	Y
## 670	RFn	2	546	TA	TA	Y
## 677	Unf	2	572	TA	TA	Y
## 680	Unf	2	431	TA	TA	Y
## 683	Fin	2	577	TA	TA	Y
## 685	Unf	2	480	TA	TA	Y
## 688	RFn	2	420	TA	TA	Y
## 704	Unf	2	739	TA	TA	Y
## 707	Unf	1	408	TA	TA	Y
## 712	RFn	2	475	TA	TA	Y
## 718	RFn	2	564	TA	TA	Y
## 719	RFn	2	420	TA	TA	Y

## 724	Fin	2	540	TA	TA	Y
## 732	Unf	1	300	TA	TA	Y
## 743	Fin	2	831	TA	TA	Y
## 744	Fin	2	554	TA	TA	Y
## 749	Fin	2	400	TA	TA	Y
## 755	Fin	2	440	TA	TA	Y
## 768	Unf	2	576	TA	TA	Y
## 781	Fin	2	602	TA	TA	Y
## 783	Unf	2	457	TA	TA	Y
## 787	Fin	2	444	TA	TA	Y
## 789	RFn	2	539	TA	TA	Y
## 792	Fin	2	409	TA	TA	Y
## 809	Fin	2	420	TA	TA	Y
## 814	RFn	1	275	TA	TA	Y
## 815	RFn	3	857	TA	TA	Y
## 820	Fin	2	433	TA	TA	Y
## 826	Fin	2	538	TA	TA	Y
## 838	Unf	1	400	TA	TA	P
## 843	Fin	2	611	TA	TA	Y
## 849	Fin	2	400	TA	TA	Y
## 851	RFn	2	645	TA	TA	Y
## 853	Unf	1	260	TA	TA	Y
## 854	Unf	2	576	TA	Fa	Y
## 857	Unf	2	619	TA	TA	Y
## 863	Unf	2	902	TA	TA	Y
## 866	Unf	2	672	TA	TA	P
## 877	Unf	1	336	TA	TA	Y
## 880	RFn	2	389	TA	TA	Y
## 891	Unf	1	354	TA	TA	Y
## 898	Unf	1	684	TA	TA	Y
## 902	Unf	1	288	TA	TA	Y
## 906	Unf	2	484	TA	TA	Y
## 909	Unf	1	252	TA	TA	Y
## 915	RFn	1	284	TA	TA	Y
## 923	RFn	2	540	TA	TA	Y
## 925	RFn	2	486	TA	TA	Y
## 926	RFn	2	522	TA	TA	Y
## 927	Fin	2	642	TA	TA	Y
## 936	Unf	1	349	TA	TA	Y
## 938	RFn	2	390	TA	TA	Y
## 941	RFn	2	525	TA	TA	Y
## 950	RFn	2	530	TA	TA	Y
## 958	Fin	2	619	TA	TA	Y
## 964	Unf	1	260	TA	TA	Y
## 971	Unf	2	490	TA	TA	Y
## 975	RFn	2	588	TA	TA	Y
## 978	Unf	2	779	TA	TA	Y
## 983	Fin	2	551	TA	TA	Y
## 991	Unf	1	368	TA	TA	Y
## 992	RFn	2	615	TA	TA	Y
## 998	Unf	2	528	TA	TA	Y
## 1001	Unf	2	484	TA	TA	Y

## 1012	RFn	2	565	TA	TA	Y
## 1013	RFn	2	402	TA	TA	Y
## 1019	Fin	2	665	TA	TA	Y
## 1025	<NA>	0	0	<NA>	<NA>	N
## 1027	RFn	3	796	TA	TA	Y
## 1028	Unf	3	900	TA	TA	Y
## 1030	Unf	1	290	TA	TA	N
## 1032	Fin	2	905	TA	TA	Y
## 1036	Unf	2	484	TA	TA	Y
## 1040	Unf	2	452	TA	TA	Y
## 1052	Fin	2	467	TA	TA	Y
## 1054	Unf	2	432	TA	Fa	Y
## 1059	RFn	2	480	TA	TA	Y
## 1072	Fin	1	299	TA	TA	Y
## 1079	Fin	2	409	TA	TA	Y
## 1081	RFn	1	286	TA	TA	Y
## 1092	RFn	2	461	TA	TA	Y
## 1103	RFn	2	463	TA	TA	Y
## 1105	Fin	2	431	TA	TA	Y
## 1111	Fin	2	527	TA	TA	Y
## 1117	Unf	1	288	TA	TA	Y
## 1119	Fin	2	392	TA	TA	Y
## 1133	RFn	2	714	TA	TA	Y
## 1136	Unf	2	484	TA	TA	Y
## 1138	<NA>	0	0	<NA>	<NA>	Y
## 1141	Unf	2	403	TA	TA	Y
## 1143	Unf	1	288	TA	TA	Y
## 1148	Unf	1	432	TA	TA	Y
## 1149	Unf	2	492	TA	TA	Y
## 1156	Unf	2	924	TA	TA	Y
## 1159	Unf	2	588	TA	TA	Y
## 1172	Unf	1	210	TA	TA	N
## 1175	Fin	2	693	TA	TA	Y
## 1185	Fin	4	1356	TA	TA	Y
## 1188	Fin	2	402	TA	TA	Y
## 1201	Unf	1	384	TA	TA	Y
## 1208	Unf	1	364	TA	TA	Y
## 1225	RFn	2	600	TA	TA	N
## 1228	RFn	2	531	TA	TA	Y
## 1238	Unf	2	400	TA	TA	Y
## 1241	Unf	3	888	TA	TA	Y
## 1245	RFn	2	478	TA	TA	Y
## 1247	RFn	2	518	TA	TA	Y
## 1254	Fin	2	502	TA	TA	Y
## 1256	Unf	1	304	TA	TA	Y
## 1262	Unf	3	1014	TA	TA	Y
## 1264	Fin	2	586	TA	TA	Y
## 1265	RFn	2	462	TA	TA	Y
## 1266	Unf	1	288	TA	TA	Y
## 1270	Unf	2	497	TA	TA	Y
## 1271	RFn	2	480	TA	TA	Y
## 1279	Unf	2	528	TA	TA	Y

## 1280	Unf	2	390	TA	TA	N
## 1283	RFn	2	484	TA	TA	Y
## 1293	Fin	2	490	TA	TA	Y
## 1294	Unf	1	213	TA	TA	P
## 1302	RFn	2	496	TA	TA	Y
## 1305	RFn	2	750	Gd	Gd	Y
## 1311	RFn	3	748	TA	TA	Y
## 1314	Unf	1	287	TA	Fa	Y
## 1335	RFn	2	647	TA	TA	Y
## 1339	RFn	2	508	Gd	TA	Y
## 1341	RFn	2	514	TA	TA	Y
## 1347	RFn	3	839	TA	TA	Y
## 1349	RFn	1	264	TA	TA	Y
## 1350	Fin	2	500	TA	TA	Y
## 1351	Unf	2	440	TA	TA	Y
## 1355	Unf	1	368	TA	TA	Y
## 1358	RFn	2	663	TA	TA	Y
## 1361	Fin	2	420	TA	TA	Y
## 1366	RFn	3	804	TA	TA	Y
## 1373	Fin	2	550	TA	TA	Y
## 1375	Unf	2	576	TA	TA	N
## 1388	Unf	2	572	TA	TA	N
## 1399	<NA>	0	0	<NA>	<NA>	Y
## 1409	Fin	3	1069	TA	TA	Y
## 1411	RFn	2	540	TA	TA	Y
## 1415	Unf	2	432	Gd	Gd	Y
## 1416	Unf	1	484	TA	TA	Y
## 1421	Fin	2	467	TA	TA	Y
## 1423	RFn	2	440	TA	TA	Y
## 1433	RFn	2	420	TA	TA	Y
## 1435	Unf	1	192	Fa	Po	P
## 1438	Unf	1	312	TA	TA	P
##	WoodDeckSF	OpenPorchSF	EnclosedPorch	X3SsnPorch	ScreenPorch	PoolArea
## 8	235	204	228	0	0	0
## 13	140	0	0	0	176	0
## 15	0	213	176	0	0	0
## 17	0	0	0	0	0	0
## 25	406	90	0	0	0	0
## 32	0	65	0	0	0	0
## 43	240	0	0	0	0	0
## 44	145	0	0	0	0	0
## 51	0	75	0	0	0	0
## 65	576	36	0	0	0	0
## 67	301	0	0	0	0	0
## 77	0	0	0	0	0	0
## 85	120	72	0	0	0	0
## 96	232	63	0	0	0	0
## 101	168	68	0	0	0	0
## 105	0	0	0	0	184	0
## 112	180	0	0	0	0	0
## 114	166	120	192	0	0	0
## 117	0	20	144	0	0	0

## 121	0	130	0	130	0	0
## 127	0	205	0	0	0	0
## 132	24	48	0	0	0	0
## 134	192	25	0	0	0	0
## 137	0	111	0	0	0	0
## 148	144	48	0	0	0	0
## 150	200	114	0	0	0	0
## 153	0	66	0	0	0	0
## 154	409	0	0	0	0	0
## 161	0	0	0	0	0	0
## 167	476	0	0	0	142	0
## 170	574	64	0	0	0	0
## 171	237	0	0	0	0	0
## 178	0	0	0	0	0	0
## 181	0	0	0	0	0	0
## 187	168	27	0	0	0	0
## 192	0	32	0	0	0	0
## 204	149	0	0	0	0	0
## 208	355	0	0	0	0	0
## 209	60	55	0	0	154	0
## 215	0	36	0	0	0	0
## 219	0	119	150	0	0	0
## 222	120	46	0	0	0	0
## 237	370	70	0	238	0	0
## 244	0	130	0	0	0	0
## 249	0	98	0	0	0	0
## 269	370	30	0	0	0	0
## 287	0	0	0	0	0	0
## 288	0	0	0	0	0	0
## 293	0	250	0	0	0	0
## 307	0	144	0	0	0	0
## 308	158	0	0	0	0	0
## 310	190	63	0	0	0	0
## 319	233	48	0	0	0	0
## 328	0	60	268	0	0	0
## 330	155	0	0	0	0	0
## 335	670	0	0	0	0	0
## 342	0	0	0	0	0	0
## 346	0	0	0	0	0	0
## 347	0	40	0	0	0	0
## 351	0	80	0	0	184	0
## 356	120	26	0	0	0	0
## 360	0	0	0	0	192	0
## 361	0	0	0	0	0	0
## 364	306	111	0	0	0	0
## 366	0	76	0	0	185	0
## 369	364	17	0	0	182	0
## 370	100	40	0	0	0	0
## 375	0	0	0	0	0	0
## 384	216	231	0	0	0	0
## 392	0	0	0	0	0	0
## 393	0	0	0	0	0	0

## 404	0	40	0	0	0	0
## 405	120	78	0	0	0	0
## 412	0	144	0	0	0	0
## 421	240	0	0	0	0	0
## 426	80	0	0	0	396	0
## 447	89	0	0	0	0	0
## 452	144	122	0	0	0	0
## 457	224	137	0	0	0	0
## 458	192	63	0	0	0	0
## 459	0	0	248	0	0	0
## 465	144	20	0	0	0	0
## 470	0	54	0	0	140	0
## 484	0	132	0	0	0	0
## 490	141	24	0	0	0	0
## 496	264	75	291	0	0	0
## 516	0	104	0	0	0	0
## 518	0	36	0	0	0	0
## 536	216	0	0	0	0	0
## 537	466	0	0	0	0	0
## 538	180	0	0	0	0	0
## 540	0	56	0	0	0	0
## 544	0	0	0	0	0	0
## 558	143	20	0	0	0	0
## 559	0	0	0	0	95	0
## 563	0	40	0	0	0	0
## 568	42	0	0	0	0	0
## 579	216	110	0	0	0	0
## 592	140	0	0	0	0	0
## 609	253	142	0	0	0	0
## 610	0	0	0	0	0	0
## 611	160	122	0	0	0	0
## 615	100	75	0	0	0	0
## 622	0	32	0	0	0	0
## 625	0	0	36	0	0	0
## 640	0	235	0	0	0	0
## 644	0	312	40	0	0	0
## 658	0	113	252	0	0	0
## 664	0	265	0	0	0	0
## 666	304	0	0	0	0	0
## 670	198	42	0	0	0	0
## 677	0	0	0	0	0	0
## 680	307	0	0	0	0	0
## 683	219	0	0	0	0	0
## 685	0	60	0	0	0	0
## 688	149	0	0	0	0	0
## 704	380	48	0	0	0	0
## 707	0	0	0	0	0	0
## 712	0	44	0	0	0	0
## 718	114	28	234	0	0	0
## 719	160	0	0	0	0	0
## 724	292	44	0	182	0	0
## 732	147	0	0	0	0	0

## 743	0	204	0	0	0	0
## 744	224	54	0	0	0	0
## 749	0	48	0	0	0	0
## 755	335	0	0	0	0	0
## 768	120	0	0	0	0	0
## 781	303	30	0	0	0	0
## 783	0	0	0	0	197	0
## 787	133	168	0	0	0	0
## 789	120	0	0	0	0	0
## 792	143	46	0	0	0	0
## 809	140	0	0	0	0	0
## 814	0	0	120	0	0	0
## 815	150	59	0	0	0	0
## 820	100	48	0	0	0	0
## 826	486	0	0	0	225	0
## 838	0	0	254	0	0	0
## 843	0	0	0	0	0	0
## 849	143	20	0	0	0	0
## 851	180	0	0	0	0	0
## 853	0	104	0	0	0	0
## 854	0	0	34	0	0	0
## 857	0	65	0	0	222	0
## 863	0	0	0	0	0	0
## 866	120	144	0	0	0	0
## 877	0	0	0	0	0	0
## 880	342	40	0	0	0	0
## 891	511	116	0	0	0	0
## 898	0	0	0	0	0	0
## 902	0	0	0	0	0	0
## 906	164	0	0	0	0	0
## 909	173	0	0	0	0	0
## 915	0	0	0	0	0	0
## 923	180	0	0	0	0	0
## 925	0	43	0	0	0	0
## 926	202	151	0	0	0	0
## 927	0	0	0	0	0	0
## 936	56	0	318	0	0	0
## 938	0	0	0	168	0	0
## 941	0	118	0	0	233	0
## 950	305	189	0	0	0	0
## 958	550	282	0	0	0	0
## 964	0	0	0	0	0	0
## 971	153	50	0	0	0	0
## 975	144	76	0	0	0	0
## 978	0	0	0	0	0	0
## 983	0	224	0	0	0	0
## 991	0	319	0	0	0	0
## 992	371	0	0	0	0	0
## 998	0	0	0	0	0	0
## 1001	0	0	0	0	147	0
## 1012	63	0	0	0	0	0
## 1013	164	0	0	0	0	0

## 1019	0	72	174	0	0	0
## 1025	0	0	228	0	0	0
## 1027	209	55	0	0	0	0
## 1028	0	136	0	0	0	0
## 1030	186	0	0	0	0	0
## 1032	0	45	0	0	189	0
## 1036	0	40	0	0	0	0
## 1040	0	0	0	0	0	0
## 1052	168	98	0	0	0	0
## 1054	0	0	19	0	0	0
## 1059	0	58	0	0	0	0
## 1072	240	32	0	0	0	0
## 1079	315	44	0	0	0	0
## 1081	120	96	0	0	0	0
## 1092	0	74	137	0	0	0
## 1103	100	48	0	0	0	0
## 1105	224	84	0	0	0	0
## 1111	120	0	0	0	0	0
## 1117	64	0	0	0	160	0
## 1119	100	25	0	0	0	0
## 1133	264	32	0	0	0	0
## 1136	448	96	0	0	0	0
## 1138	0	24	0	0	0	0
## 1141	165	26	0	0	0	0
## 1143	0	0	176	0	0	0
## 1148	0	0	96	0	0	0
## 1149	60	84	0	0	273	0
## 1156	108	0	0	216	0	0
## 1159	168	180	0	0	0	0
## 1172	0	0	116	0	0	0
## 1175	0	0	0	0	0	0
## 1185	439	0	0	0	0	0
## 1188	0	304	0	0	0	0
## 1201	0	42	0	0	0	0
## 1208	88	0	0	0	0	0
## 1225	155	24	145	0	0	0
## 1228	0	0	0	0	0	0
## 1238	0	0	0	0	0	0
## 1241	0	0	0	0	0	0
## 1245	148	36	0	0	0	0
## 1247	220	47	0	0	0	0
## 1254	0	103	0	0	0	0
## 1256	120	0	0	0	0	0
## 1262	314	12	0	0	0	0
## 1264	268	0	0	0	0	0
## 1265	0	0	0	0	0	0
## 1266	180	0	0	0	0	0
## 1270	294	116	0	0	0	0
## 1271	0	0	0	0	0	0
## 1279	0	26	0	0	0	0
## 1280	168	198	0	0	0	0
## 1283	227	0	0	0	0	0

## 1293	0	0	0	0	0	0	0	
## 1294	0	0	0	0	224	0	0	
## 1302	112	51	0	0	0	0	0	
## 1305	500	0	0	0	0	0	0	
## 1311	198	150	0	0	0	0	0	
## 1314	0	0	0	0	0	0	0	
## 1335	192	87	0	0	0	0	0	
## 1339	0	80	0	290	0	0	0	
## 1341	402	25	0	0	0	0	0	
## 1347	0	184	0	0	0	0	0	
## 1349	0	0	0	0	0	0	0	
## 1350	0	0	0	0	0	0	0	
## 1351	0	32	0	0	0	0	0	
## 1355	55	0	0	0	0	0	0	
## 1358	0	96	0	0	0	0	0	
## 1361	140	0	0	0	0	0	0	
## 1366	314	140	0	0	0	0	0	
## 1373	0	42	0	0	0	0	0	
## 1375	0	0	112	0	0	0	0	
## 1388	0	0	50	0	0	0	0	
## 1399	0	0	0	0	0	0	0	
## 1409	0	126	0	0	0	0	0	
## 1411	0	73	216	0	0	0	0	
## 1415	586	236	0	0	0	738		
## 1416	316	28	0	0	0	0	0	
## 1421	0	0	99	0	0	0	0	
## 1423	0	60	0	0	0	0	0	
## 1433	149	0	0	0	0	0	0	
## 1435	0	98	0	0	40	0		
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## 538	272000
## 540	248000
## 544	229000
## 558	234000
## 559	121500
## 563	268000
## 568	135960
## 579	181900
## 592	140000
## 609	313000
## 610	148000
## 611	261500
## 615	183200
## 622	168500
## 625	139900
## 640	226000
## 644	143250
## 658	197900
## 664	129000
## 666	168000
## 670	165000
## 677	128500
## 680	173000
## 683	207500
## 685	148800
## 688	141000
## 704	302000
## 707	109900
## 712	130500
## 718	275000
## 719	143000
## 724	222000
## 732	108000
## 743	299800
## 744	236000
## 749	162000
## 755	158900

## 768	134900
## 781	165500
## 783	161500
## 787	187500
## 789	146800
## 792	194500
## 809	144500
## 814	137000
## 815	271000
## 820	225000
## 826	185000
## 838	140000
## 843	171000
## 849	215000
## 851	158000
## 853	127000
## 854	147000
## 857	250000
## 863	148500
## 866	169000
## 877	136500
## 880	178000
## 891	165000
## 898	110000
## 902	125500
## 906	131000
## 909	143500
## 915	135000
## 923	175000
## 925	176000
## 926	236500
## 927	222000
## 936	244400
## 938	214000
## 941	137500
## 950	172000
## 958	272000
## 964	135000
## 971	165000
## 975	178400
## 978	255900
## 983	195000
## 991	136500
## 992	185000
## 998	136905
## 1001	163500
## 1012	187500
## 1013	160000
## 1019	287000
## 1025	160000
## 1027	310000
## 1028	230000

```
## 1030      84000
## 1032     287000
## 1036    173000
## 1040   139600
## 1052   248000
## 1054   220000
## 1059   154000
## 1072  138800
## 1079  187500
## 1081   83500
## 1092  170000
## 1103  181000
## 1105  188000
## 1111  184100
## 1117  112000
## 1119  163900
## 1133  196000
## 1136  197500
## 1138   80000
## 1141  180000
## 1143  116900
## 1148  120500
## 1149  201800
## 1156  224000
## 1159  194000
## 1172  115000
## 1175  250000
## 1185  168000
## 1188  165000
## 1201  107000
## 1208  145000
## 1225  190000
## 1228  142000
## 1238  230000
## 1241  169900
## 1245  171750
## 1247  294000
## 1254  181000
## 1256  161500
## 1262  381000
## 1264  260000
## 1265  185750
## 1266  137000
## 1270  162000
## 1271  197900
## 1279  143000
## 1280  190000
## 1283  180500
## 1293  225000
## 1294  177500
## 1302  179200
## 1305  302000
```

```
## 1311    275000
## 1314    72500
## 1335    228500
## 1339    262500
## 1341    215000
## 1347    235000
## 1349    110000
## 1350    149900
## 1351    177500
## 1355    104900
## 1358    216000
## 1361    144000
## 1366    466500
## 1373    237500
## 1375    112000
## 1388    160000
## 1399    112000
## 1409    340000
## 1411    223000
## 1415    274970
## 1416    144000
## 1421    182900
## 1423    143750
## 1433    149300
## 1435    121000
## 1438    157900
```

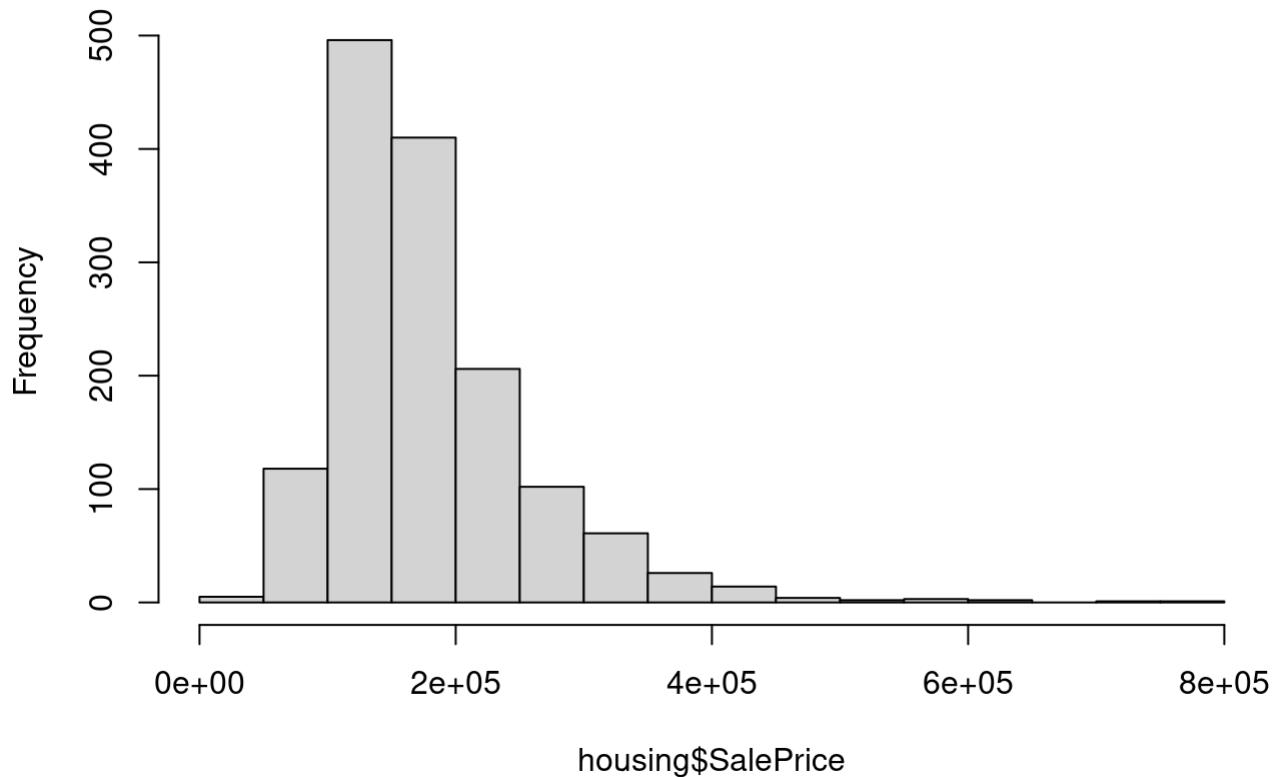
A total of 257 rows contain NA values, this constitutes 17.7% of the data, after dropping 9 rows from NA's in Elctrical & MasVnrType

Data Exploration

8.

```
hist(housing$SalePrice)
```

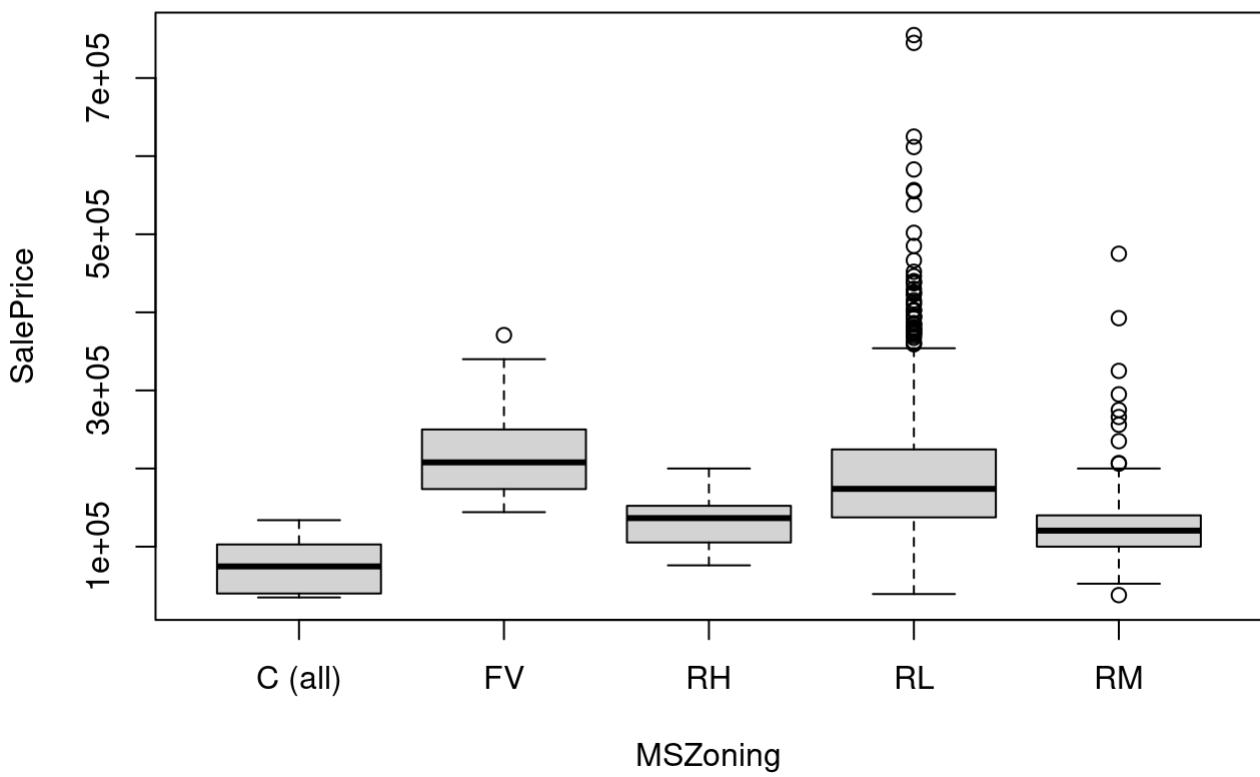
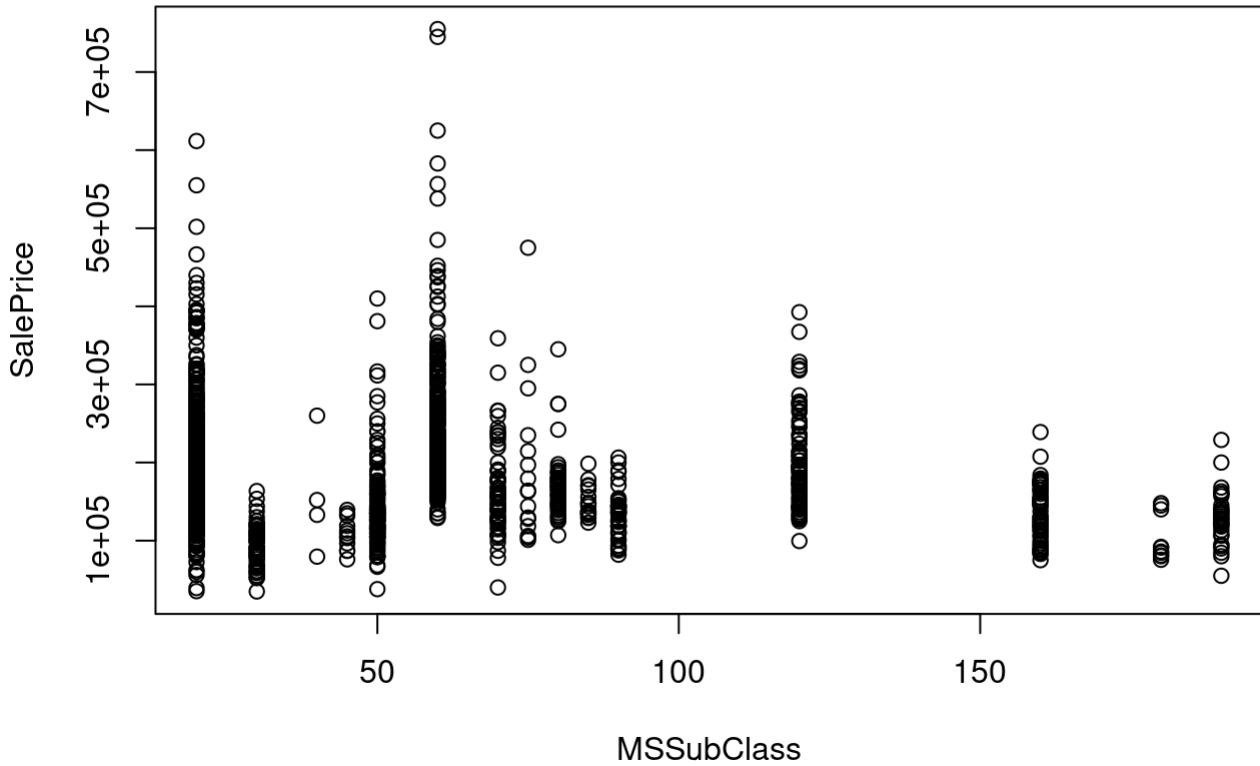
Histogram of housing\$SalePrice

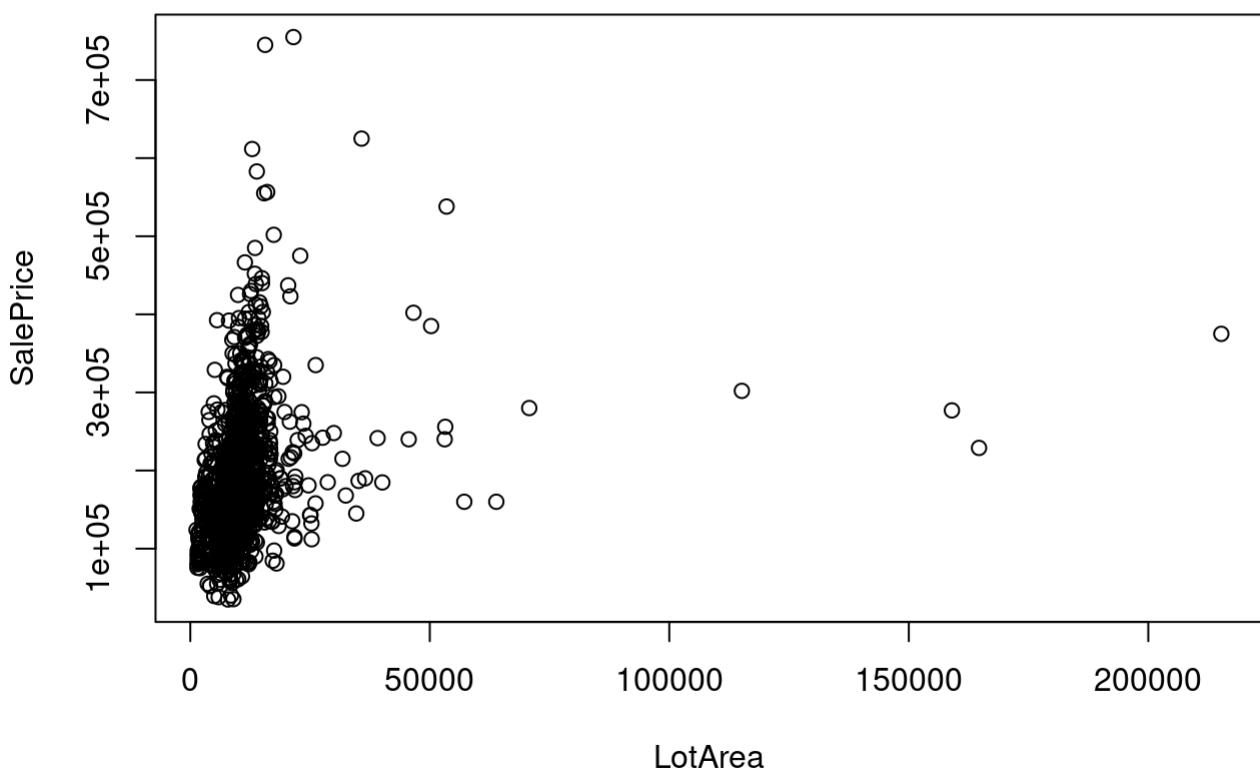
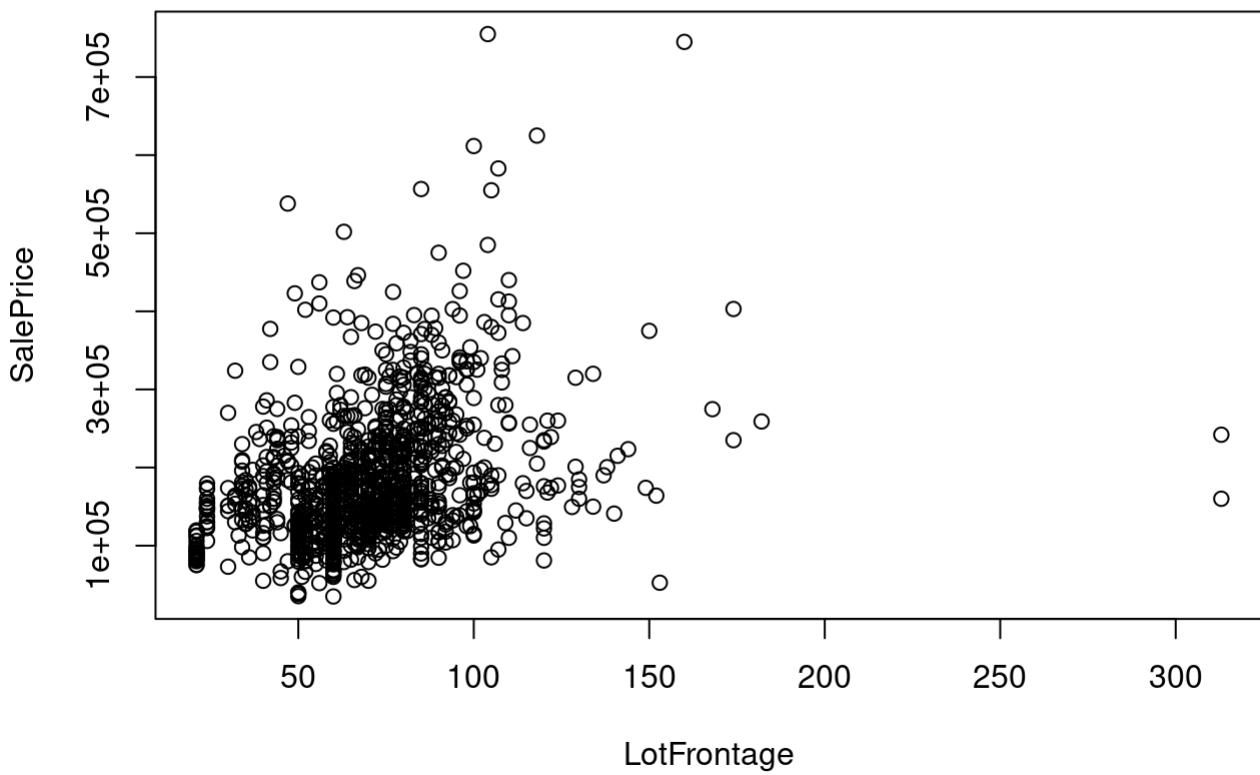


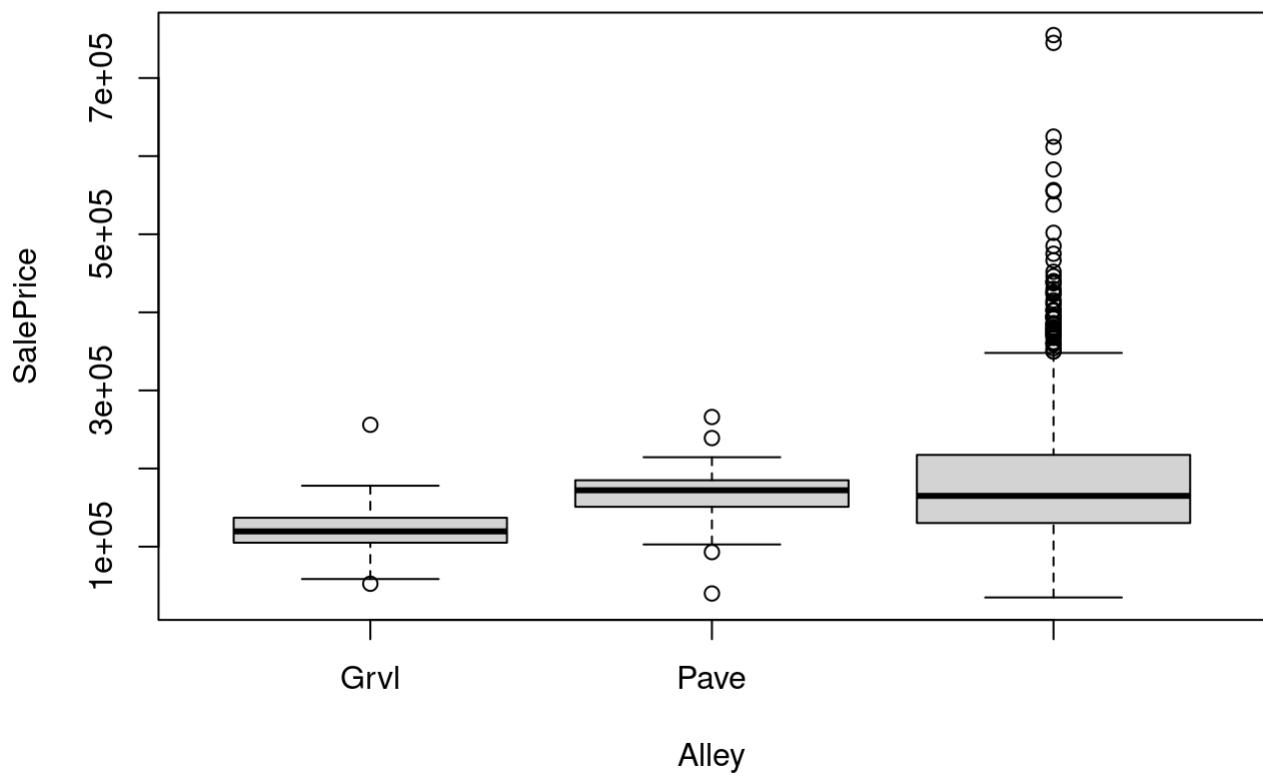
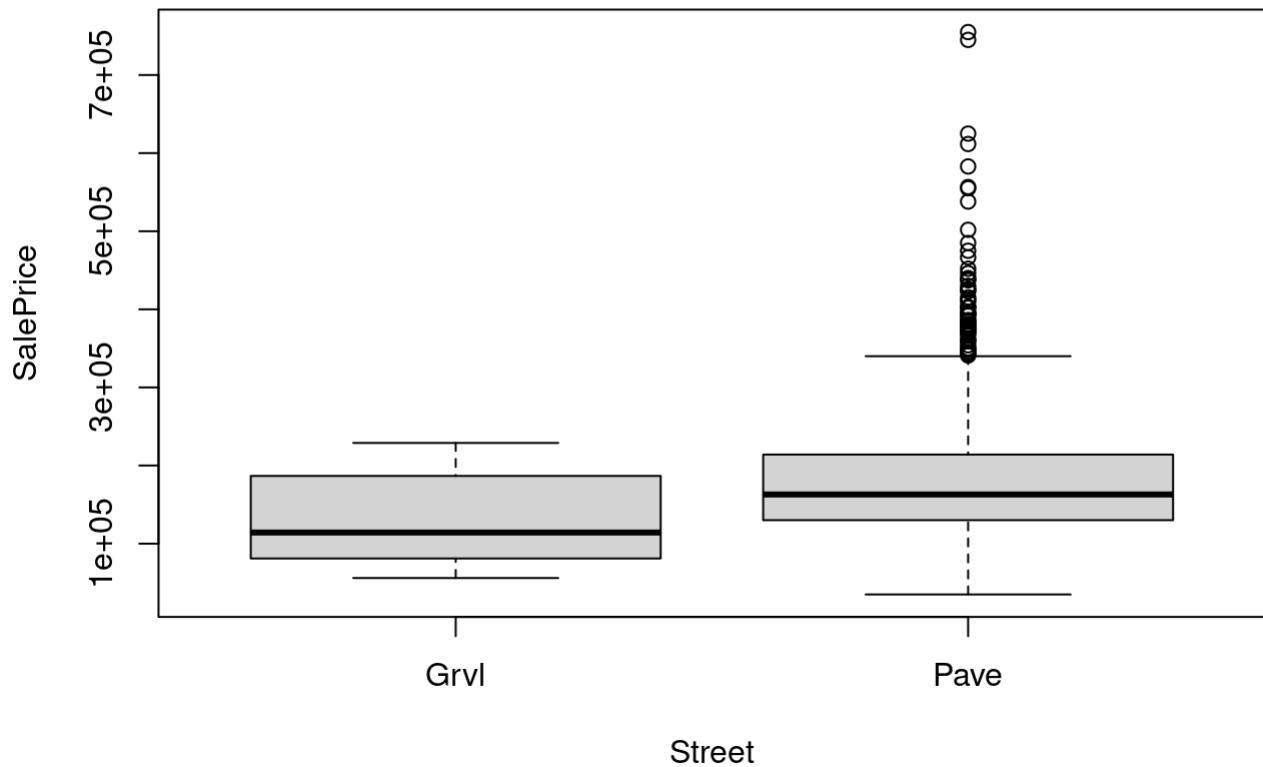
Sales Price is right-skewed, so the mean is greater than the median.

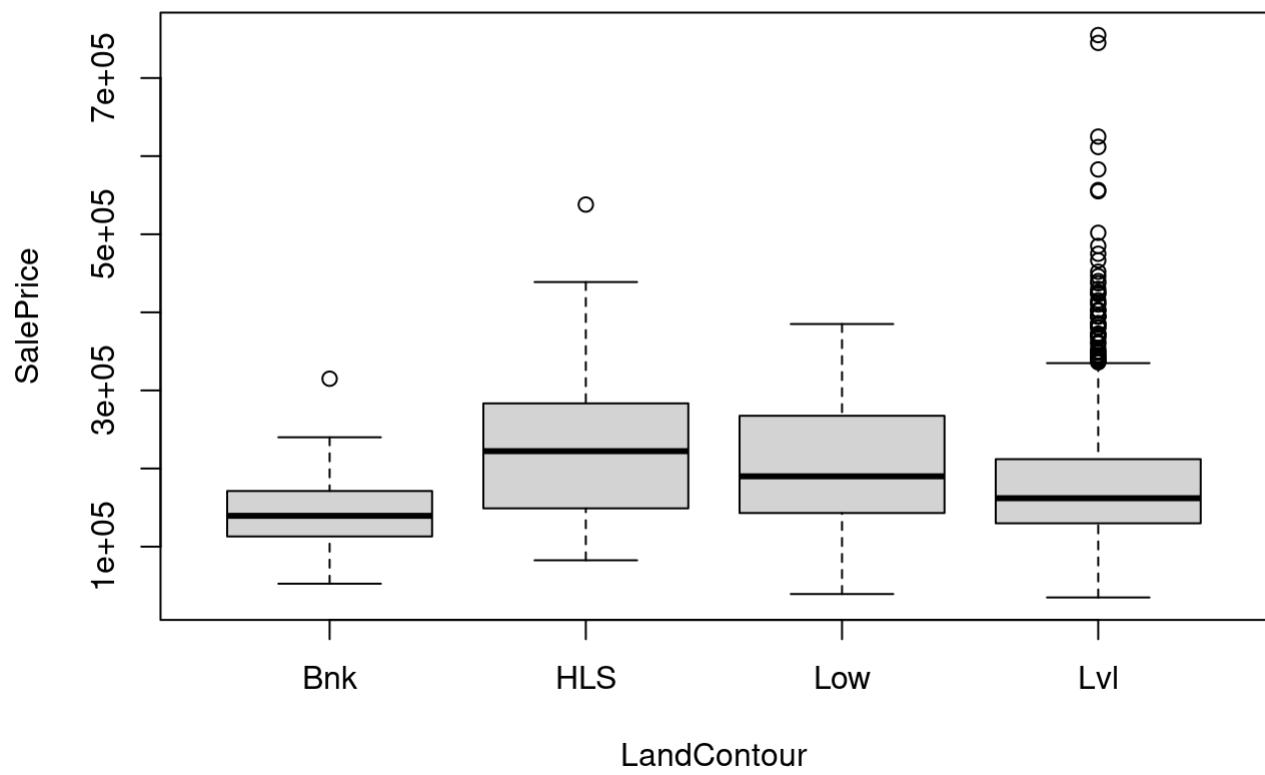
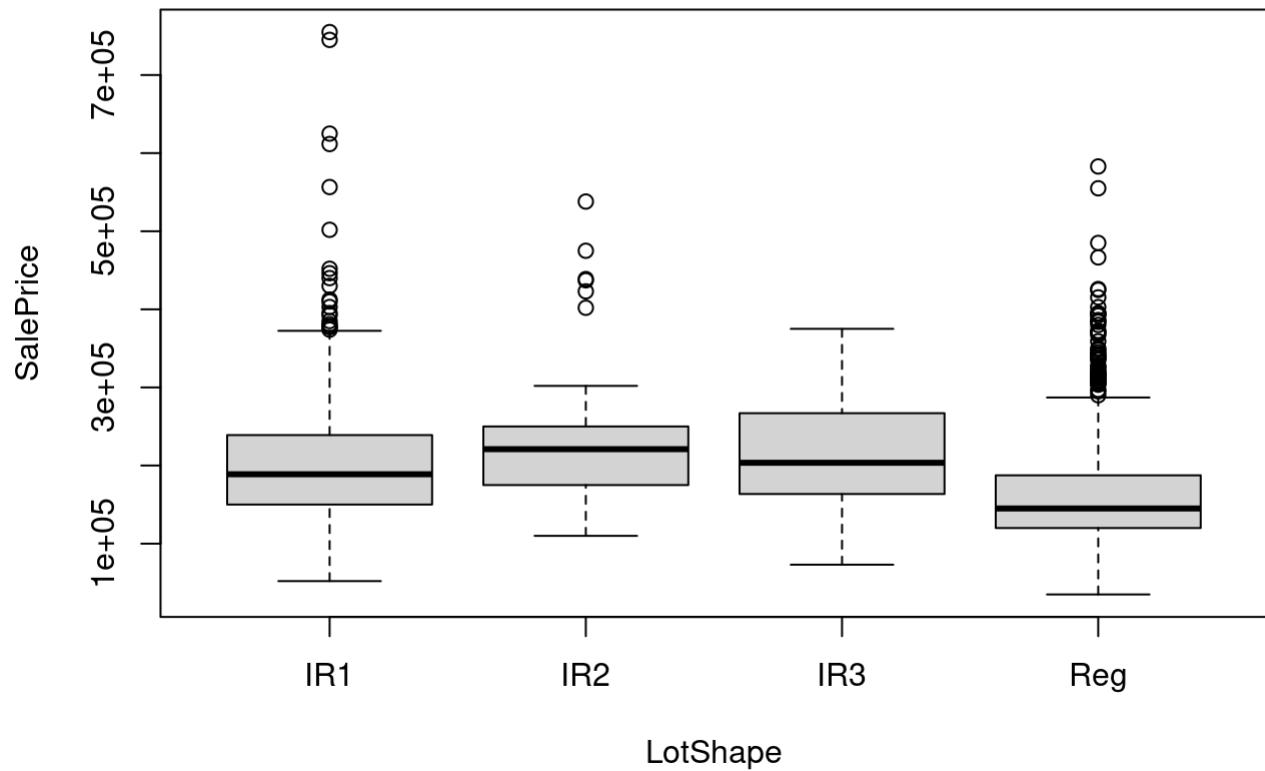
9.

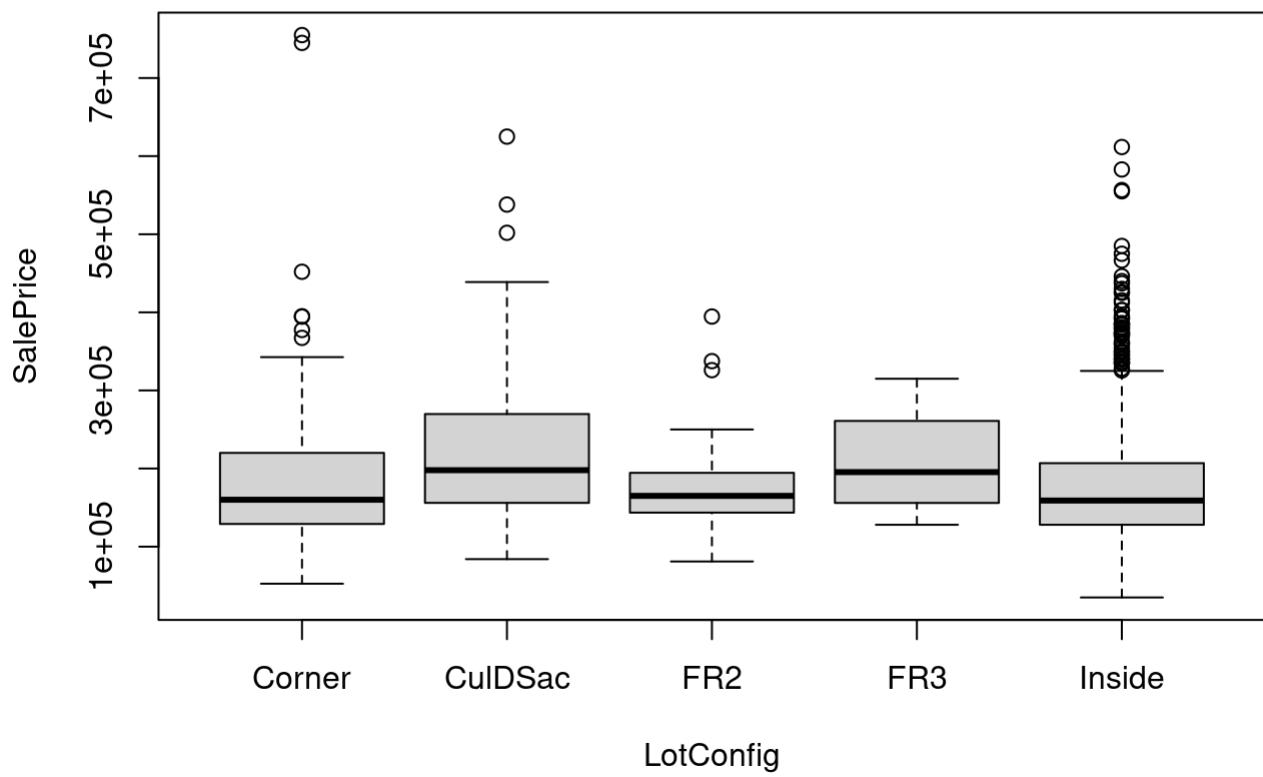
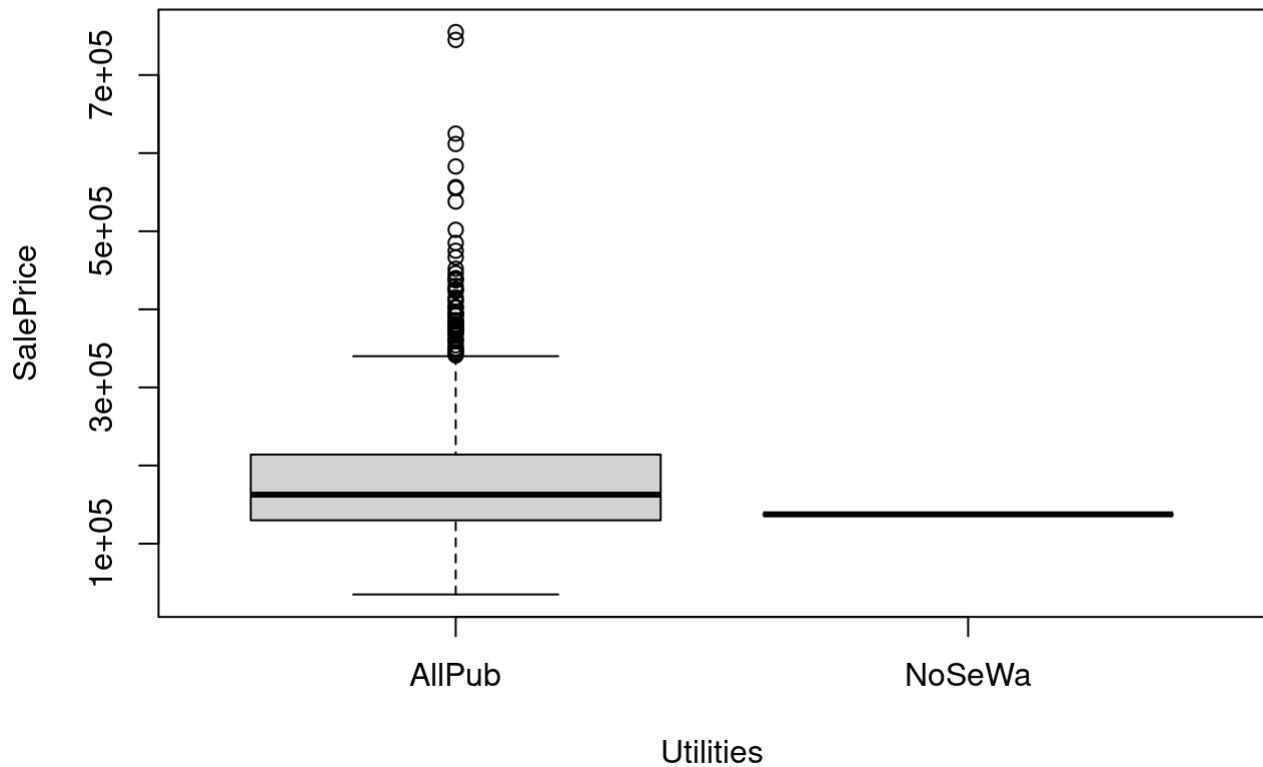
```
plot(SalePrice~., data=housing)
```

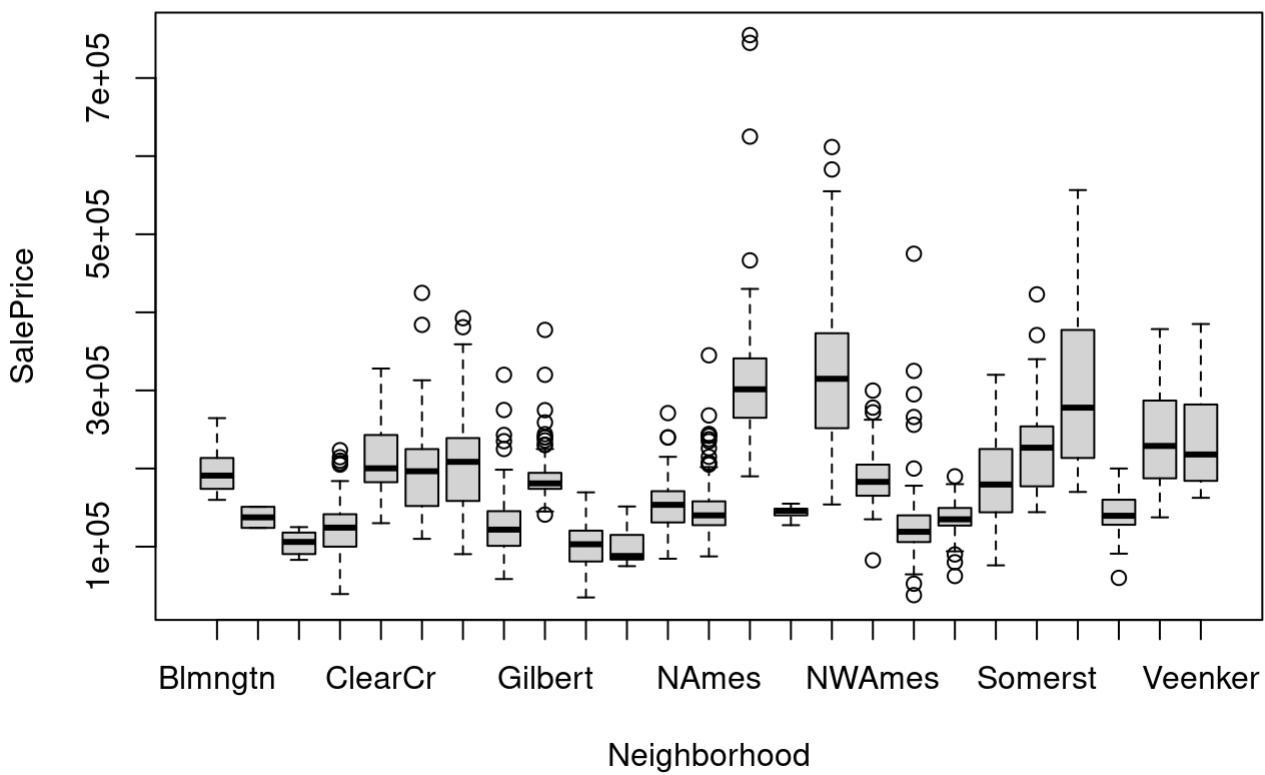
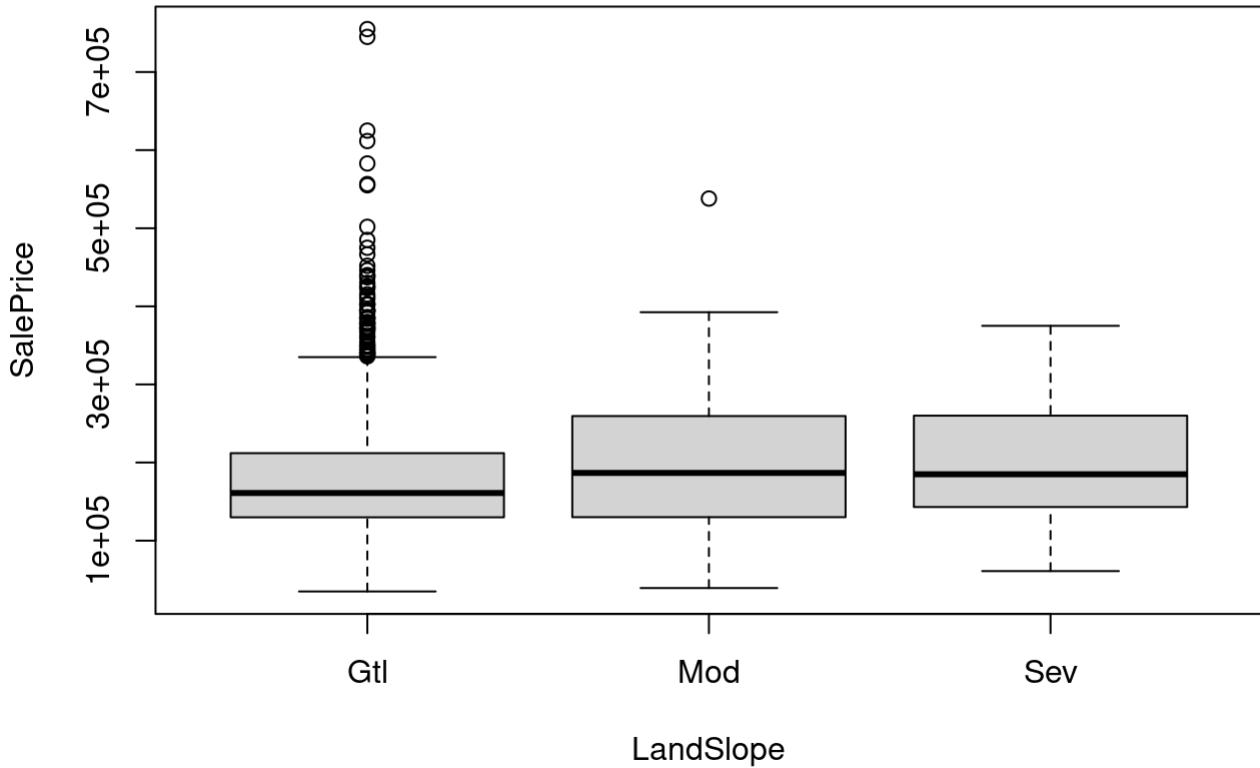



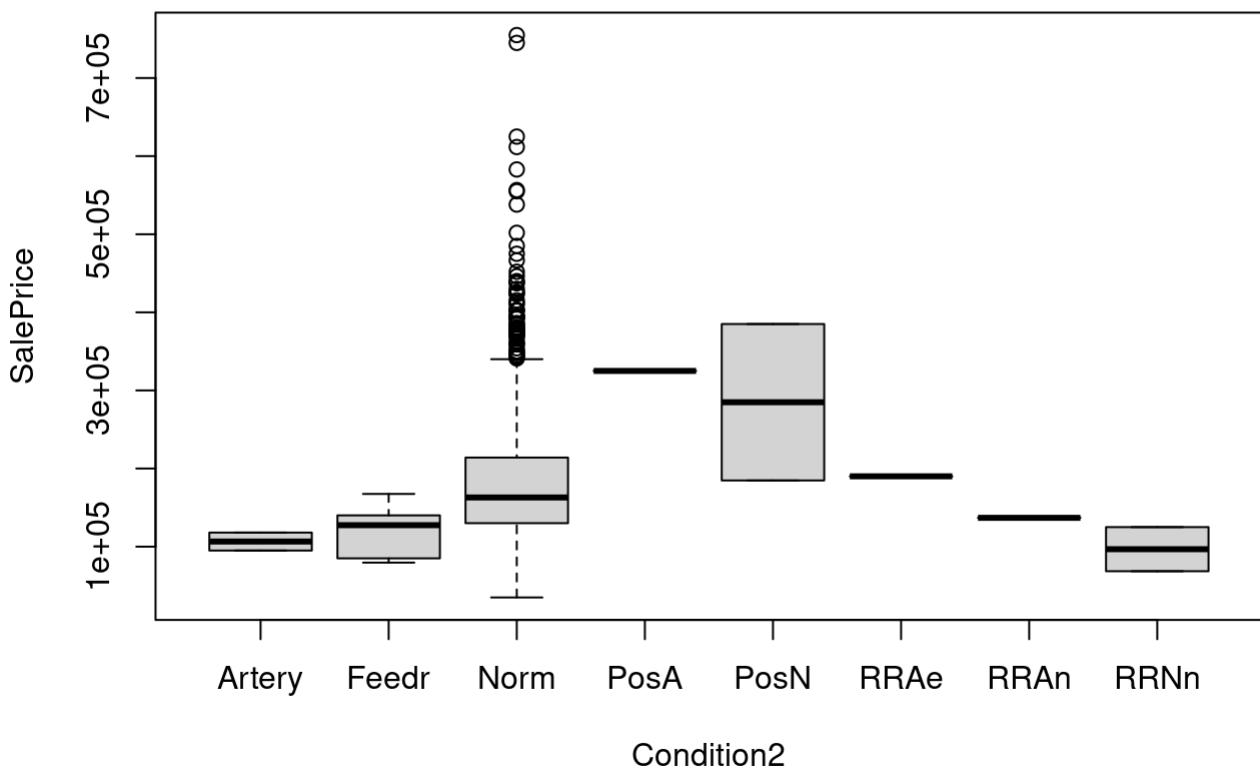
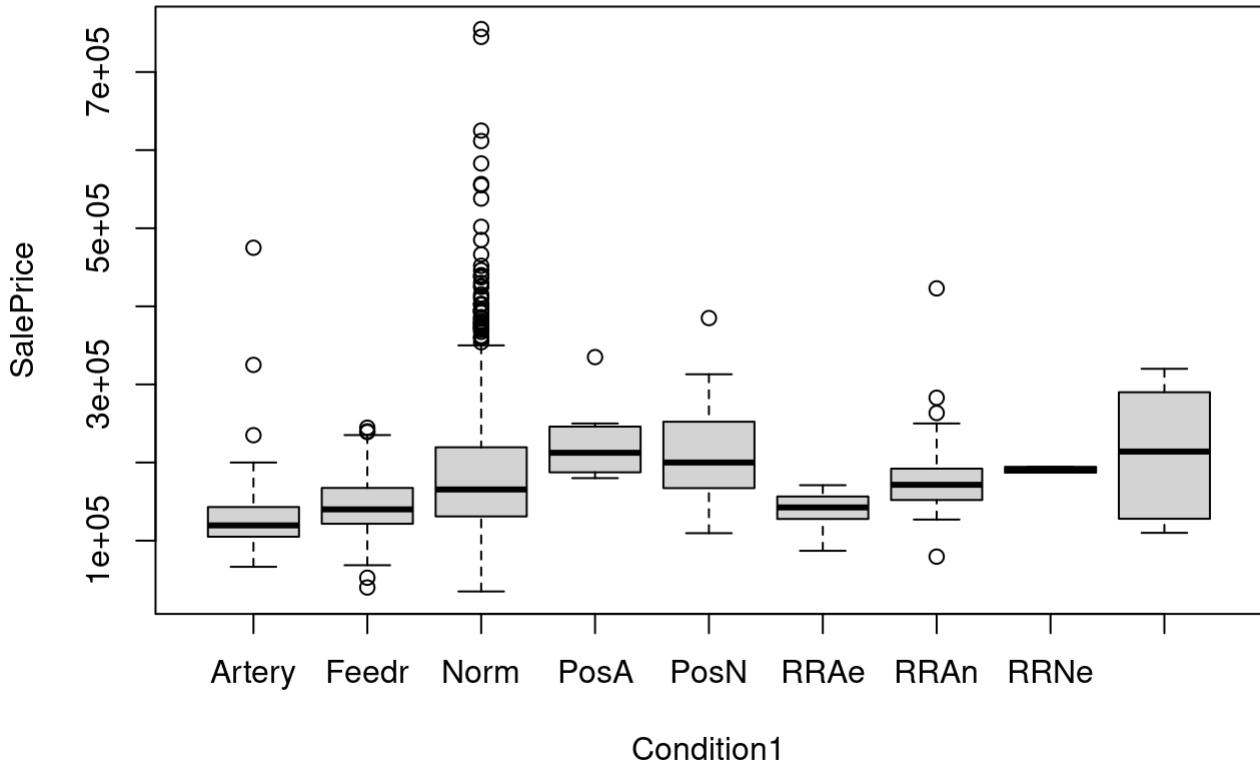


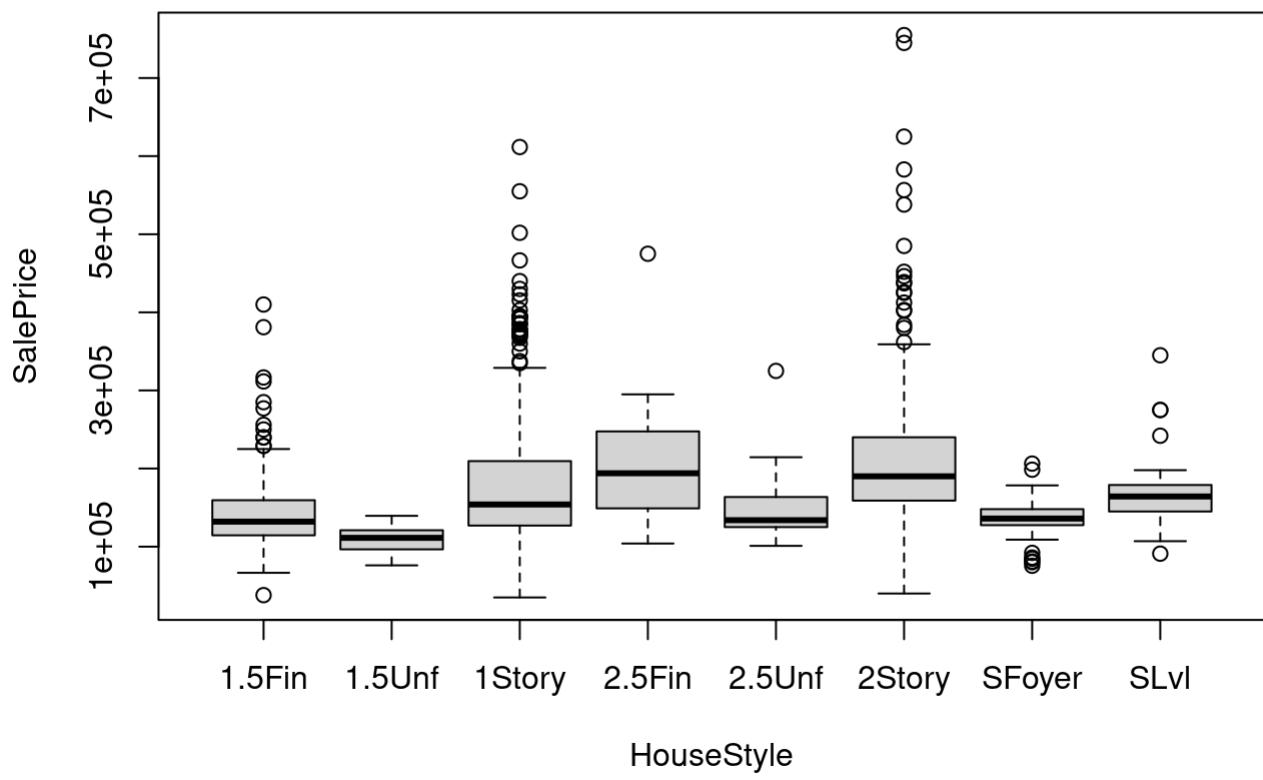
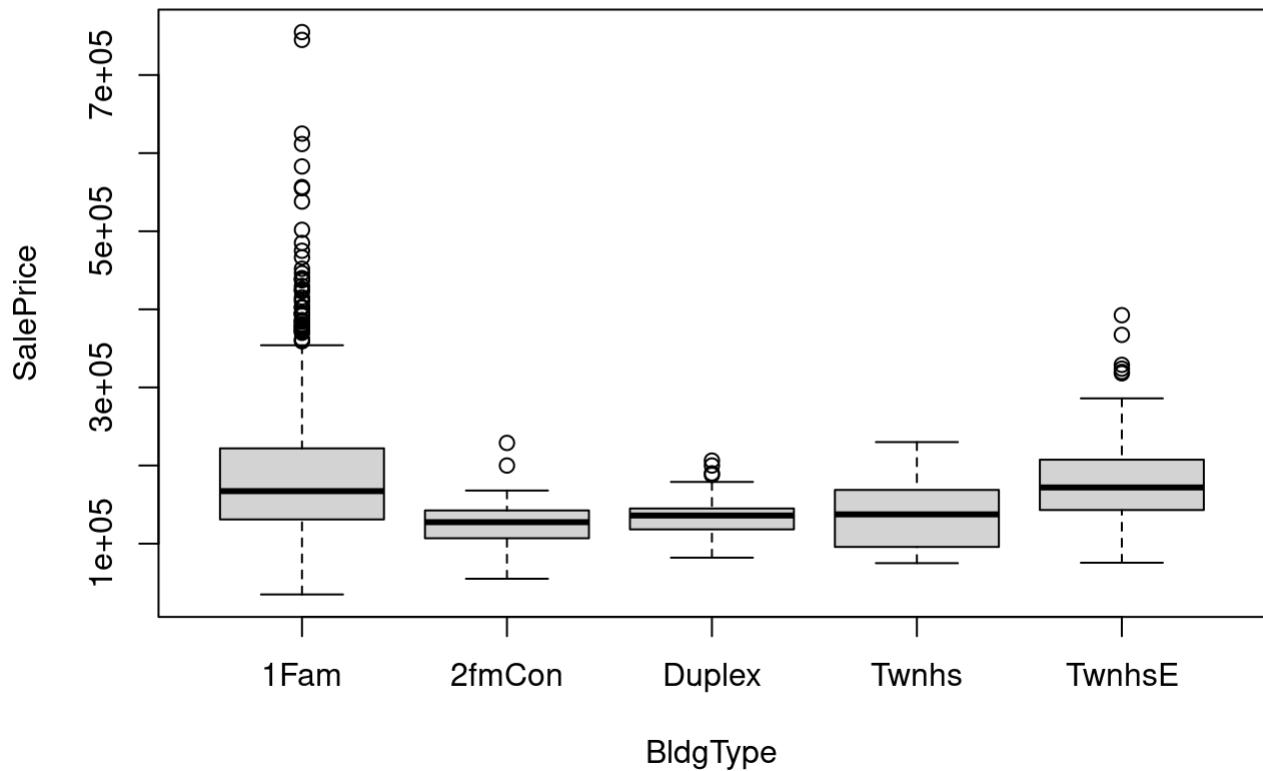


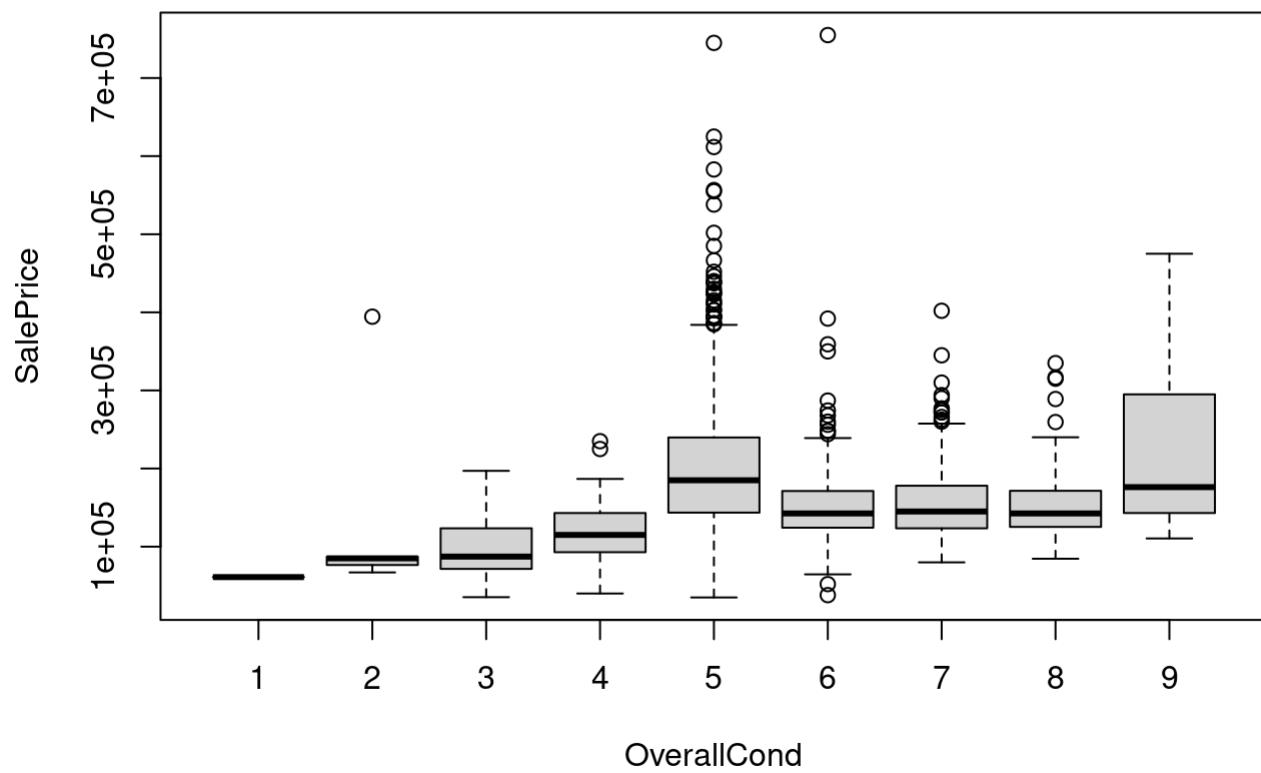
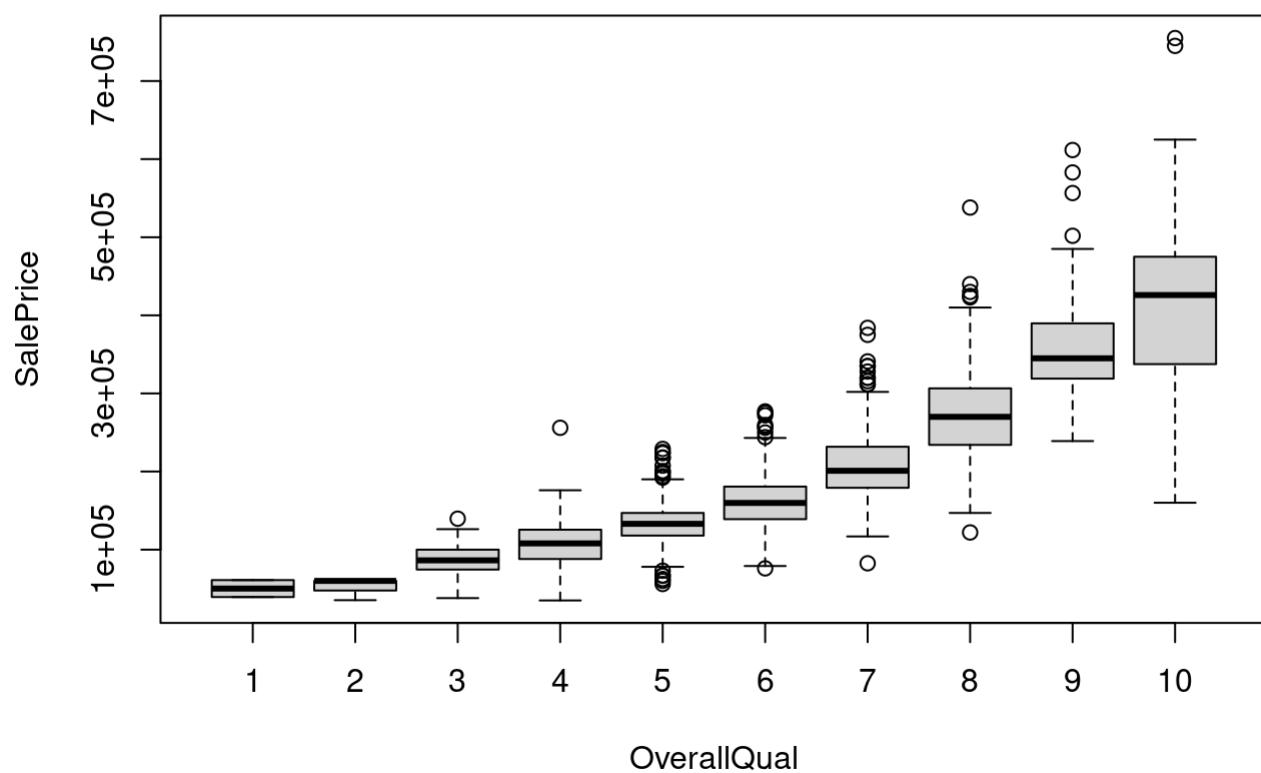


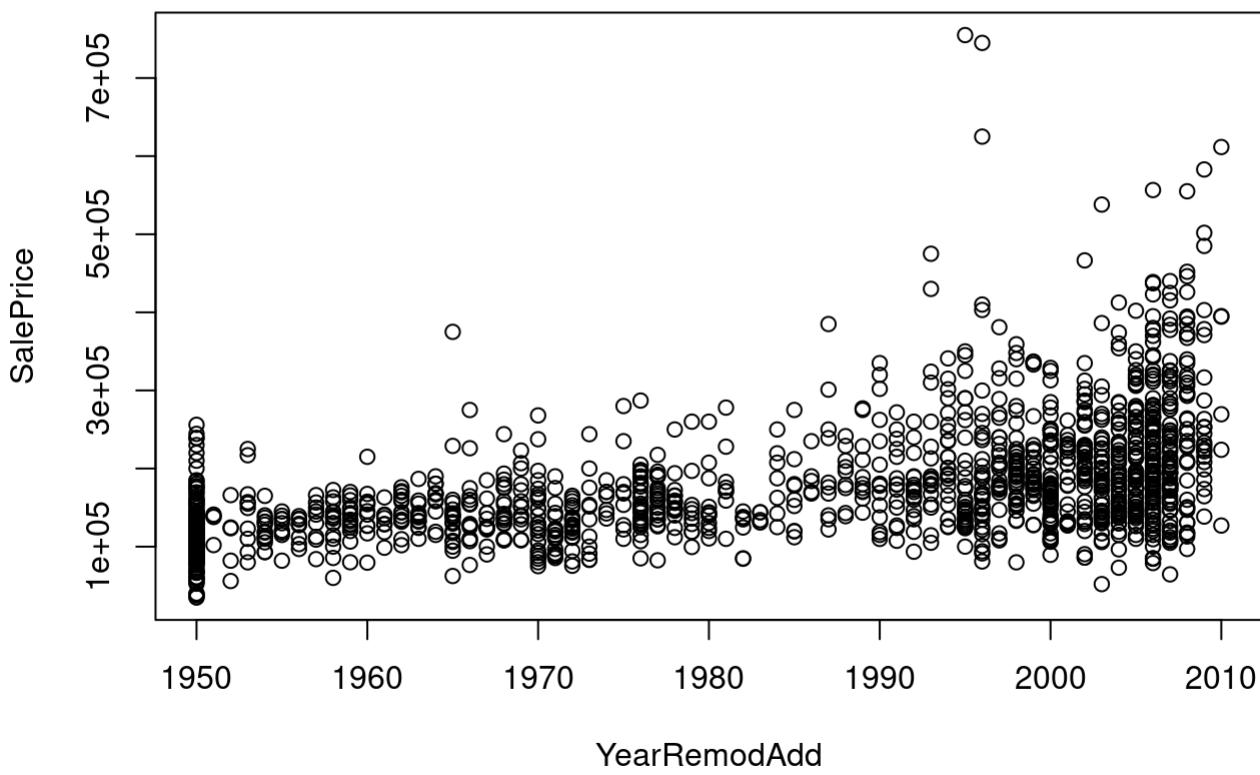
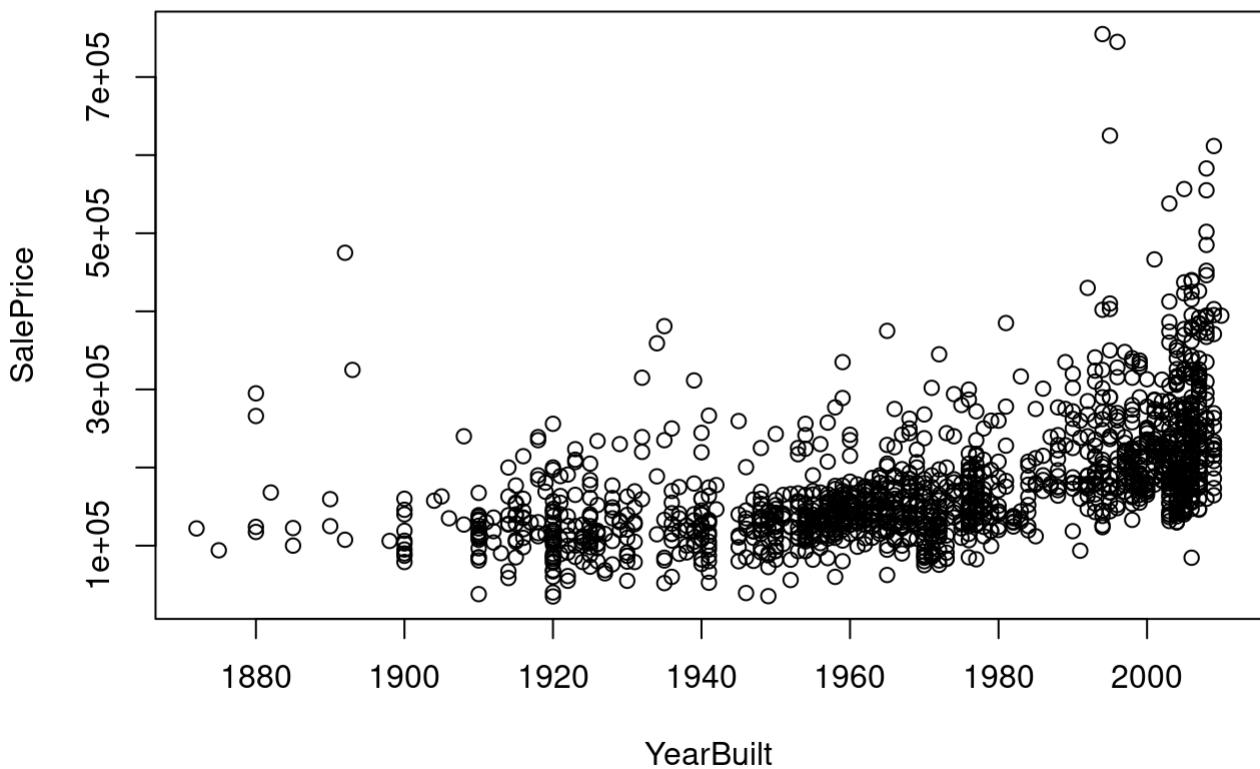


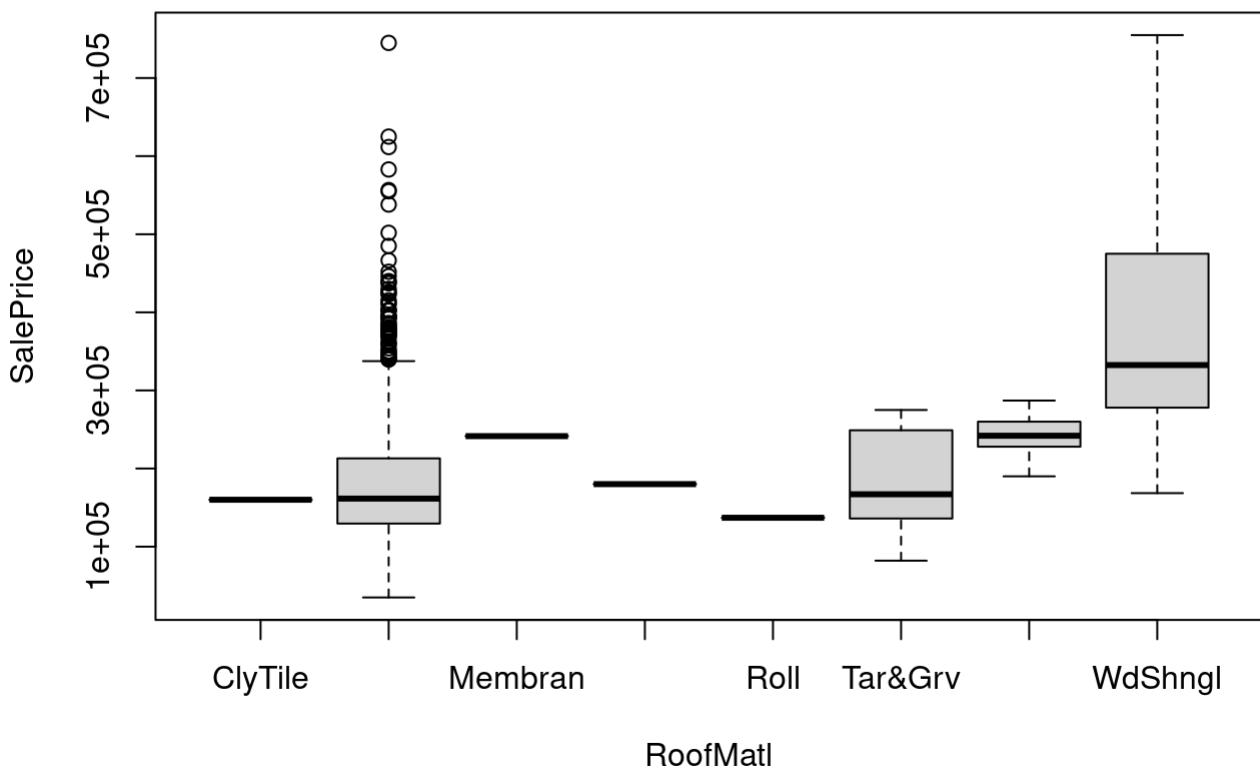
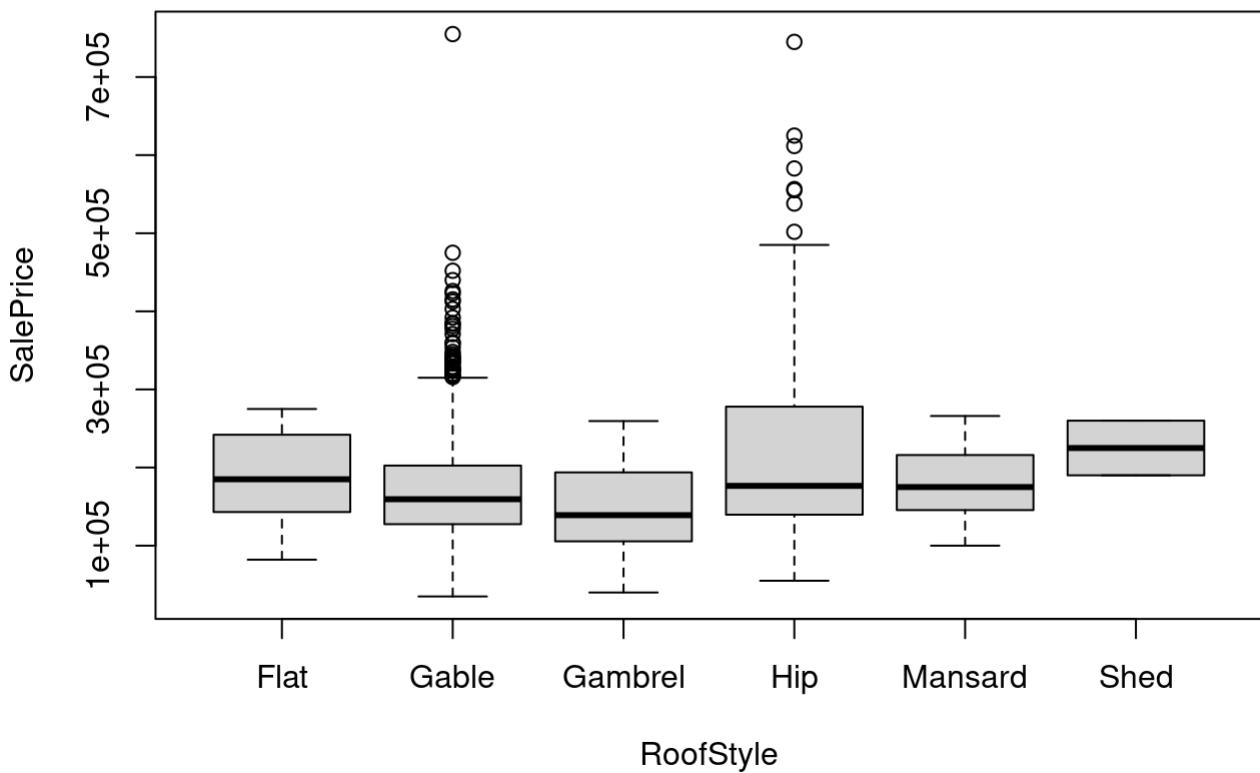


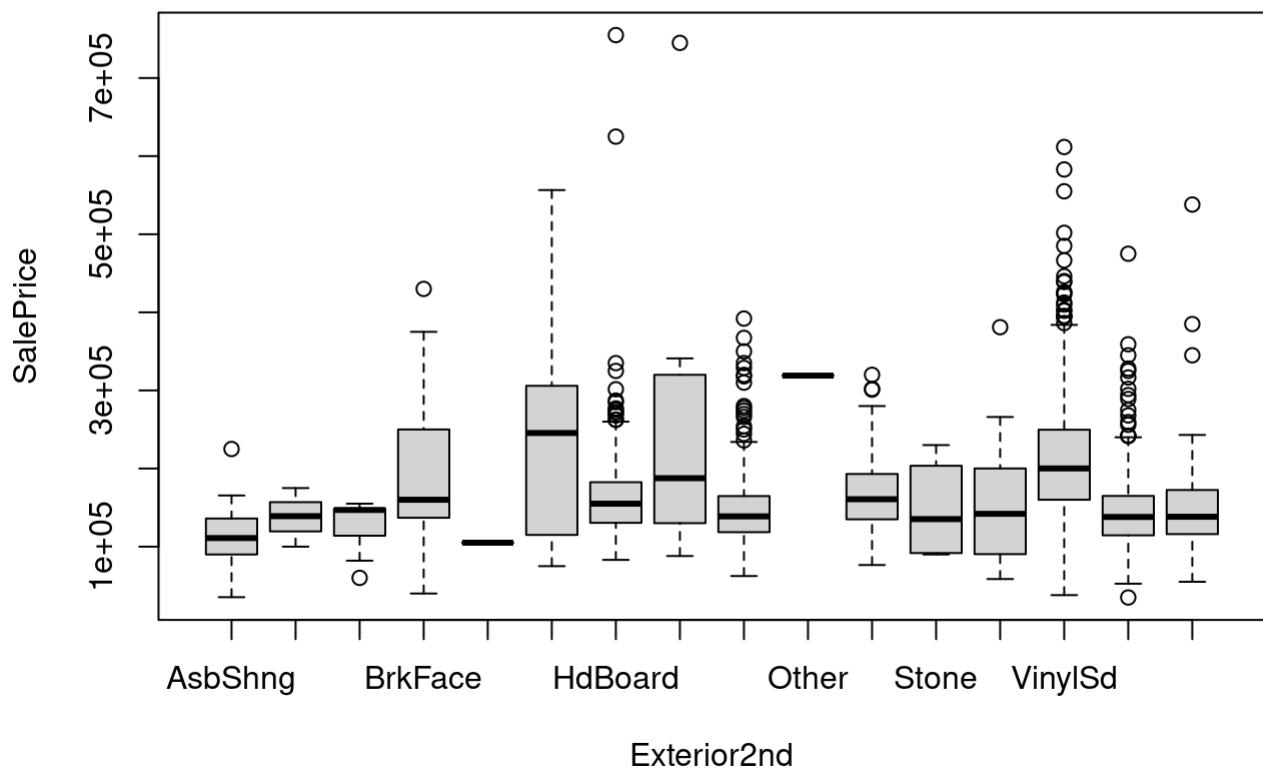
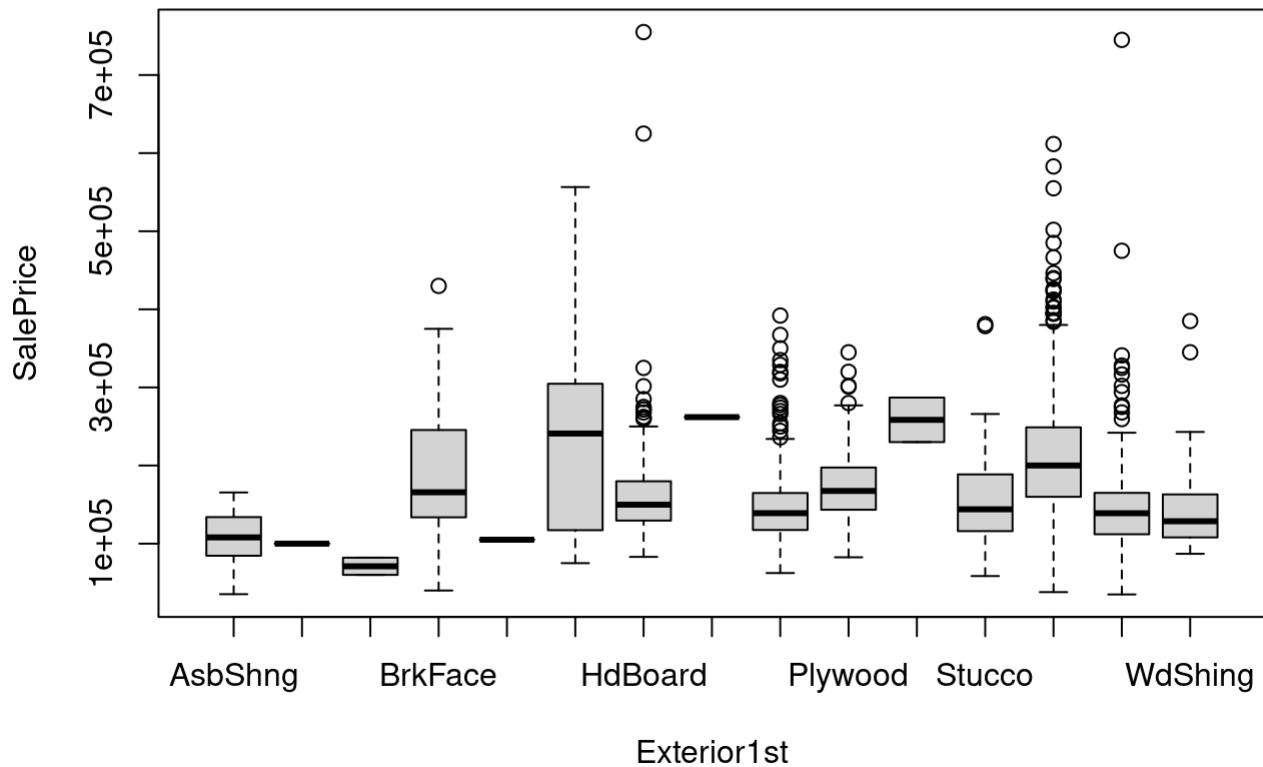


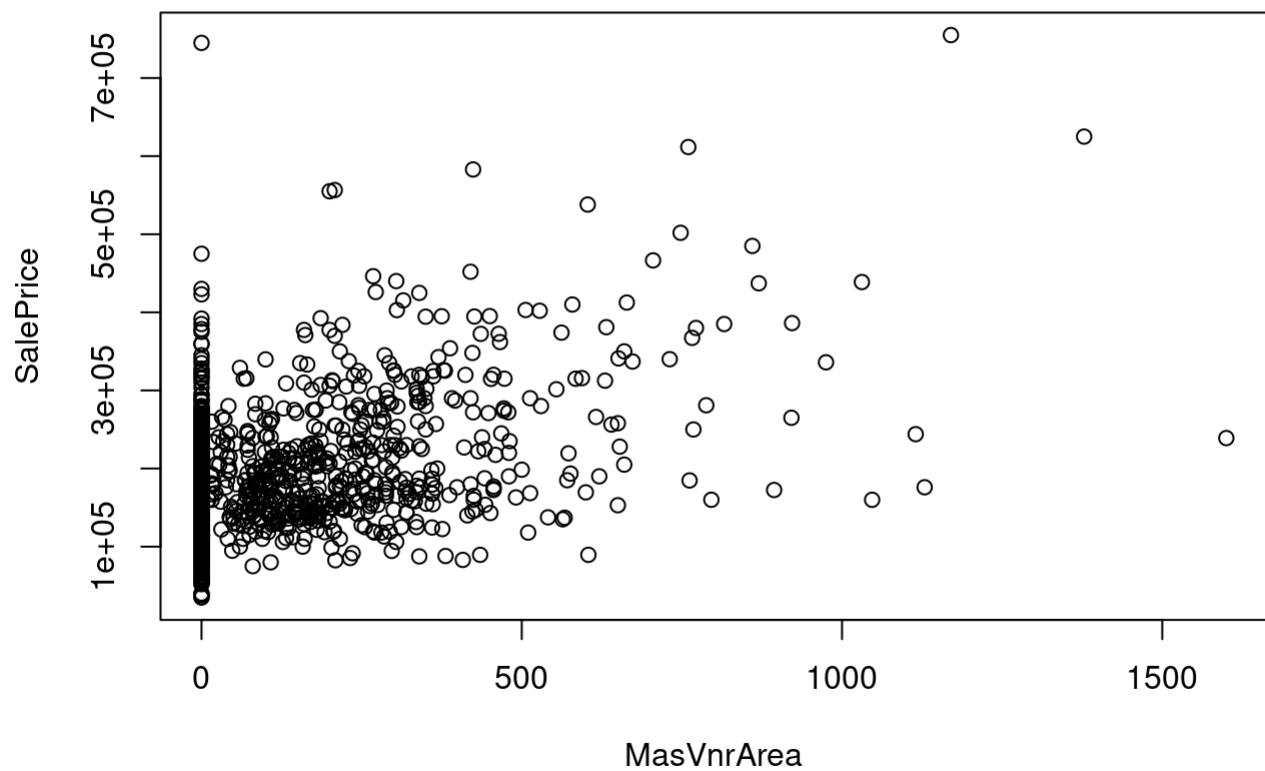
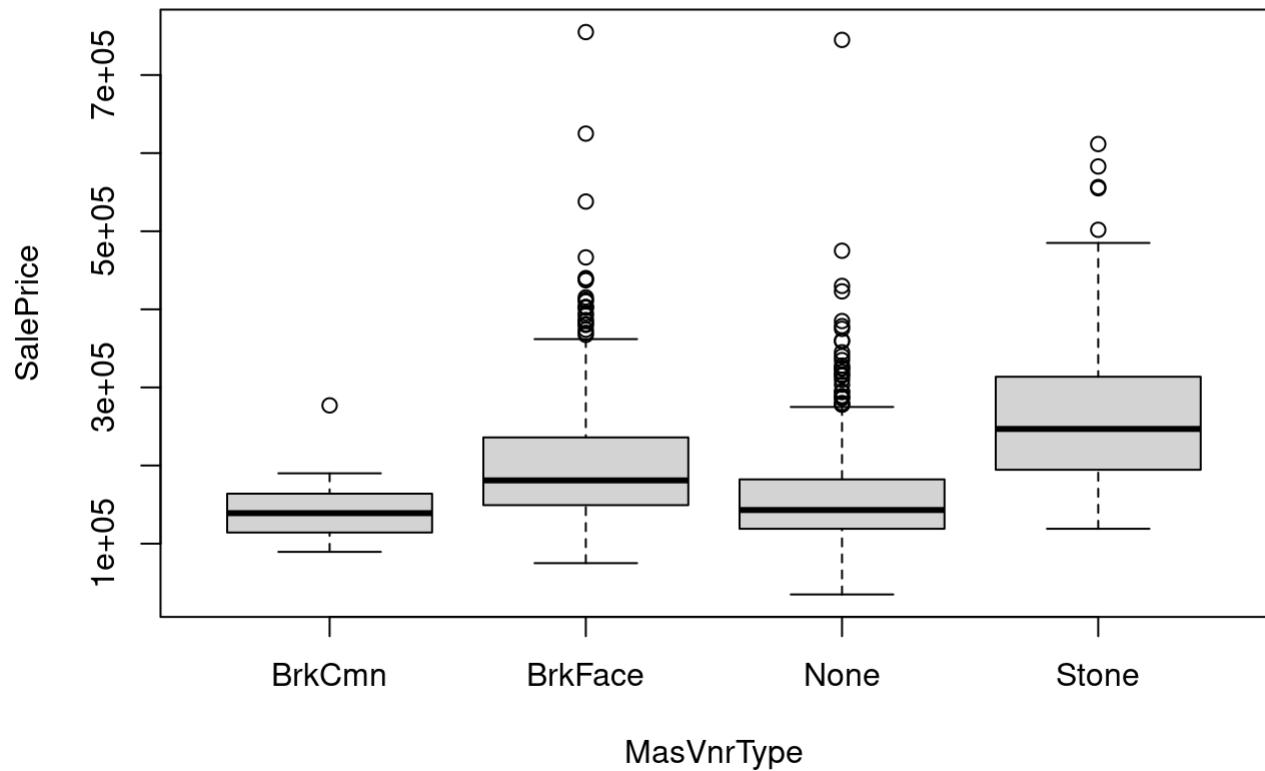


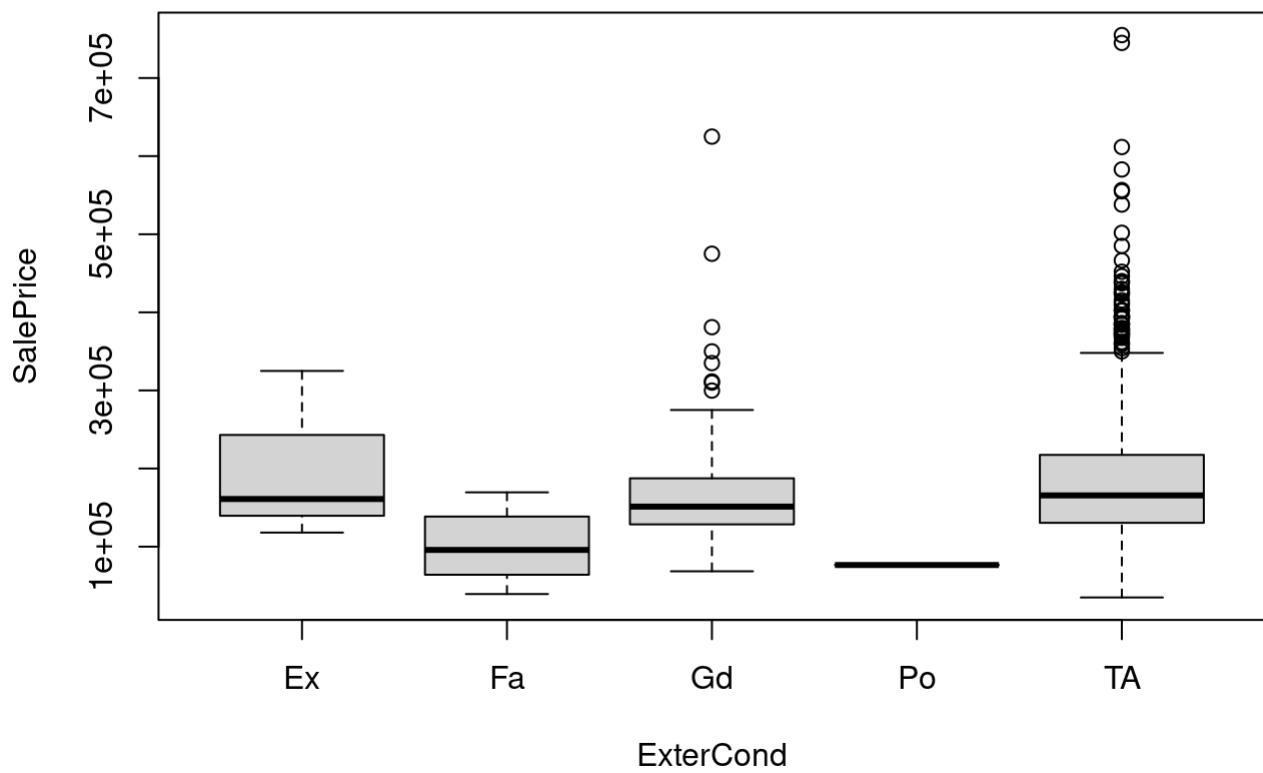
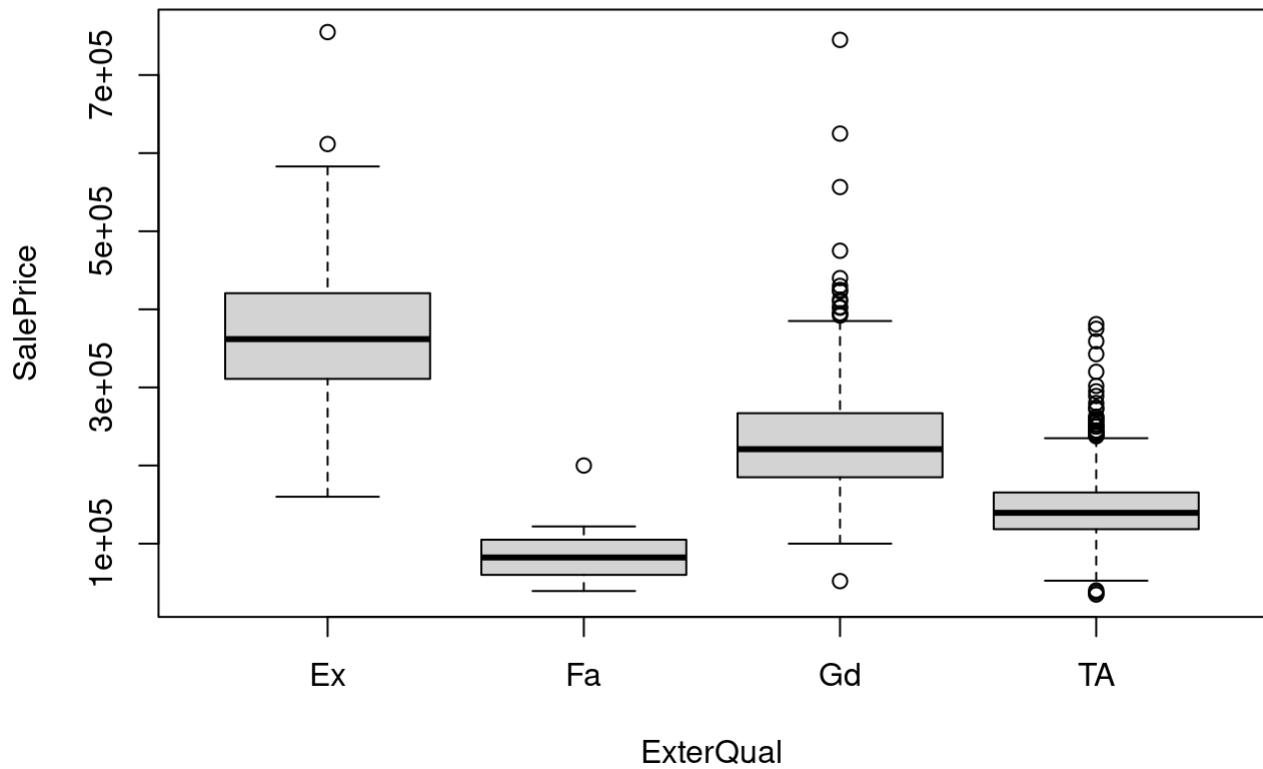


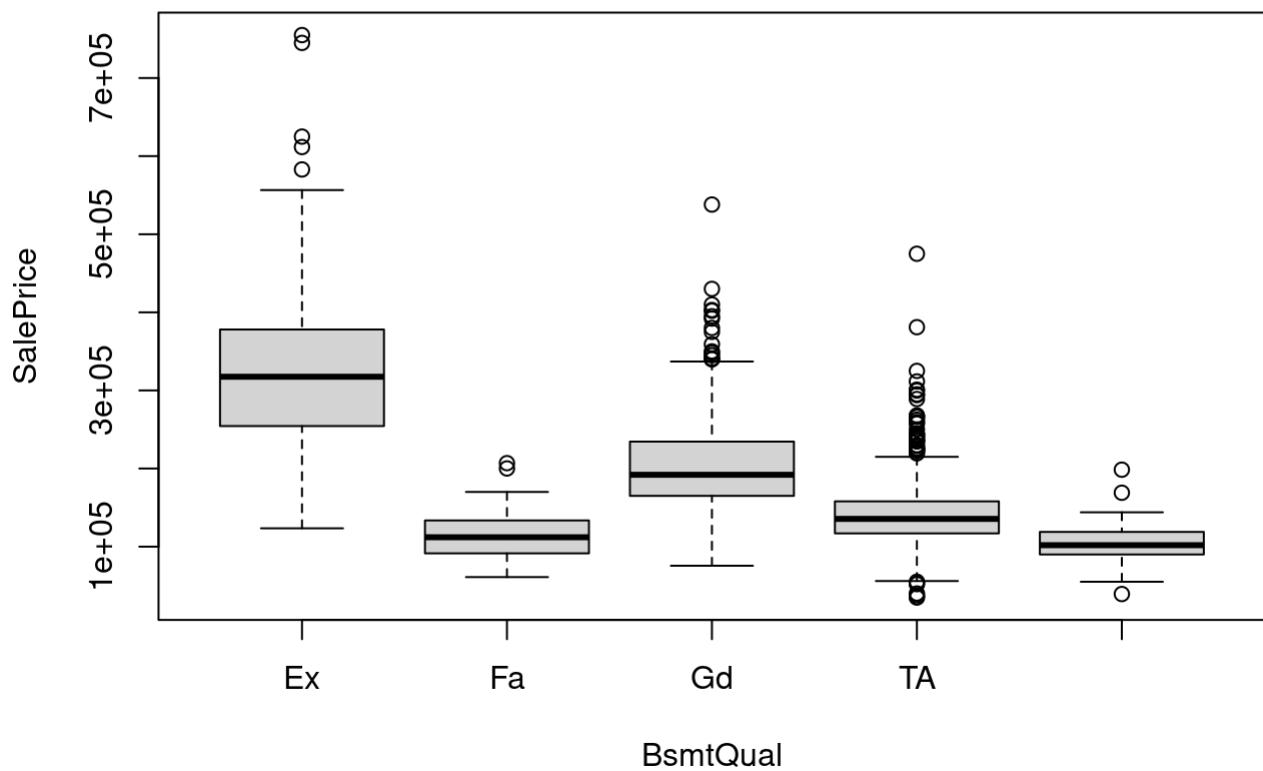
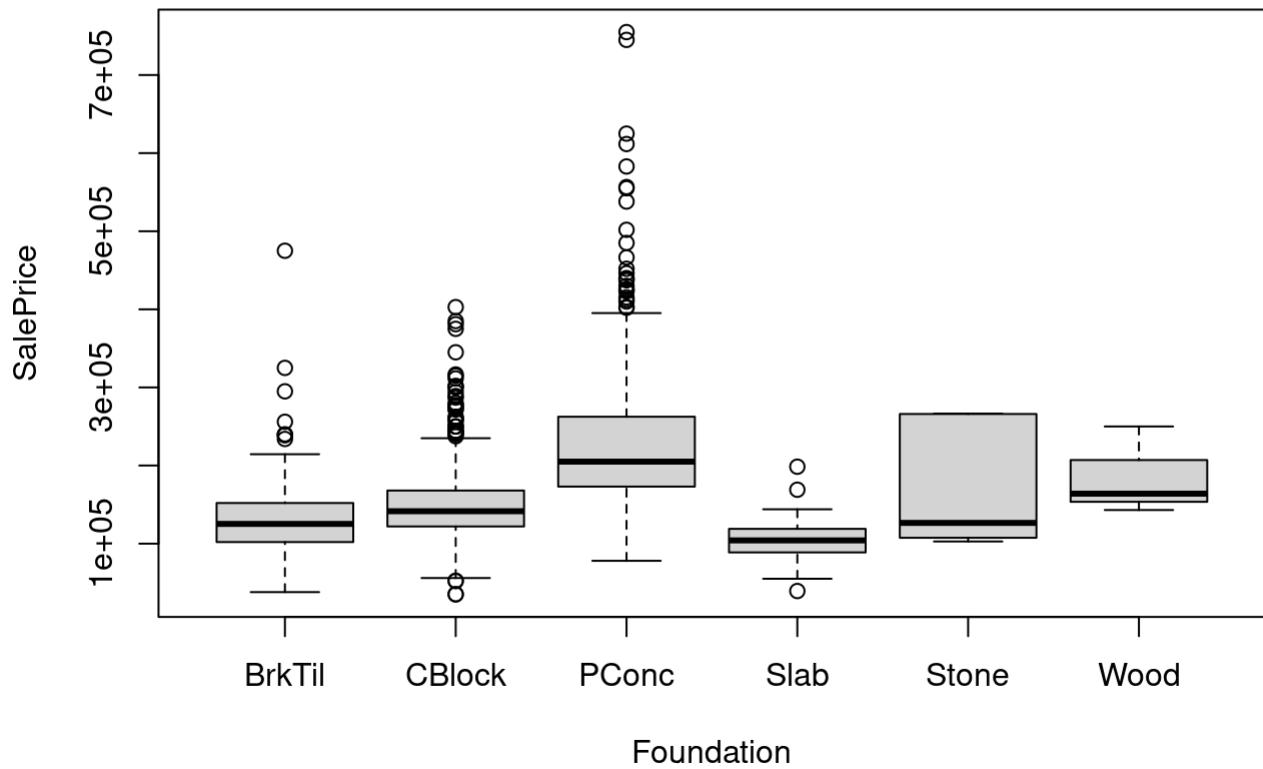


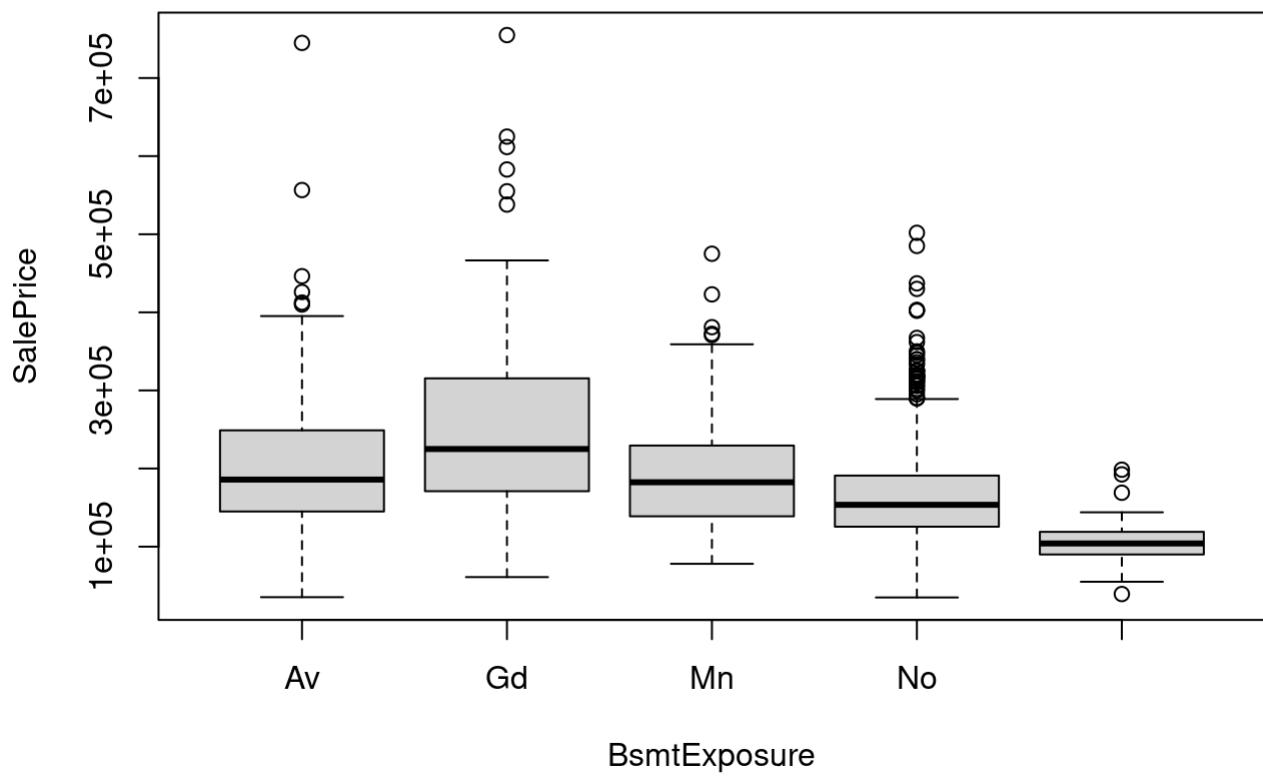
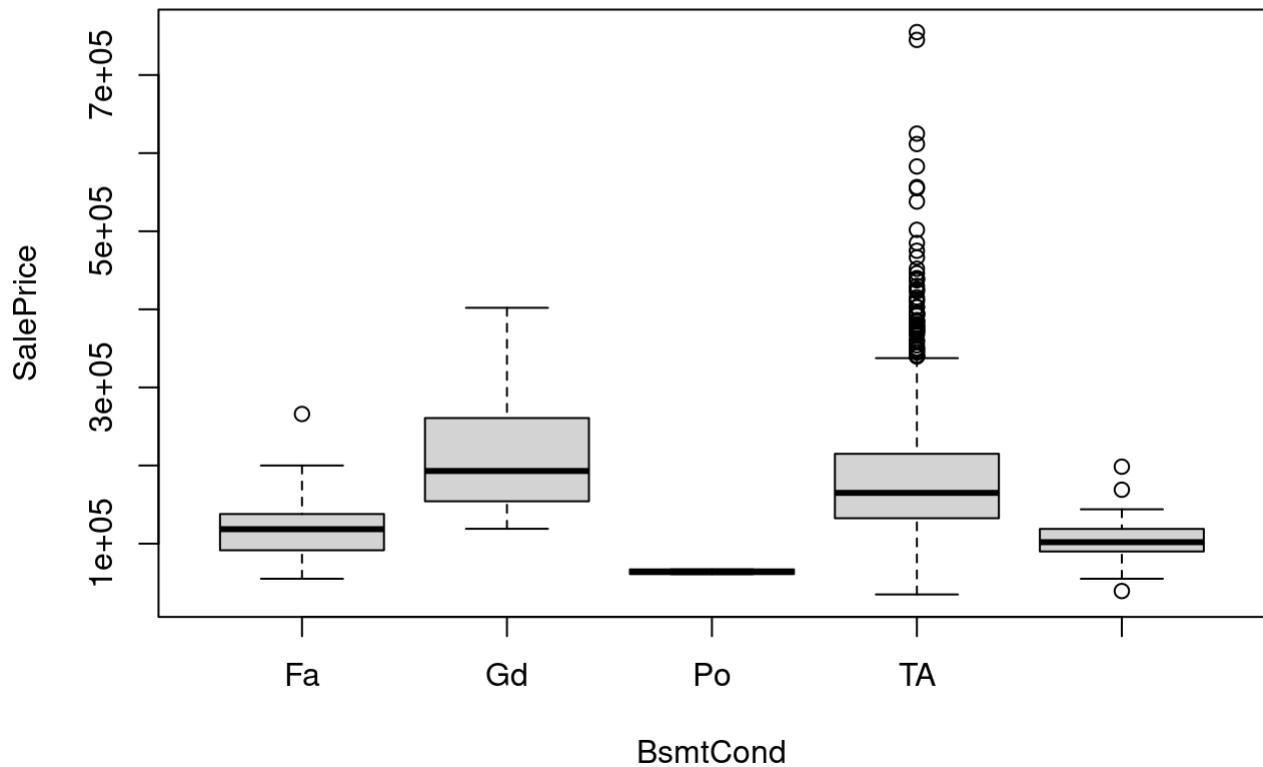


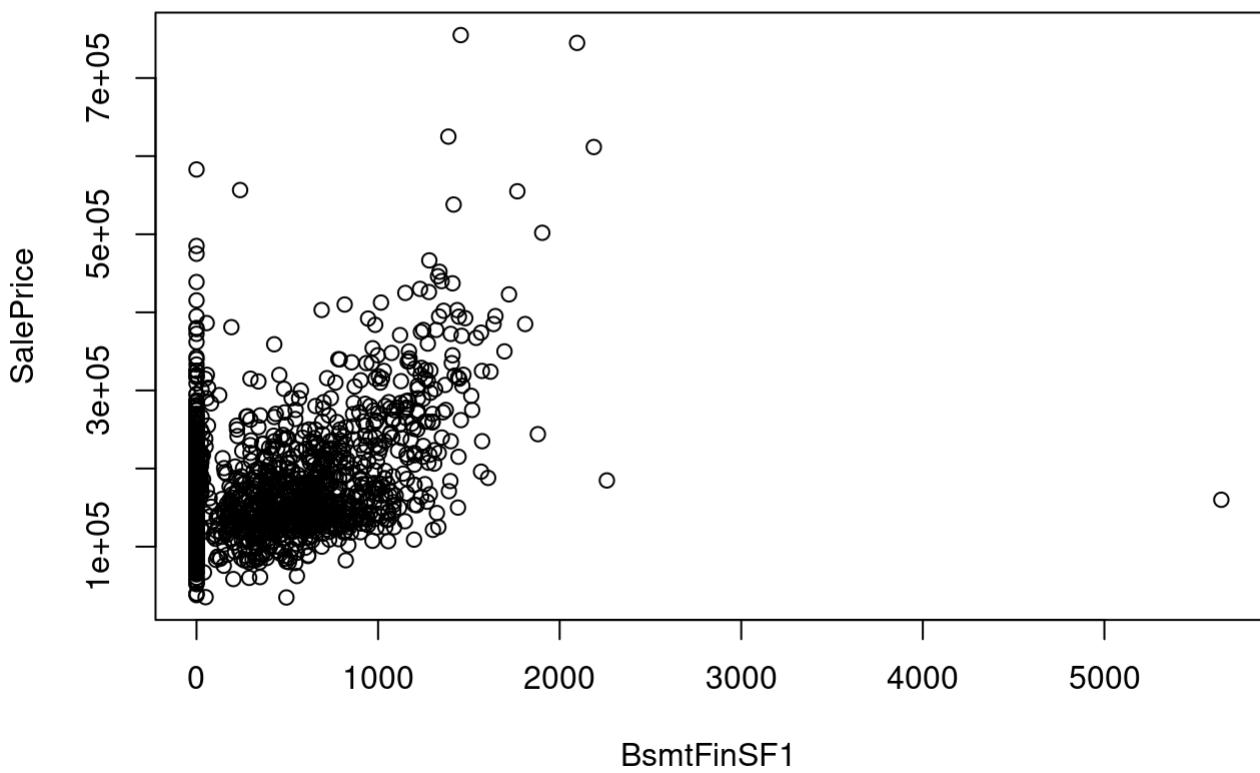
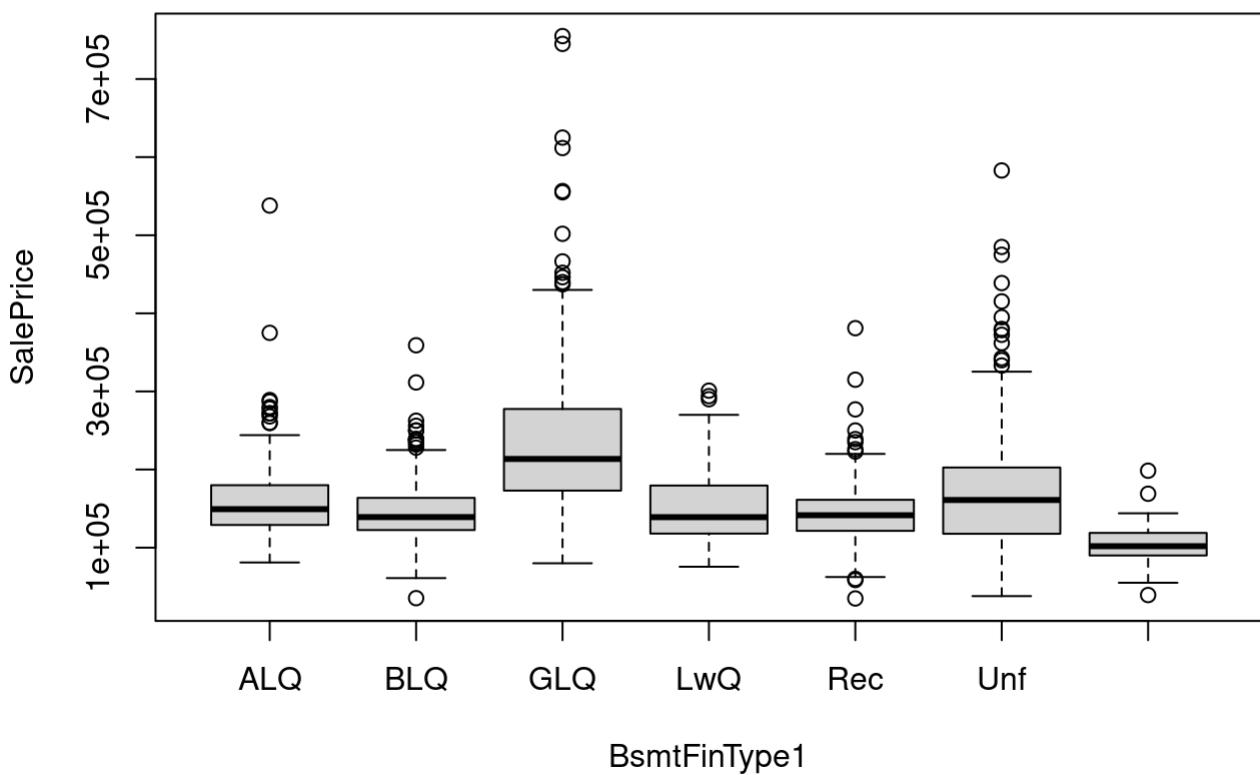


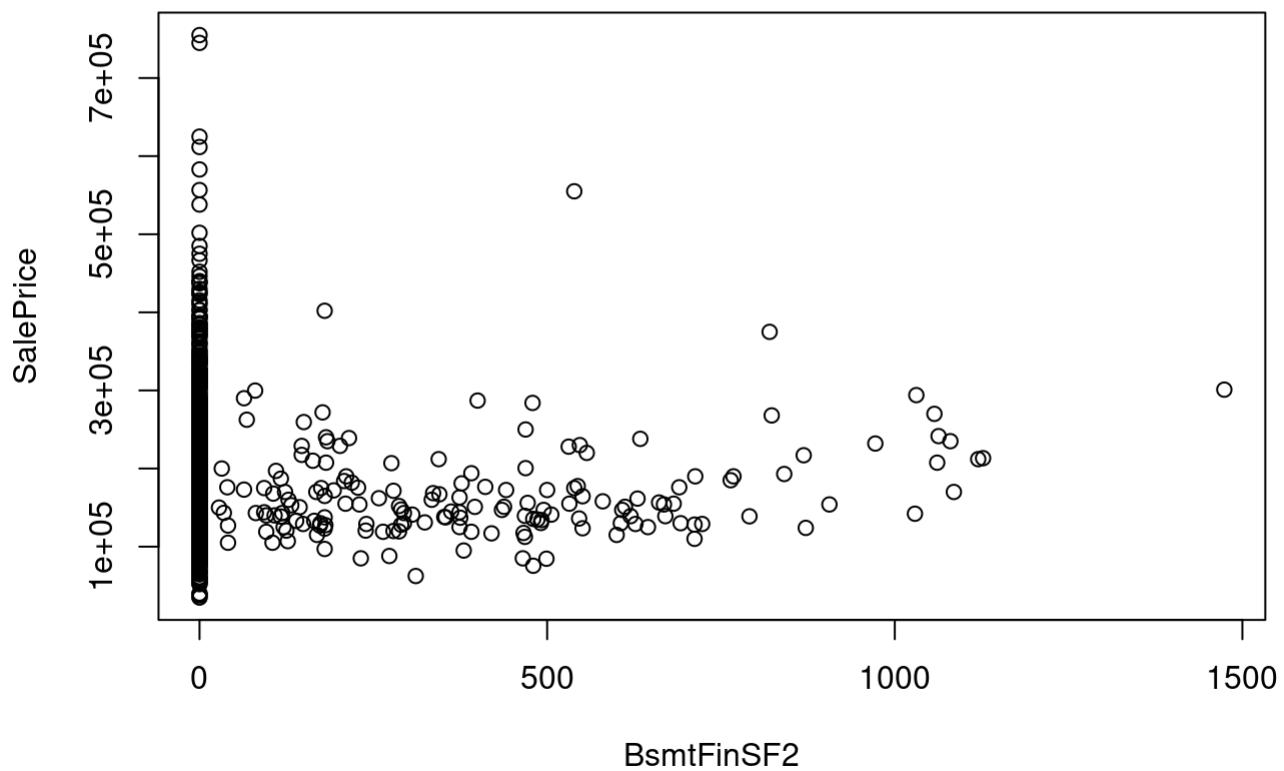
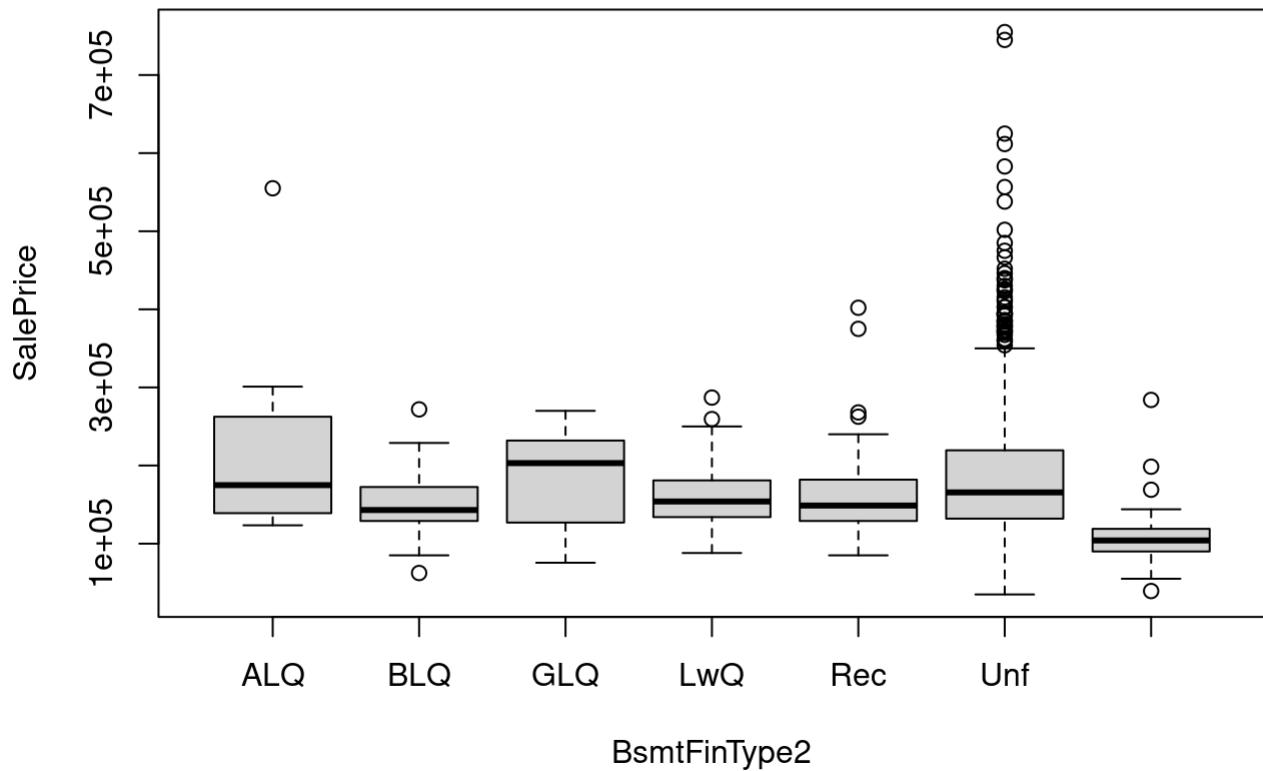


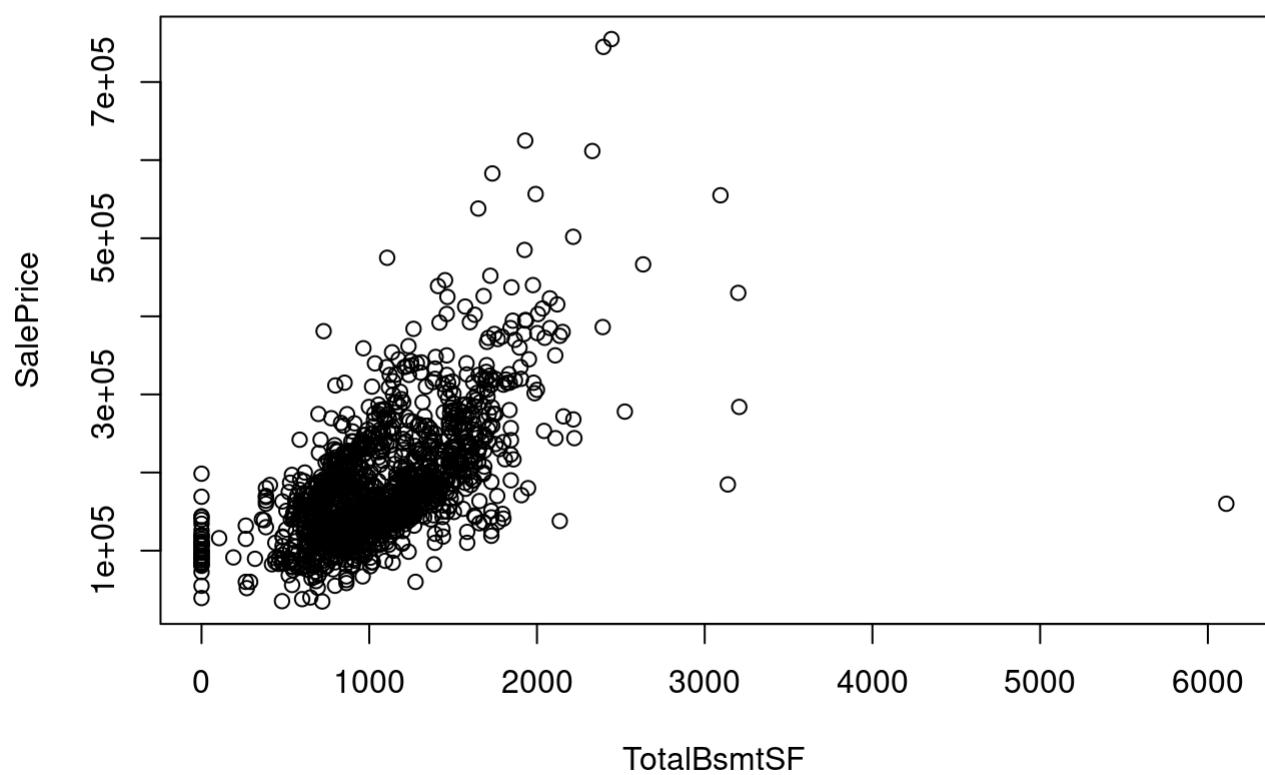
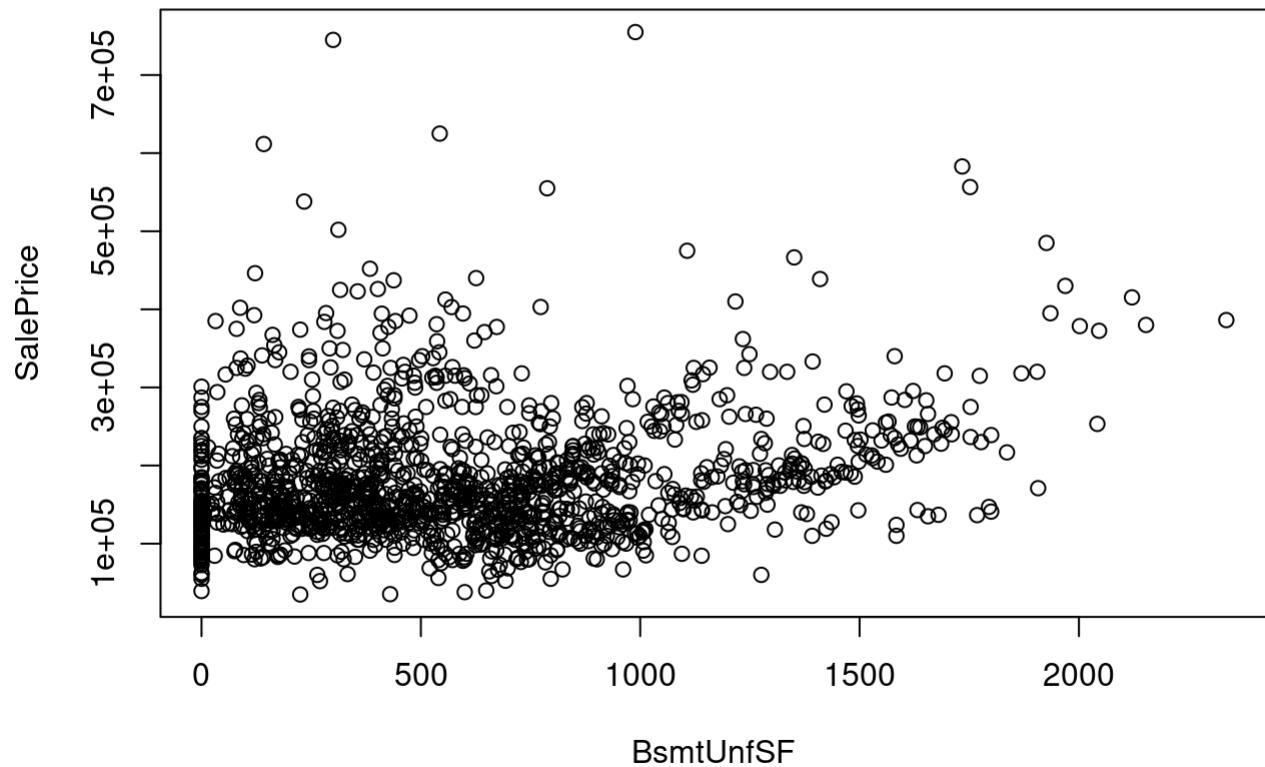


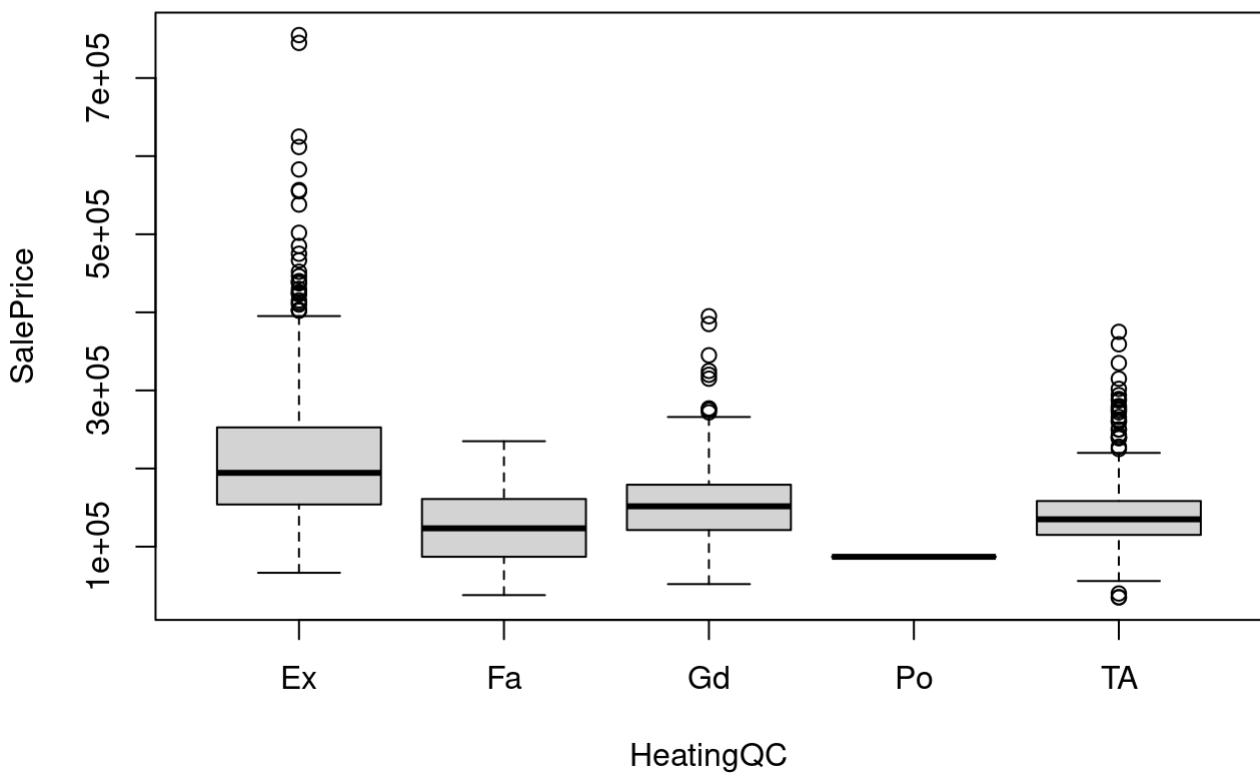
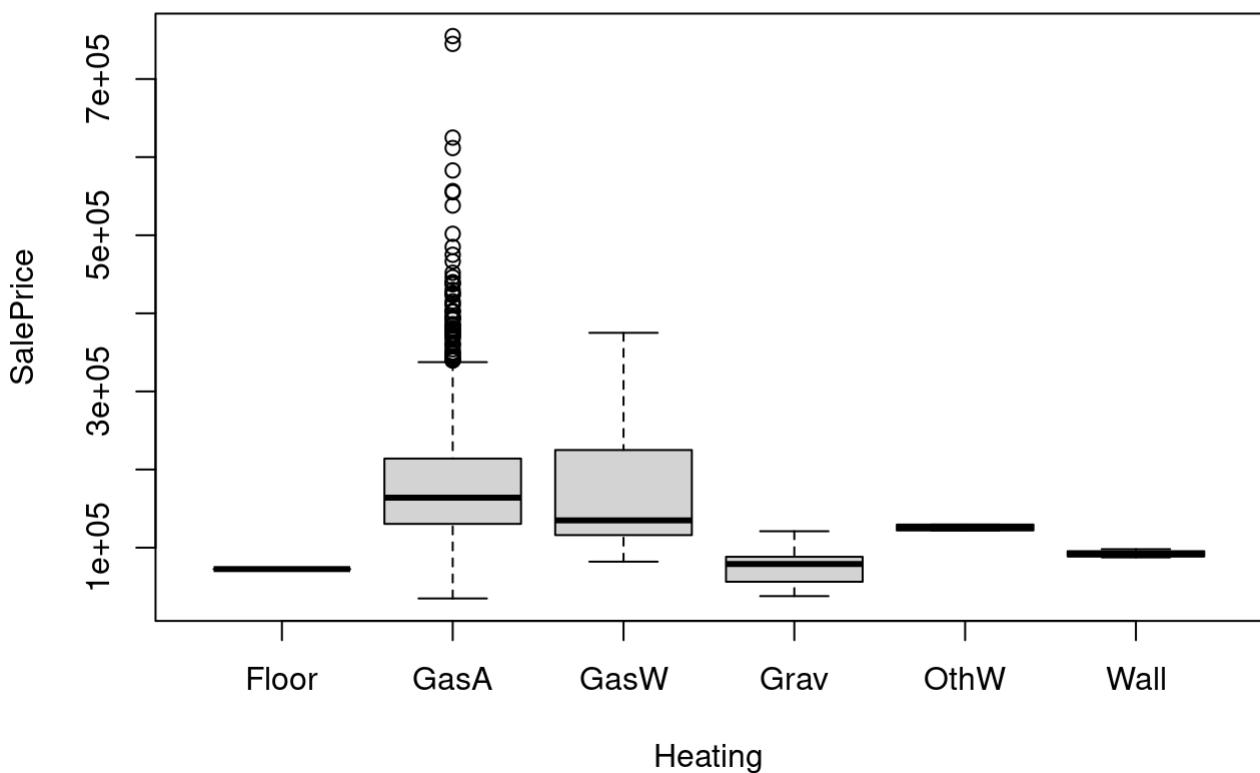


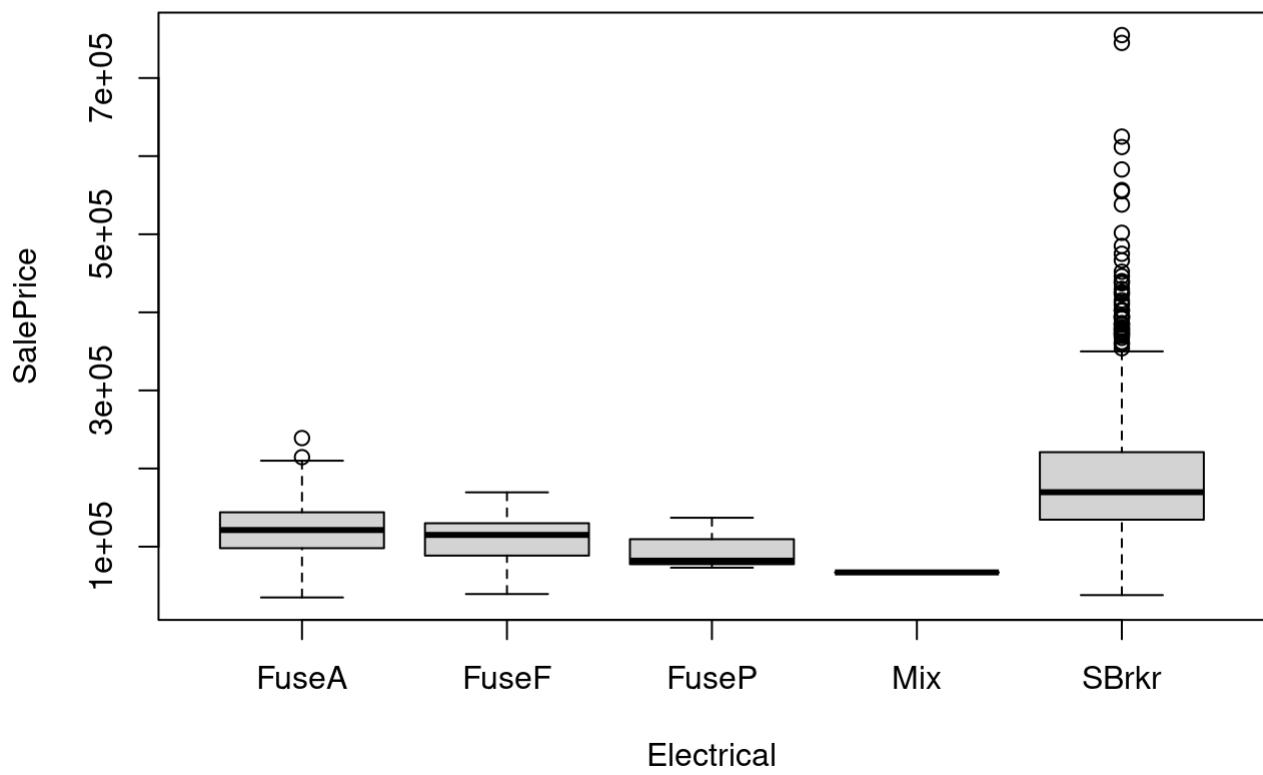
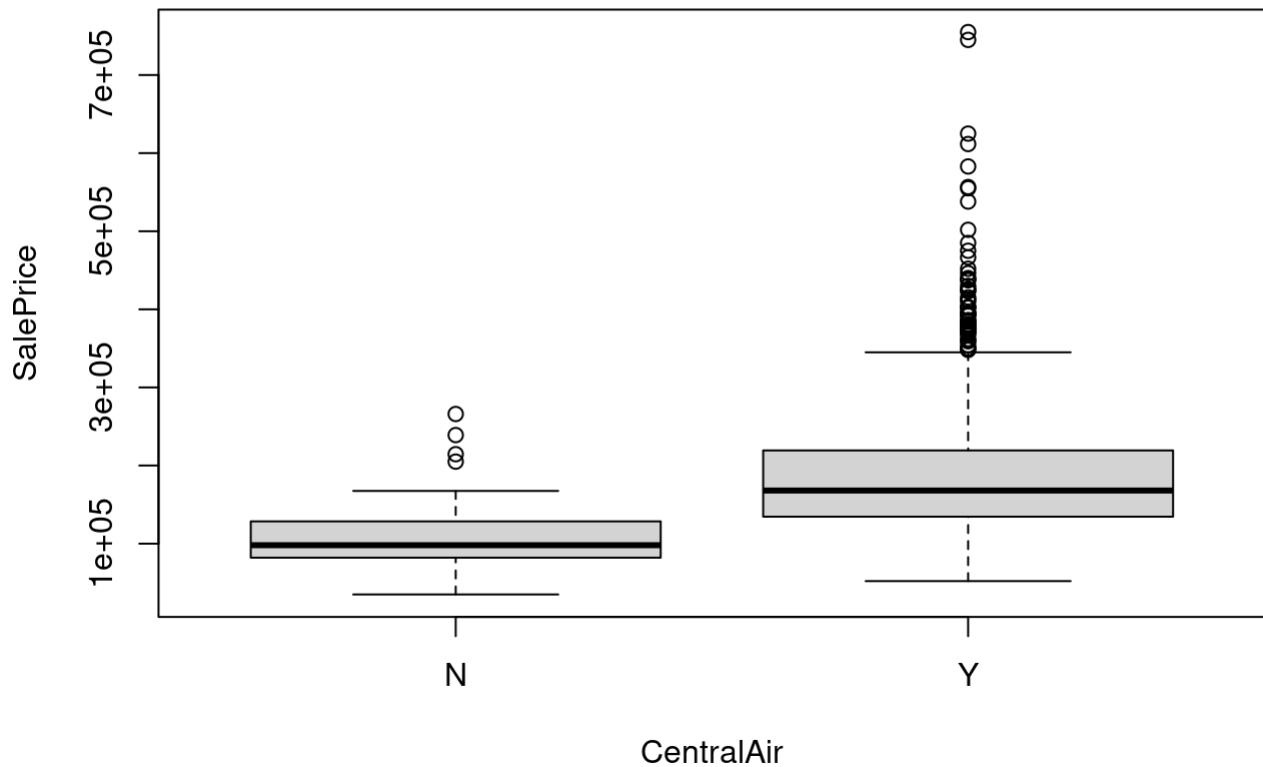


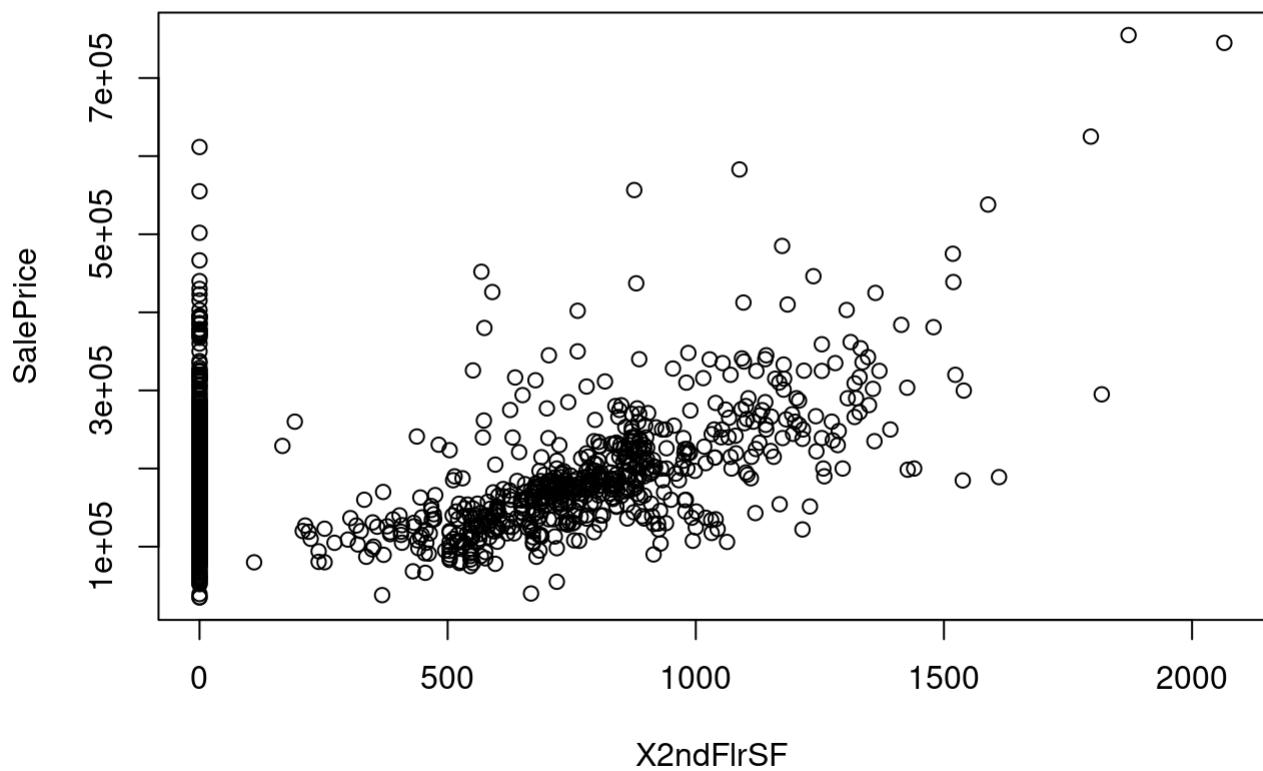
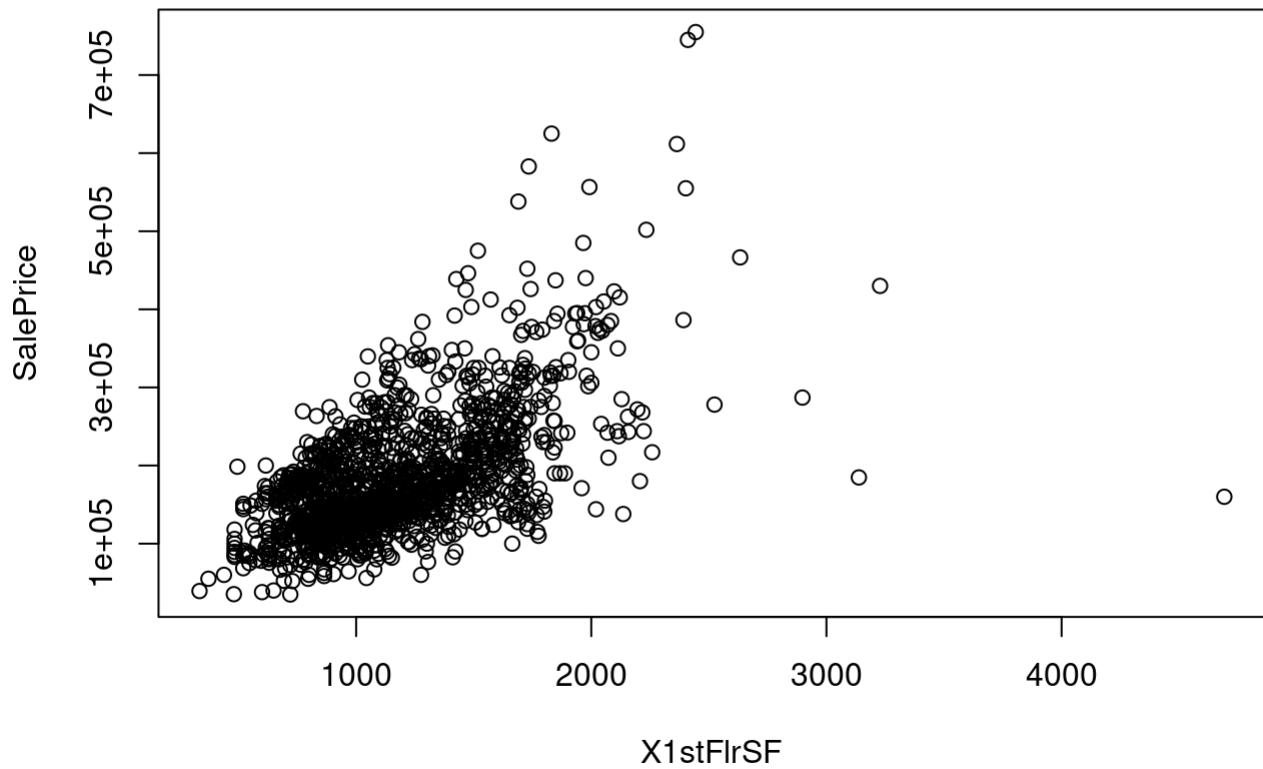


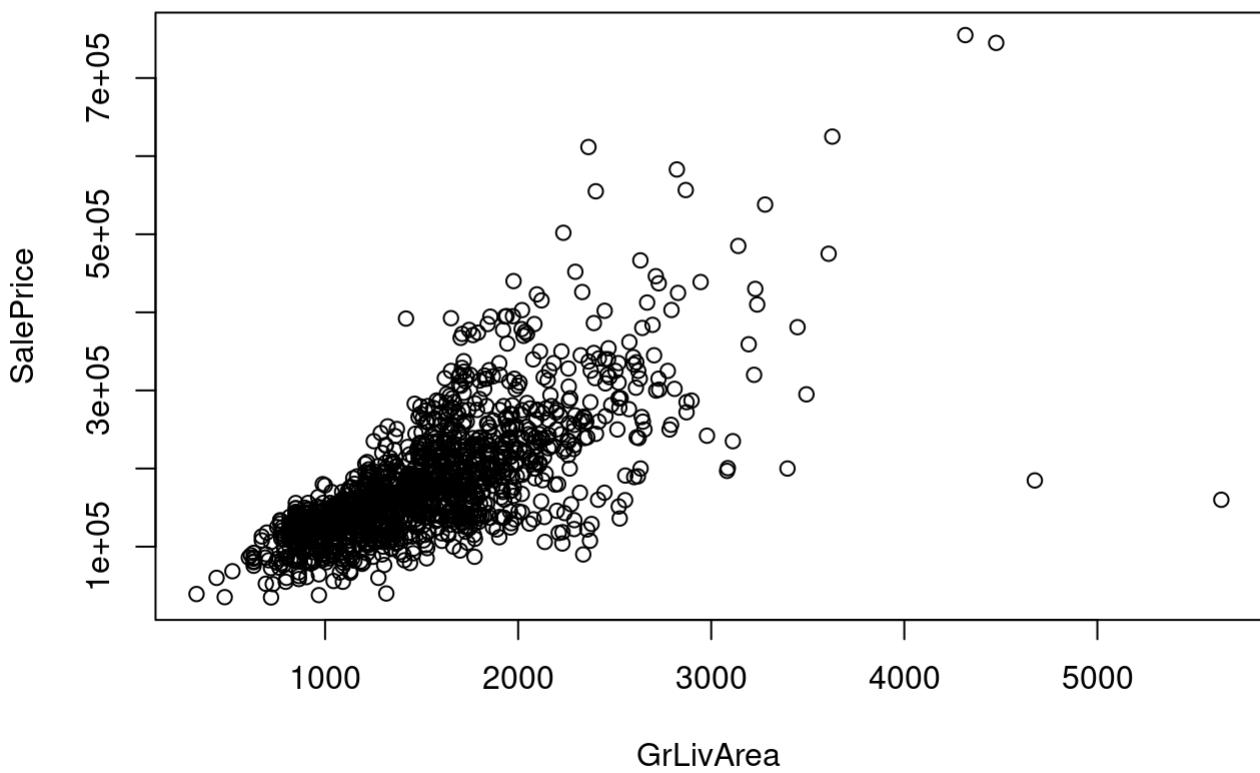
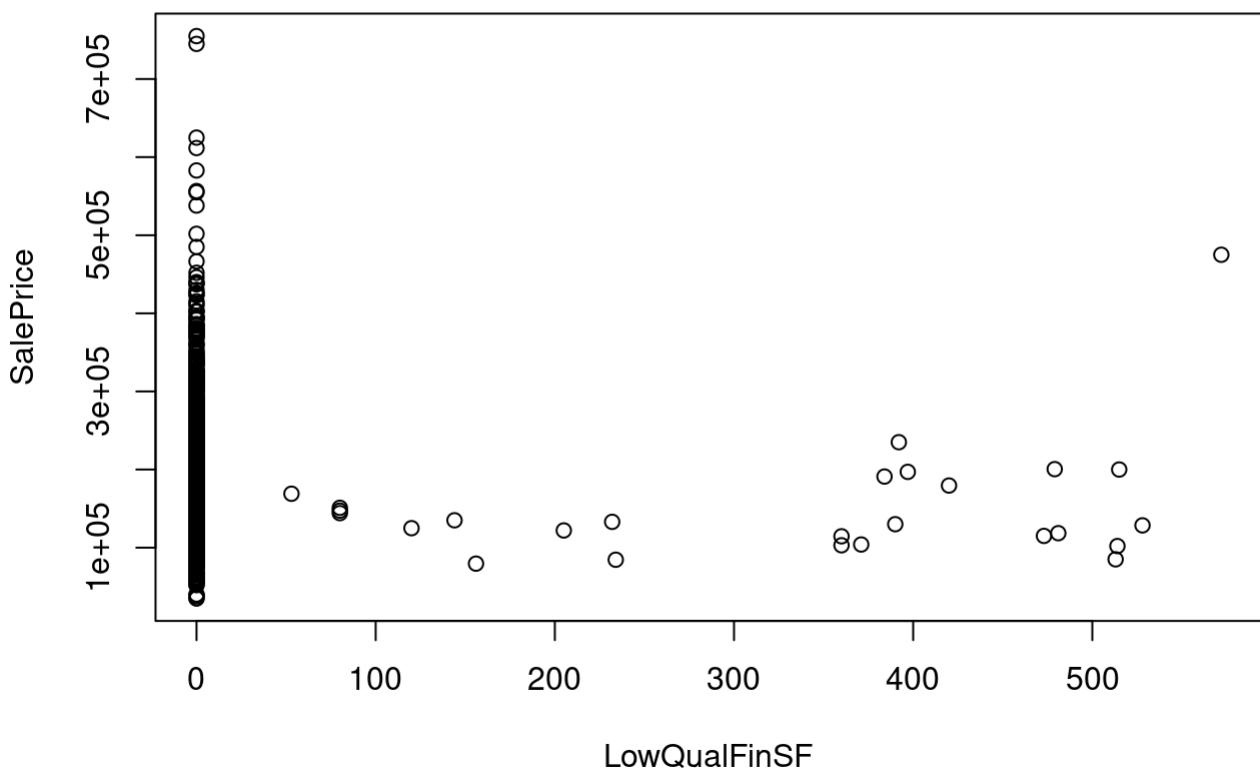


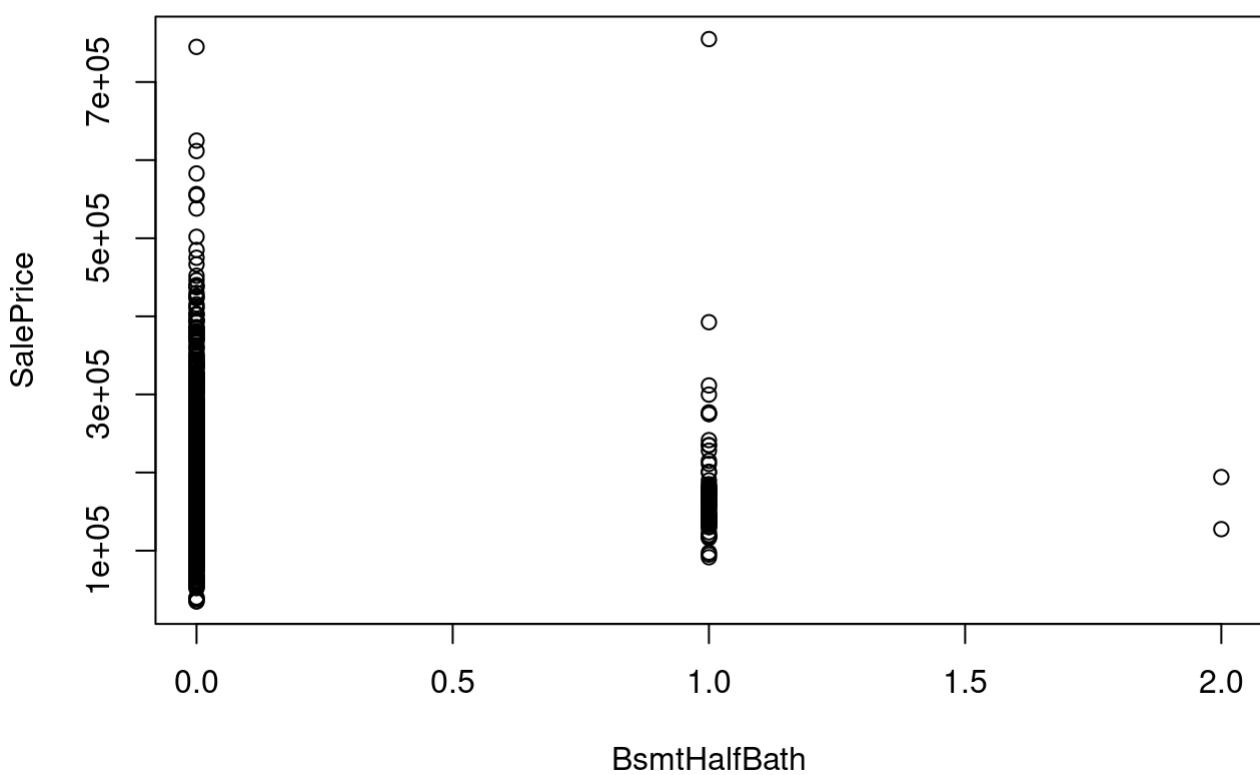
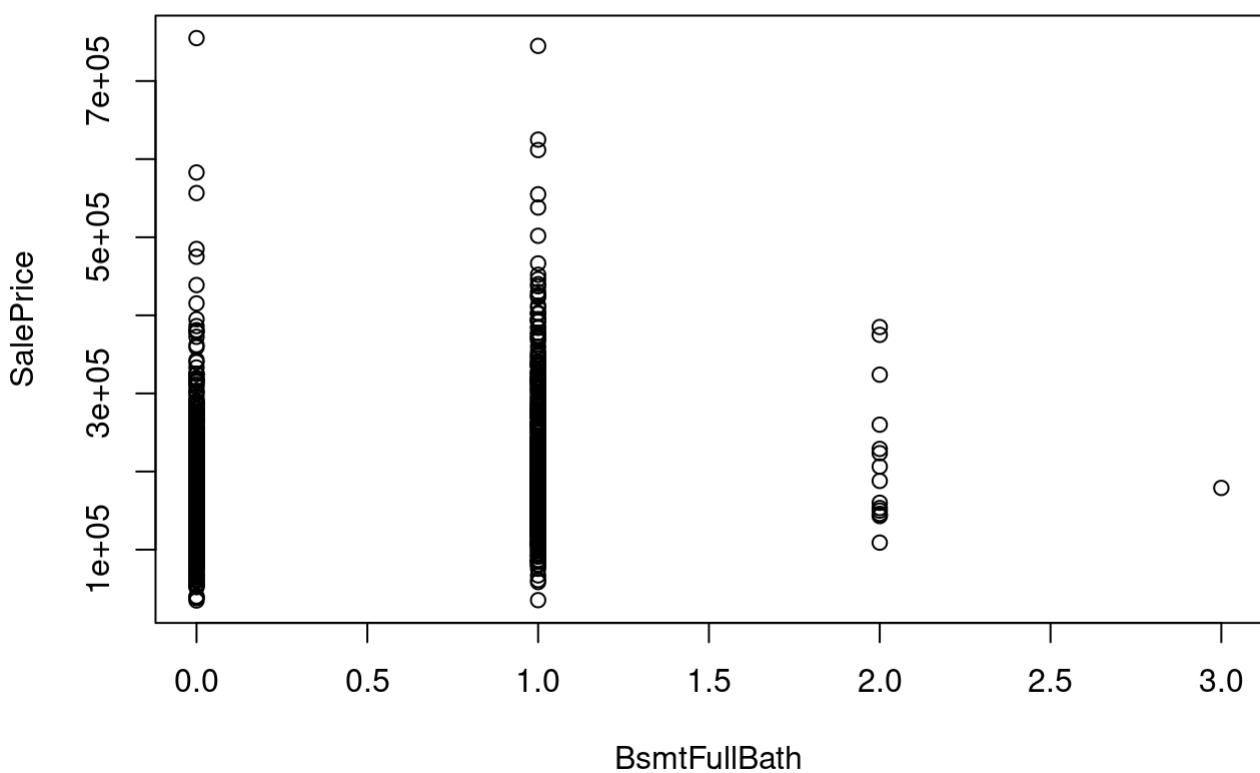


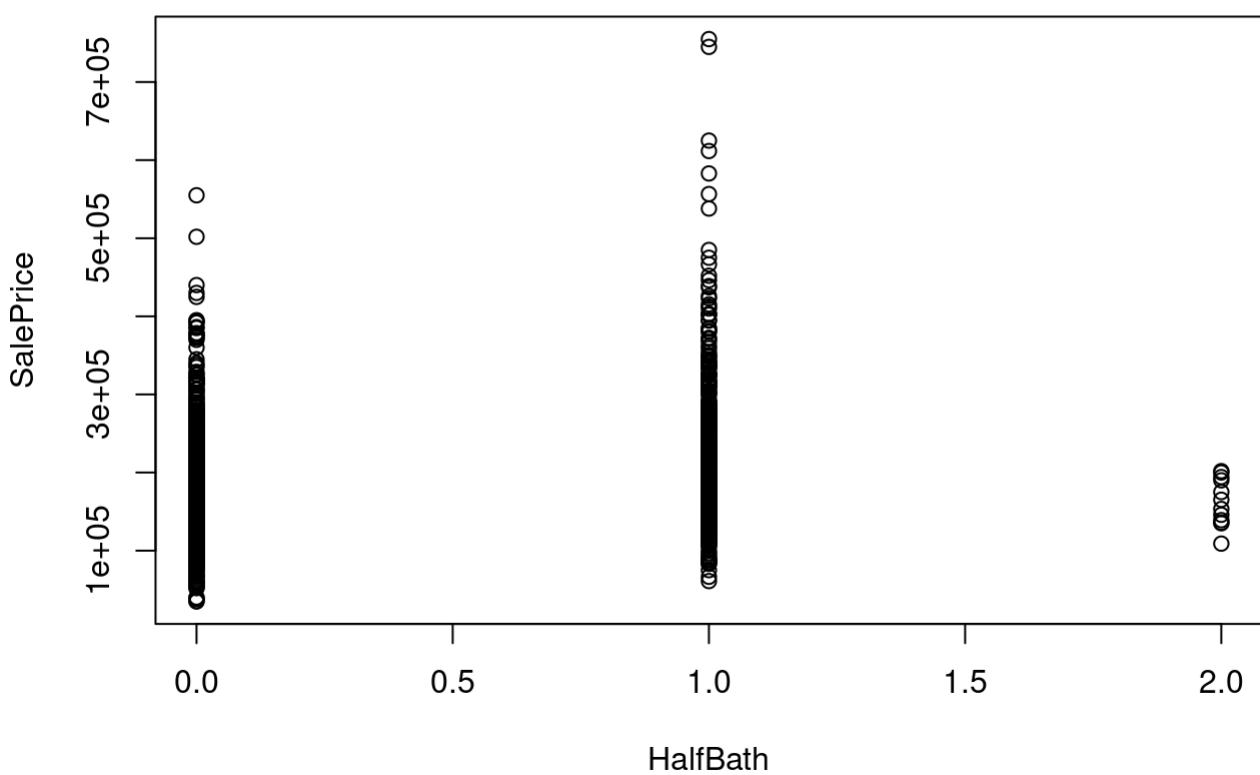
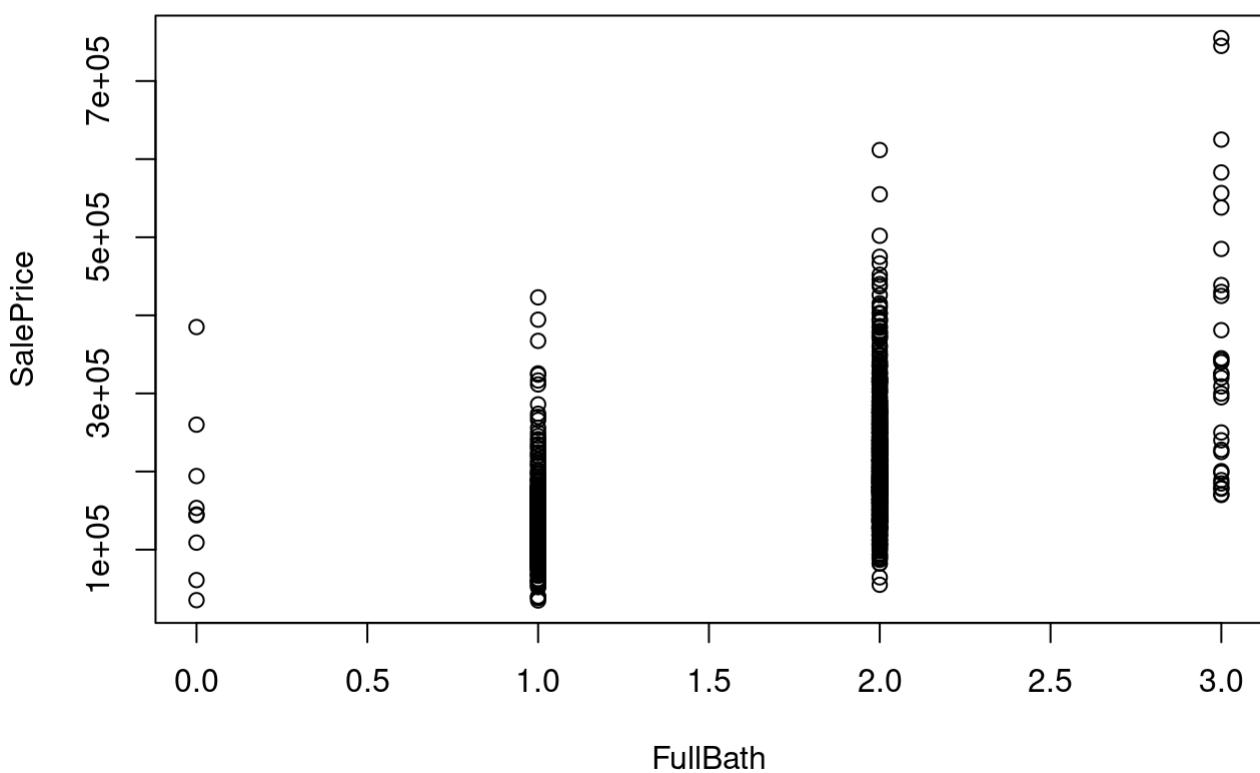


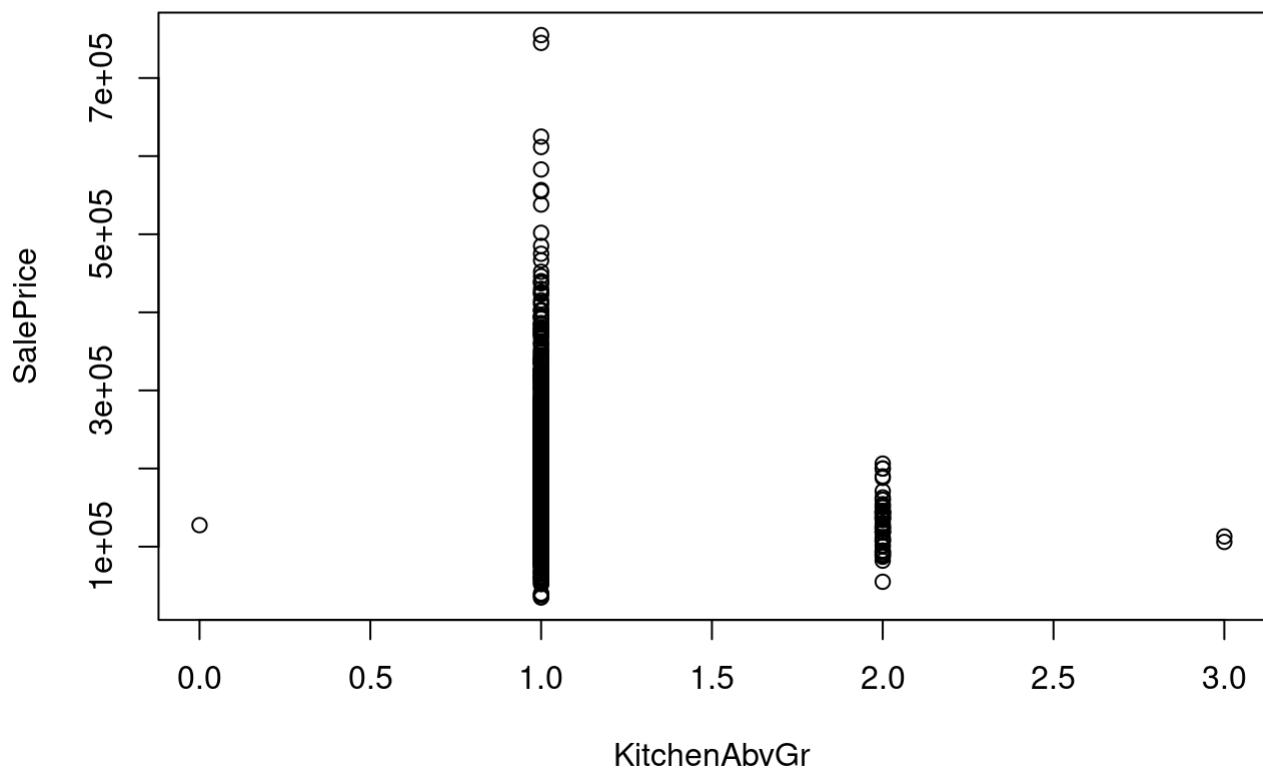
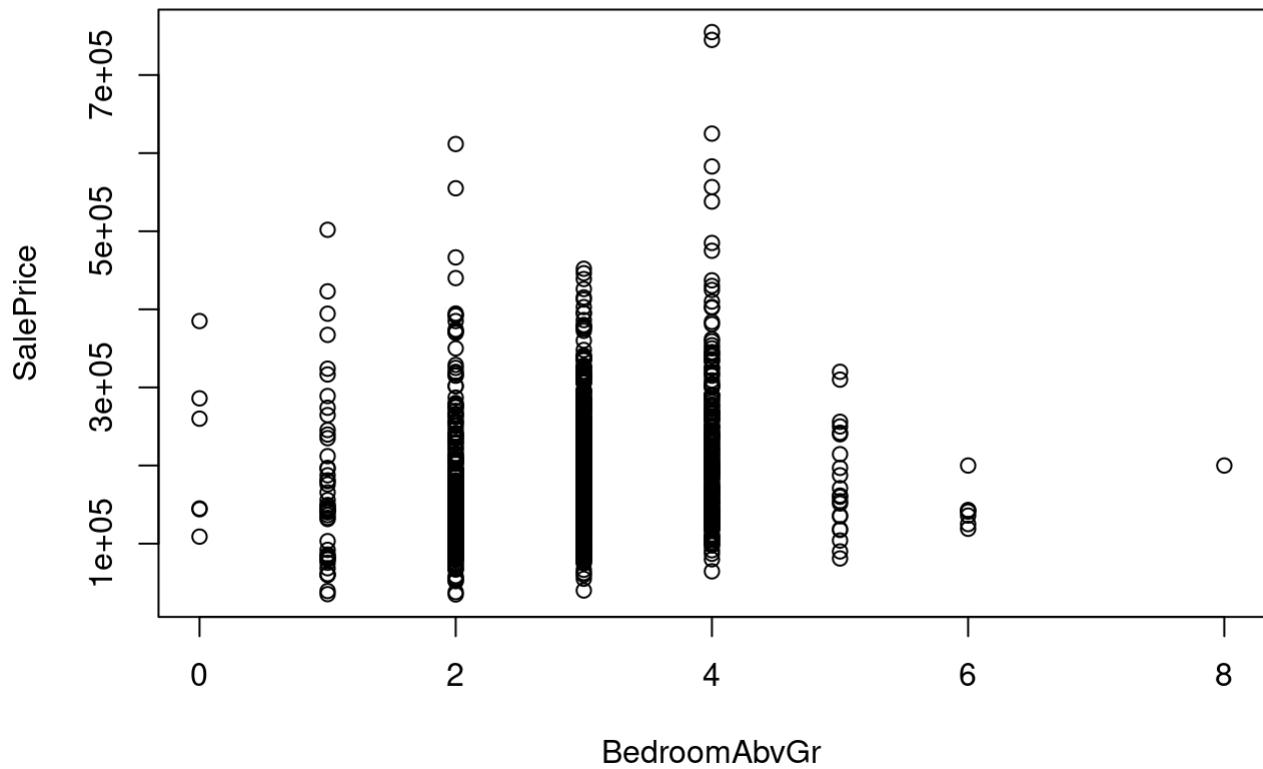


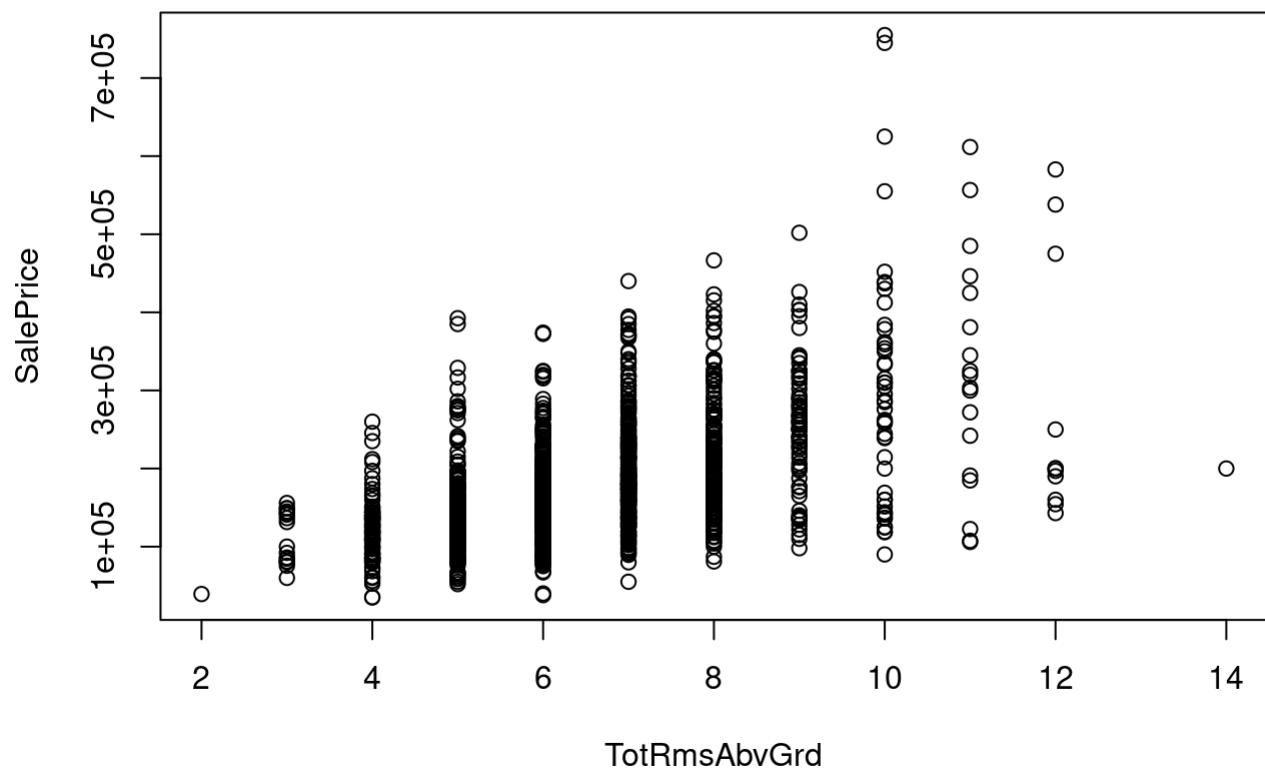
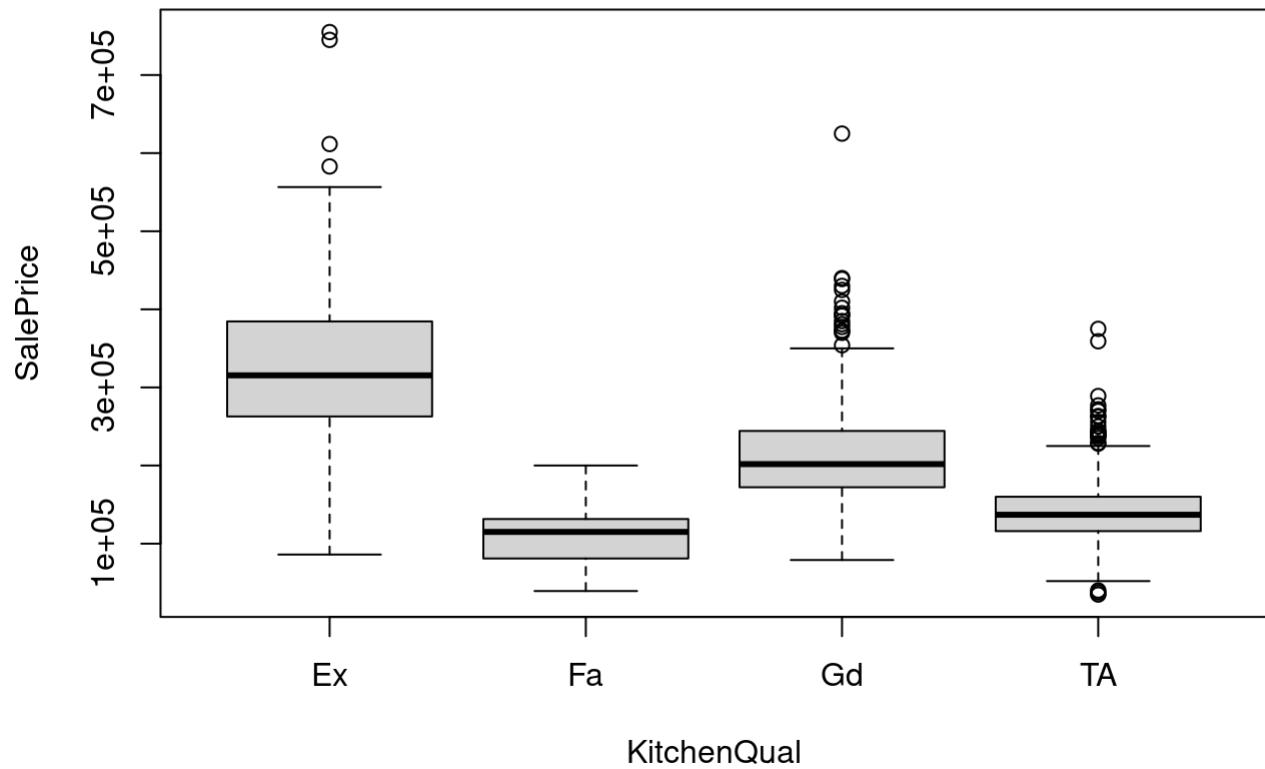


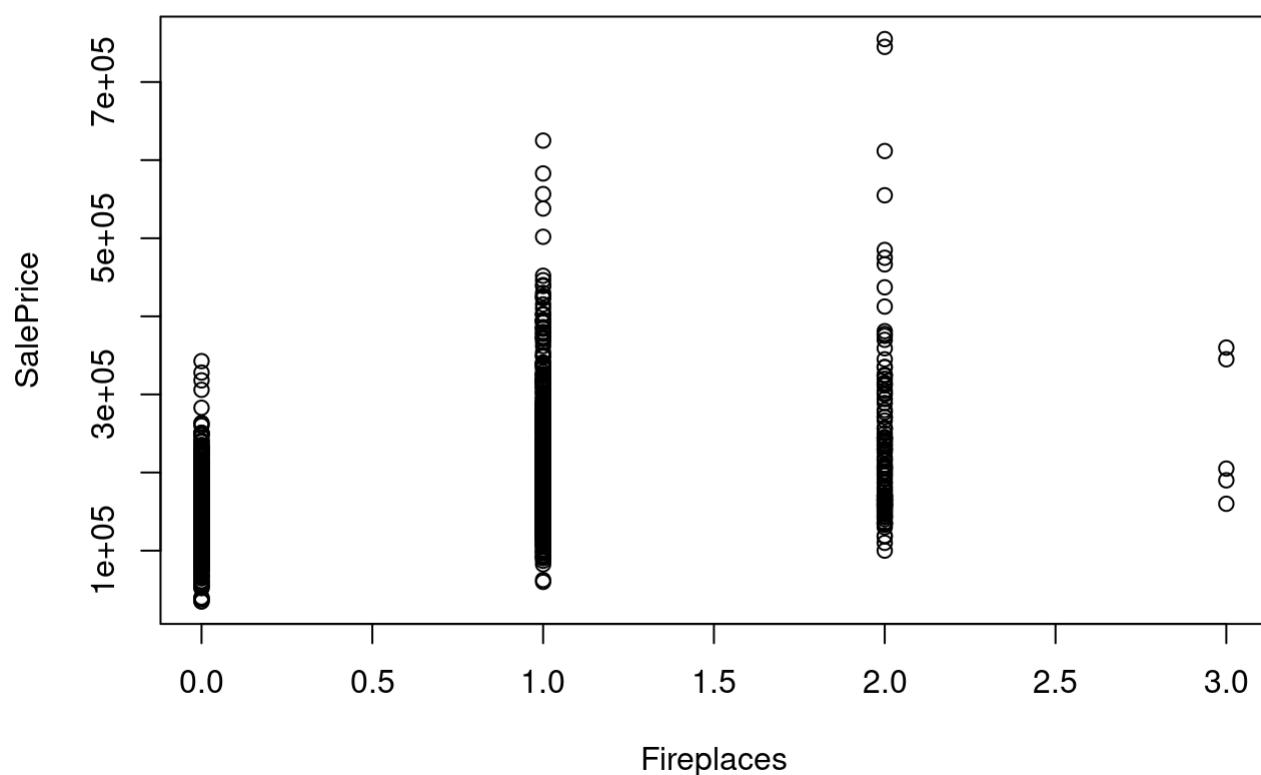
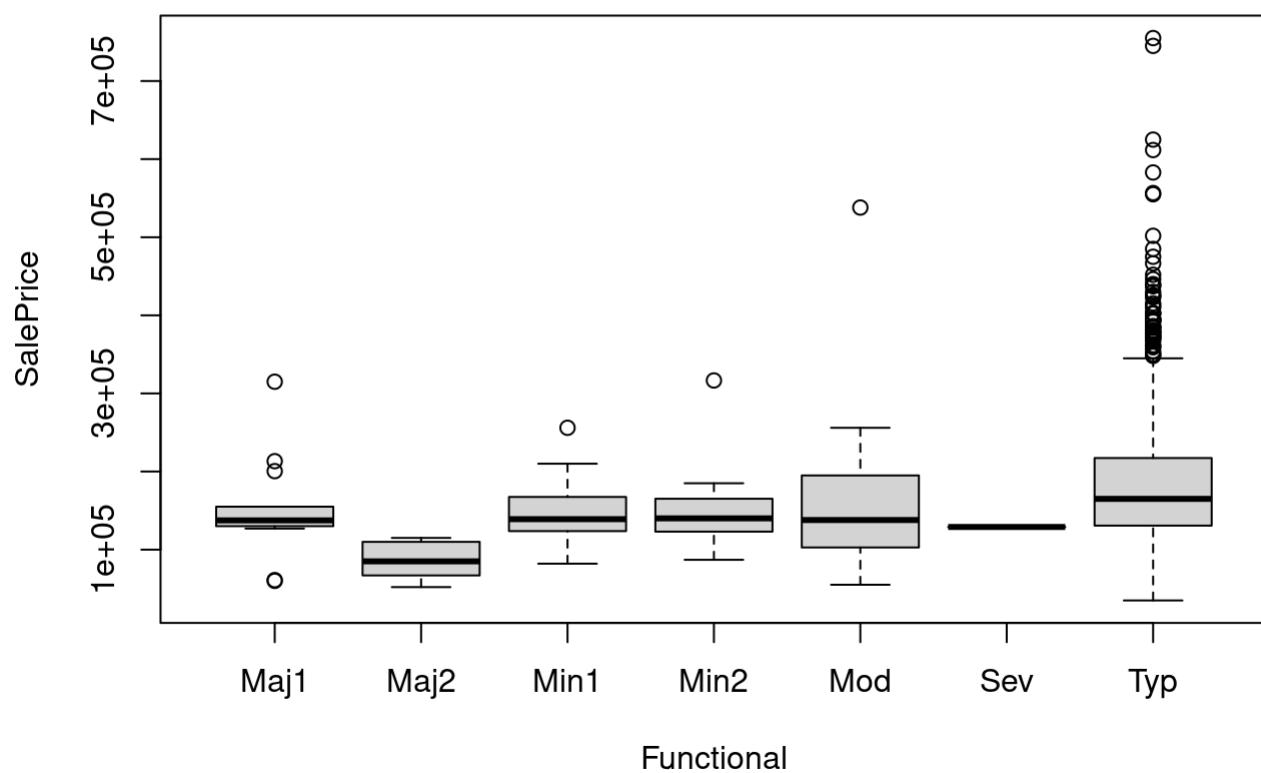


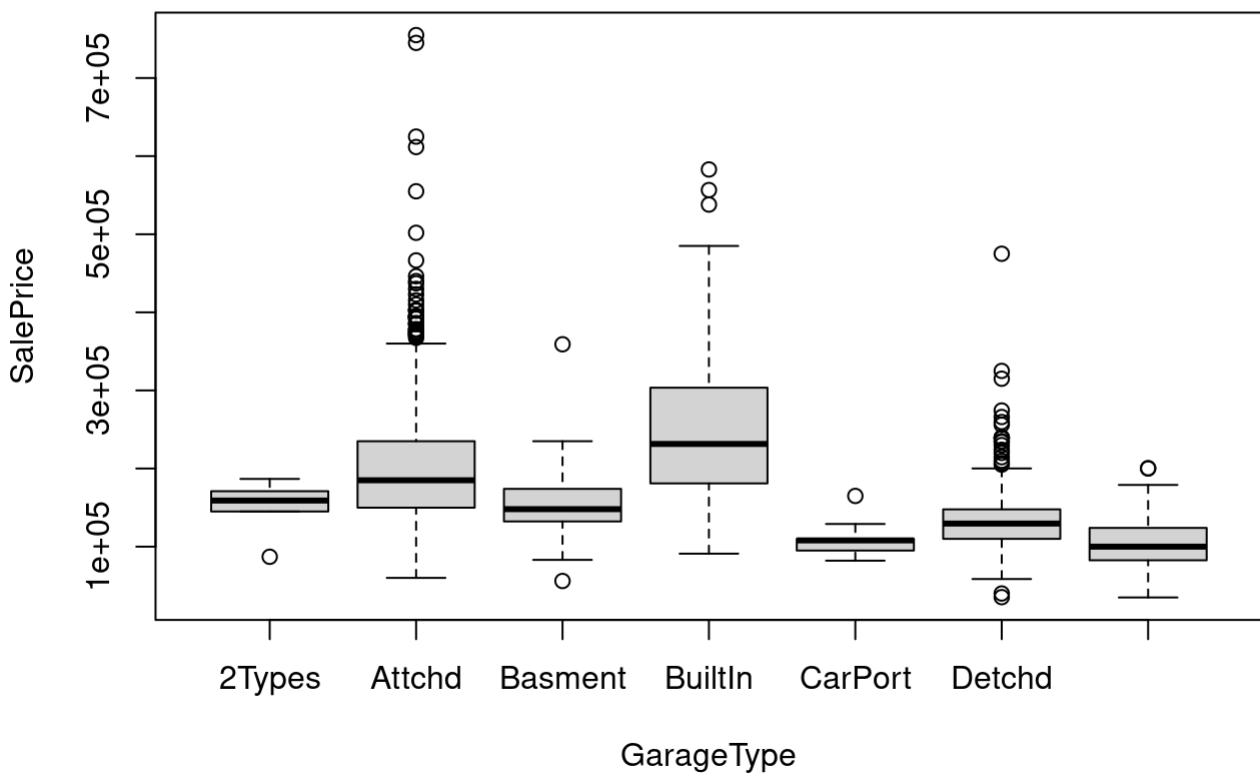
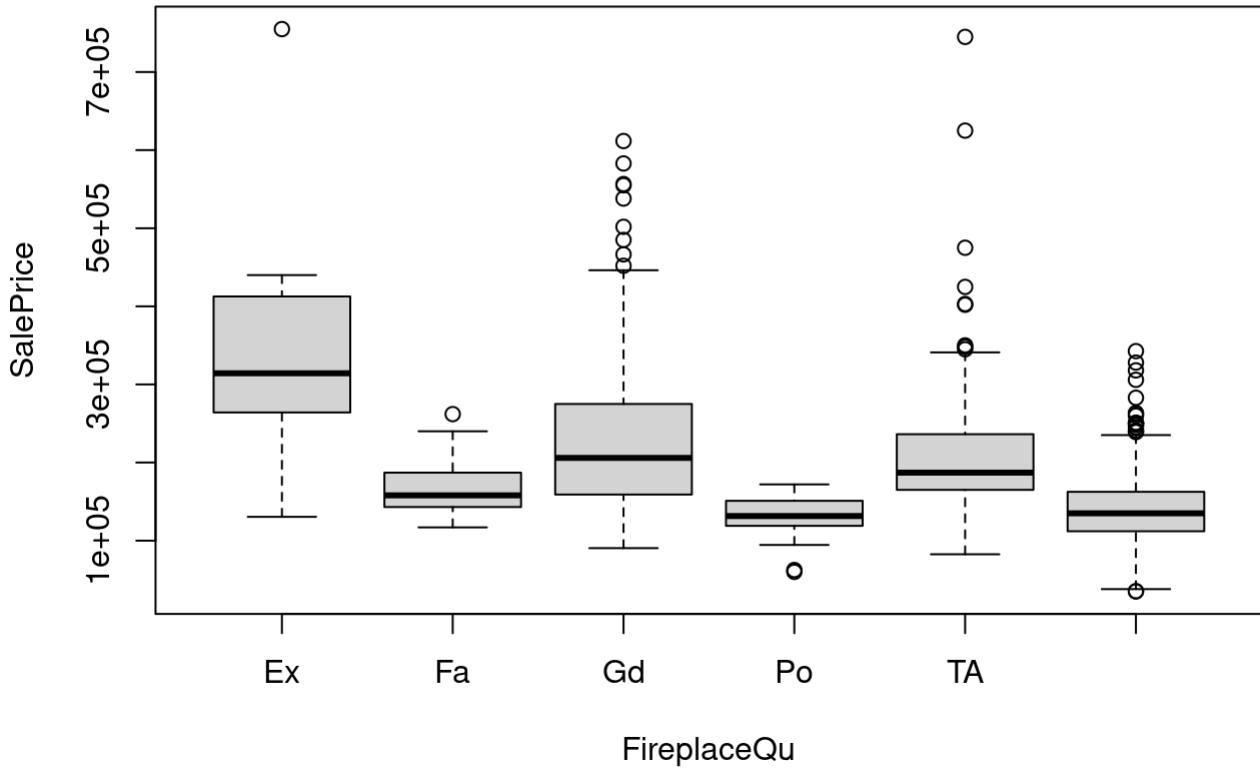


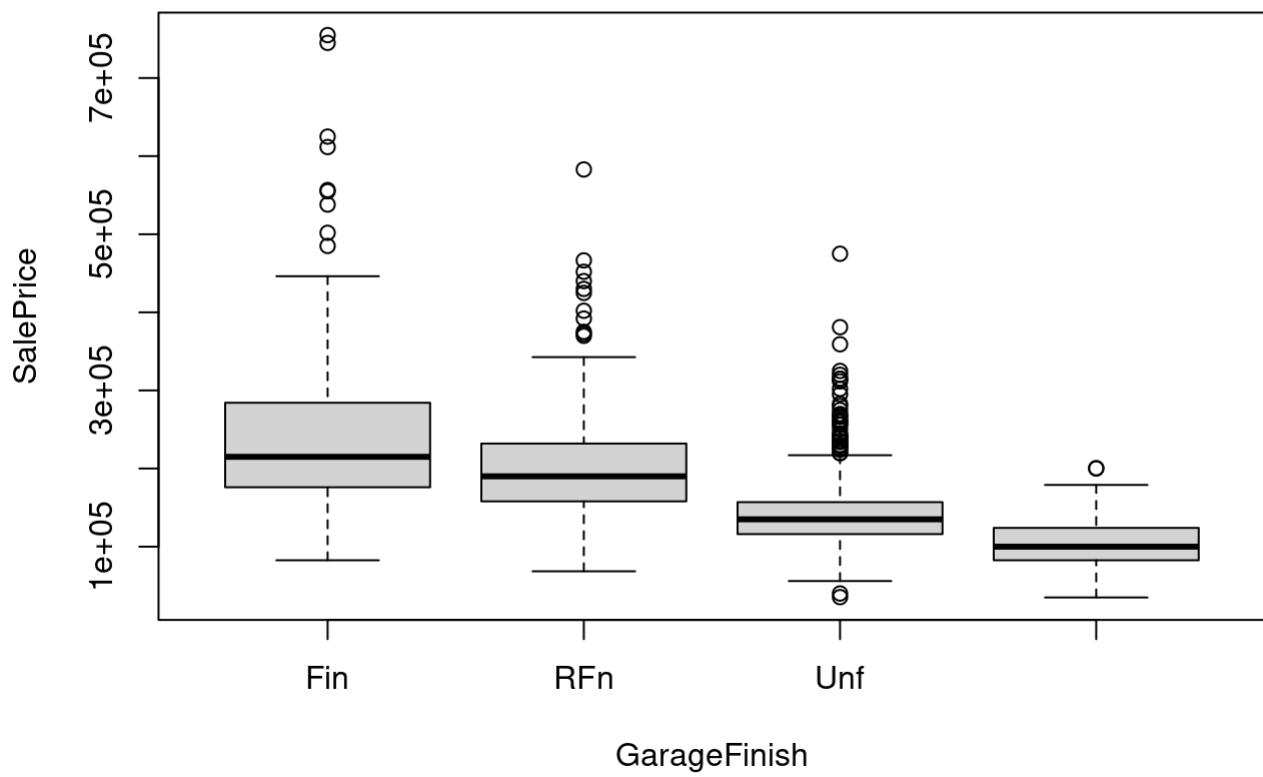
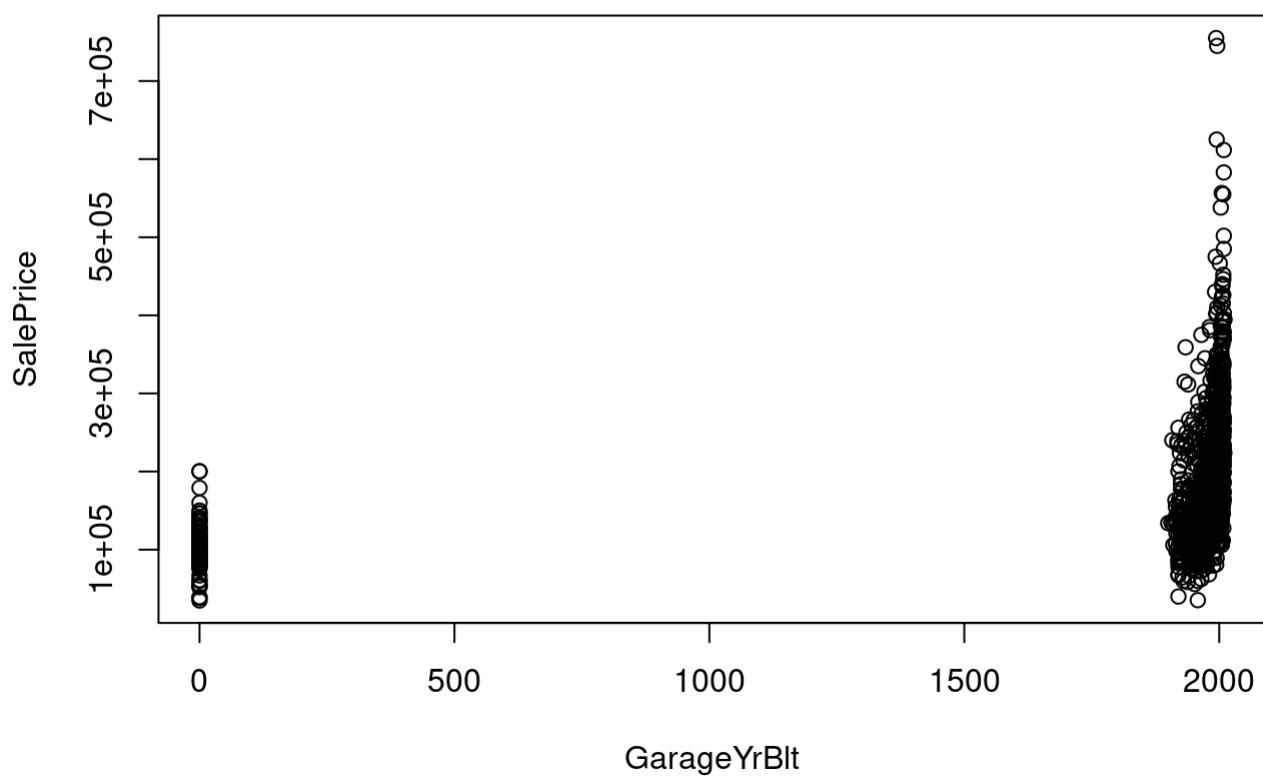


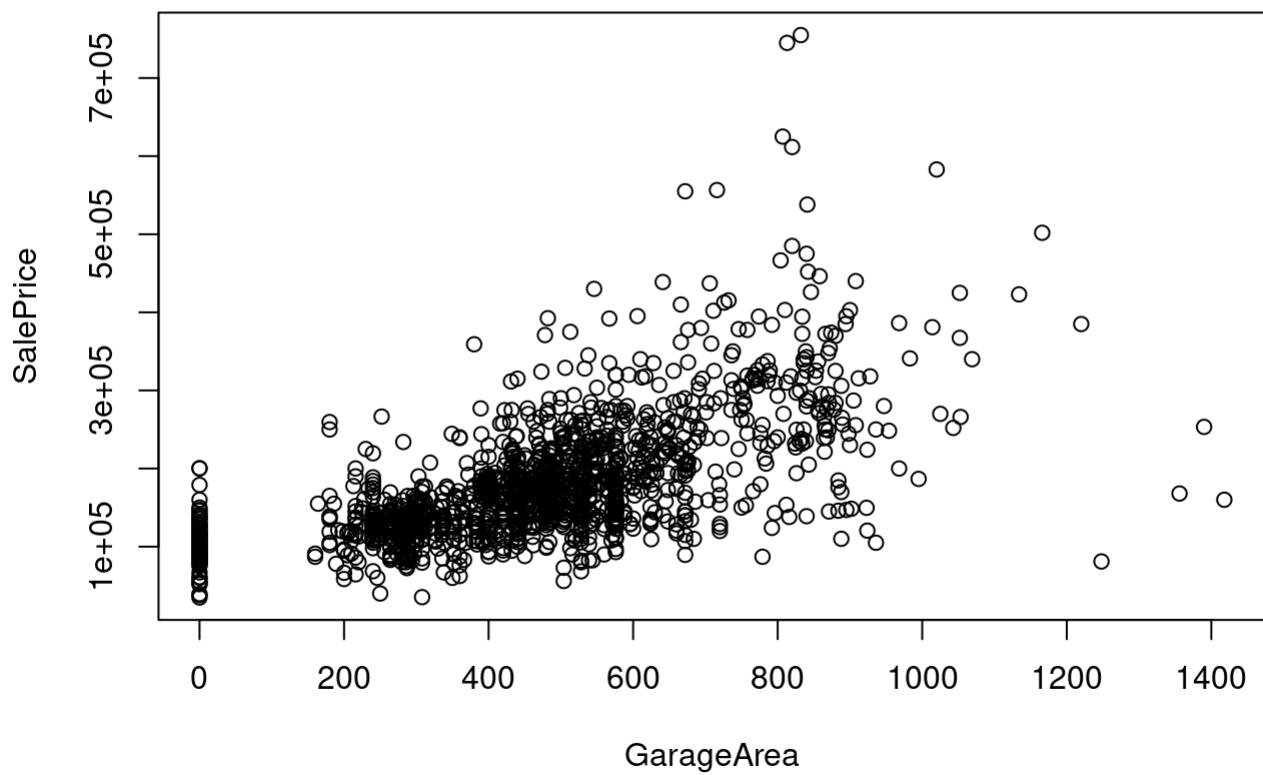
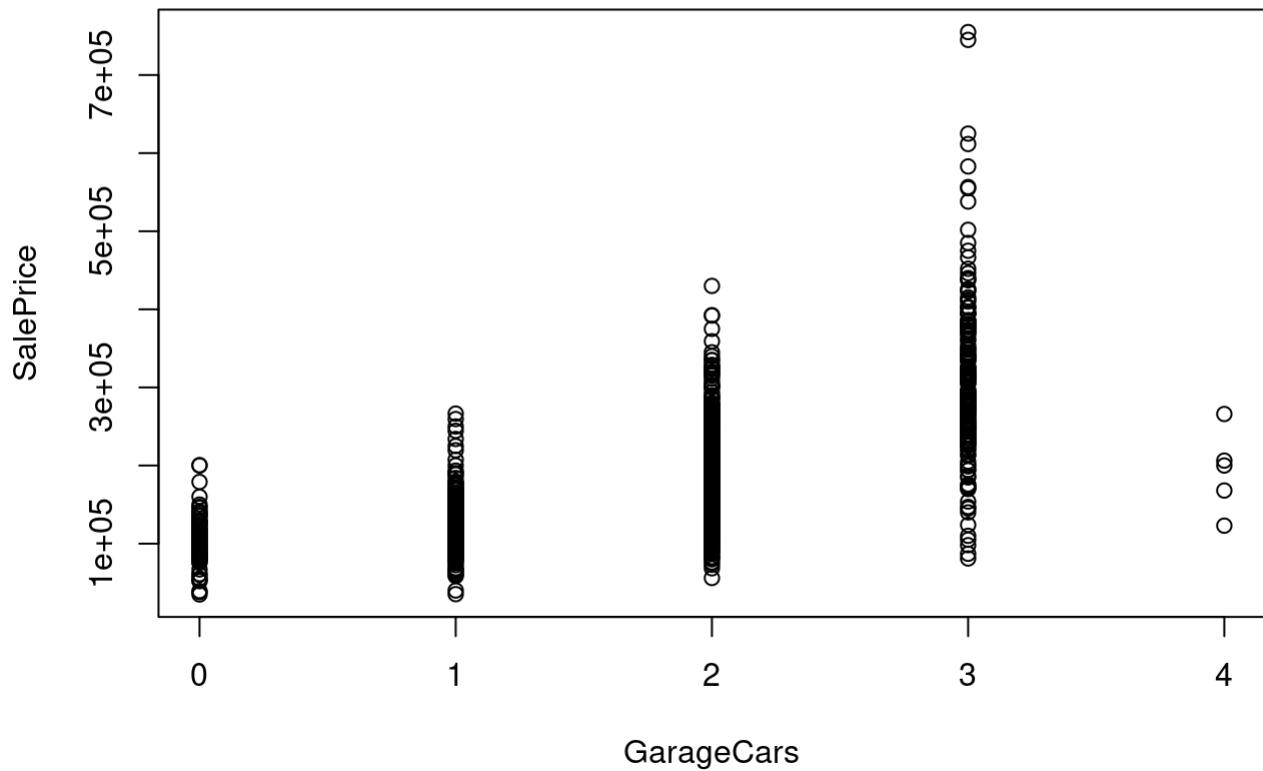


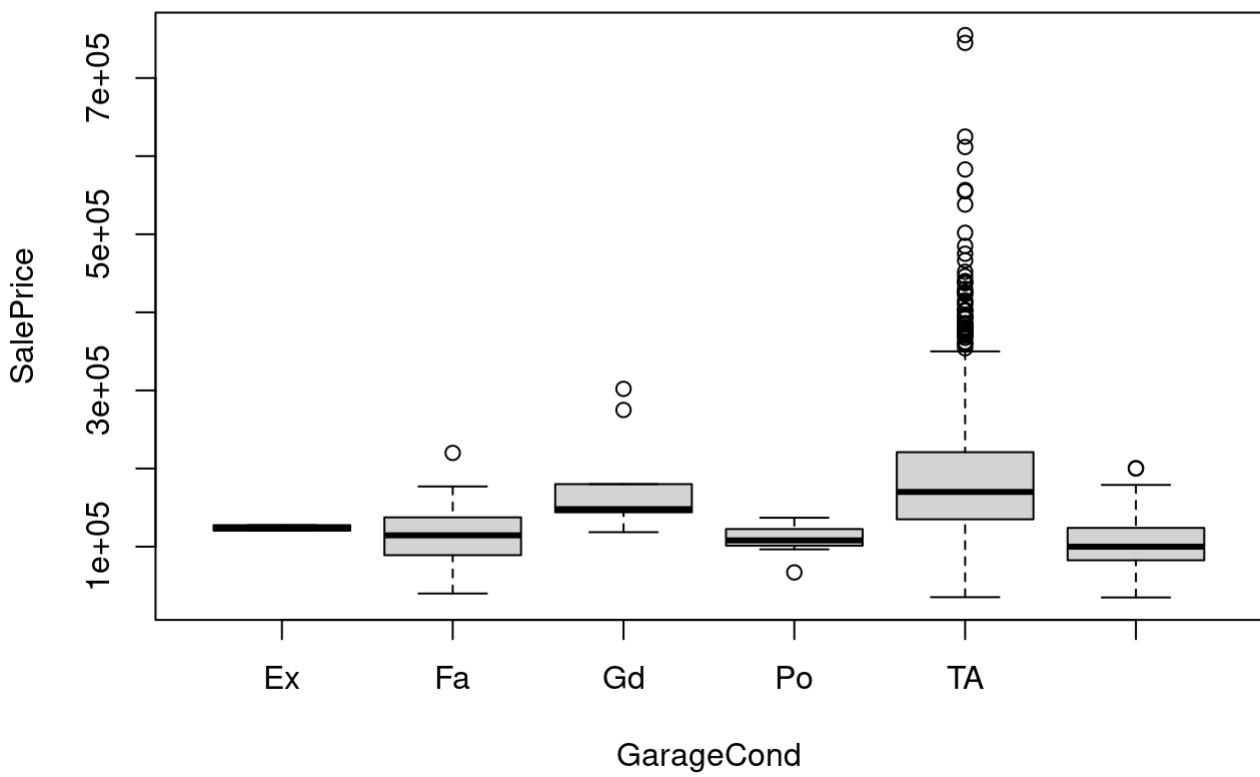
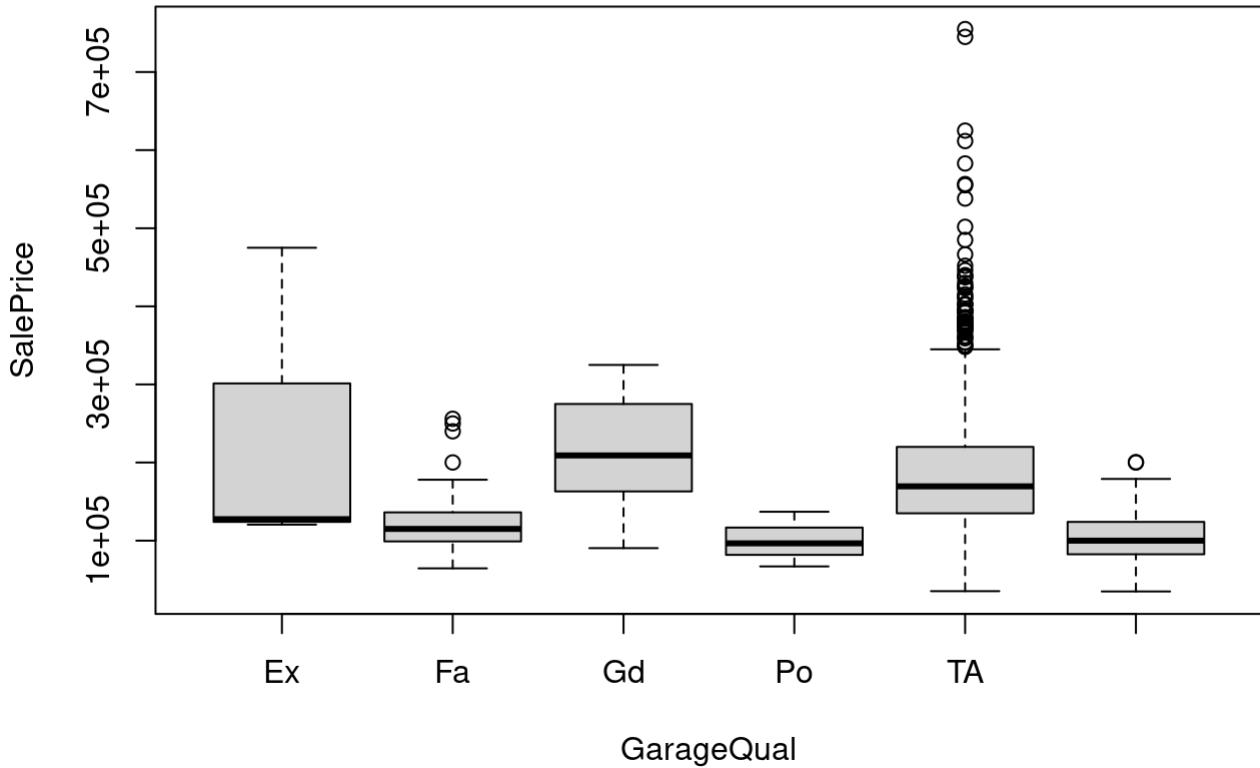


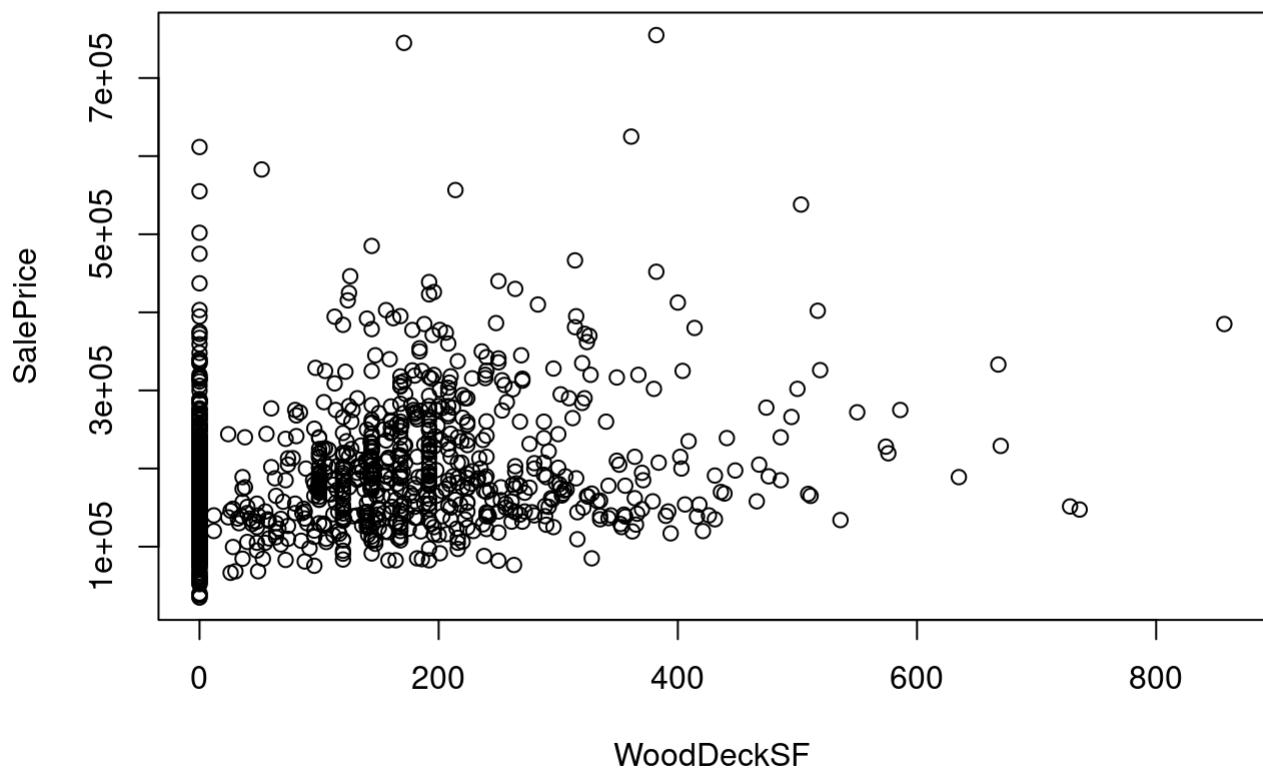
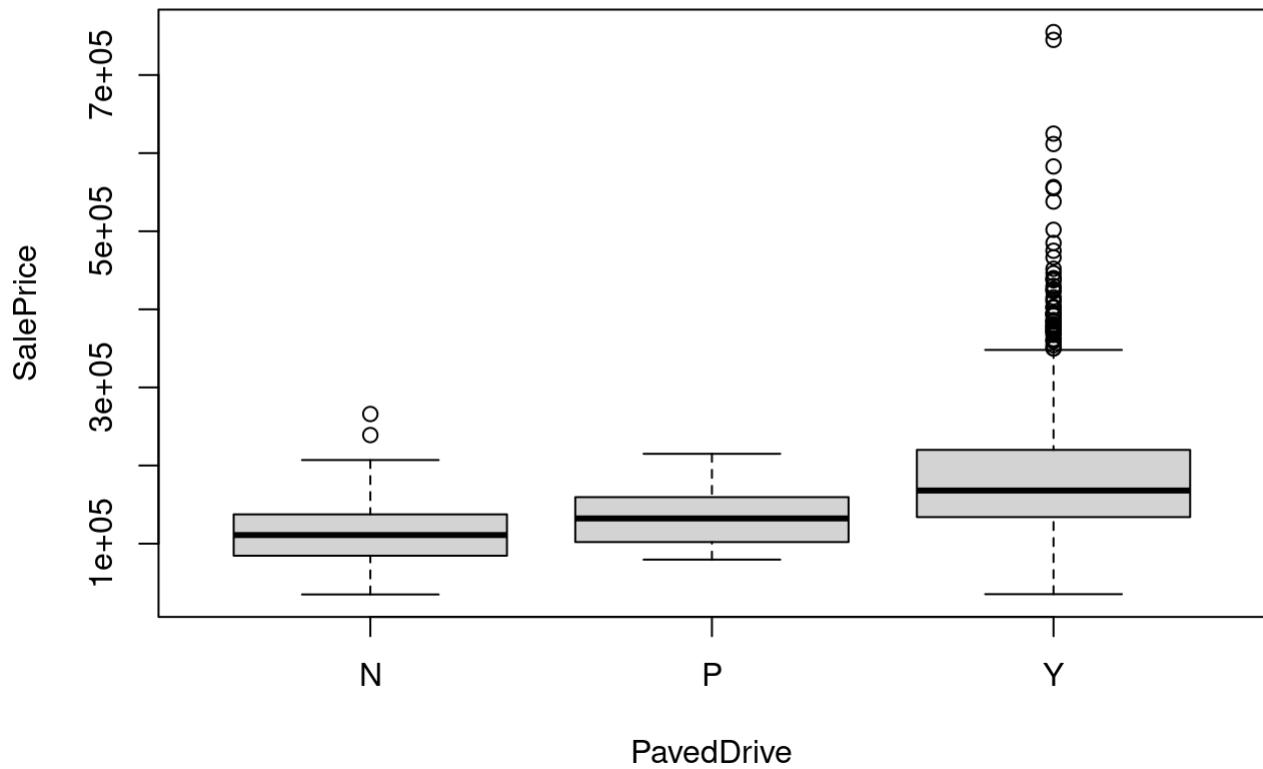


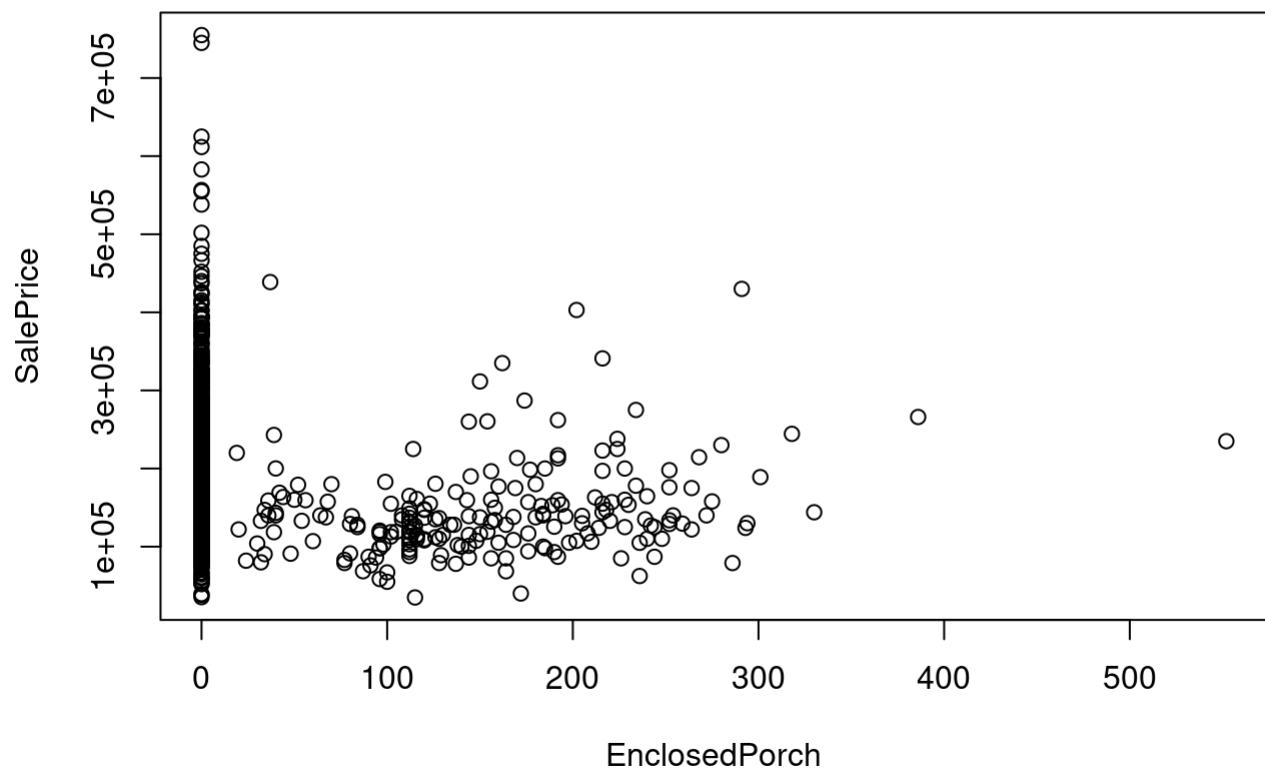
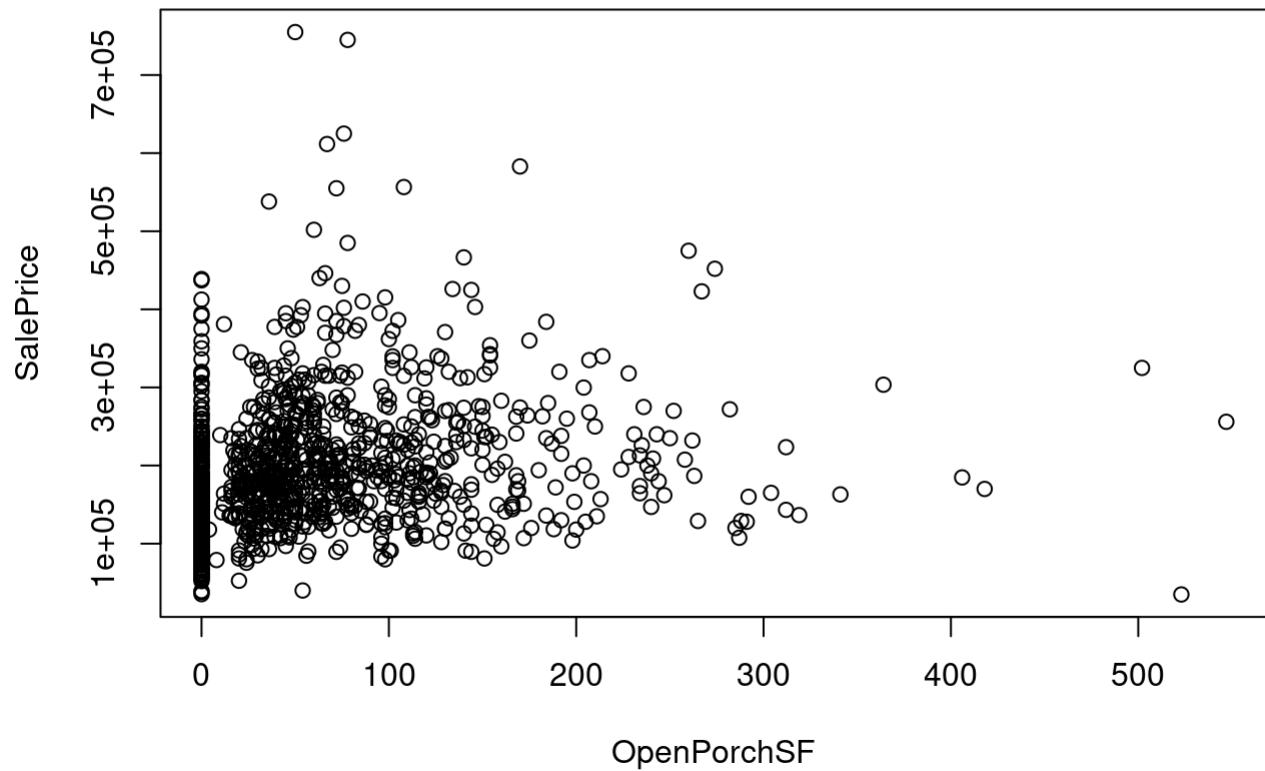


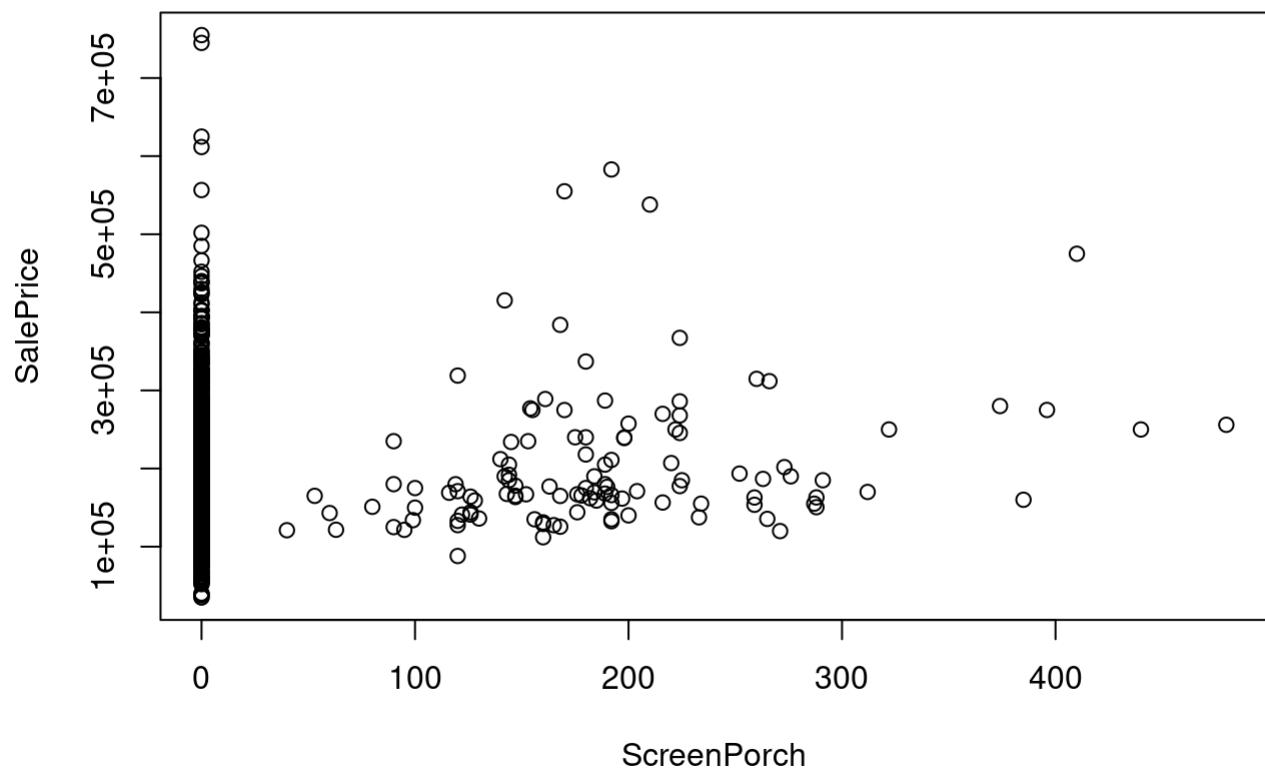
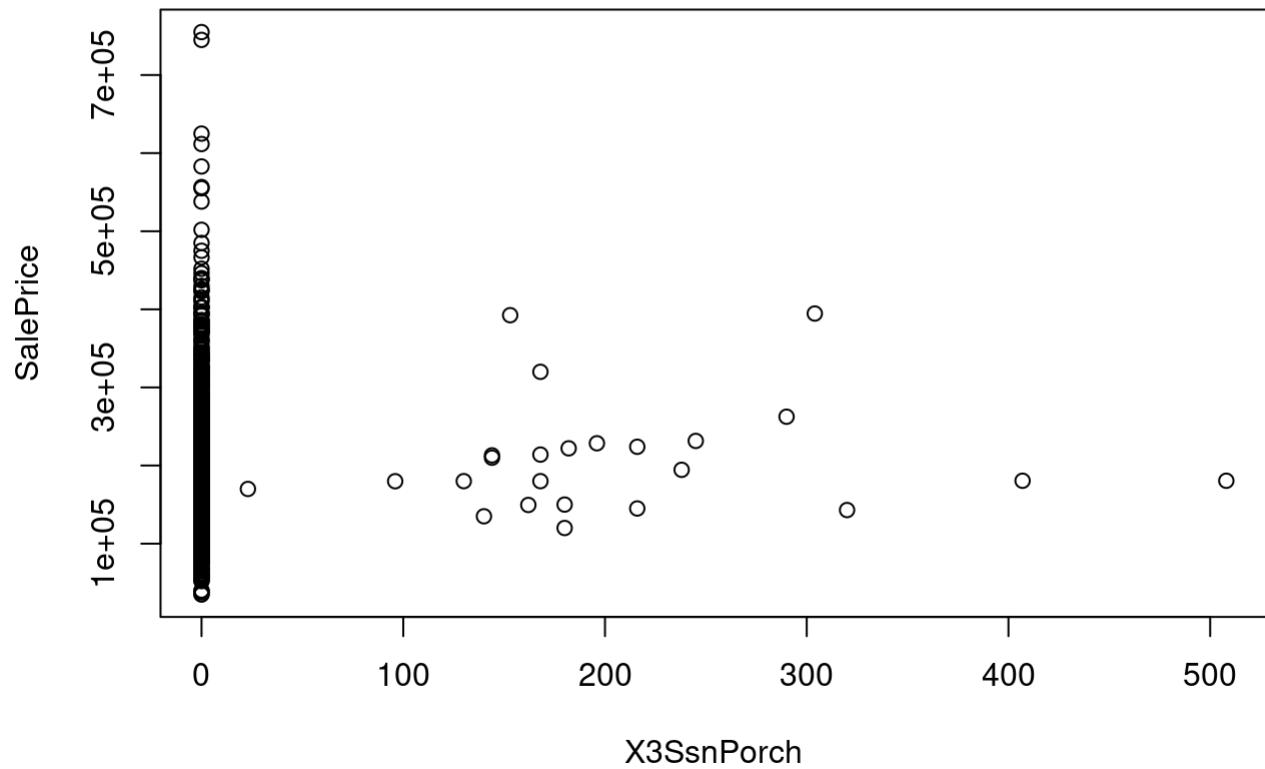


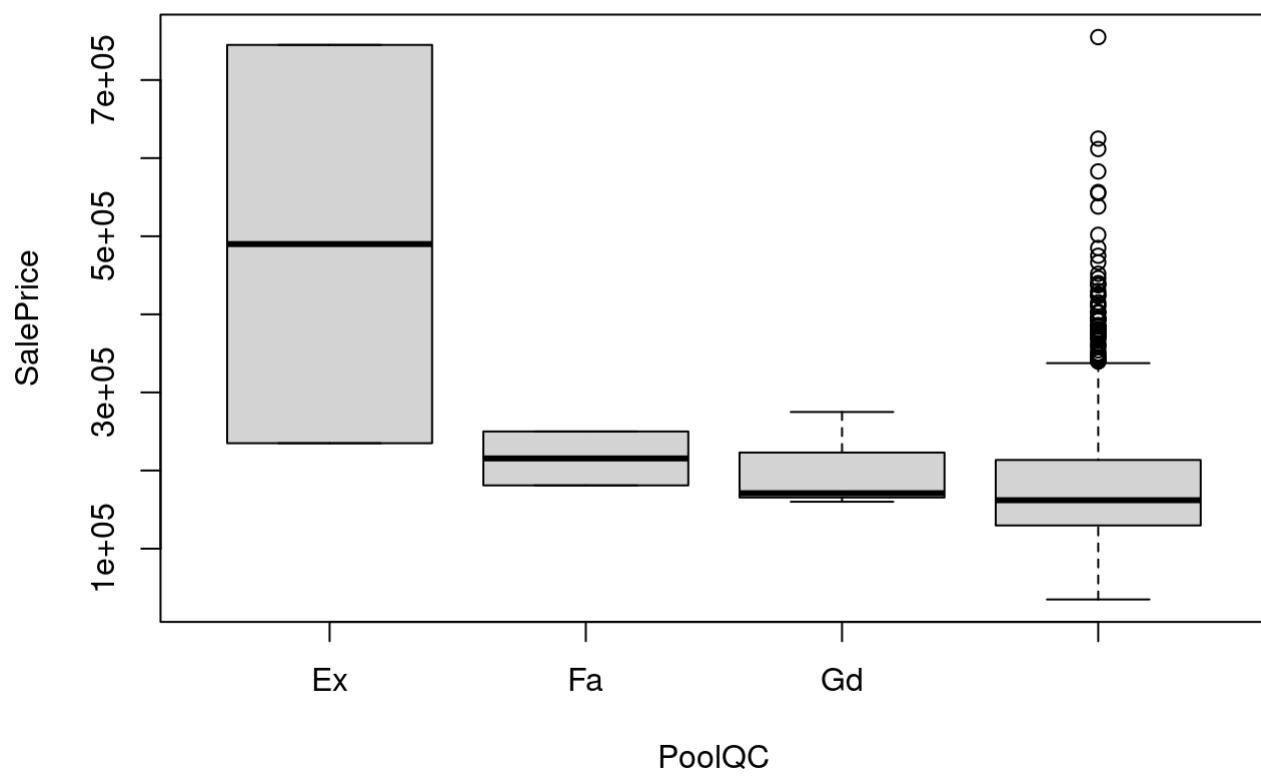
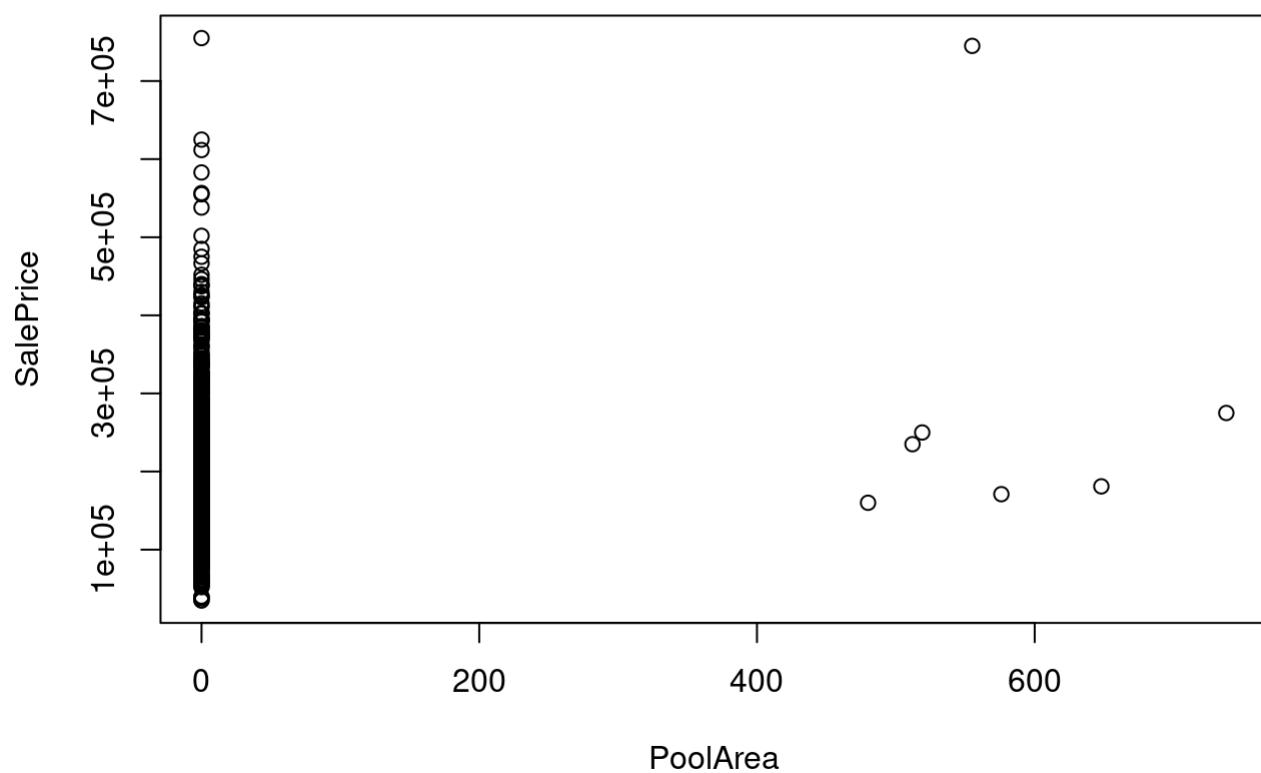


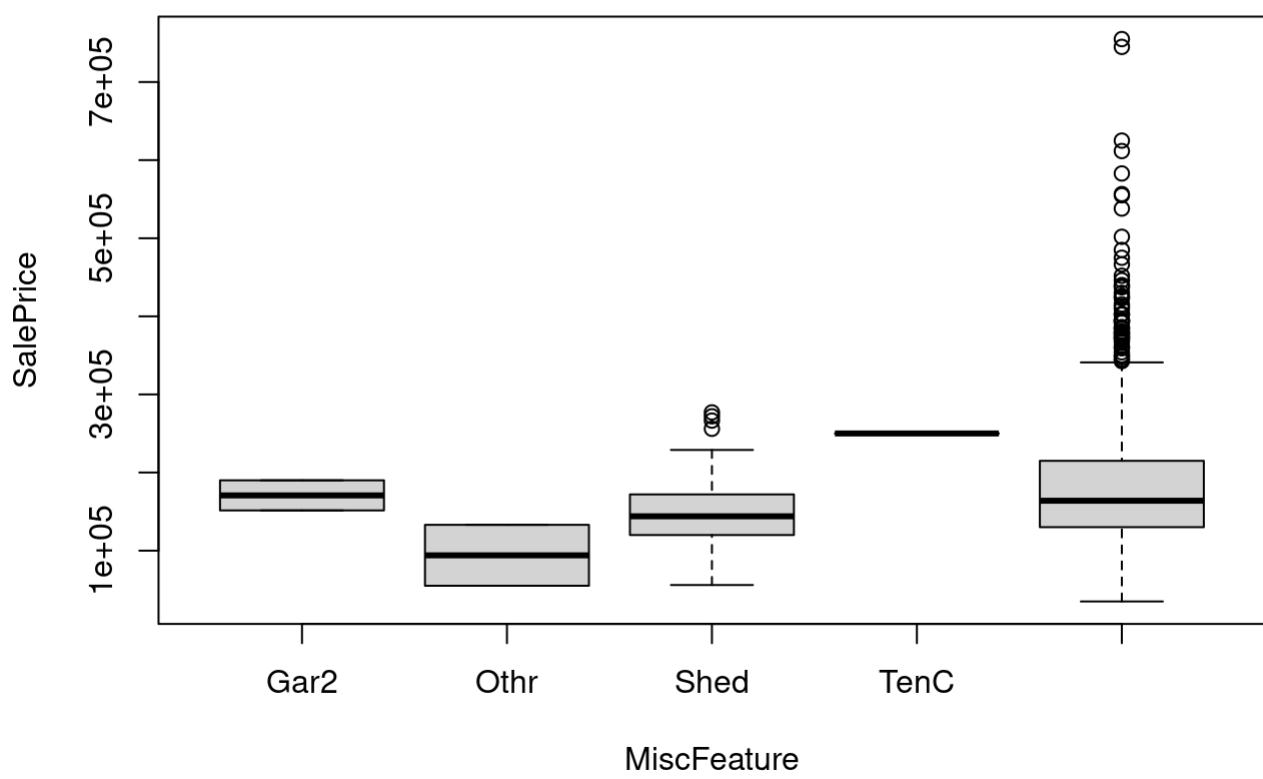
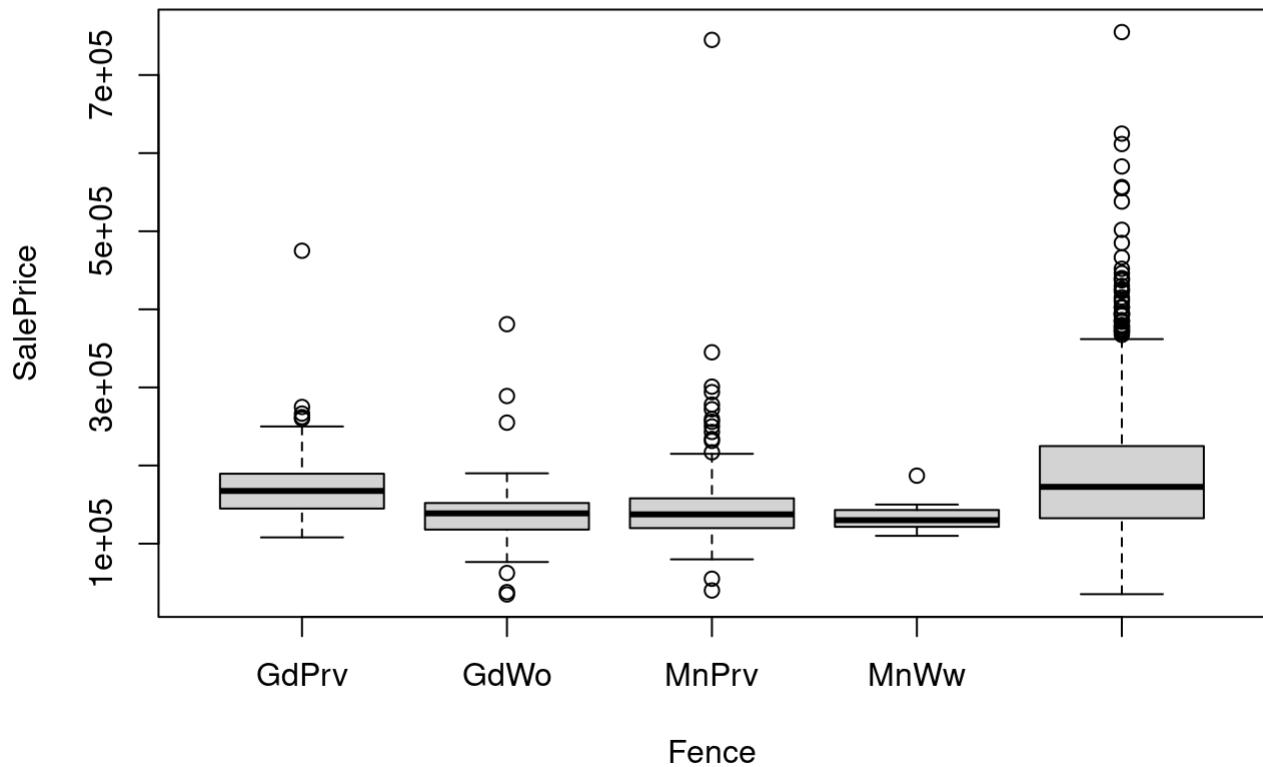


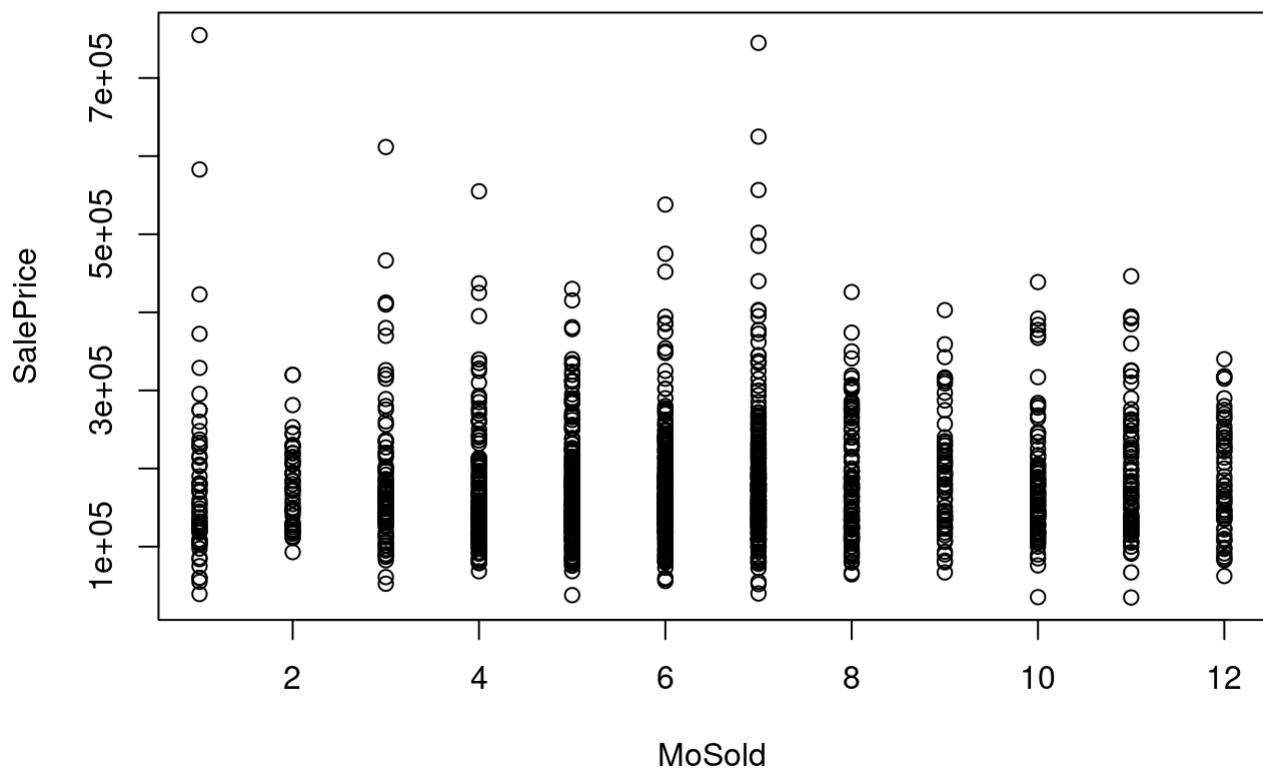
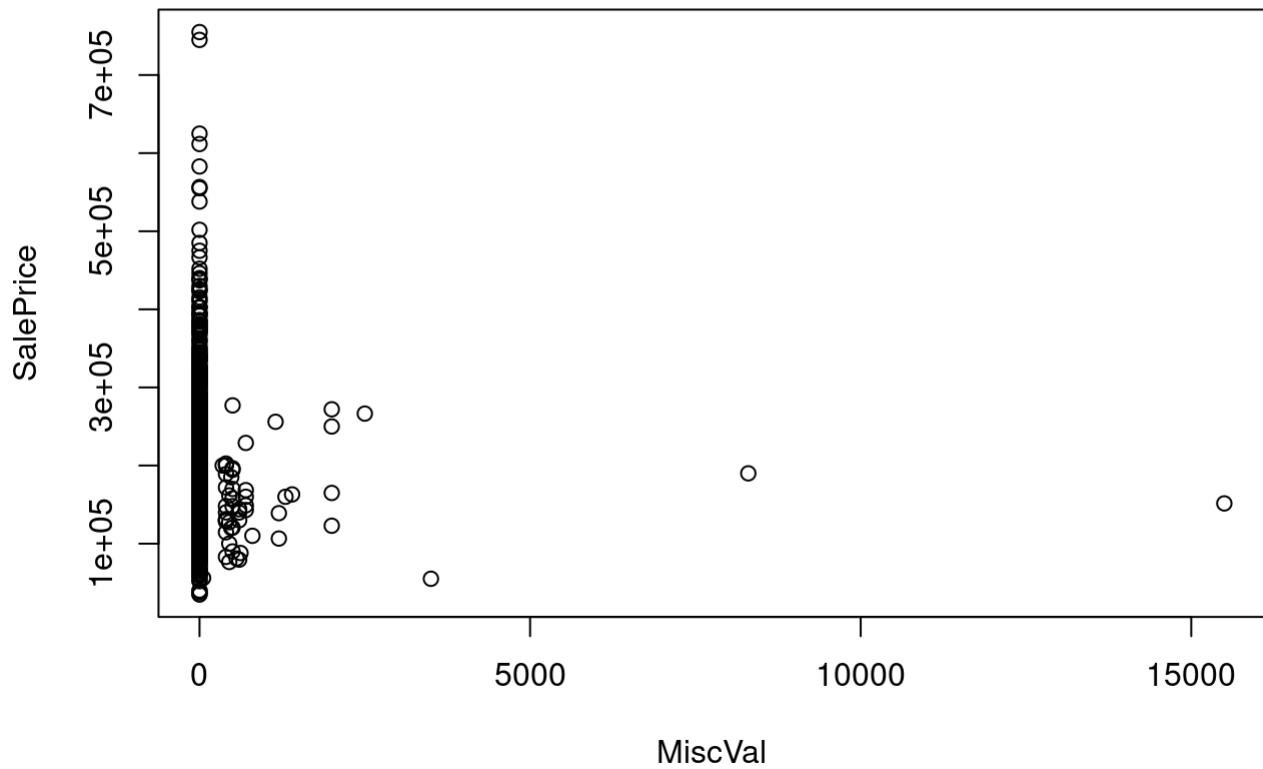


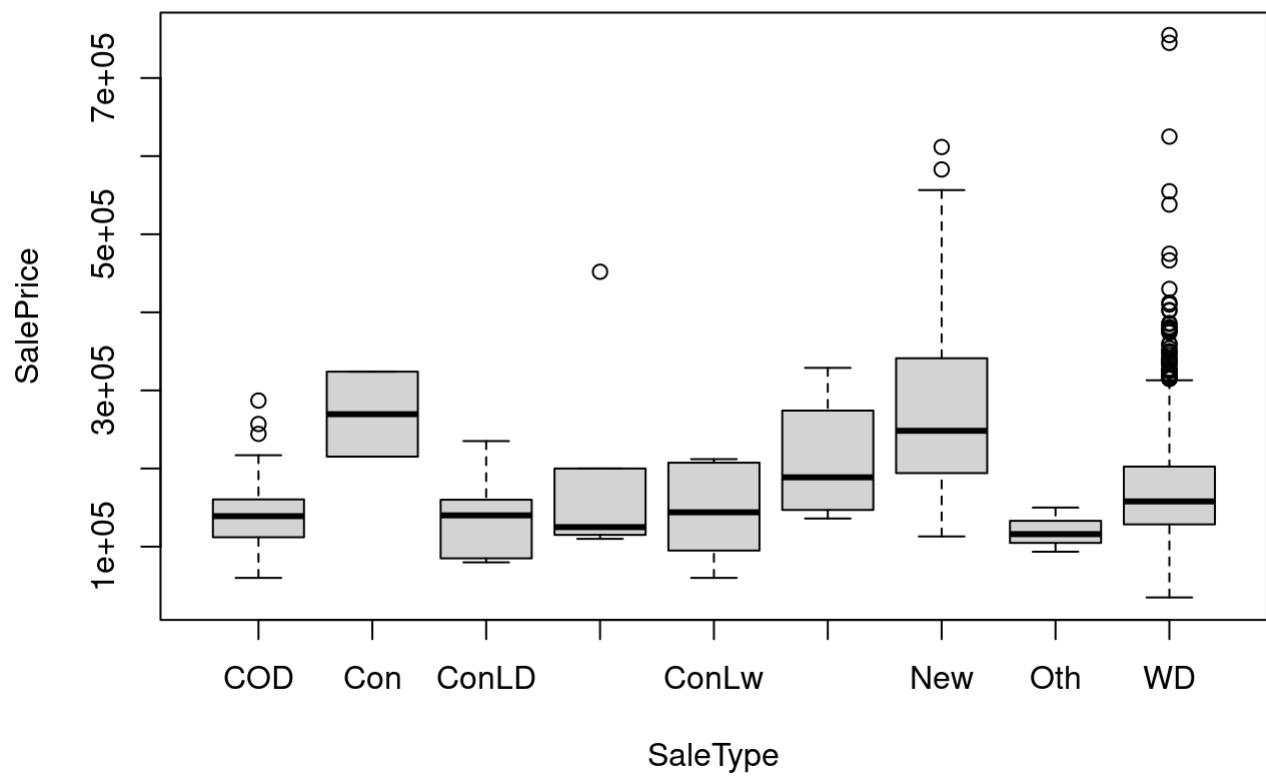
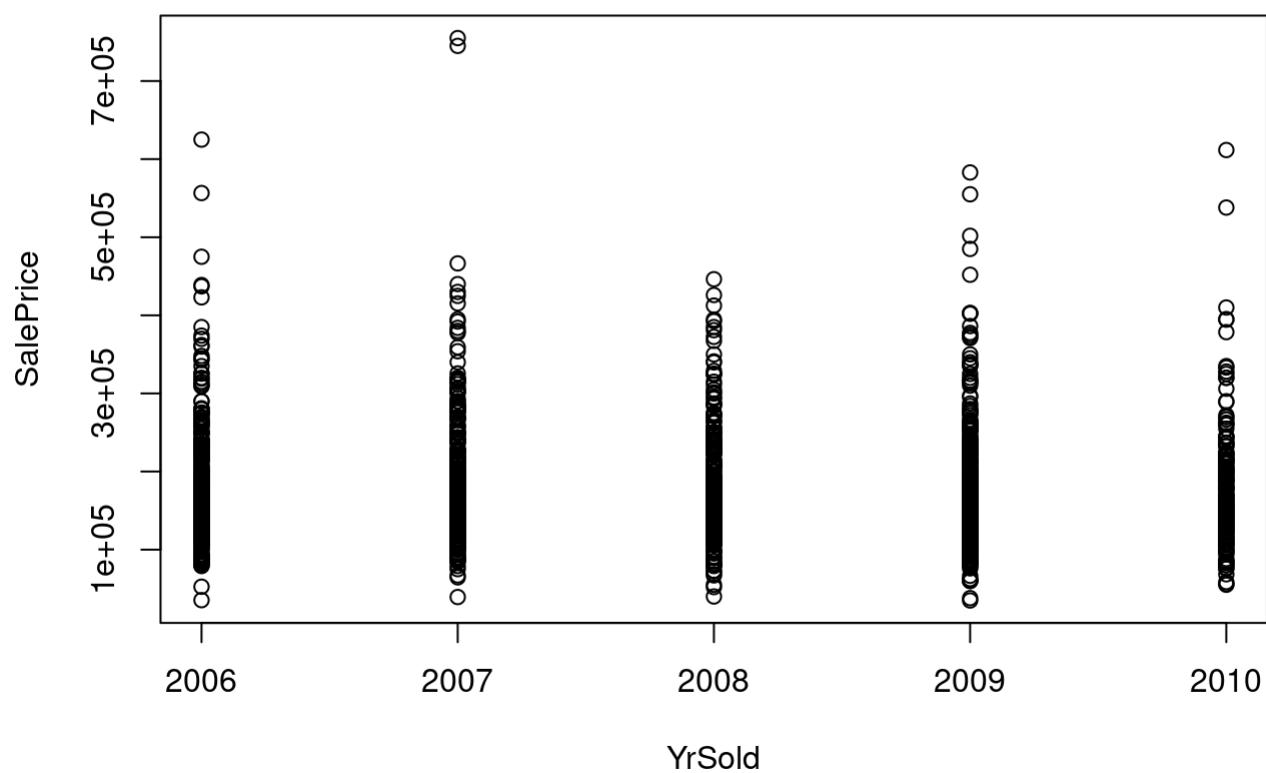


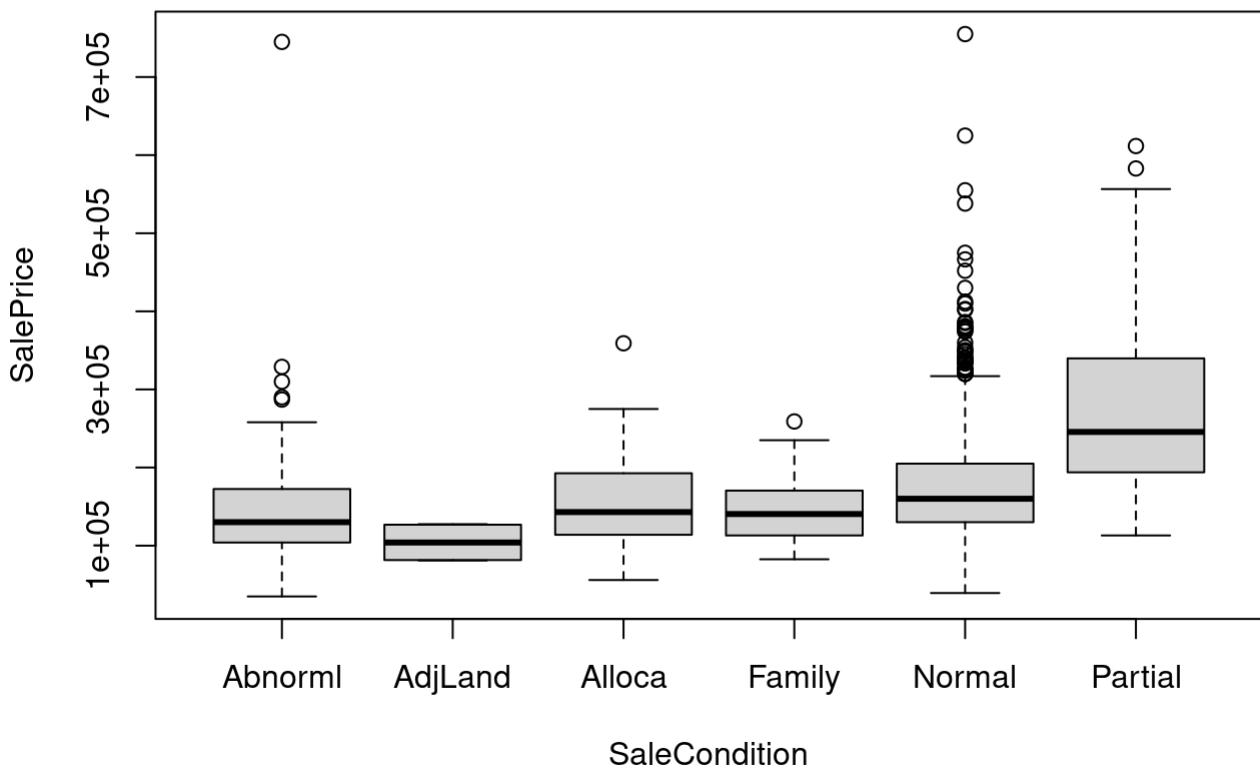












Sales Price appears to have correlation with: MSZoning (specifically Residential Low Density seems to correlate with higher prices), Street (Paved = higher prices), Alley (homes with no Alley or paved Alley have higher prices), Neighborhood (specific neighborhoods correlate with higher prices), Condition2 (Adjacent or near off-site features correlate with higher prices), BldgType, OverallQual, OverallCond, YearBuilt, YearRemodAdd (may be a better variable than YearBuilt, since remodel age = year built if no remodel has occurred), RoofMatl, ExterQual, BsmtQual, BsmtExposure, BsmtFinType1, BstFinSF1, TotalBsmtSF, HeatingQC, CentralAir, Electrical, 1stFlrSF, 2ndFlrSF, GrLivArea, FullBath, KitchenQual, TotRmsAbvGrd, FireplaceQu, GarageType, GarageFinish, GarageCars, GarageArea, GarageQual, GarageCond, PavedDrive, PoolQC, SaleType, SaleCondition

10.

```
library(caret)
```

```
## Loading required package: ggplot2
```

```
## Loading required package: lattice
```

```
set.seed(123)
intrain <- createDataPartition(housing$SalePrice, p = .80, list = FALSE)
housing.train <- housing[intrain, ]
housing.test <- housing[-intrain, ]
```

Creating Predictive Models

11.

```
library(glmnet)

## Loading required package: Matrix

## 
## Attaching package: 'Matrix'

## The following objects are masked from 'package:tidyverse':
## 
##     expand, pack, unpack

## Loaded glmnet 4.1-4

set.seed(1)
lasso <- train(SalePrice ~ ., data= housing.train, preProc = "knnImpute", na.action = n
a.pass, method = "glmnet", trControl = trainControl("cv", number = 10), tuneGrid = expan
d.grid(alpha = 1, lambda = 10^seq(-3,3, length = 100)))

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RR Ae, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCPO
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,  
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,  
## Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,  
## SaleTypeCon
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
coef(lasso$finalModel, lasso$bestTune$lambda)
```

```
## 275 x 1 sparse Matrix of class "dgCMatrix"
##                                     s1
## (Intercept)      1.808748e+05
## MSSubClass     -4.855969e+03
## MSZoningFV      .
## MSZoningRH      .
## MSZoningRL      1.901305e+03
## MSZoningRM      .
## LotFrontage      .
## LotArea         9.135331e+02
## StreetPave      1.203417e+03
## AlleyPave       .
## AlleyNA          .
## LotShapeIR2     1.293812e+03
## LotShapeIR3     -2.428685e+03
## LotShapeReg      .
## LandContourHLS    .
## LandContourLow    .
## LandContourLvl    1.693954e+02
## UtilitiesNoSeWa -6.794625e+02
## LotConfigCulDSac 2.712483e+03
## LotConfigFR2      .
## LotConfigFR3     -1.943216e+02
## LotConfigInside    .
## LandSlopeMod      3.453039e+01
## LandSlopeSev     -3.111790e+02
## NeighborhoodBlueste .
## NeighborhoodBrDale .
## NeighborhoodBrkSide 1.035020e+03
## NeighborhoodClearCr 1.002119e+03
## NeighborhoodCollgCr .
## NeighborhoodCrawfor 4.474473e+03
## NeighborhoodEdwards -1.468655e+03
## NeighborhoodGilbert .
## NeighborhoodIDOTRR   .
## NeighborhoodMeadowV -2.696641e+02
## NeighborhoodMitchel .
## NeighborhoodNAmes   .
## NeighborhoodNoRidge 5.081346e+03
## NeighborhoodNPkVill .
## NeighborhoodNridgHt 5.670871e+03
## NeighborhoodNWAmes -6.888416e+02
## NeighborhoodOldTown -5.825281e+01
## NeighborhoodSawyer   .
## NeighborhoodSawyerW 9.118547e+02
## NeighborhoodSomerst 2.970225e+03
## NeighborhoodStoneBr 5.203892e+03
## NeighborhoodSWISU   -8.703419e+01
## NeighborhoodTimber   .
## NeighborhoodVeenker 1.012276e+02
## Condition1Feedr   -4.186221e+02
## Condition1Norm     2.991711e+03
```

```
## Condition1PosA      .
## Condition1PosN      .
## Condition1RRAe     -7.485716e+02
## Condition1RRAn     4.974039e+02
## Condition1RRNe      .
## Condition1RRNn      .
## Condition2Feedr     .
## Condition2Norm      .
## Condition2PosA     1.434151e+02
## Condition2PosN    -9.870577e+03
## Condition2RRAe    -1.367026e+00
## Condition2RRAn      .
## Condition2RRNn      .
## BldgType2fmCon    1.949780e+02
## BldgTypeDuplex   -1.433948e+03
## BldgTypeTwnhs   -1.125001e+03
## BldgTypeTwnhsE  -9.260561e+02
## HouseStyle1.5Unf  3.735028e+02
## HouseStyle1Story    .
## HouseStyle2.5Fin  -7.490851e+02
## HouseStyle2.5Unf    .
## HouseStyle2Story    .
## HouseStyleSFoyer    .
## HouseStyleSLvl    2.952193e+02
## OverallQual2      .
## OverallQual3    -5.463212e+02
## OverallQual4    -7.887650e+02
## OverallQual5    -6.503855e+02
## OverallQual6      .
## OverallQual7    2.123743e+03
## OverallQual8    8.359035e+03
## OverallQual9    1.256765e+04
## OverallQual10   6.564475e+03
## OverallCond2   -1.111678e+02
## OverallCond3   -2.649090e+03
## OverallCond4   -1.394846e+03
## OverallCond5   -2.711153e+03
## OverallCond6      .
## OverallCond7   1.667515e+03
## OverallCond8   7.328050e+02
## OverallCond9   1.116484e+03
## YearBuilt        6.972904e+03
## YearRemodAdd   2.300398e+03
## RoofStyleGable  -1.923172e+01
## RoofStyleGambrel    .
## RoofStyleHip      .
## RoofStyleMansard  2.641756e+02
## RoofStyleShed    1.730142e+02
## RoofMatlCompShg  1.891926e+03
## RoofMatlMembran  8.361410e+02
## RoofMatlMetal      .
## RoofMatlRoll      .
```

## RoofMatlTar&Grv	8.137608e+01
## RoofMatlWdShake	4.877634e+02
## RoofMatlWdShngl	6.634192e+03
## Exterior1stAsphShn	.
## Exterior1stBrkComm	.
## Exterior1stBrkFace	2.624487e+03
## Exterior1stCBlock	.
## Exterior1stCemntBd	1.638894e+03
## Exterior1stHdBoard	-2.902244e+02
## Exterior1stImStucc	.
## Exterior1stMetalSd	.
## Exterior1stPlywood	1.449538e+02
## Exterior1stStone	.
## Exterior1stStucco	.
## Exterior1stVinylSd	.
## Exterior1stWd Sdng	.
## Exterior1stWdShing	-2.258862e+02
## Exterior2ndAsphShn	.
## Exterior2ndBrk Cmn	.
## Exterior2ndBrkFace	.
## Exterior2ndCBlock	.
## Exterior2ndCmentBd	.
## Exterior2ndHdBoard	.
## Exterior2ndImStucc	.
## Exterior2ndMetalSd	.
## Exterior2ndOther	-3.133446e+02
## Exterior2ndPlywood	.
## Exterior2ndStone	.
## Exterior2ndStucco	-9.748898e+02
## Exterior2ndVinylSd	8.582581e+02
## Exterior2ndWd Sdng	.
## Exterior2ndWd Shng	-2.570788e+02
## MasVnrTypeBrkFace	-6.407364e+02
## MasVnrTypeNone	.
## MasVnrTypeStone	2.896943e+02
## MasVnrArea	2.756441e+03
## ExterQualFa	-1.165190e+02
## ExterQualGd	.
## ExterQualTA	-2.068488e+03
## ExterCondFa	.
## ExterCondGd	.
## ExterCondPo	-3.420444e+02
## ExterCondTA	3.438523e+02
## FoundationCBlock	.
## FoundationPConc	.
## FoundationSlab	-2.966875e+02
## FoundationStone	9.658727e+01
## FoundationWood	-5.376220e+02
## BsmtQualFa	.
## BsmtQualGd	-2.699710e+03
## BsmtQualTA	-1.559807e+03
## BsmtQualNA	-4.356053e+02

```
## BsmtCondGd          .
## BsmtCondPo         -5.093603e+02
## BsmtCondTA          8.162638e+02
## BsmtCondNA         -6.576593e+00
## BsmtExposureGd      5.699746e+03
## BsmtExposureMn          .
## BsmtExposureNo     -2.342891e+03
## BsmtExposureNA     -1.249622e+03
## BsmtFinType1BLQ          .
## BsmtFinType1GLQ      2.460948e+03
## BsmtFinType1LwQ          .
## BsmtFinType1Rec          .
## BsmtFinType1Unf     -1.335871e+03
## BsmtFinType1NA        -2.801005e+02
## BsmtFinSF1           2.520294e+03
## BsmtFinType2BLQ          .
## BsmtFinType2GLQ      5.634077e+02
## BsmtFinType2LwQ          .
## BsmtFinType2Rec     -2.006174e+02
## BsmtFinType2Unf          .
## BsmtFinType2NA          .
## BsmtFinSF2           .
## BsmtUnfSF            .
## TotalBsmtSF        1.388839e+03
## HeatingGasA          .
## HeatingGasW            .
## HeatingGrav            .
## HeatingOthW       -9.819097e+02
## HeatingWall            .
## HeatingQCfa            .
## HeatingQCGd       -4.288629e+02
## HeatingQCPo            .
## HeatingQCTA       -8.634036e+02
## CentralAirY        1.085297e+02
## ElectricalFuseF          .
## ElectricalFuseP          .
## ElectricalMix            .
## ElectricalSBrkr          .
## X1stFlrSF        9.851853e+02
## X2ndFlrSF            .
## LowQualFinSF     -7.377839e+02
## GrLivArea          2.569158e+04
## BsmtFullBath      2.920552e+03
## BsmtHalfBath      4.738209e+01
## FullBath           4.039362e+03
## HalfBath            1.094228e+01
## BedroomAbvGr     -5.372127e+02
## KitchenAbvGr      -2.773361e+03
## KitchenQualFa     -1.137243e+03
## KitchenQualGd     -3.928501e+03
## KitchenQualTA     -4.775088e+03
## TotRmsAbvGrd      2.099617e+03
```

```
## FunctionalMaj2      -8.746126e+01
## FunctionalMin1     -3.870090e+00
## FunctionalMin2      .
## FunctionalMod      .
## FunctionalSev     -9.239911e+02
## FunctionalTyp      2.876395e+03
## Fireplaces        8.452490e+02
## FireplaceQuFa      .
## FireplaceQuGd      1.190241e+02
## FireplaceQuPo      .
## FireplaceQuTA     -4.473275e+02
## FireplaceQuNA     -2.581906e+03
## GarageTypeAttchd    .
## GarageTypeBasment   -6.211299e+02
## GarageTypeBuiltIn    1.374027e+03
## GarageTypeCarPort    .
## GarageTypeDetchd    .
## GarageTypeNA        .
## GarageYrBlt        .
## GarageFinishRFn      .
## GarageFinishUnf      .
## GarageFinishNA      .
## GarageCars         6.930239e+03
## GarageArea          1.593557e+01
## GarageQualFa     -7.738352e+02
## GarageQualGd      7.220481e+02
## GarageQualPo      .
## GarageQualTA      .
## GarageQualNA      .
## GarageCondFa     -2.990867e+02
## GarageCondGd      .
## GarageCondPo      .
## GarageCondTA      .
## GarageCondNA      .
## PavedDriveP       .
## PavedDriveY       5.107758e+02
## WoodDeckSF        1.605118e+03
## OpenPorchSF       1.106775e+03
## EnclosedPorch     3.298012e+02
## X3SsnPorch        5.028829e+02
## ScreenPorch        2.176282e+03
## PoolArea          1.739860e+04
## PoolQCFA        -9.467740e+03
## PoolQCGd          -1.705031e+04
## PoolQCNA        .
## FenceGdWo        -5.559720e+02
## FenceMnPrv        -1.517562e+02
## FenceMnWw        -5.781862e+00
## FenceNA          .
## MiscFeature0thr    .
## MiscFeatureShed    .
## MiscFeatureTenC    .
```

```

## MiscFeatureNA .
## MiscVal .
## MoSold -7.637603e+02
## YrSold .
## SaleTypeCon 9.338769e+02
## SaleTypeConLD .
## SaleTypeConLI .
## SaleTypeConLw .
## SaleTypeCWD 6.399739e-01
## SaleTypeNew 7.686916e+03
## SaleType0th .
## SaleTypeWD .
## SaleConditionAdjLand 3.888843e+02
## SaleConditionAlloca 6.327893e+02
## SaleConditionFamily -4.075413e+01
## SaleConditionNormal 1.995598e+03
## SaleConditionPartial .

```

```

predictions.lasso <- predict(lasso, housing.test, na.action = na.pass)
RMSE(predictions.lasso, housing.test$SalePrice)

```

```

## [1] 34113.53

```

Several variable coefficients were shrunk to zero, meaning that they were not used for this prediction model.
RMSE = 34113.53

12.

```

set.seed(1)
ridge <- train(SalePrice ~ ., data= housing.train, preProc = "knnImpute", na.action = n
a.pass, method = "glmnet", trControl = trainControl("cv", number = 10), tuneGrid = expan
d.grid(alpha = 0, lambda = 10^seq(-3,3, length = 100)))

```

```

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

```

```

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone

```

```

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,  
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,  
## Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,  
## SaleTypeCon
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
predictions.ridge <- predict(ridge, housing.test, na.action = na.pass)  
RMSE(predictions.ridge, housing.test$SalePrice)
```

```
## [1] 32406.35
```

RMSE = 32406.35

13.

```
set.seed(1)
enet <- train(SalePrice ~ ., data= housing.train, preProc = "knnImpute", na.action = na.pass,
method = "glmnet", trControl = trainControl("cv", number = 10), tuneGrid = expand.grid(alpha = seq(0, 1, length = 10), lambda = 10^seq(-3,3, length = 100)))
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC
```

```
## Warning in preprocess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone  
  
## Warning in preprocess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone  
  
## Warning in preprocess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone  
  
## Warning in preprocess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone  
  
## Warning in preprocess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone  
  
## Warning in preprocess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone  
  
## Warning in preprocess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone  
  
## Warning in preprocess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone  
  
## Warning in preprocess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone
```



```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc
```



```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc
```

```
predictions.enet <- predict(enet, housing.test, na.action = na.pass)
RMSE(predictions.enet, housing.test$SalePrice)
```

```
## [1] 32406.35
```

RMSE = 32406.35; which is identical to ridge; which indicates that an alpha of 1 was the best alpha used and optimal lamda was the same for ridge as enet.

14.

```
set.seed(1)
rf <- train(SalePrice ~ ., data= housing.train, preProc = "knnImpute", na.action = na.pass,
importance = T, method = "rf", metric = "RMSE", trControl = trainControl("cv", number = 10), tuneGrid = expand.grid(mtry = c(5, 15, 30, 60, 79)))

## Warning in preProcess.default_thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default_thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default_thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default_thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in preProcess.default_thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,
## Exterior1stImStucc

```

```

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,
## SaleTypeCon

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,
## SaleTypeCon

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,
## SaleTypeCon

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,
## SaleTypeCon

```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
predictions.rf <- predict(rf, housing.test, na.action = na.pass)
RMSE(predictions.rf, housing.test$SalePrice)
```

```
## [1] 26146.37
```

```
varImp(rf)
```

```

## rf variable importance
##
##   only 20 most important variables shown (out of 274)
##
##          Overall
## GrLivArea      100.00
## TotalBsmtSF    61.99
## X2ndFlrSF      56.96
## X1stFlrSF      52.07
## GarageArea     48.38
## LotArea        47.11
## YearBuilt      46.92
## YearRemodAdd   45.05
## GarageCars     45.01
## ExterQualTA    44.69
## Fireplaces     42.11
## BsmtFinSF1     40.47
## FireplaceQuNA  40.00
## GarageYrBlt    39.89
## OverallQual7   38.42
## MSZoningRL     37.41
## KitchenQualTA  37.12
## FullBath       36.76
## KitchenQualGd  36.59
## MSSubClass      36.55

```

RMSE 26146.37

The variables: GrLivArea, TotalBsmtSF, X2ndFlrSF, X1stFlrSF, GarageArea, LotArea, YearBuilt, YearRemodAdd, GarageCars, and ExterQualTA were the 10 most predictive variables.

15.

```

set.seed(1)
gbm <- train(SalePrice ~ ., data = housing.train, preProc = "nzv", na.action = na.pass,
method = "gbm", trControl = trainControl("cv", number = 10))

```

## Iter	TrainDeviance	ValidDeviance	StepSize	Improve
## 1	5810517523.4057	-nan	0.1000	412206625.2410
## 2	5418794652.7246	-nan	0.1000	367903339.1821
## 3	5101203039.4251	-nan	0.1000	282547983.2481
## 4	4776626098.1778	-nan	0.1000	301721161.9660
## 5	4477609190.4700	-nan	0.1000	284014279.7840
## 6	4231343318.6250	-nan	0.1000	195158781.9390
## 7	3977786668.2257	-nan	0.1000	234747904.8043
## 8	3759492265.4612	-nan	0.1000	222619710.9716
## 9	3579609849.8262	-nan	0.1000	179512399.0900
## 10	3419346423.7009	-nan	0.1000	160187693.9525
## 20	2313241552.3796	-nan	0.1000	79828744.0008
## 40	1433471318.6721	-nan	0.1000	18914487.5603
## 60	1143834913.8656	-nan	0.1000	-2658220.6605
## 80	1023183005.4850	-nan	0.1000	4306459.3543
## 100	957836892.5763	-nan	0.1000	-19801963.9460
## 120	901092450.9095	-nan	0.1000	-10308140.7067
## 140	865039959.0498	-nan	0.1000	-1054613.2748
## 150	856506078.4405	-nan	0.1000	-12190924.2521
##				
## Iter	TrainDeviance	ValidDeviance	StepSize	Improve
## 1	5620611416.5482	-nan	0.1000	599917625.7505
## 2	5137946101.2975	-nan	0.1000	420877286.7205
## 3	4654762764.3019	-nan	0.1000	438202431.1373
## 4	4283144551.1734	-nan	0.1000	386876021.9633
## 5	3955196721.1058	-nan	0.1000	302784481.0819
## 6	3696440149.0543	-nan	0.1000	236531393.9556
## 7	3384204915.7867	-nan	0.1000	286696598.1948
## 8	3160573765.0286	-nan	0.1000	240312496.5710
## 9	2974748663.5895	-nan	0.1000	195376392.4608
## 10	2794410176.8200	-nan	0.1000	172435698.8097
## 20	1651427715.7795	-nan	0.1000	65014368.5059
## 40	1054662953.4832	-nan	0.1000	-3018825.9277
## 60	858099948.1010	-nan	0.1000	2912141.7942
## 80	769958965.2351	-nan	0.1000	-1122926.8329
## 100	696077517.5866	-nan	0.1000	-4848016.5611
## 120	646163156.1802	-nan	0.1000	1631823.8846
## 140	602423331.5376	-nan	0.1000	-3109313.5926
## 150	589343587.3863	-nan	0.1000	-9255723.4399
##				
## Iter	TrainDeviance	ValidDeviance	StepSize	Improve
## 1	5517418278.0121	-nan	0.1000	729202838.5460
## 2	4955051879.9838	-nan	0.1000	519157110.7618
## 3	4473164300.1120	-nan	0.1000	521166451.0027
## 4	4047446208.6388	-nan	0.1000	403156289.8010
## 5	3660158899.4957	-nan	0.1000	339765601.1908
## 6	3347051597.7590	-nan	0.1000	252130820.0807
## 7	3050084479.5011	-nan	0.1000	248880501.1887
## 8	2818844839.5564	-nan	0.1000	231523845.5054
## 9	2594990838.3118	-nan	0.1000	196623509.9012
## 10	2402351294.7681	-nan	0.1000	166308496.8176
## 20	1355527258.4092	-nan	0.1000	39333664.4248

```

##      40 848960053.5965      -nan      0.1000 3531196.7250
##      60 691418996.7677      -nan      0.1000 -4176294.8259
##      80 608269528.1309      -nan      0.1000 -7369204.3735
##     100 534862826.0827      -nan      0.1000 -1684989.8913
##     120 493908562.0640      -nan      0.1000 -3374722.6912
##     140 446960423.2994      -nan      0.1000 -2784207.8908
##     150 430697169.1151      -nan      0.1000 -2987867.2184
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##      1 6160592621.9610      -nan      0.1000 440980474.3094
##      2 5721062572.8025      -nan      0.1000 468108248.2007
##      3 5377056260.9103      -nan      0.1000 339473195.9387
##      4 5050393454.8901      -nan      0.1000 333211984.0022
##      5 4757841198.6609      -nan      0.1000 273548116.1285
##      6 4508356135.4049      -nan      0.1000 212047905.8927
##      7 4253928376.7478      -nan      0.1000 257245084.9928
##      8 4027555206.4180      -nan      0.1000 211904349.6546
##      9 3816184423.1873      -nan      0.1000 191675350.6181
##     10 3608336703.3204      -nan      0.1000 193272327.8169
##    20 2401865596.2038      -nan      0.1000 87088274.2661
##    40 1488204686.1044      -nan      0.1000 23197036.5846
##    60 1172838509.9474      -nan      0.1000 8260766.1687
##    80 1052457690.0236      -nan      0.1000 -1890633.7563
##   100 994905336.8291      -nan      0.1000 -6034837.7659
##   120 951020629.0980      -nan      0.1000 1114312.0158
##   140 915592506.9078      -nan      0.1000 -4679668.1222
##   150 897556229.4320      -nan      0.1000 -10875240.5056
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##      1 5932896052.0099      -nan      0.1000 623229458.5710
##      2 5438051872.0562      -nan      0.1000 482736242.4847
##      3 4940288251.5179      -nan      0.1000 421052169.8095
##      4 4526453133.6632      -nan      0.1000 364627391.0810
##      5 4115946303.6636      -nan      0.1000 376356825.6445
##      6 3813151557.8601      -nan      0.1000 199197315.8465
##      7 3525982767.6679      -nan      0.1000 241109356.4354
##      8 3268871644.6728      -nan      0.1000 255921053.4491
##      9 3049402668.2721      -nan      0.1000 207305046.1762
##     10 2854540686.1239      -nan      0.1000 164955618.1738
##    20 1750638188.9392      -nan      0.1000 71096223.6568
##    40 1069532445.2089      -nan      0.1000 4550131.7524
##    60 894252109.4196      -nan      0.1000 -5056589.1692
##    80 802634388.9929      -nan      0.1000 -5314942.1957
##   100 748952348.1138      -nan      0.1000 1580061.7632
##   120 703082991.5817      -nan      0.1000 -6210867.3433
##   140 653207184.3743      -nan      0.1000 503726.2780
##   150 623916444.8743      -nan      0.1000 -10469170.8572
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##      1 5873667976.7261      -nan      0.1000 699339729.0287
##      2 5257044053.8921      -nan      0.1000 562590660.3514
##      3 4759751201.2593      -nan      0.1000 459013496.7967

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##      4 4314009656.3604      -nan      0.1000 495251224.8407
##      5 3918265084.7000      -nan      0.1000 398207708.1125
##      6 3556425515.6325      -nan      0.1000 279513907.7444
##      7 3248146267.6559      -nan      0.1000 256399912.2598
##      8 2988682621.7603      -nan      0.1000 166034171.0693
##      9 2748933634.1319      -nan      0.1000 217082741.8684
##     10 2542309929.0197      -nan      0.1000 179462099.7996
##     20 1419021454.6024      -nan      0.1000 39941999.6133
##    40 900892035.9553      -nan      0.1000 5280947.7033
##    60 742729530.6835      -nan      0.1000 -6376590.1733
##   80 650071632.5343      -nan      0.1000 6133130.1785
##  100 561974145.3448      -nan      0.1000 -3444218.8833
##  120 509443855.6271      -nan      0.1000 -4712274.7187
##  140 476684210.9352      -nan      0.1000 295956.3803
##  150 454116002.2801      -nan      0.1000 -3382557.4760
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##   1 5854177546.9492      -nan      0.1000 411426808.7938
##   2 5467179066.5729      -nan      0.1000 367530678.1610
##   3 5099913719.5577      -nan      0.1000 356289670.6169
##   4 4812789684.2725      -nan      0.1000 297510644.9878
##   5 4532902023.6949      -nan      0.1000 282936660.3958
##   6 4274804392.8882      -nan      0.1000 252171188.3030
##   7 4050933350.4951      -nan      0.1000 213557624.9716
##   8 3795699047.6249      -nan      0.1000 205952599.3702
##   9 3613958853.4779      -nan      0.1000 173126567.8681
##  10 3437009008.1595      -nan      0.1000 167308480.5086
##  20 2280141171.1667      -nan      0.1000 59833351.5156
##  40 1380929195.7622      -nan      0.1000 3541053.1667
##  60 1077191987.2629      -nan      0.1000 7673119.9089
##  80 945945198.4697      -nan      0.1000 -2722636.5633
## 100 863146245.0508      -nan      0.1000 -8336866.7437
## 120 826777446.6781      -nan      0.1000 -9047415.1484
## 140 795933753.3884      -nan      0.1000 -4302703.0416
## 150 785176765.9823      -nan      0.1000 372388.4895
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##   1 5736187185.9915      -nan      0.1000 471496778.8048
##   2 5138000641.2040      -nan      0.1000 605224389.1727
##   3 4642704103.5073      -nan      0.1000 523150625.1409
##   4 4222691961.0090      -nan      0.1000 416731612.2015
##   5 3849239919.7670      -nan      0.1000 333097803.9065
##   6 3494388893.9883      -nan      0.1000 324989727.3128
##   7 3225052644.6825      -nan      0.1000 252948456.8457
##   8 3005787386.3780      -nan      0.1000 209779818.0370
##   9 2810557141.2837      -nan      0.1000 189266161.6836
##  10 2612047504.4781      -nan      0.1000 191810167.5283
##  20 1545720657.3578      -nan      0.1000 55883087.8347
##  40 964693270.3917      -nan      0.1000 9798297.3384
##  60 811668771.7798      -nan      0.1000 -241604.2514
##  80 728811876.3073      -nan      0.1000 -3817861.6901
## 100 657856228.5770      -nan      0.1000 -4206200.7686

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##      120 611141389.2523      -nan      0.1000 -2774582.1833
##      140 579147083.7213      -nan      0.1000 -4326920.1865
##      150 560774037.5304      -nan      0.1000 -676352.9107
##
## Iter TrainDeviance  ValidDeviance StepSize Improve
##      1 5593116286.3290      -nan      0.1000 569468951.4793
##      2 5038768828.0325      -nan      0.1000 551580478.6502
##      3 4509650236.2430      -nan      0.1000 485479726.8933
##      4 4055592436.0314      -nan      0.1000 482690617.0540
##      5 3644329456.9311      -nan      0.1000 332883479.5129
##      6 3301305332.8843      -nan      0.1000 303295454.7224
##      7 3050909196.8196      -nan      0.1000 205657237.1342
##      8 2790592673.6670      -nan      0.1000 232997090.9615
##      9 2572328527.4820      -nan      0.1000 203848592.9195
##     10 2373081782.9094      -nan      0.1000 190721377.0404
##    20 1304881170.2175      -nan      0.1000 43886477.7512
##    40 781296089.3811      -nan      0.1000 4009959.1289
##   60 649796140.9502      -nan      0.1000 -10433171.3192
##   80 573744533.2247      -nan      0.1000 -5846268.9742
##  100 528855676.1426      -nan      0.1000 -3702813.5419
##  120 491809702.2441      -nan      0.1000 -4310375.2433
##  140 468101622.4865      -nan      0.1000 -3100111.2709
##  150 448695219.6123      -nan      0.1000 -4086275.7459
##
## Iter TrainDeviance  ValidDeviance StepSize Improve
##      1 5847341678.8806      -nan      0.1000 421720505.1755
##      2 5452788520.8510      -nan      0.1000 430409585.2569
##      3 5119826590.5870      -nan      0.1000 342900553.2067
##      4 4806151223.9645      -nan      0.1000 268503305.8967
##      5 4530039305.8279      -nan      0.1000 247894363.5592
##      6 4262365253.1509      -nan      0.1000 253327629.5427
##      7 4043287335.2893      -nan      0.1000 210438761.6338
##      8 3813074071.0217      -nan      0.1000 214160571.9842
##      9 3632046358.5677      -nan      0.1000 181978421.6231
##     10 3469624686.1961      -nan      0.1000 168242020.7860
##    20 2337394428.9587      -nan      0.1000 67901921.1504
##    40 1483985205.7337      -nan      0.1000 22898100.9435
##    60 1183536372.2427      -nan      0.1000 278394.4829
##    80 1059742621.1655      -nan      0.1000 -8166767.4641
##   100 992871734.0824      -nan      0.1000 -6287229.8913
##   120 943305822.6502      -nan      0.1000 -7174664.3368
##   140 898931086.0325      -nan      0.1000 132999.9586
##   150 881799802.9681      -nan      0.1000 1577581.1737
##
## Iter TrainDeviance  ValidDeviance StepSize Improve
##      1 5627890743.0495      -nan      0.1000 662855129.2384
##      2 5144482338.1345      -nan      0.1000 477226554.1946
##      3 4716882828.3830      -nan      0.1000 393360596.6879
##      4 4384393764.2846      -nan      0.1000 258086653.6198
##      5 4042772821.8348      -nan      0.1000 313252427.0590
##      6 3680050041.0097      -nan      0.1000 297280001.8267
##      7 3427412222.3900      -nan      0.1000 164387337.7731

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##      8 3174057338.9701      -nan      0.1000 217509651.0387
##      9 2957871581.9347      -nan      0.1000 178625766.3336
##     10 2781334688.0406      -nan      0.1000 154878100.0353
##     20 1627830372.0761      -nan      0.1000 60664375.6110
##     40 1059486881.0296      -nan      0.1000 2399794.1625
##     60 884896419.7912      -nan      0.1000 -6273153.7402
##     80 781338792.0094      -nan      0.1000 -4460274.1577
##    100 721297604.7092      -nan      0.1000 -6256385.4306
##    120 666567910.2838      -nan      0.1000 -2355688.5252
##    140 624707924.5357      -nan      0.1000 -3073769.5811
##    150 608266028.2253      -nan      0.1000 -2934234.4090
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##   1 5592830553.3143      -nan      0.1000 655593167.8272
##   2 5007981719.9299      -nan      0.1000 591094740.8248
##   3 4521829360.3523      -nan      0.1000 405214014.1913
##   4 4119851576.8613      -nan      0.1000 382786912.1430
##   5 3733827078.0281      -nan      0.1000 386668128.0735
##   6 3396530984.0230      -nan      0.1000 317129271.1247
##   7 3100977467.2646      -nan      0.1000 290515522.6069
##   8 2826817100.9276      -nan      0.1000 163894689.3521
##   9 2622409965.5217      -nan      0.1000 168871313.3858
##  10 2427795908.1872      -nan      0.1000 174375875.2713
##  20 1370651142.8774      -nan      0.1000 49013270.9160
##  40 831009793.9885      -nan      0.1000 5772235.6090
##  60 690239311.5191      -nan      0.1000 -4925737.2273
##  80 606994504.5978      -nan      0.1000 912882.8359
## 100 540071846.1607      -nan      0.1000 -2483141.5081
## 120 485988092.0815      -nan      0.1000 -1671109.9916
## 140 450962745.8178      -nan      0.1000 -3186404.0482
## 150 431364062.1999      -nan      0.1000 -484786.7896
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##   1 5913759504.1483      -nan      0.1000 379316549.4356
##   2 5532270197.9776      -nan      0.1000 346078481.9455
##   3 5176062580.9699      -nan      0.1000 337816217.7217
##   4 4850335816.3248      -nan      0.1000 310247732.6538
##   5 4561926814.1061      -nan      0.1000 286554598.5713
##   6 4285720037.4924      -nan      0.1000 265121434.5288
##   7 4065401455.6381      -nan      0.1000 186523332.4169
##   8 3849159915.3790      -nan      0.1000 201998823.1491
##   9 3651364627.3071      -nan      0.1000 178330139.4247
##  10 3471790358.6992      -nan      0.1000 167343959.0756
##  20 2335119064.1154      -nan      0.1000 57546000.1150
##  40 1490729902.7350      -nan      0.1000 14413224.5154
##  60 1193541623.2322      -nan      0.1000 1516321.0805
##  80 1081165111.9317      -nan      0.1000 4564851.1559
## 100 1009774288.0583      -nan      0.1000 -4814511.8660
## 120 972984578.8250      -nan      0.1000 -10186891.7982
## 140 937479690.4936      -nan      0.1000 -4152431.1814
## 150 923495522.6108      -nan      0.1000 1601959.2728
##

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## Iter TrainDeviance ValidDeviance StepSize Improve
## 1 5770247497.6126 -nan 0.1000 631822780.8018
## 2 5232692592.3193 -nan 0.1000 569469574.7582
## 3 4756476555.9040 -nan 0.1000 451361847.8192
## 4 4331646557.5298 -nan 0.1000 448707521.2263
## 5 4022739862.1484 -nan 0.1000 316396278.0784
## 6 3691672362.9062 -nan 0.1000 315651678.7719
## 7 3430416882.0506 -nan 0.1000 201383846.0448
## 8 3193170850.6813 -nan 0.1000 223174168.9583
## 9 2958787661.3042 -nan 0.1000 198501427.2016
## 10 2779420917.1476 -nan 0.1000 185447238.7936
## 20 1663709597.3424 -nan 0.1000 62927072.8980
## 40 1074476172.0298 -nan 0.1000 -193662.8415
## 60 905458131.0277 -nan 0.1000 -14006322.5989
## 80 808665487.9780 -nan 0.1000 1255365.9629
## 100 737975677.6894 -nan 0.1000 -8784102.0592
## 120 685017592.9054 -nan 0.1000 -6380446.8780
## 140 641859995.4666 -nan 0.1000 -4809223.3637
## 150 620769988.9924 -nan 0.1000 414814.8601
##
## Iter TrainDeviance ValidDeviance StepSize Improve
## 1 5670737667.8657 -nan 0.1000 704548445.2034
## 2 5079687418.9972 -nan 0.1000 542647052.0319
## 3 4573343679.8666 -nan 0.1000 437282872.7705
## 4 4113164494.6911 -nan 0.1000 359661430.9168
## 5 3730486995.9999 -nan 0.1000 368221395.7069
## 6 3398266144.2765 -nan 0.1000 344089466.4962
## 7 3116286670.8807 -nan 0.1000 217654013.5156
## 8 2863788181.6559 -nan 0.1000 250560033.0567
## 9 2641457178.3974 -nan 0.1000 211675714.6667
## 10 2444113564.4301 -nan 0.1000 144445221.1099
## 20 1422821734.9350 -nan 0.1000 37775664.1424
## 40 902576920.4174 -nan 0.1000 -3260084.0248
## 60 754277027.4505 -nan 0.1000 -1635629.2838
## 80 652767126.3607 -nan 0.1000 -2587996.6289
## 100 596812140.8238 -nan 0.1000 -10268817.7717
## 120 542640820.4174 -nan 0.1000 -3771407.3513
## 140 496612492.6886 -nan 0.1000 -2379011.9998
## 150 476510569.4942 -nan 0.1000 -317929.2953
##
## Iter TrainDeviance ValidDeviance StepSize Improve
## 1 6015688539.3074 -nan 0.1000 434265283.5254
## 2 5662518644.9517 -nan 0.1000 366728999.0463
## 3 5297257505.7971 -nan 0.1000 300188742.8196
## 4 4957064801.9814 -nan 0.1000 327682490.1510
## 5 4651993370.3552 -nan 0.1000 271131069.5595
## 6 4419584543.4236 -nan 0.1000 229538119.8002
## 7 4157505136.7809 -nan 0.1000 200658671.4111
## 8 3948808718.5255 -nan 0.1000 177832178.4891
## 9 3756103417.3924 -nan 0.1000 176266111.3316
## 10 3574418887.4538 -nan 0.1000 108067123.9794
## 20 2392537603.4594 -nan 0.1000 88514060.8708

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##      40 1538723936.0438      -nan      0.1000 21317859.1992
##      60 1256640513.4725      -nan      0.1000 -167548.6880
##      80 1118773089.2890      -nan      0.1000 -6813971.3273
##     100 1039411120.9378      -nan      0.1000 3616882.3391
##     120 984784994.4457      -nan      0.1000 -1187358.5186
##     140 954194805.0250      -nan      0.1000 -8960840.7418
##     150 934512978.6260      -nan      0.1000 1401906.6821
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##    1 5839659865.2026      -nan      0.1000 490458306.3422
##    2 5301059301.6303      -nan      0.1000 532753125.2908
##    3 4849270828.8471      -nan      0.1000 403486035.3662
##    4 4425399005.5279      -nan      0.1000 378739007.7588
##    5 4059700879.2591      -nan      0.1000 345901739.8822
##    6 3765759319.8551      -nan      0.1000 237332054.7883
##    7 3515833259.5746      -nan      0.1000 234823899.1492
##    8 3276872813.8491      -nan      0.1000 207786658.7914
##    9 3055575599.4047      -nan      0.1000 220367647.5010
##   10 2872473713.3813      -nan      0.1000 207452922.1768
##   20 1769385707.5505      -nan      0.1000 45397211.2705
##   40 1138157828.8653      -nan      0.1000 -10819644.6710
##   60 941681762.1068      -nan      0.1000 -11134083.1547
##   80 836598045.8169      -nan      0.1000 -10212782.3586
##  100 770765291.4753      -nan      0.1000 -3205441.4567
##  120 722089745.2672      -nan      0.1000 -4445965.9502
##  140 677819016.6476      -nan      0.1000 -2868324.7505
##  150 654195730.3485      -nan      0.1000 -7908829.5296
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##    1 5782347524.3524      -nan      0.1000 650371793.5030
##    2 5188760023.5454      -nan      0.1000 540162142.6247
##    3 4713246559.4597      -nan      0.1000 497062567.0849
##    4 4272201009.9585      -nan      0.1000 388093685.1760
##    5 3903510795.4591      -nan      0.1000 359290013.2179
##    6 3564321318.9448      -nan      0.1000 309023707.7738
##    7 3300242795.0271      -nan      0.1000 295073842.6950
##    8 3044960145.2357      -nan      0.1000 223666961.6002
##    9 2804246967.6814      -nan      0.1000 203915922.4443
##   10 2589975872.5504      -nan      0.1000 206975992.2099
##   20 1470214007.9728      -nan      0.1000 42065900.6618
##   40 911763318.4862      -nan      0.1000 5080460.0301
##   60 742436942.7321      -nan      0.1000 -7643676.0366
##   80 642616565.1088      -nan      0.1000 -412982.9438
##  100 579358598.2890      -nan      0.1000 -3876573.5789
##  120 527323069.0771      -nan      0.1000 -2074107.0070
##  140 492295900.1968      -nan      0.1000 -3597403.4363
##  150 475041718.5944      -nan      0.1000 -4638598.0746
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##    1 6003148545.5368      -nan      0.1000 440696197.7289
##    2 5618121806.2035      -nan      0.1000 366392849.6558
##    3 5224170672.5765      -nan      0.1000 361658686.2444

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##      4 4933495569.9515      -nan      0.1000 305137426.3268
##      5 4631715251.3577      -nan      0.1000 276440603.2351
##      6 4340043716.7738      -nan      0.1000 225547108.1422
##      7 4090404820.5020      -nan      0.1000 226030029.3024
##      8 3872455818.5956      -nan      0.1000 183804381.4153
##      9 3676126741.8468      -nan      0.1000 141746170.3819
##     10 3508445556.3533      -nan      0.1000 158987616.0645
##     20 2367956137.9017      -nan      0.1000 86031425.4321
##    40 1502597310.7965      -nan      0.1000 4115433.5098
##    60 1220187489.2123      -nan      0.1000 -1318855.8802
##    80 1074970595.5351      -nan      0.1000 2965579.1358
##   100 1003656791.3753      -nan      0.1000 -8189501.8325
##   120 956755558.6838      -nan      0.1000 -8869984.2367
##   140 919918348.0513      -nan      0.1000 -1579839.9326
##   150 898859411.7137      -nan      0.1000 -4704408.8991
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##   1 5768901813.5977      -nan      0.1000 627836519.7216
##   2 5240718046.4360      -nan      0.1000 423647901.9623
##   3 4775577372.0024      -nan      0.1000 446770169.5178
##   4 4387879994.8199      -nan      0.1000 285394394.8184
##   5 4075233364.2288      -nan      0.1000 216130282.7237
##   6 3795796524.8102      -nan      0.1000 267112607.3085
##   7 3512444381.9844      -nan      0.1000 279801897.1429
##   8 3258677866.8500      -nan      0.1000 256250438.3751
##   9 3052571649.2398      -nan      0.1000 181297324.5578
##  10 2839268670.9120      -nan      0.1000 211453440.1922
##  20 1736846741.0322      -nan      0.1000 54105253.7643
##  40 1078248341.3843      -nan      0.1000 12140673.3381
##  60 883645746.0234      -nan      0.1000 -1112589.9424
##  80 781860330.1106      -nan      0.1000 -11862966.2966
## 100 711181316.4385      -nan      0.1000 -7837990.6921
## 120 665628406.0639      -nan      0.1000 -4395166.4222
## 140 629399141.0209      -nan      0.1000 -148440.3852
## 150 610542717.6065      -nan      0.1000 -4788577.0379
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##   1 5751620320.6718      -nan      0.1000 668215597.6215
##   2 5172206585.5886      -nan      0.1000 572925904.5185
##   3 4613787246.1843      -nan      0.1000 422444950.0094
##   4 4143842913.5124      -nan      0.1000 354858762.0584
##   5 3795927438.5854      -nan      0.1000 275781532.8229
##   6 3460142347.0227      -nan      0.1000 331748850.7943
##   7 3142590800.8974      -nan      0.1000 292610081.8179
##   8 2888256912.7457      -nan      0.1000 262227875.9217
##   9 2646521013.4902      -nan      0.1000 198088913.6044
##  10 2451612515.9980      -nan      0.1000 161215385.1770
##  20 1410538397.6859      -nan      0.1000 37892830.2839
##  40 886171624.8191      -nan      0.1000 3670007.1991
##  60 714804969.7231      -nan      0.1000 1162957.6605
##  80 619517452.3084      -nan      0.1000 -2792700.8311
## 100 557144561.1797      -nan      0.1000 -8024288.7576

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##      120 515360424.7610      -nan      0.1000 -1765547.8045
##      140 472260135.5726      -nan      0.1000 -6271271.9655
##      150 459948745.0299      -nan      0.1000 -4140900.9787
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##      1 6080116818.3424      -nan      0.1000 462920689.0670
##      2 5718627412.4956      -nan      0.1000 340208619.3661
##      3 5353777084.4551      -nan      0.1000 329792436.3414
##      4 4977977569.7284      -nan      0.1000 325165952.1541
##      5 4692671413.8403      -nan      0.1000 280814083.1291
##      6 4439333091.5729      -nan      0.1000 252488911.6995
##      7 4189011279.8147      -nan      0.1000 214073269.5163
##      8 4014023372.0433      -nan      0.1000 113463105.9833
##      9 3813272883.6062      -nan      0.1000 178236166.4268
##     10 3612898933.2786      -nan      0.1000 206562383.0715
##     20 2394397251.5079      -nan      0.1000 69368400.2742
##     40 1530528226.6767      -nan      0.1000 20628485.3485
##     60 1233394964.4762      -nan      0.1000 9586055.8782
##     80 1112242799.6090      -nan      0.1000 2302800.9602
##    100 1047893783.5159      -nan      0.1000 -1831676.5896
##    120 1006688677.0669      -nan      0.1000 -6209632.4181
##    140 966772817.9699      -nan      0.1000 -2076187.0415
##    150 948974224.1447      -nan      0.1000 -14630314.7414
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##      1 6000303943.1096      -nan      0.1000 498509054.7949
##      2 5376986731.3652      -nan      0.1000 510378216.5721
##      3 4870500824.1644      -nan      0.1000 465081351.4042
##      4 4441362633.5819      -nan      0.1000 419688864.3220
##      5 4126222050.0349      -nan      0.1000 325721949.7884
##      6 3798763454.5292      -nan      0.1000 334162576.9759
##      7 3510550629.0862      -nan      0.1000 269901878.7145
##      8 3259447521.7684      -nan      0.1000 251396783.0632
##      9 3068517127.4103      -nan      0.1000 158272906.0957
##     10 2867877635.7615      -nan      0.1000 158275084.7516
##     20 1738240305.3569      -nan      0.1000 53032923.6129
##     40 1096773559.7424      -nan      0.1000 8361598.5860
##     60 902202816.7975      -nan      0.1000 -487130.1552
##     80 811443122.5498      -nan      0.1000 -5710798.6224
##    100 750146070.9596      -nan      0.1000 -3887814.5939
##    120 698502911.8275      -nan      0.1000 -2116330.5754
##    140 656902967.7003      -nan      0.1000 -7356327.6513
##    150 645092435.8899      -nan      0.1000 -6239445.1527
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##      1 5814572603.9377      -nan      0.1000 682996268.0045
##      2 5213534772.4058      -nan      0.1000 572722404.0068
##      3 4743232100.7752      -nan      0.1000 470016063.9899
##      4 4294117151.1999      -nan      0.1000 415934918.0683
##      5 3910970757.4528      -nan      0.1000 331536640.0875
##      6 3577315944.6631      -nan      0.1000 281135117.4293
##      7 3252368921.0338      -nan      0.1000 308897848.9231

```

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##      8 3013621233.5182      -nan      0.1000 234735703.0026
##      9 2770442415.7970      -nan      0.1000 152555629.7149
##     10 2567408965.2898      -nan      0.1000 188505963.2604
##     20 1490052134.8872      -nan      0.1000 51235170.4764
##     40 941078347.0439      -nan      0.1000 5047527.5306
##     60 751221053.4070      -nan      0.1000 -1097530.2578
##     80 651469291.7804      -nan      0.1000 -2877321.3116
##    100 578342292.1491      -nan      0.1000 -4677671.7035
##    120 525325253.0438      -nan      0.1000 -6571431.5277
##    140 471453662.3423      -nan      0.1000 -2006252.6860
##    150 452214807.5770      -nan      0.1000 -3386295.7265
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##   1 6172391947.1586      -nan      0.1000 411251054.4800
##   2 5696752229.9187      -nan      0.1000 498314328.1433
##   3 5353960938.9204      -nan      0.1000 354395476.8698
##   4 5013856954.8120      -nan      0.1000 338913713.3296
##   5 4728720431.4199      -nan      0.1000 281302437.6111
##   6 4468686282.4851      -nan      0.1000 271283423.3398
##   7 4235272267.8623      -nan      0.1000 231675675.8983
##   8 3995703447.1697      -nan      0.1000 181956116.2806
##   9 3790370007.0756      -nan      0.1000 198755178.0477
##  10 3625980449.6807      -nan      0.1000 166023793.1293
##  20 2394866616.2821      -nan      0.1000 77271672.1161
##  40 1463836946.9903      -nan      0.1000 20682126.5241
##  60 1156694466.0220      -nan      0.1000 1420630.2039
##  80 1014288959.2176      -nan      0.1000 885104.5064
## 100 950977111.9951      -nan      0.1000 3668326.2502
## 120 889811254.3538      -nan      0.1000 1459481.5101
## 140 858074617.4842      -nan      0.1000 -15133067.9541
## 150 842502225.8202      -nan      0.1000 -3928169.7886
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##   1 5918363044.9584      -nan      0.1000 604381049.2106
##   2 5340248804.3755      -nan      0.1000 581720908.3032
##   3 4895092281.8385      -nan      0.1000 406324332.4276
##   4 4461739100.7458      -nan      0.1000 438131659.1260
##   5 4102085056.4324      -nan      0.1000 300179518.1686
##   6 3790136107.8580      -nan      0.1000 329946149.6718
##   7 3502219197.3189      -nan      0.1000 233046990.6349
##   8 3256201067.0370      -nan      0.1000 264607312.3862
##   9 3052512400.6930      -nan      0.1000 193738204.1323
##  10 2899921588.9719      -nan      0.1000 150857090.4569
##  20 1706513726.9130      -nan      0.1000 35975629.2356
##  40 1025444246.1755      -nan      0.1000 7174803.0967
##  60 837626927.1366      -nan      0.1000 -5065240.8924
##  80 743978793.2639      -nan      0.1000 -3337734.9498
## 100 690480223.0380      -nan      0.1000 -6589558.9514
## 120 650742869.3526      -nan      0.1000 -304704.1013
## 140 614344436.8564      -nan      0.1000 -2811297.0323
## 150 589405228.4681      -nan      0.1000 -2292717.2929
##

```

```

## Iter TrainDeviance ValidDeviance StepSize Improve
## 1 5804095752.8832 -nan 0.1000 730078416.8591
## 2 5225333786.1990 -nan 0.1000 540583549.1362
## 3 4637499707.5971 -nan 0.1000 462097826.6053
## 4 4190912982.2407 -nan 0.1000 460754355.6754
## 5 3815183057.7995 -nan 0.1000 280118980.6605
## 6 3478613702.9520 -nan 0.1000 316255786.6623
## 7 3160329054.1042 -nan 0.1000 319265728.0363
## 8 2919382571.0227 -nan 0.1000 209883445.6096
## 9 2681588574.3558 -nan 0.1000 232438953.5199
## 10 2480951527.0838 -nan 0.1000 176110026.0942
## 20 1382604245.3122 -nan 0.1000 55003823.6733
## 40 833902816.3544 -nan 0.1000 -3002335.7228
## 60 698815354.7706 -nan 0.1000 -3164541.8754
## 80 621440036.0748 -nan 0.1000 -3151055.9603
## 100 564508924.9198 -nan 0.1000 -8837790.2598
## 120 518215403.4279 -nan 0.1000 -4684376.8726
## 140 479049672.3819 -nan 0.1000 -913742.0487
## 150 463186574.5090 -nan 0.1000 -4875529.4769
##
## Iter TrainDeviance ValidDeviance StepSize Improve
## 1 6147920783.5987 -nan 0.1000 391818554.0390
## 2 5759701488.9908 -nan 0.1000 388088078.7301
## 3 5429352474.1258 -nan 0.1000 336602931.4662
## 4 5105764841.1366 -nan 0.1000 315930903.3408
## 5 4800440118.1854 -nan 0.1000 269569945.2893
## 6 4510229782.1048 -nan 0.1000 266597076.1856
## 7 4239577892.6229 -nan 0.1000 173261508.5707
## 8 3984619003.5126 -nan 0.1000 219104150.9707
## 9 3788076680.6935 -nan 0.1000 185147265.7937
## 10 3599482730.9720 -nan 0.1000 171931242.5041
## 20 2397922702.0765 -nan 0.1000 78752708.8622
## 40 1486476659.3824 -nan 0.1000 19573351.3521
## 60 1215872495.5116 -nan 0.1000 6866562.7921
## 80 1112553238.7515 -nan 0.1000 1493051.3460
## 100 1043944153.8973 -nan 0.1000 1767901.7213
## 120 996959742.2375 -nan 0.1000 1628283.7121
## 140 972127411.2428 -nan 0.1000 -4253596.4131
## 150 953063130.9157 -nan 0.1000 -2739642.2835
##
## Iter TrainDeviance ValidDeviance StepSize Improve
## 1 5925009546.4218 -nan 0.1000 569711228.5859
## 2 5407797685.2981 -nan 0.1000 453672869.4688
## 3 4929804061.7367 -nan 0.1000 473961247.6789
## 4 4478379504.1601 -nan 0.1000 427565595.6868
## 5 4107730474.4833 -nan 0.1000 356419809.4052
## 6 3804065347.4720 -nan 0.1000 256512003.4791
## 7 3509543758.0096 -nan 0.1000 272591792.9466
## 8 3281190861.9536 -nan 0.1000 188025403.6709
## 9 3081988815.1138 -nan 0.1000 157076031.1535
## 10 2859120113.6673 -nan 0.1000 178458115.9795
## 20 1719976487.2362 -nan 0.1000 70107244.9089

```

```

##      40 1123534925.1787      -nan      0.1000 7349205.0850
##      60 945818162.2569      -nan      0.1000 -9355518.9578
##      80 852515151.1640      -nan      0.1000 -11083434.9810
##     100 782075353.1237      -nan      0.1000 -1755176.9620
##     120 723801490.7290      -nan      0.1000 -691429.9723
##     140 682570410.1870      -nan      0.1000 -5982705.0909
##     150 658866015.7659      -nan      0.1000 -2423459.5125
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##    1 5896175321.6603      -nan      0.1000 672929273.3563
##    2 5263758919.3340      -nan      0.1000 612364381.3973
##    3 4761268907.6126      -nan      0.1000 462411702.5635
##    4 4273685370.5568      -nan      0.1000 405580625.2650
##    5 3867658951.3609      -nan      0.1000 370079960.9854
##    6 3536616976.8564      -nan      0.1000 329419009.5395
##    7 3261820957.1270      -nan      0.1000 299379905.8343
##    8 2994744400.9708      -nan      0.1000 221001160.7120
##    9 2747803854.0362      -nan      0.1000 224887766.9828
##   10 2553947316.4261      -nan      0.1000 165269632.6103
##   20 1458747794.9849      -nan      0.1000 55189731.0962
##   40 939500212.8855      -nan      0.1000 550001.4490
##   60 773440319.7295      -nan      0.1000 -5808007.2892
##   80 675574632.9241      -nan      0.1000 -7071363.7227
##  100 596692234.5166      -nan      0.1000 -1493991.8062
##  120 538528256.6339      -nan      0.1000 -5318889.6683
##  140 494825668.5729      -nan      0.1000 -3492791.7826
##  150 478853284.9723      -nan      0.1000 -1772709.9057
##
## Iter TrainDeviance ValidDeviance StepSize Improve
##    1 5717854958.6248      -nan      0.1000 647384629.2667
##    2 5135196344.5461      -nan      0.1000 561323851.6643
##    3 4639991106.2062      -nan      0.1000 482440421.8882
##    4 4237903719.5836      -nan      0.1000 416519229.2280
##    5 3874573747.4656      -nan      0.1000 269917643.7163
##    6 3523440740.1211      -nan      0.1000 325327052.4296
##    7 3205670333.5018      -nan      0.1000 310694170.7426
##    8 2950904221.2388      -nan      0.1000 175817302.7315
##    9 2689527803.6894      -nan      0.1000 222614049.2454
##   10 2492069747.8062      -nan      0.1000 150621241.2042
##   20 1417436674.6797      -nan      0.1000 46224893.3319
##   40 897393789.3868      -nan      0.1000 -2797134.2295
##   60 736500028.2566      -nan      0.1000 1938194.0520
##   80 647526948.3527      -nan      0.1000 -4429868.8365
##  100 596957994.3258      -nan      0.1000 -896000.7551
##  120 547302725.9249      -nan      0.1000 -3157075.0850
##  140 505460775.8940      -nan      0.1000 -2596057.2899
##  150 487750801.8779      -nan      0.1000 -8510460.8780

```

```

predictions.gbm <- predict(gbm, housing.test, na.action = na.pass)
RMSE(predictions.gbm, housing.test$SalePrice)

```

```
## [1] 26147.59
```

RMSE 26147.59

16.

```
set.seed(1)
svmlin <- train(SalePrice ~ ., data= housing.train, preProc = "knnImpute", na.action = n
a.pass, method = "svmLinear", trControl = trainControl("cv", number = 10), tuneGrid = ex
pand.grid(C = c(1, 190, 225)))
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,  
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,  
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,  
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
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```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
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## Exterior1stAsphShn, Exterior1stImStucc
```

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## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
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```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,  
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,  
## Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,  
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,  
## Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,  
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,  
## Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,  
## SaleTypeCon
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,  
## SaleTypeCon
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,  
## SaleTypeCon
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
predictions.svmlin <- predict(svmlin, housing.test, na.action = na.pass)  
RMSE(predictions.svmlin, housing.test$SalePrice)
```

```
## [1] 26994.74
```

RMSE = 26994.74 C controls how big the penalty there is for the “soft margin” larger value = thinner margins.

17.

```
set.seed(1)
svmrad <- train(SalePrice ~ ., data= housing.train, preProc = "knnImpute", na.action = na.pass, method = "svmRadial", trControl = trainControl("cv", number = 10))

## Warning in preProcess.default(method = "knnImpute", k = 5, x = structure(c(60, :
## These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stImStucc

## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,
## Exterior1stAsphShn, Exterior1stCBlock, Exterior1stImStucc, Exterior2ndCBlock,
## ElectricalMix, MiscFeatureTenC

## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone

## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.

## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlMembran,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc, Exterior1stStone
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,  
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,  
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition1RRNe, Condition2PosN,  
## Condition2RRNn, RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAe, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, HeatingQCpo
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRAn, Condition2RRNn,  
## RoofMatlRoll, Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,  
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,  
## Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,  
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,  
## Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: UtilitiesNoSeWa, Condition2PosA,  
## Condition2RRNn, RoofMatlMetal, RoofMatlRoll, Exterior1stAsphShn,  
## Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,  
## SaleTypeCon
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,  
## SaleTypeCon
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, Exterior2ndOther, ExterCondPo,  
## SaleTypeCon
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc, FunctionalSev
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
## Warning in preProcess.default(thresh = 0.95, k = 5, freqCut = 19, uniqueCut  
## = 10, : These variables have zero variances: Condition2RRNn, RoofMatlRoll,  
## Exterior1stAsphShn, Exterior1stImStucc
```

```
## Warning in .local(x, ...): Variable(s) `` constant. Cannot scale data.
```

```
predictions.svmrad <- predict(svmrad, housing.test, na.action = na.pass)  
RMSE(predictions.svmrad, housing.test$SalePrice)
```

```
## [1] 77423.92
```

RMSE = 77423.92

18.

```
compare = resamples(list(L=lasso, R=ridge, E=enet, RF=rf, svmLIN=svmlin, svmRAD=svmradi, G=gbm))
summary(compare, metric=compare$metrics)

## 
## Call:
## summary.resamples(object = compare, metric = compare$metrics)
##
## Models: L, R, E, RF, svmLIN, svmRAD, G
## Number of resamples: 10
##
## MAE
##           Min. 1st Qu. Median   Mean 3rd Qu.   Max. NA's
## L      14701.66 16660.84 18364.14 18250.12 20141.77 21956.57 0
## R      15137.68 18273.20 19050.04 18941.71 20914.96 21819.43 0
## E      15137.68 18273.20 19050.04 18941.71 20914.96 21819.43 0
## RF     16072.94 16645.57 17794.08 17965.57 19094.18 20601.00 0
## svmLIN 13841.20 15698.66 16950.14 17046.90 18694.84 20207.97 0
## svmRAD 50827.34 53920.22 57266.55 55874.01 58091.90 59037.47 0
## G      15872.90 18882.69 19504.85 19386.12 20439.28 22806.77 0
##
## RMSE
##           Min. 1st Qu. Median   Mean 3rd Qu.   Max. NA's
## L      20591.06 24655.50 29433.59 34129.47 37582.84 73690.11 0
## R      21174.89 26115.57 30206.80 34026.59 36962.98 68921.75 0
## E      21174.89 26115.57 30206.80 34026.59 36962.98 68921.75 0
## RF     22847.42 25335.14 28865.13 30461.72 34569.96 43917.08 0
## svmLIN 19190.40 22656.05 26584.85 30830.04 32740.14 63000.04 0
## svmRAD 72099.78 73747.36 81362.70 81830.12 89588.79 94405.31 0
## G      21963.15 25560.58 31139.04 31238.51 35515.43 45284.12 0
##
## Rsquared
##           Min. 1st Qu. Median   Mean 3rd Qu.   Max. NA's
## L      0.4493449 0.8126273 0.8847586 0.8246095 0.8929485 0.9293024 0
## R      0.4817790 0.8201216 0.8739816 0.8256416 0.8841331 0.9314466 0
## E      0.4817790 0.8201216 0.8739816 0.8256416 0.8841331 0.9314466 0
## RF     0.7532677 0.8562373 0.8856585 0.8632701 0.9022848 0.9202865 0
## svmLIN 0.4946516 0.8797603 0.8949264 0.8528318 0.9197926 0.9420518 0
## svmRAD 0.2436634 0.4214664 0.4600261 0.4326348 0.4890375 0.5270952 0
## G      0.7421612 0.8386198 0.8650415 0.8495071 0.8947391 0.9078028 0
```

Random forest had the best RMSE, but it was a narrow victory over the GBM model and the SVMLinear model.

19.

```
set.seed(123)
in_train <- createDataPartition(housing.train$SalePrice, p = .90, list = FALSE)
train <- housing.train[in_train, ]
val <- housing.train[-in_train, ]
```

20.

```
library("RANN")
preproc <- preProcess(train, method="knnImpute")
train.imputed <- predict(preproc, train)
test.imputed <- predict(preproc, housing.test)
val.imputed <- predict(preproc, val)
```

21.

```
library(mltools)
```

```
##
## Attaching package: 'mltools'
```

```
## The following object is masked from 'package:tidyr':
##
##     replace_na
```

```
library(data.table)
train.onehot <- as.data.frame(one_hot(as.data.table(train.imputed), dropCols = TRUE, dropUnusedLevels = FALSE))
val.onehot <- as.data.frame(one_hot(as.data.table(val.imputed), dropCols = TRUE, dropUnusedLevels = FALSE))
test <- as.data.frame(one_hot(as.data.table(test.imputed), dropCols = TRUE, dropUnusedLevels = FALSE))
train.onehot <- train.onehot[ , -which(names(train.onehot) %in% "SalePrice")]
val.onehot <- val.onehot[ , -which(names(val.onehot) %in% "SalePrice")]
test <- test[ , -which(names(test) %in% "SalePrice")]
train.labels <- log(train$SalePrice)
val.labels <- log(val$SalePrice)
test_labels <- log(housing.test$SalePrice)
```

22.

```
library(tfruns)
library(keras)
set.seed(1)
tensorflow::set_random_seed(1)
```

```
## Loaded Tensorflow version 2.8.0
```

```
housing_runs <- tuning_run("housing_tuning.R",
  flags = list(
    nodes = c(32, 64, 128, 392),
    learning_rate = c(0.01, 0.05, 0.001, 0.0001),
    batch_size=c(50, 100, 500, 1000),
    epochs=c(30, 50, 100, 200),
    activation=c("relu","sigmoid","tanh"),
    dropout1=c(.2, .3, .5),
    dropout2=c(.2, .4, .5)
  ), sample = .02)
```

```
## 6,912 total combinations of flags
```

```
## (sampled to 139 combinations)
```

```
## Training run 1/139 (flags = list(32, 0.001, 1000, 200, "relu", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-22-55Z
```

```
##
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]
##
## > model = keras_model_sequential()
##
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]
##
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),
## +      loss = "mse", metrics = "mae")
##
## > model %>% fit(as.matrix(train.onehot), train.labels,
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##
## Run completed: runs/2022-04-19T14-22-55Z
```

```
## Training run 2/139 (flags = list(128, 0.05, 500, 100, "relu", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-23-17Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-23-17Z
```

```
## Training run 3/139 (flags = list(32, 0.01, 50, 100, "tanh", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-23-34Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-23-34Z
```

```
## Training run 4/139 (flags = list(64, 0.01, 500, 100, "sigmoid", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-24-03Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-24-03Z
```

```
## Training run 5/139 (flags = list(32, 1e-04, 1000, 200, "tanh", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-24-19Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-24-19Z
```

```
## Training run 6/139 (flags = list(128, 0.05, 100, 200, "tanh", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-24-39Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-24-39Z
```

```
## Training run 7/139 (flags = list(128, 0.001, 500, 30, "relu", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T14-25-06Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-25-06Z
```

```
## Training run 8/139 (flags = list(64, 1e-04, 50, 30, "sigmoid", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-25-17Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-25-17Z
```

```
## Training run 9/139 (flags = list(64, 0.01, 100, 200, "relu", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-25-30Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-25-30Z
```

```
## Training run 10/139 (flags = list(128, 0.001, 1000, 100, "tanh", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-25-56Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-25-56Z
```

```
## Training run 11/139 (flags = list(128, 0.01, 1000, 30, "sigmoid", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T14-26-16Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-26-16Z
```

```
## Training run 12/139 (flags = list(32, 0.01, 500, 200, "relu", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-26-29Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-26-29Z
```

```
## Training run 13/139 (flags = list(32, 0.05, 100, 50, "tanh", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-26-51Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-26-51Z
```

```
## Training run 14/139 (flags = list(32, 0.05, 100, 30, "tanh", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-27-05Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-27-05Z
```

```
## Training run 15/139 (flags = list(64, 0.05, 1000, 100, "tanh", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-27-17Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-27-17Z
```

```
## Training run 16/139 (flags = list(64, 0.001, 50, 50, "sigmoid", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-27-32Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-27-32Z
```

```
## Training run 17/139 (flags = list(128, 0.05, 50, 30, "sigmoid", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-27-47Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-27-47Z
```

```
## Training run 18/139 (flags = list(32, 0.001, 50, 50, "relu", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-28-00Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-28-00Z
```

```
## Training run 19/139 (flags = list(128, 1e-04, 50, 50, "sigmoid", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-28-15Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-28-15Z
```

```
## Training run 20/139 (flags = list(32, 0.05, 100, 200, "relu", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-28-31Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-28-31Z
```

```
## Training run 21/139 (flags = list(32, 0.05, 500, 30, "relu", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-28-57Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-28-57Z
```

```
## Training run 22/139 (flags = list(32, 0.001, 500, 50, "sigmoid", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-29-08Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-29-08Z
```

```
## Training run 23/139 (flags = list(32, 0.001, 100, 200, "tanh", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-29-22Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-29-22Z
```

```
## Training run 24/139 (flags = list(64, 1e-04, 500, 50, "relu", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-29-48Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-29-48Z
```

```
## Training run 25/139 (flags = list(32, 0.05, 500, 200, "sigmoid", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-30-02Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-30-02Z
```

```
## Training run 26/139 (flags = list(64, 0.01, 500, 30, "tanh", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-30-24Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-30-24Z
```

```
## Training run 27/139 (flags = list(64, 1e-04, 1000, 50, "sigmoid", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-30-35Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-30-35Z
```

```
## Training run 28/139 (flags = list(392, 0.001, 500, 100, "relu", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-30-48Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-30-48Z
```

```
## Training run 29/139 (flags = list(128, 1e-04, 50, 200, "sigmoid", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-31-07Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-31-07Z
```

```
## Training run 30/139 (flags = list(32, 0.01, 500, 30, "tanh", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T14-31-40Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-31-40Z
```

```
## Training run 31/139 (flags = list(392, 0.01, 100, 50, "tanh", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T14-31-52Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-31-52Z
```

```
## Training run 32/139 (flags = list(64, 0.05, 50, 50, "sigmoid", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-32-08Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-32-08Z
```

```
## Training run 33/139 (flags = list(64, 0.001, 50, 50, "relu", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T14-32-23Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-32-23Z
```

```
## Training run 34/139 (flags = list(64, 0.001, 500, 30, "relu", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-32-43Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-32-43Z
```

```
## Training run 35/139 (flags = list(64, 0.05, 500, 100, "tanh", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-32-55Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-32-55Z
```

```
## Training run 36/139 (flags = list(128, 1e-04, 500, 50, "tanh", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-33-11Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-33-11Z
```

```
## Training run 37/139 (flags = list(392, 0.01, 100, 100, "sigmoid", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T14-33-26Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-33-26Z
```

```
## Training run 38/139 (flags = list(392, 0.001, 100, 100, "sigmoid", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-33-56Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-33-56Z
```

```
## Training run 39/139 (flags = list(392, 0.01, 100, 30, "sigmoid", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T14-34-26Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-34-26Z
```

```
## Training run 40/139 (flags = list(64, 0.001, 1000, 200, "tanh", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-34-39Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-34-39Z
```

```
## Training run 41/139 (flags = list(392, 0.001, 500, 30, "tanh", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-35-00Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-35-00Z
```

```
## Training run 42/139 (flags = list(128, 0.05, 100, 50, "tanh", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-35-15Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-35-15Z
```

```
## Training run 43/139 (flags = list(64, 0.05, 50, 50, "tanh", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-35-29Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-35-29Z
```

```
## Training run 44/139 (flags = list(392, 0.05, 500, 30, "sigmoid", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-35-44Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-35-44Z
```

```
## Training run 45/139 (flags = list(32, 0.001, 100, 30, "relu", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-35-59Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-35-59Z
```

```
## Training run 46/139 (flags = list(128, 0.05, 1000, 50, "sigmoid", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-36-11Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-36-11Z
```

```
## Training run 47/139 (flags = list(392, 0.05, 1000, 200, "sigmoid", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-36-26Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-36-26Z
```

```
## Training run 48/139 (flags = list(64, 0.05, 50, 200, "sigmoid", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-36-54Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-36-54Z
```

```
## Training run 49/139 (flags = list(64, 0.001, 1000, 50, "relu", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T14-37-44Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-37-44Z
```

```
## Training run 50/139 (flags = list(128, 0.05, 500, 30, "tanh", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-37-58Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-37-58Z
```

```
## Training run 51/139 (flags = list(128, 0.01, 1000, 100, "relu", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T14-38-10Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-38-10Z
```

```
## Training run 52/139 (flags = list(64, 0.001, 500, 30, "tanh", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T14-38-27Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-38-27Z
```

```
## Training run 53/139 (flags = list(64, 0.05, 50, 100, "relu", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-38-39Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-38-39Z
```

```
## Training run 54/139 (flags = list(392, 0.05, 100, 30, "relu", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-39-09Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-39-09Z
```

```
## Training run 55/139 (flags = list(392, 1e-04, 100, 100, "relu", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-39-23Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-39-23Z
```

```
## Training run 56/139 (flags = list(64, 1e-04, 50, 30, "tanh", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-39-45Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-39-45Z
```

```
## Training run 57/139 (flags = list(64, 0.01, 50, 100, "tanh", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-39-58Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-39-58Z
```

```
## Training run 58/139 (flags = list(32, 1e-04, 500, 30, "sigmoid", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-40-19Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-40-19Z
```

```
## Training run 59/139 (flags = list(64, 0.01, 100, 100, "relu", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-40-31Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-40-31Z
```

```
## Training run 60/139 (flags = list(64, 0.05, 100, 30, "relu", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-40-50Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-40-50Z
```

```
## Training run 61/139 (flags = list(64, 1e-04, 50, 200, "sigmoid", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-41-02Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-41-02Z
```

```
## Training run 62/139 (flags = list(64, 0.05, 500, 200, "sigmoid", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-41-35Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-41-35Z
```

```
## Training run 63/139 (flags = list(32, 0.01, 50, 200, "relu", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-42-05Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-42-05Z
```

```
## Training run 64/139 (flags = list(128, 0.01, 1000, 50, "relu", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-42-37Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-42-37Z
```

```
## Training run 65/139 (flags = list(128, 0.01, 1000, 200, "sigmoid", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-42-51Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-42-51Z
```

```
## Training run 66/139 (flags = list(392, 0.05, 500, 50, "sigmoid", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-43-14Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-43-14Z
```

```
## Training run 67/139 (flags = list(128, 0.05, 100, 200, "relu", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-43-28Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-43-28Z
```

```
## Training run 68/139 (flags = list(128, 1e-04, 1000, 200, "relu", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-43-57Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-43-57Z
```

```
## Training run 69/139 (flags = list(392, 0.001, 500, 200, "relu", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-44-20Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-44-20Z
```

```
## Training run 70/139 (flags = list(64, 0.05, 50, 50, "relu", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-44-49Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-44-49Z
```

```
## Training run 71/139 (flags = list(392, 0.05, 500, 50, "sigmoid", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-45-05Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-45-05Z
```

```
## Training run 72/139 (flags = list(128, 0.05, 500, 50, "relu", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-45-20Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-45-20Z
```

```
## Training run 73/139 (flags = list(128, 0.001, 50, 50, "sigmoid", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-45-34Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-45-34Z
```

```
## Training run 74/139 (flags = list(32, 0.01, 100, 200, "sigmoid", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-45-50Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-45-50Z
```

```
## Training run 75/139 (flags = list(392, 0.01, 500, 200, "sigmoid", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-46-17Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-46-17Z
```

```
## Training run 76/139 (flags = list(32, 1e-04, 50, 30, "sigmoid", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-46-46Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-46-46Z
```

```
## Training run 77/139 (flags = list(392, 1e-04, 500, 100, "sigmoid", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-47-01Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-47-01Z
```

```
## Training run 78/139 (flags = list(128, 0.05, 100, 30, "relu", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-47-20Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-47-20Z
```

```
## Training run 79/139 (flags = list(64, 1e-04, 500, 50, "sigmoid", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-47-33Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-47-33Z
```

```
## Training run 80/139 (flags = list(392, 0.01, 100, 50, "relu", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-47-46Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-47-46Z
```

```
## Training run 81/139 (flags = list(128, 0.05, 500, 50, "sigmoid", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-48-07Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-48-07Z
```

```
## Training run 82/139 (flags = list(32, 1e-04, 100, 30, "relu", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T14-48-21Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-48-21Z
```

```
## Training run 83/139 (flags = list(32, 1e-04, 50, 100, "tanh", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-48-34Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-48-34Z
```

```
## Training run 84/139 (flags = list(392, 0.001, 1000, 200, "tanh", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-49-04Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-49-04Z
```

```
## Training run 85/139 (flags = list(64, 0.05, 100, 100, "relu", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-49-35Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-49-35Z
```

```
## Training run 86/139 (flags = list(128, 0.001, 100, 200, "tanh", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-49-55Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-49-55Z
```

```
## Training run 87/139 (flags = list(392, 0.001, 500, 50, "tanh", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-50-24Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-50-24Z
```

```
## Training run 88/139 (flags = list(392, 1e-04, 500, 30, "tanh", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-50-39Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-50-39Z
```

```
## Training run 89/139 (flags = list(32, 1e-04, 500, 30, "tanh", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-50-52Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-50-52Z
```

```
## Training run 90/139 (flags = list(32, 0.05, 100, 100, "sigmoid", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-51-04Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-51-04Z
```

```
## Training run 91/139 (flags = list(128, 1e-04, 100, 30, "sigmoid", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-51-22Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-51-22Z
```

```
## Training run 92/139 (flags = list(64, 0.05, 500, 50, "tanh", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-51-35Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-51-35Z
```

```
## Training run 93/139 (flags = list(32, 0.01, 100, 100, "relu", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T14-51-47Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-51-47Z
```

```
## Training run 94/139 (flags = list(32, 0.001, 50, 50, "sigmoid", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-52-05Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-52-05Z
```

```
## Training run 95/139 (flags = list(128, 0.05, 500, 200, "sigmoid", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-52-20Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-52-20Z
```

```
## Training run 96/139 (flags = list(64, 0.05, 1000, 50, "tanh", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T14-52-50Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-52-50Z
```

```
## Training run 97/139 (flags = list(64, 0.01, 1000, 200, "tanh", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-53-05Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-53-05Z
```

```
## Training run 98/139 (flags = list(64, 0.001, 100, 50, "relu", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-53-27Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-53-27Z
```

```
## Training run 99/139 (flags = list(392, 1e-04, 500, 30, "tanh", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-53-41Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-53-41Z
```

```
## Training run 100/139 (flags = list(128, 0.001, 500, 50, "tanh", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-53-57Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-53-57Z
```

```
## Training run 101/139 (flags = list(392, 1e-04, 1000, 30, "relu", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-54-10Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-54-10Z
```

```
## Training run 102/139 (flags = list(64, 1e-04, 100, 200, "relu", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T14-54-26Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-54-26Z
```

```
## Training run 103/139 (flags = list(128, 0.05, 500, 50, "relu", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T14-54-53Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-54-53Z
```

```
## Training run 104/139 (flags = list(392, 0.001, 1000, 30, "sigmoid", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-55-08Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-55-08Z
```

```
## Training run 105/139 (flags = list(128, 0.01, 1000, 30, "tanh", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-55-23Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-55-23Z
```

```
## Training run 106/139 (flags = list(32, 1e-04, 100, 200, "tanh", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-55-34Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-55-34Z
```

```
## Training run 107/139 (flags = list(64, 0.01, 500, 30, "relu", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T14-56-01Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-56-01Z
```

```
## Training run 108/139 (flags = list(64, 0.001, 50, 100, "tanh", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-56-13Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-56-13Z
```

```
## Training run 109/139 (flags = list(32, 0.01, 50, 100, "relu", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-56-36Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-56-36Z
```

```
## Training run 110/139 (flags = list(128, 0.001, 500, 30, "sigmoid", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-57-06Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-57-06Z
```

```
## Training run 111/139 (flags = list(128, 0.001, 1000, 100, "sigmoid", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T14-57-18Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-57-18Z
```

```
## Training run 112/139 (flags = list(64, 0.001, 100, 30, "relu", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T14-57-35Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-57-35Z  
  
## Training run 113/139 (flags = list(128, 1e-04, 50, 100, "sigmoid", 0.3, 0.2))  
  
## Using run directory runs/2022-04-19T14-57-48Z  
  
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]  
  
##  
## Run completed: runs/2022-04-19T14-57-48Z  
  
## Training run 114/139 (flags = list(64, 0.001, 1000, 100, "sigmoid", 0.3, 0.4))  
  
## Using run directory runs/2022-04-19T14-58-10Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-58-10Z
```

```
## Training run 115/139 (flags = list(32, 1e-04, 100, 30, "sigmoid", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T14-58-26Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-58-26Z
```

```
## Training run 116/139 (flags = list(392, 0.05, 100, 100, "relu", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T14-58-39Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-58-39Z
```

```
## Training run 117/139 (flags = list(64, 0.001, 500, 100, "relu", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T14-59-01Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-59-01Z
```

```
## Training run 118/139 (flags = list(32, 0.05, 1000, 200, "sigmoid", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T14-59-18Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T14-59-18Z
```

```
## Training run 119/139 (flags = list(392, 0.001, 50, 200, "tanh", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T14-59-49Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T14-59-49Z
```

```
## Training run 120/139 (flags = list(128, 1e-04, 1000, 200, "sigmoid", 0.5, 0.5))
```

```
## Using run directory runs/2022-04-19T15-00-31Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-00-31Z
```

```
## Training run 121/139 (flags = list(392, 0.05, 100, 30, "tanh", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T15-00-53Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-00-53Z
```

```
## Training run 122/139 (flags = list(392, 0.001, 100, 200, "sigmoid", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T15-01-06Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-01-06Z
```

```
## Training run 123/139 (flags = list(64, 0.05, 100, 200, "relu", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T15-01-57Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-01-57Z
```

```
## Training run 124/139 (flags = list(128, 0.01, 500, 100, "tanh", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T15-02-23Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-02-23Z
```

```
## Training run 125/139 (flags = list(128, 0.001, 500, 30, "tanh", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T15-02-40Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-02-40Z
```

```
## Training run 126/139 (flags = list(32, 0.01, 50, 30, "tanh", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T15-02-51Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## + 100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## + input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## + loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## + epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-02-51Z
```

```
## Training run 127/139 (flags = list(32, 1e-04, 100, 30, "relu", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T15-03-04Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-03-04Z
```

```
## Training run 128/139 (flags = list(64, 1e-04, 50, 50, "tanh", 0.3, 0.4))
```

```
## Using run directory runs/2022-04-19T15-03-17Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-03-17Z
```

```
## Training run 129/139 (flags = list(64, 0.05, 100, 100, "sigmoid", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T15-03-32Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-03-32Z
```

```
## Training run 130/139 (flags = list(64, 0.05, 50, 50, "sigmoid", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T15-03-51Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-03-51Z
```

```
## Training run 131/139 (flags = list(392, 0.001, 100, 30, "sigmoid", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T15-04-11Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-04-11Z
```

```
## Training run 132/139 (flags = list(392, 0.01, 1000, 50, "sigmoid", 0.3, 0.5))
```

```
## Using run directory runs/2022-04-19T15-04-25Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##
```

```
## Run completed: runs/2022-04-19T15-04-25Z
```

```
## Training run 133/139 (flags = list(32, 0.001, 500, 200, "tanh", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T15-04-40Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", ... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-04-40Z
```

```
## Training run 134/139 (flags = list(32, 0.05, 500, 30, "tanh", 0.3, 0.2))
```

```
## Using run directory runs/2022-04-19T15-05-10Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-05-10Z
```

```
## Training run 135/139 (flags = list(32, 1e-04, 1000, 30, "relu", 0.2, 0.5))
```

```
## Using run directory runs/2022-04-19T15-05-22Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-05-22Z
```

```
## Training run 136/139 (flags = list(64, 1e-04, 500, 100, "sigmoid", 0.5, 0.2))
```

```
## Using run directory runs/2022-04-19T15-05-33Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
RUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-05-33Z
```

```
## Training run 137/139 (flags = list(32, 0.01, 1000, 50, "sigmoid", 0.2, 0.2))
```

```
## Using run directory runs/2022-04-19T15-05-50Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-05-50Z
```

```
## Training run 138/139 (flags = list(128, 0.01, 50, 200, "relu", 0.2, 0.4))
```

```
## Using run directory runs/2022-04-19T15-06-04Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNCATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(as.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-06-04Z
```

```
## Training run 139/139 (flags = list(64, 0.05, 100, 50, "sigmoid", 0.5, 0.4))
```

```
## Using run directory runs/2022-04-19T15-06-39Z
```

```
##  
## > FLAGS <- flags(flag_numeric("nodes", 128), flag_numeric("batch_size",  
## +      100), flag_string("activation", "relu"), flag_numeric("learning_rate", .... [T  
TRUNCATED]  
##  
## > model = keras_model_sequential()  
##  
## > model %>% layer_dense(units = FLAGS$nodes, activation = FLAGS$activation,  
## +      input_shape = ncol(train.onehot)) %>% layer_dropout(FLAGS$dropout1) .... [TRUNC  
ATED]  
##  
## > model %>% compile(optimizer = optimizer_adam(learning_rate = FLAGS$learning_rate),  
## +      loss = "mse", metrics = "mae")  
##  
## > model %>% fit(as.matrix(train.onehot), train.labels,  
## +      epochs = FLAGS$epochs, batch_size = FLAGS$batch_size, validation_data = list(a  
s.matrix(v .... [TRUNCATED]
```

```
##  
## Run completed: runs/2022-04-19T15-06-39Z
```

23.

```
housing_runs_ordered <- housing_runs[order(housing_runs$metric_val_loss), ]  
head(housing_runs_ordered)
```

```

## Data frame: 6 x 27
## run_dir metric_loss metric_mae metric_val_loss
## 2 runs/2022-04-19T15-06-04Z 0.1501 0.3062 0.0158
## 109 runs/2022-04-19T14-31-52Z 0.2980 0.4348 0.0159
## 101 runs/2022-04-19T14-34-26Z 0.5177 0.5669 0.0183
## 21 runs/2022-04-19T14-59-49Z 0.2772 0.4241 0.0198
## 102 runs/2022-04-19T14-33-56Z 0.2688 0.4159 0.0199
## 17 runs/2022-04-19T15-01-57Z 0.0395 0.1395 0.0207
## metric_val_mae
## 2 0.0924
## 109 0.0919
## 101 0.1006
## 21 0.1046
## 102 0.1064
## 17 0.1061
## # ... with 22 more columns:
## # flag_nodes, flag_batch_size, flag_activation, flag_learning_rate,
## # flag_epochs, flag_dropout1, flag_dropout2, epochs, epochs_completed,
## # metrics, model, loss_function, optimizer, learning_rate, script, start,
## # end, completed, output, source_code, context, type

```

```
view_run(housing_runs$run_dir[2])
```

```
## starting httpd help server ... done
```

```
## Warning in readLines(file.path(source_dir, file)): incomplete final line found
## on '/tmp/RtmpVCtGOJ/file3699f4655ea331/source/housing_tuning.R'
```

The best model was run #2 with a val_loss of .0158. The model is a pretty good fit. Not excessively overfitting or underfitting. loss and validation loss appear to be decreasing and converging together in the graph.

The hyper parameters are: nodes = 128, batch_size = 50, activation = relu, learning rate = .01, epochs = 200, dropout1 = .2, dropout 2 = .4

24.

```

# combine train w/ validation
housing_train <- rbind(train.onehot, val.onehot)
housing_train_labels <- c(train.labels, val.labels)

set.seed(1)
tensorflow::set_random_seed(1)
best_model = keras_model_sequential()
best_model %>%
  layer_dense(units = 128, activation = "relu", input_shape = ncol(housing_train)) %>%
  layer_dropout(.2) %>%
  layer_dense(units = 128, activation = "relu") %>%
  layer_dropout(.4) %>%
  layer_dense(units = 1)

best_model %>% compile(
  optimizer = optimizer_adam(learning_rate=.01),
  loss = 'mse',
  metrics = 'mae')

best_model %>% fit(
  as.matrix(housing_train), housing_train_labels, epochs = 200,
  batch_size = 50, validation_data=list(as.matrix(test), test_labels))

```

25.

```

predictions.nn <- best_model %>% predict(as.matrix(test))

RMSE(exp(predictions.nn), housing.test$SalePrice)

```

```
## [1] 47067.6
```

RMSE = 47067.6

26.

RMSE Comparison Lasso - 34113.53 Ridge - 32406.35 Elastic Net - 32406.35 Random Forest - 26146.37 GBM - 26147.59 svmLinear - 26994.74 svmRadial - 77423.92 Neural Network - 47067.6

The random forest model performed best on this dataset, but the GBM model was very close.