
itle: "DataCleaning_ATP Dataset_2012-01 to 2017-07_Int_V4"
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ate: "September 30, 2018"
utput: pdf_document

```
HouseCopy = read.csv("train.csv")
House = read.csv("train.csv")
House = data.frame(House)
colnames(House)
```

```
## [1] "Id"           "MSSubClass"    "MSZoning"      "LotFrontage"
## [5] "LotArea"      "Street"        "Alley"         "LotShape"
## [9] "LandContour"  "Utilities"     "LotConfig"     "LandSlope"
## [13] "Neighborhood" "Condition1"    "Condition2"    "BldgType"
## [17] "HouseStyle"   "OverallQual"   "OverallCond"   "YearBuilt"
## [21] "YearRemodAdd" "RoofStyle"     "RoofMatl"      "Exterior1st"
## [25] "Exterior2nd"  "MasVnrType"    "MasVnrArea"    "ExterQual"
## [29] "ExterCond"    "Foundation"    "BsmtQual"       "BsmtCond"
## [33] "BsmtExposure" "BsmtFinType1"  "BsmtFinSF1"    "BsmtFinType2"
## [37] "BsmtFinSF2"   "BsmtUnfSF"     "TotalBsmtSF"   "Heating"
## [41] "HeatingQC"    "CentralAir"    "Electrical"     "X1stFlrSF"
## [45] "X2ndFlrSF"    "LowQualFinSF"  "GrLivArea"      "BsmtFullBath"
## [49] "BsmtHalfBath" "FullBath"      "HalfBath"       "BedroomAbvGr"
## [53] "KitchenAbvGr" "KitchenQual"   "TotRmsAbvGrd"  "Functional"
## [57] "Fireplaces"   "FireplaceQu"   "GarageType"     "GarageYrBlt"
## [61] "GarageFinish" "GarageCars"    "GarageArea"     "GarageQual"
## [65] "GarageCond"   "PavedDrive"    "WoodDeckSF"     "OpenPorchSF"
## [69] "EnclosedPorch" "X3SsnPorch"    "ScreenPorch"    "PoolArea"
## [73] "PoolQC"       "Fence"         "MiscFeature"    "MiscVal"
## [77] "MoSold"       "YrSold"        "SaleType"       "SaleCondition"
## [81] "SalePrice"
```

```
AlleyGrvl = which(House$Alley == "Grvl")
AlleyPave = which(House$Alley == "Pave")
```

```
# House$SaleCondition
# hist(House$MoSold)

# Summerhouse = subset(House, House$MoSold >= 4 & House$MoSold <= 7)
# MonthPrice = lm(Summerhouse$SalePrice ~ Summerhouse$MoSold, data = Summerhouse)
# summary(MonthPrice)
# plot(MonthPrice)
# residuals(MonthPrice)
```

```
SelectedFeatures = select (House, MSZoning, LotShape, LandContour, Utilities, LandSlope , Neighborhood
write.csv(SelectedFeatures, "./SelectedFeatures.csv", row.names = FALSE)
```

```
Selected15 = dplyr::select(House, Id, MSZoning, LotShape, LandContour, Utilities, LandSlope , Neighborhood
Selected15 = data.frame(Selected15)
logSalePrice = log(Selected15$SalePrice)
Selected15$logSalePrice = logSalePrice
write.csv(Selected15, "./SelectedF15.csv", row.names = FALSE)
```

```

Selected15$OverallQual = as.factor(Selected15$OverallQual)
Selected15$OverallCond = as.factor(Selected15$OverallCond)
Selected15$YearBuilt = as.factor(Selected15$YearBuilt)
Selected15$YearRemodAdd = as.factor(Selected15$YearRemodAdd)

```

```

#treat YearBuilt,YearRemodAdd as factor

```

```

mod1 <- lm(logSalePrice ~.-Id-SalePrice,data = Selected15)

```

```

summary(mod1)

```

```

##
## Call:
## lm(formula = logSalePrice ~ . - Id - SalePrice, data = Selected15)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.81342 -0.09620  0.00000  0.08735  0.73040
##
## Coefficients: (2 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    10.3706236   0.3352281   30.936 < 2e-16 ***
## MSZoningFV      0.2607999   0.0871757    2.992 0.002831 **
## MSZoningRH      0.2410803   0.0903113    2.669 0.007700 **
## MSZoningRL      0.3163273   0.0743042    4.257 2.23e-05 ***
## MSZoningRM      0.3064029   0.0692727    4.423 1.06e-05 ***
## LotShapeIR2     0.0359681   0.0307048    1.171 0.241662
## LotShapeIR3     0.0588517   0.0592178    0.994 0.320511
## LotShapeReg    -0.0166928   0.0118607   -1.407 0.159566
## LandContourHLS   0.0449183   0.0389596    1.153 0.249161
## LandContourLow   0.1311683   0.0471427    2.782 0.005481 **
## LandContourLvl   0.0773001   0.0282991    2.732 0.006396 **
## UtilitiesNoSeWa -0.1209097   0.1834452   -0.659 0.509954
## LandSlopeMod     0.0852454   0.0295148    2.888 0.003943 **
## LandSlopeSev     0.1162166   0.0676694    1.717 0.086160 .
## NeighborhoodBlueste -0.1273759   0.1512942   -0.842 0.400006
## NeighborhoodBrDale -0.1870579   0.0822040   -2.276 0.023049 *
## NeighborhoodBrkSide -0.1108552   0.0673479   -1.646 0.100023
## NeighborhoodClearCr  0.0618829   0.0670331    0.923 0.356104
## NeighborhoodCollgCr -0.1045610   0.0514893   -2.031 0.042501 *
## NeighborhoodCrawfor  0.1495151   0.0618493    2.417 0.015779 *
## NeighborhoodEdwards -0.1634953   0.0557883   -2.931 0.003446 **
## NeighborhoodGilbert -0.1411350   0.0561171   -2.515 0.012032 *
## NeighborhoodIDOTRR -0.2048528   0.0768125   -2.667 0.007757 **
## NeighborhoodMeadowV -0.1760633   0.0784862   -2.243 0.025063 *
## NeighborhoodMitchel -0.0952771   0.0585662   -1.627 0.104035
## NeighborhoodNames -0.0932205   0.0559007   -1.668 0.095653 .
## NeighborhoodNoRidge  0.1384426   0.0619711    2.234 0.025667 *
## NeighborhoodNPkVill -0.0025773   0.0800392   -0.032 0.974317
## NeighborhoodNridgHt  0.0963974   0.0514660    1.873 0.061306 .
## NeighborhoodNWAmes -0.0364979   0.0587087   -0.622 0.534271
## NeighborhoodOldTown -0.1869405   0.0676883   -2.762 0.005836 **
## NeighborhoodSawyer -0.1392580   0.0595106   -2.340 0.019443 *
## NeighborhoodSawyerW -0.0441507   0.0577845   -0.764 0.444983
## NeighborhoodSomerst -0.0108996   0.0627920   -0.174 0.862222

```

## NeighborhoodStoneBr	0.1380451	0.0605519	2.280	0.022795	*
## NeighborhoodSWISU	-0.0139795	0.0716473	-0.195	0.845335	
## NeighborhoodTimber	0.0001252	0.0592772	0.002	0.998316	
## NeighborhoodVeenker	0.1536954	0.0763192	2.014	0.044247	*
## Condition1Feedr	0.0267690	0.0384087	0.697	0.485968	
## Condition1Norm	0.0565146	0.0322073	1.755	0.079562	.
## Condition1PosA	0.1523182	0.0775544	1.964	0.049758	*
## Condition1PosN	0.1526286	0.0558791	2.731	0.006399	**
## Condition1RR Ae	-0.0197246	0.0660557	-0.299	0.765292	
## Condition1RR An	0.0468043	0.0512697	0.913	0.361476	
## Condition1RR Ne	-0.0033405	0.1377854	-0.024	0.980662	
## Condition1RR Nn	0.0197349	0.0913757	0.216	0.829043	
## Condition2Feedr	-0.0994451	0.1737057	-0.572	0.567096	
## Condition2Norm	-0.0639530	0.1467290	-0.436	0.663018	
## Condition2PosA	0.5138960	0.3102004	1.657	0.097849	.
## Condition2PosN	-0.5791438	0.2047209	-2.829	0.004748	**
## Condition2RR Ae	0.1439956	0.3080835	0.467	0.640304	
## Condition2RR An	-0.1492515	0.2317519	-0.644	0.519689	
## Condition2RR Nn	-0.2074501	0.2082955	-0.996	0.319479	
## BldgType2fmCon	0.0348045	0.0383610	0.907	0.364435	
## BldgTypeDuplex	0.0126777	0.0298064	0.425	0.670669	
## BldgTypeTwnhs	-0.2755489	0.0381864	-7.216	9.45e-13	***
## BldgTypeTwnhsE	-0.1735515	0.0255293	-6.798	1.66e-11	***
## HouseStyle1.5Unf	-0.1476273	0.0540751	-2.730	0.006425	**
## HouseStyle1Story	-0.1213514	0.0211928	-5.726	1.30e-08	***
## HouseStyle2.5Fin	0.1468755	0.0830803	1.768	0.077335	.
## HouseStyle2.5Unf	0.0396378	0.0730622	0.543	0.587560	
## HouseStyle2Story	-0.0520619	0.0218487	-2.383	0.017334	*
## HouseStyleSFoyer	-0.1400291	0.0385060	-3.637	0.000288	***
## HouseStyleSLvl	-0.1105345	0.0312053	-3.542	0.000412	***
## OverallQual2	0.4313359	0.2201096	1.960	0.050268	.
## OverallQual3	0.6887353	0.2011120	3.425	0.000636	***
## OverallQual4	0.8214954	0.1978842	4.151	3.54e-05	***
## OverallQual5	0.9210582	0.1981593	4.648	3.72e-06	***
## OverallQual6	1.0358113	0.1983502	5.222	2.08e-07	***
## OverallQual7	1.1674084	0.1984882	5.881	5.26e-09	***
## OverallQual8	1.3400274	0.1995152	6.716	2.86e-11	***
## OverallQual9	1.5541971	0.2019426	7.696	2.90e-14	***
## OverallQual10	1.7092410	0.2059327	8.300	2.76e-16	***
## OverallCond2	-0.3727864	0.2954680	-1.262	0.207308	
## OverallCond3	-0.4450083	0.2739205	-1.625	0.104512	
## OverallCond4	-0.2831014	0.2778635	-1.019	0.308478	
## OverallCond5	-0.2818151	0.2773728	-1.016	0.309826	
## OverallCond6	-0.2220940	0.2778137	-0.799	0.424196	
## OverallCond7	-0.1950594	0.2776786	-0.702	0.482525	
## OverallCond8	-0.2266389	0.2782079	-0.815	0.415440	
## OverallCond9	-0.1297715	0.2809731	-0.462	0.644262	
## YearBuilt1875	0.1791025	0.2638403	0.679	0.497376	
## YearBuilt1880	0.7054361	0.2088716	3.377	0.000755	***
## YearBuilt1882	0.2708631	0.2834609	0.956	0.339488	
## YearBuilt1885	0.5040333	0.2290811	2.200	0.027979	*
## YearBuilt1890	0.4963714	0.2264967	2.192	0.028605	*
## YearBuilt1892	0.5771084	0.2338773	2.468	0.013742	*
## YearBuilt1893	NA	NA	NA	NA	

## YearBuilt1898	0.3307839	0.2723075	1.215	0.224702	
## YearBuilt1900	0.4803238	0.1986708	2.418	0.015767	*
## YearBuilt1904	0.6943556	0.2573779	2.698	0.007077	**
## YearBuilt1905	0.5748104	0.2605192	2.206	0.027544	*
## YearBuilt1906	0.3591328	0.2610265	1.376	0.169124	
## YearBuilt1908	0.5593535	0.2356618	2.374	0.017774	*
## YearBuilt1910	0.3119358	0.1928693	1.617	0.106066	
## YearBuilt1911	0.5989004	0.2628933	2.278	0.022894	*
## YearBuilt1912	0.3216756	0.2208008	1.457	0.145416	
## YearBuilt1913	-0.1430142	0.2605959	-0.549	0.583247	
## YearBuilt1914	0.4064141	0.2012697	2.019	0.043682	*
## YearBuilt1915	0.5660585	0.1976946	2.863	0.004265	**
## YearBuilt1916	0.4967683	0.1960623	2.534	0.011412	*
## YearBuilt1917	0.4786534	0.2632887	1.818	0.069316	.
## YearBuilt1918	0.5315640	0.2009502	2.645	0.008269	**
## YearBuilt1919	0.5427135	0.2166617	2.505	0.012380	*
## YearBuilt1920	0.3826338	0.1911648	2.002	0.045553	*
## YearBuilt1921	0.4634263	0.2033585	2.279	0.022849	*
## YearBuilt1922	0.4206846	0.2014572	2.088	0.036989	*
## YearBuilt1923	0.6205354	0.2006981	3.092	0.002035	**
## YearBuilt1924	0.3541980	0.2003280	1.768	0.077299	.
## YearBuilt1925	0.4036817	0.1932960	2.088	0.036970	*
## YearBuilt1926	0.3212935	0.1979098	1.623	0.104758	
## YearBuilt1927	0.3080217	0.2192279	1.405	0.160270	
## YearBuilt1928	0.4463756	0.2007870	2.223	0.026392	*
## YearBuilt1929	0.3419236	0.2088031	1.638	0.101779	
## YearBuilt1930	0.3190174	0.1976677	1.614	0.106809	
## YearBuilt1931	0.3636800	0.2022515	1.798	0.072402	.
## YearBuilt1932	0.6479995	0.2102393	3.082	0.002101	**
## YearBuilt1934	0.4118543	0.2157976	1.909	0.056561	.
## YearBuilt1935	0.4148704	0.2034983	2.039	0.041699	*
## YearBuilt1936	0.4888130	0.1955377	2.500	0.012557	*
## YearBuilt1937	0.4935446	0.2062891	2.392	0.016887	*
## YearBuilt1938	0.3850154	0.2091713	1.841	0.065916	.
## YearBuilt1939	0.4759180	0.2005829	2.373	0.017816	*
## YearBuilt1940	0.4589889	0.1942187	2.363	0.018273	*
## YearBuilt1941	0.3531719	0.1948822	1.812	0.070199	.
## YearBuilt1942	0.5278853	0.2283248	2.312	0.020946	*
## YearBuilt1945	0.4795363	0.2029829	2.362	0.018313	*
## YearBuilt1946	0.4210675	0.2032056	2.072	0.038466	*
## YearBuilt1947	0.3838767	0.2048904	1.874	0.061231	.
## YearBuilt1948	0.6055275	0.1952757	3.101	0.001974	**
## YearBuilt1949	0.4917792	0.1969735	2.497	0.012669	*
## YearBuilt1950	0.5275882	0.1941682	2.717	0.006679	**
## YearBuilt1951	0.6325992	0.2292579	2.759	0.005880	**
## YearBuilt1952	0.5723669	0.2057577	2.782	0.005491	**
## YearBuilt1953	0.4956097	0.2106281	2.353	0.018782	*
## YearBuilt1954	0.6104419	0.1985505	3.074	0.002156	**
## YearBuilt1955	0.6191289	0.2000594	3.095	0.002015	**
## YearBuilt1956	0.5967274	0.2050534	2.910	0.003679	**
## YearBuilt1957	0.6543325	0.1978068	3.308	0.000968	***
## YearBuilt1958	0.5553017	0.1947903	2.851	0.004436	**
## YearBuilt1959	0.6962808	0.2003060	3.476	0.000527	***
## YearBuilt1960	0.5994344	0.1973124	3.038	0.002433	**

## YearBuilt1961	0.5789002	0.2068212	2.799	0.005207	**
## YearBuilt1962	0.4753159	0.2098472	2.265	0.023686	*
## YearBuilt1963	0.7857708	0.2216411	3.545	0.000407	***
## YearBuilt1964	0.5915900	0.2111162	2.802	0.005157	**
## YearBuilt1965	0.6000253	0.1997514	3.004	0.002721	**
## YearBuilt1966	0.6257602	0.2082369	3.005	0.002710	**
## YearBuilt1967	0.6845688	0.2128748	3.216	0.001335	**
## YearBuilt1968	0.6473878	0.2042926	3.169	0.001569	**
## YearBuilt1969	0.6480652	0.2285061	2.836	0.004643	**
## YearBuilt1970	0.5753176	0.2052688	2.803	0.005148	**
## YearBuilt1971	0.5886819	0.2108148	2.792	0.005314	**
## YearBuilt1972	0.6505673	0.2004202	3.246	0.001203	**
## YearBuilt1973	0.5416104	0.2313496	2.341	0.019390	*
## YearBuilt1974	0.6416510	0.2079588	3.085	0.002079	**
## YearBuilt1975	0.5022930	0.2116474	2.373	0.017788	*
## YearBuilt1976	0.6361418	0.2042027	3.115	0.001881	**
## YearBuilt1977	0.6385990	0.2035859	3.137	0.001750	**
## YearBuilt1978	0.6142472	0.2123485	2.893	0.003889	**
## YearBuilt1979	0.6661826	0.2256681	2.952	0.003218	**
## YearBuilt1980	0.5842766	0.2190841	2.667	0.007758	**
## YearBuilt1981	0.5187957	0.2127877	2.438	0.014909	*
## YearBuilt1982	0.5649592	0.2088549	2.705	0.006926	**
## YearBuilt1983	0.5081515	0.2301559	2.208	0.027442	*
## YearBuilt1984	0.5388477	0.2086878	2.582	0.009938	**
## YearBuilt1985	0.6416491	0.2272070	2.824	0.004820	**
## YearBuilt1986	0.5502675	0.2112234	2.605	0.009297	**
## YearBuilt1987	0.6317150	0.2061407	3.064	0.002229	**
## YearBuilt1988	0.5777192	0.2009733	2.875	0.004116	**
## YearBuilt1989	0.8219232	0.2224195	3.695	0.000229	***
## YearBuilt1990	0.6781654	0.2018853	3.359	0.000806	***
## YearBuilt1991	0.6032449	0.2104839	2.866	0.004229	**
## YearBuilt1992	0.7060864	0.2025149	3.487	0.000507	***
## YearBuilt1993	0.6326004	0.1993856	3.173	0.001548	**
## YearBuilt1994	0.6719524	0.1967249	3.416	0.000657	***
## YearBuilt1995	0.7518300	0.1975661	3.805	0.000149	***
## YearBuilt1996	0.7188204	0.1997208	3.599	0.000332	***
## YearBuilt1997	0.7463507	0.1992784	3.745	0.000189	***
## YearBuilt1998	0.6949821	0.1969187	3.529	0.000432	***
## YearBuilt1999	0.7111954	0.1971007	3.608	0.000321	***
## YearBuilt2000	0.7835316	0.1967456	3.982	7.23e-05	***
## YearBuilt2001	0.7192070	0.1968797	3.653	0.000270	***
## YearBuilt2002	0.7101845	0.1959674	3.624	0.000302	***
## YearBuilt2003	0.7724085	0.1937619	3.986	7.11e-05	***
## YearBuilt2004	0.7536285	0.1932908	3.899	0.000102	***
## YearBuilt2005	0.8019530	0.1932335	4.150	3.56e-05	***
## YearBuilt2006	0.7911864	0.1928368	4.103	4.35e-05	***
## YearBuilt2007	0.7882352	0.1938263	4.067	5.08e-05	***
## YearBuilt2008	0.7406025	0.1984591	3.732	0.000199	***
## YearBuilt2009	0.6764881	0.2078266	3.255	0.001165	**
## YearBuilt2010	0.6794177	0.2982267	2.278	0.022890	*
## YearRemodAdd1951	0.1014475	0.1551992	0.654	0.513456	
## YearRemodAdd1952	NA	NA	NA	NA	
## YearRemodAdd1953	0.1196645	0.1013084	1.181	0.237760	
## YearRemodAdd1954	-0.0440230	0.0788688	-0.558	0.576825	

## YearRemodAdd1955	0.0486368	0.0839372	0.579	0.562399	
## YearRemodAdd1956	0.0412017	0.1082966	0.380	0.703676	
## YearRemodAdd1957	-0.0172063	0.0833293	-0.206	0.836446	
## YearRemodAdd1958	-0.0190272	0.0690748	-0.275	0.783011	
## YearRemodAdd1959	-0.0889447	0.0787618	-1.129	0.259001	
## YearRemodAdd1960	0.1234342	0.0771816	1.599	0.110023	
## YearRemodAdd1961	0.1057790	0.1016129	1.041	0.298085	
## YearRemodAdd1962	0.2017242	0.1030886	1.957	0.050601	.
## YearRemodAdd1963	-0.1220566	0.1238967	-0.985	0.324749	
## YearRemodAdd1964	0.0813824	0.1094051	0.744	0.457104	
## YearRemodAdd1965	0.0217983	0.0753349	0.289	0.772362	
## YearRemodAdd1966	0.0590041	0.0945766	0.624	0.532827	
## YearRemodAdd1967	-0.0781989	0.1079053	-0.725	0.468777	
## YearRemodAdd1968	0.0281852	0.0831681	0.339	0.734748	
## YearRemodAdd1969	0.0319007	0.1283148	0.249	0.803702	
## YearRemodAdd1970	0.0742795	0.0729231	1.019	0.308597	
## YearRemodAdd1971	-0.0100202	0.1035616	-0.097	0.922936	
## YearRemodAdd1972	-0.0396901	0.0698816	-0.568	0.570166	
## YearRemodAdd1973	0.1258945	0.1300954	0.968	0.333384	
## YearRemodAdd1974	0.0594207	0.1012424	0.587	0.557371	
## YearRemodAdd1975	0.1592634	0.0878920	1.812	0.070230	.
## YearRemodAdd1976	0.0394459	0.0788769	0.500	0.617100	
## YearRemodAdd1977	0.0310316	0.0822267	0.377	0.705950	
## YearRemodAdd1978	0.0409529	0.0990312	0.414	0.679288	
## YearRemodAdd1979	-0.0312665	0.1173492	-0.266	0.789946	
## YearRemodAdd1980	0.1464409	0.1031727	1.419	0.156048	
## YearRemodAdd1981	0.2016390	0.0955326	2.111	0.035005	*
## YearRemodAdd1982	0.0513335	0.0825214	0.622	0.534018	
## YearRemodAdd1983	0.0959031	0.1152698	0.832	0.405580	
## YearRemodAdd1984	0.0713024	0.0961968	0.741	0.458708	
## YearRemodAdd1985	0.0165429	0.1018346	0.162	0.870980	
## YearRemodAdd1986	0.1600280	0.1282015	1.248	0.212181	
## YearRemodAdd1987	0.2064771	0.0736372	2.804	0.005129	**
## YearRemodAdd1988	0.1837276	0.0734240	2.502	0.012471	*
## YearRemodAdd1989	0.1143656	0.0733424	1.559	0.119179	
## YearRemodAdd1990	0.1078615	0.0597313	1.806	0.071203	.
## YearRemodAdd1991	0.0840470	0.0667186	1.260	0.208013	
## YearRemodAdd1992	0.0186684	0.0647979	0.288	0.773318	
## YearRemodAdd1993	0.1736175	0.0563959	3.079	0.002127	**
## YearRemodAdd1994	0.1293835	0.0506953	2.552	0.010828	*
## YearRemodAdd1995	0.1319090	0.0456475	2.890	0.003925	**
## YearRemodAdd1996	0.0505182	0.0452084	1.117	0.264024	
## YearRemodAdd1997	0.1440846	0.0519623	2.773	0.005642	**
## YearRemodAdd1998	0.1225553	0.0492016	2.491	0.012876	*
## YearRemodAdd1999	0.1386800	0.0534400	2.595	0.009572	**
## YearRemodAdd2000	0.0519899	0.0418318	1.243	0.214171	
## YearRemodAdd2001	0.1108666	0.0527238	2.103	0.035692	*
## YearRemodAdd2002	0.1313189	0.0439907	2.985	0.002892	**
## YearRemodAdd2003	0.0386103	0.0409812	0.942	0.346306	
## YearRemodAdd2004	0.0589127	0.0397897	1.481	0.138974	
## YearRemodAdd2005	0.0300661	0.0380232	0.791	0.429257	
## YearRemodAdd2006	0.0491785	0.0354486	1.387	0.165601	
## YearRemodAdd2007	0.0335278	0.0378677	0.885	0.376121	
## YearRemodAdd2008	0.1112576	0.0485853	2.290	0.022197	*

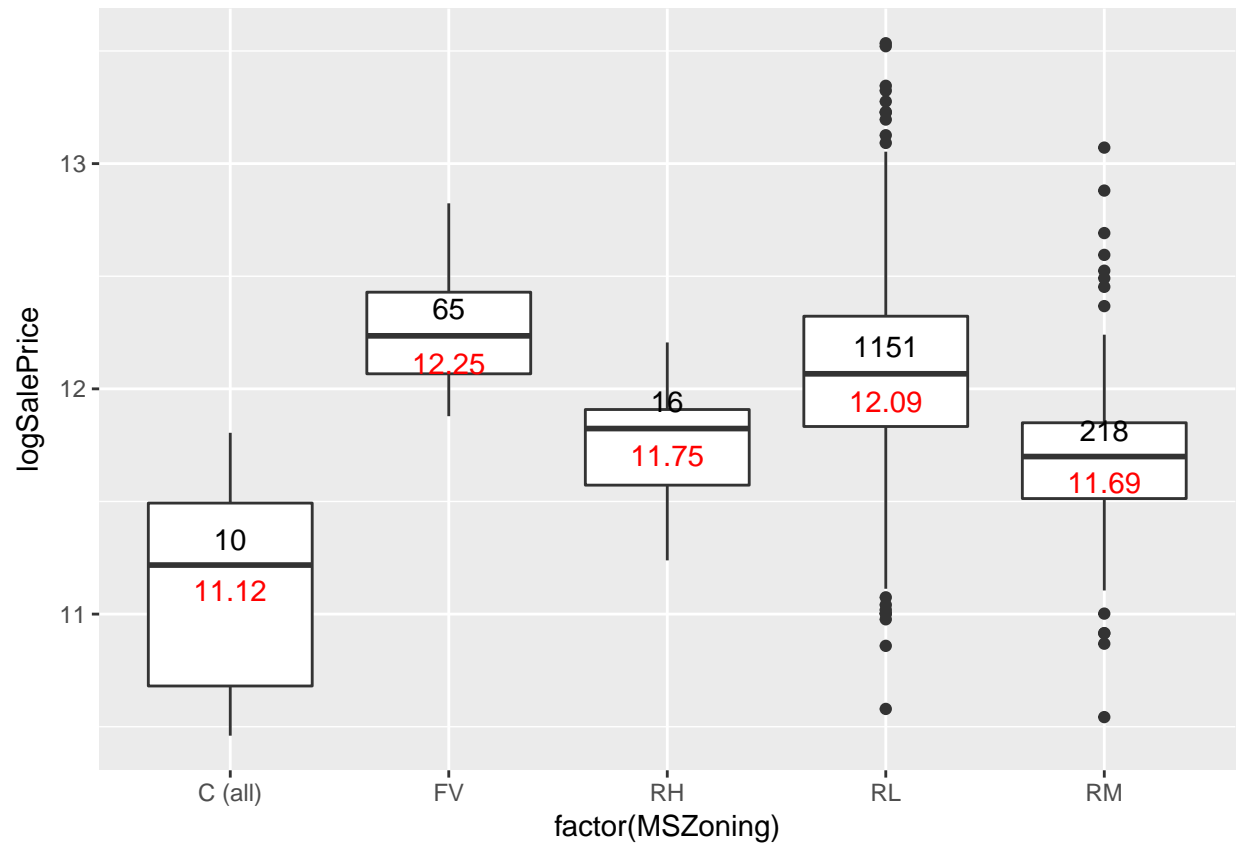
```
## YearRemodAdd2009      0.2050958  0.0776511   2.641 0.008367 **
## YearRemodAdd2010      0.2710838  0.1108178   2.446 0.014579 *
## RoofStyleGable        -0.0441062  0.0597803  -0.738 0.460777
## RoofStyleGambrel      -0.0069213  0.0839413  -0.082 0.934299
## RoofStyleHip          -0.0035237  0.0605169  -0.058 0.953578
## RoofStyleMansard      -0.0408161  0.0948562  -0.430 0.667058
## RoofStyleShed         0.0374704  0.1988802   0.188 0.850590
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1712 on 1205 degrees of freedom
## Multiple R-squared:  0.8484, Adjusted R-squared:  0.8164
## F-statistic: 26.54 on 254 and 1205 DF,  p-value: < 2.2e-16

# Selected15$YearBuilt = as.numeric(Selected15$YearBuilt)
# Selected15$YearRemodAdd = as.numeric(Selected15$YearRemodAdd)
# mod2 <- lm(logSalePrice ~.-Id -SalePrice,data = Selected15)
# summary(mod2)

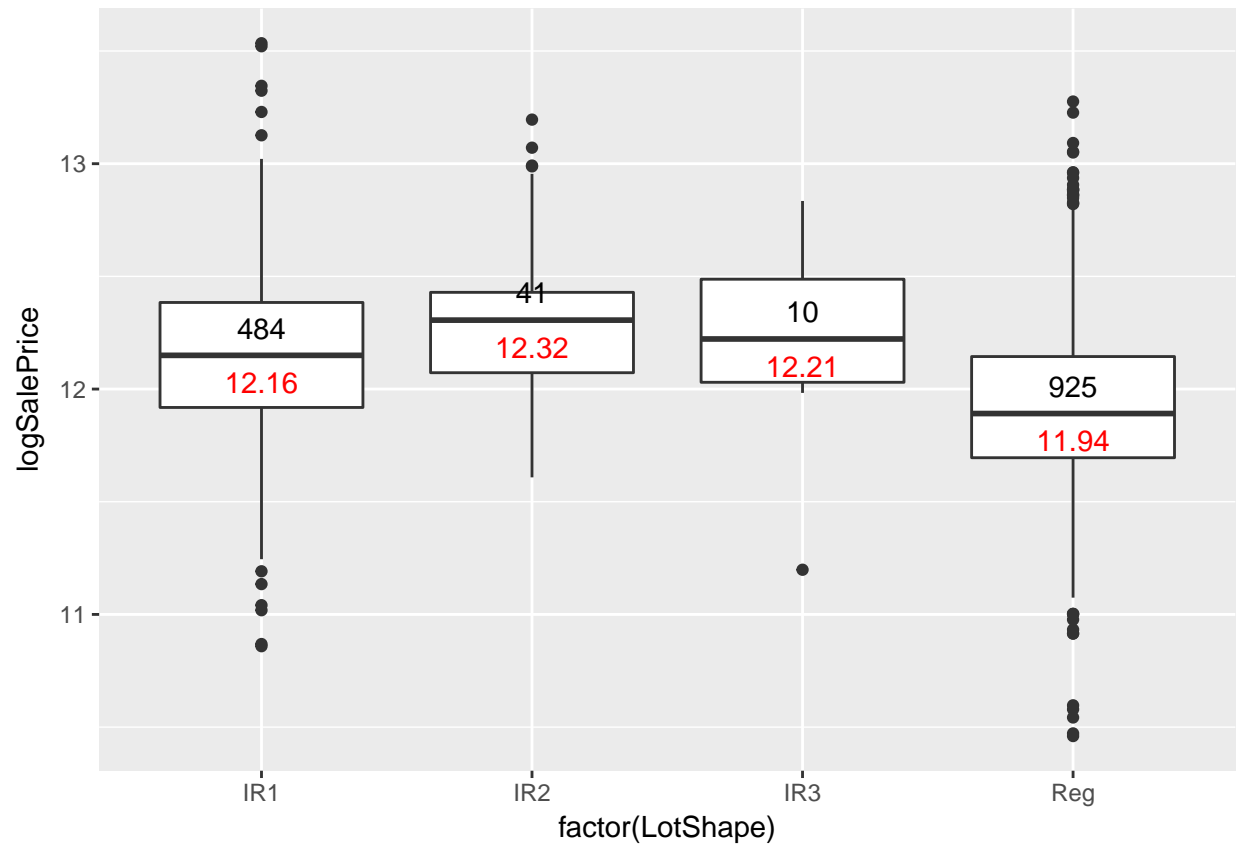
give.n <- function(x){
  return(c(y = median(x)*1.01, label = length(x)))
  # experiment with the multiplier to find the perfect position
}

# function for mean labels
mean.n <- function(x){
  return(c(y = median(x)*0.99, label = round(mean(x),2)))
  # experiment with the multiplier to find the perfect position
}

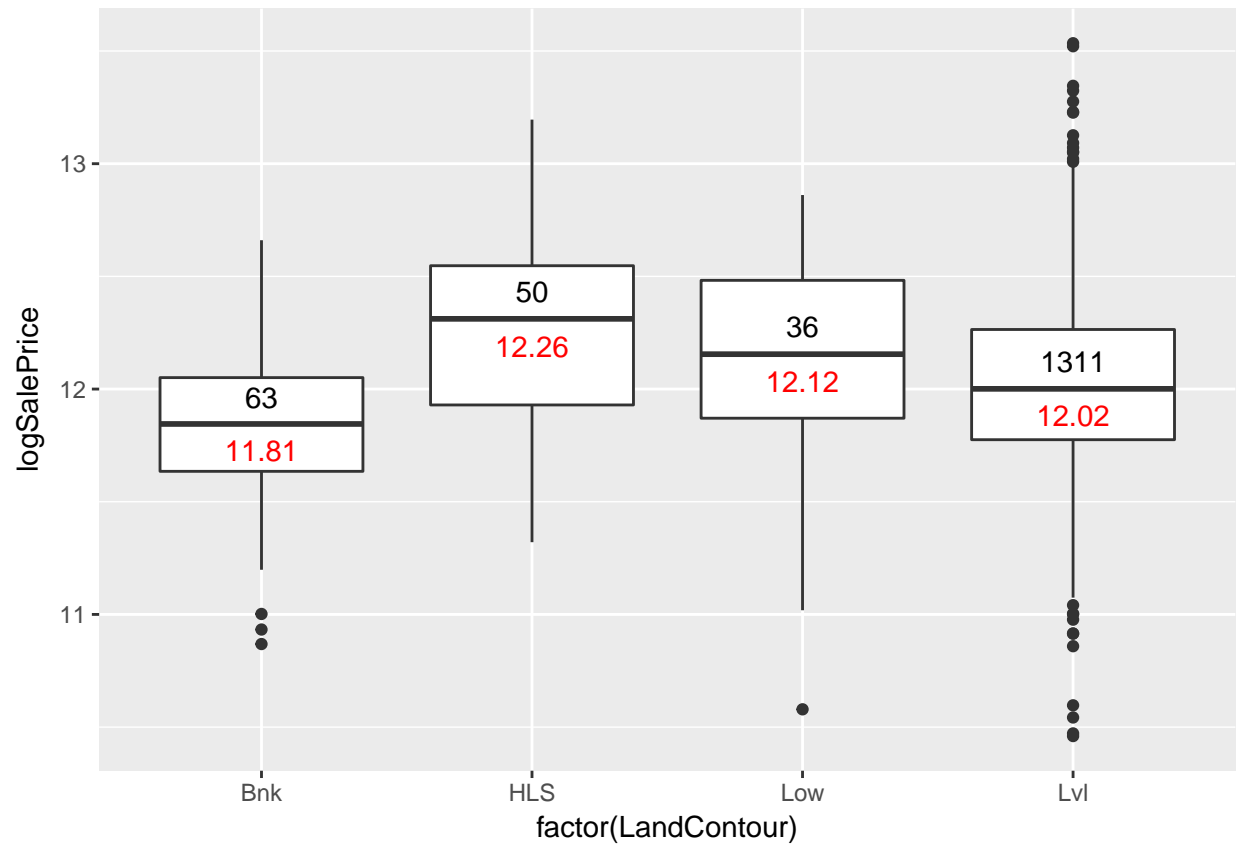
#MSZoning
ggplot(Selected15, aes(factor(MSZoning), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



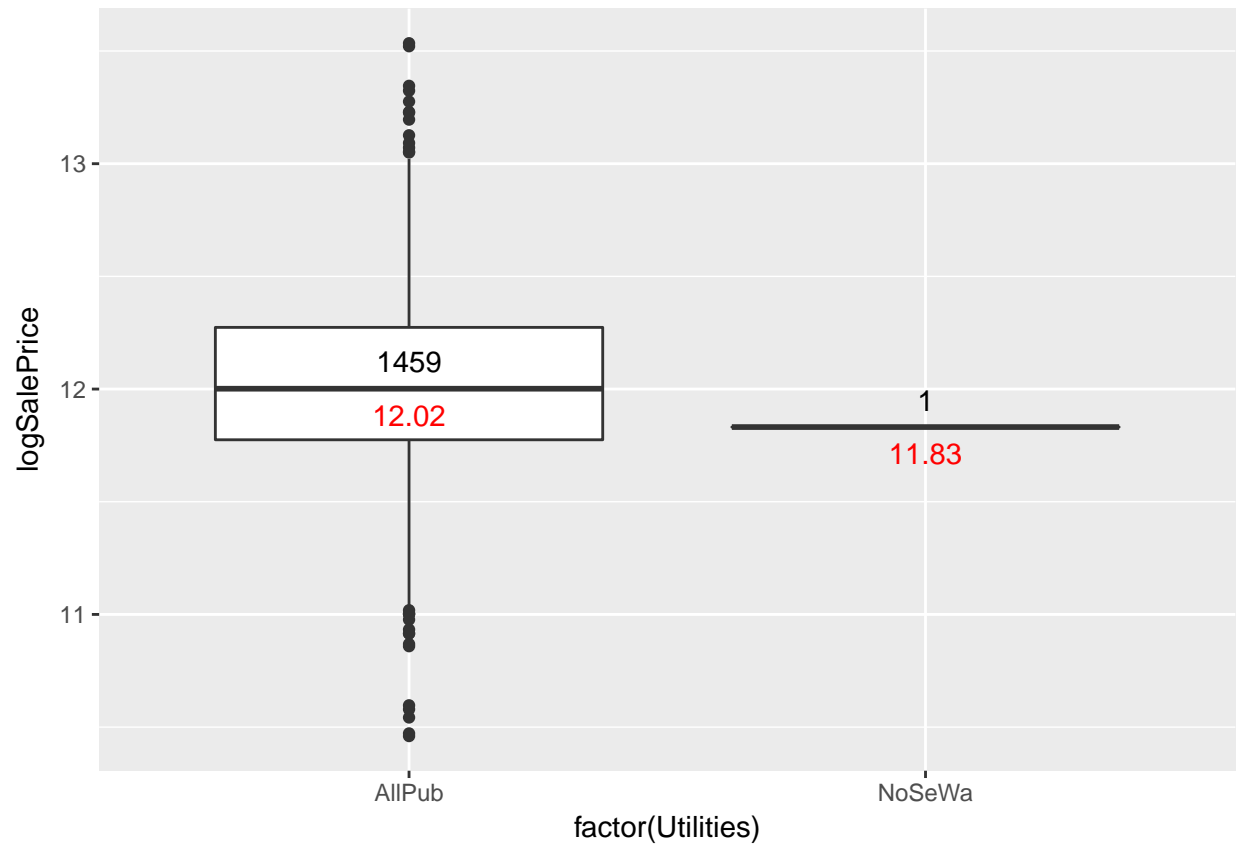
```
#LotShape
ggplot(Selected15, aes(factor(LotShape), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```

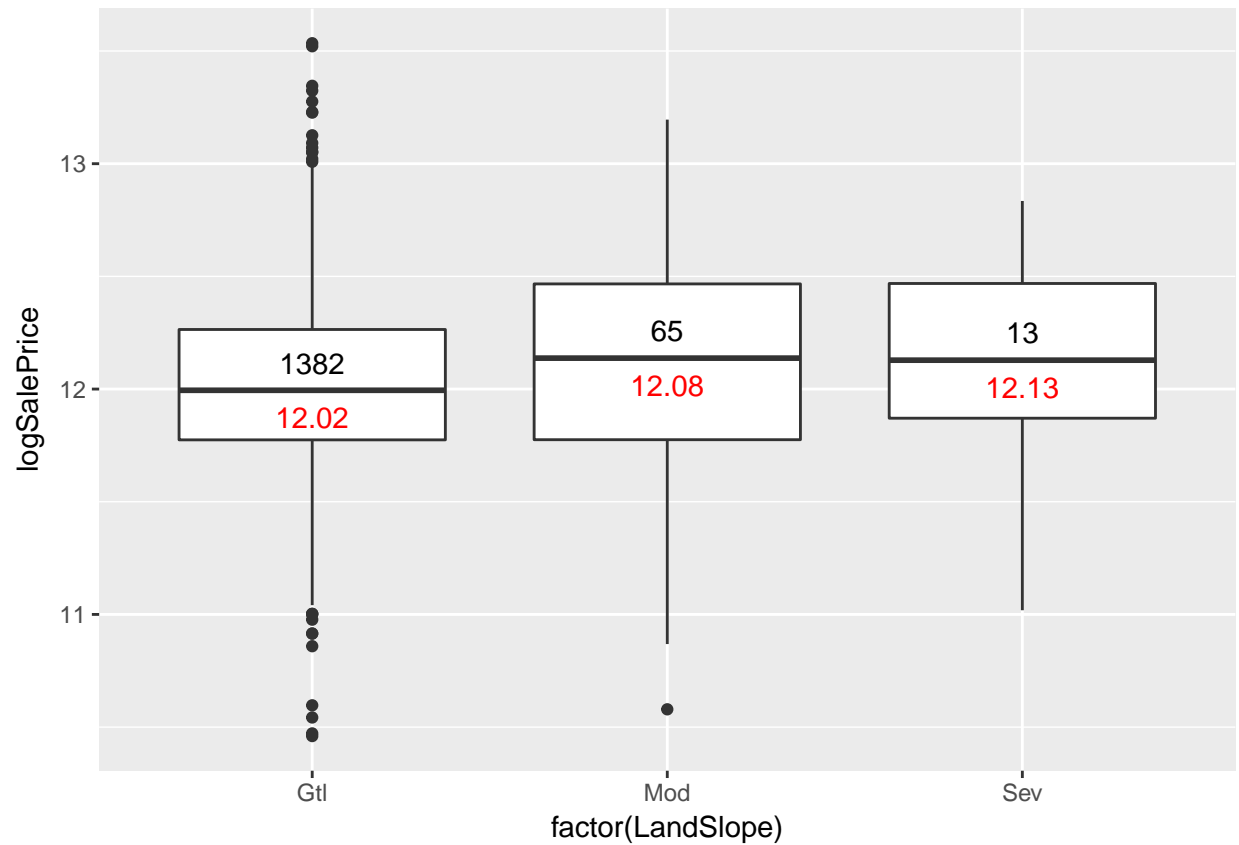
```
#LandContour
ggplot(Selected15, aes(factor(LandContour), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



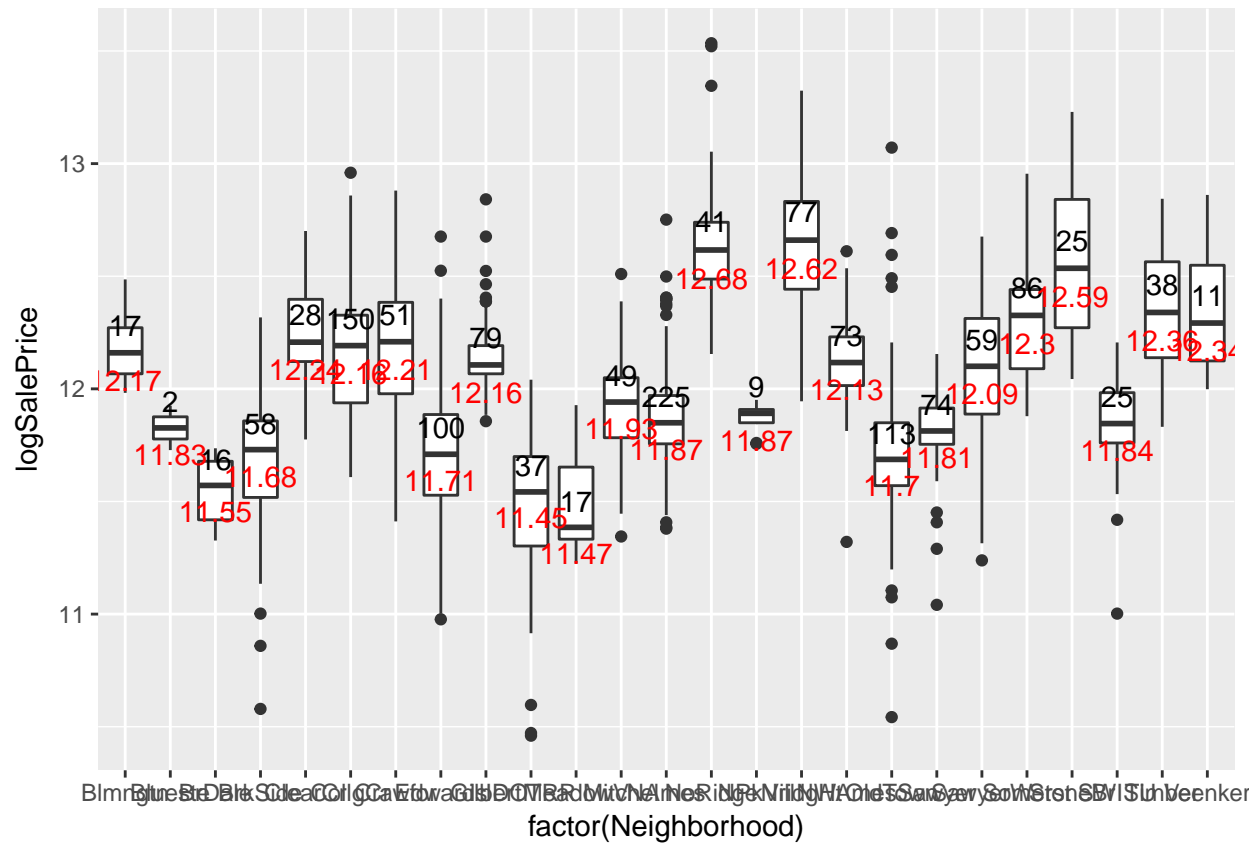
```
#Utilities
ggplot(Selected15, aes(factor(Utilities), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



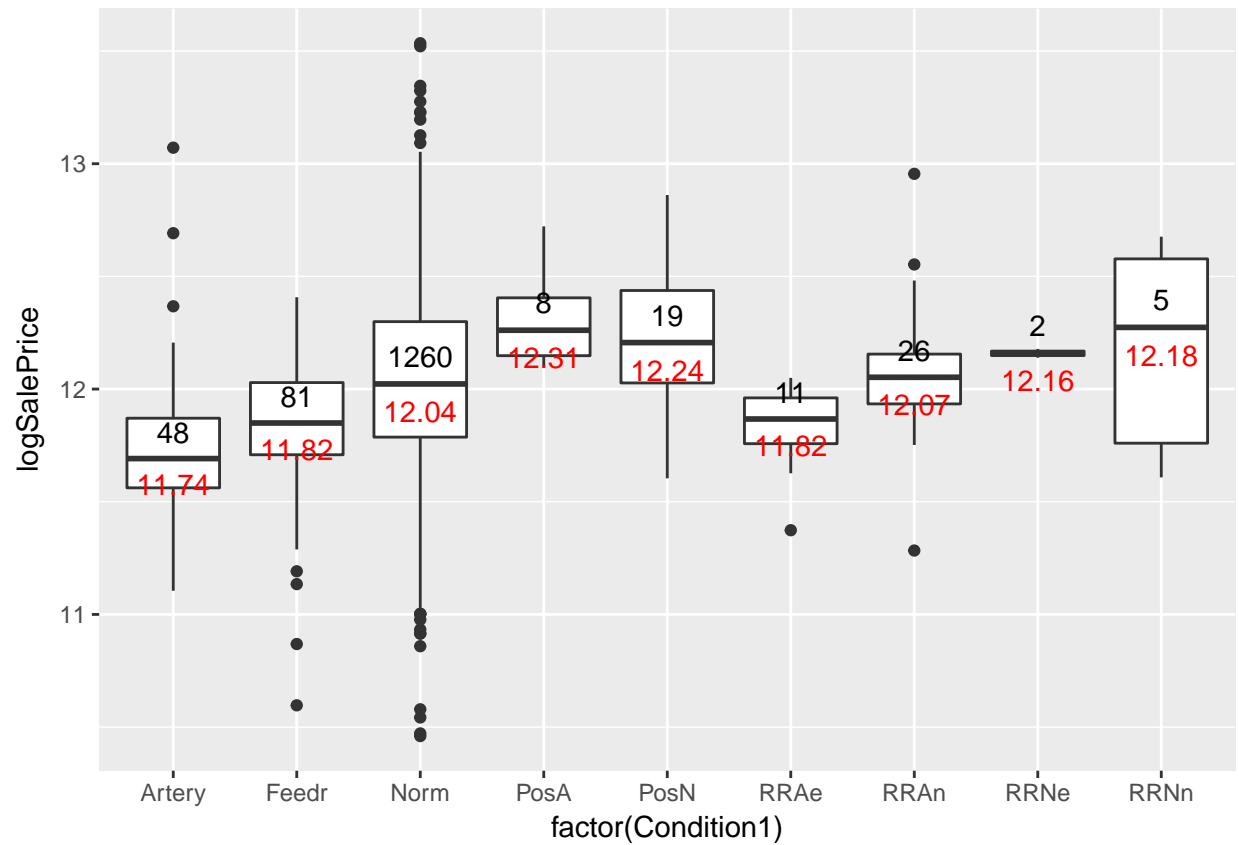
```
#LandSlope
ggplot(Selected15, aes(factor(LandSlope), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



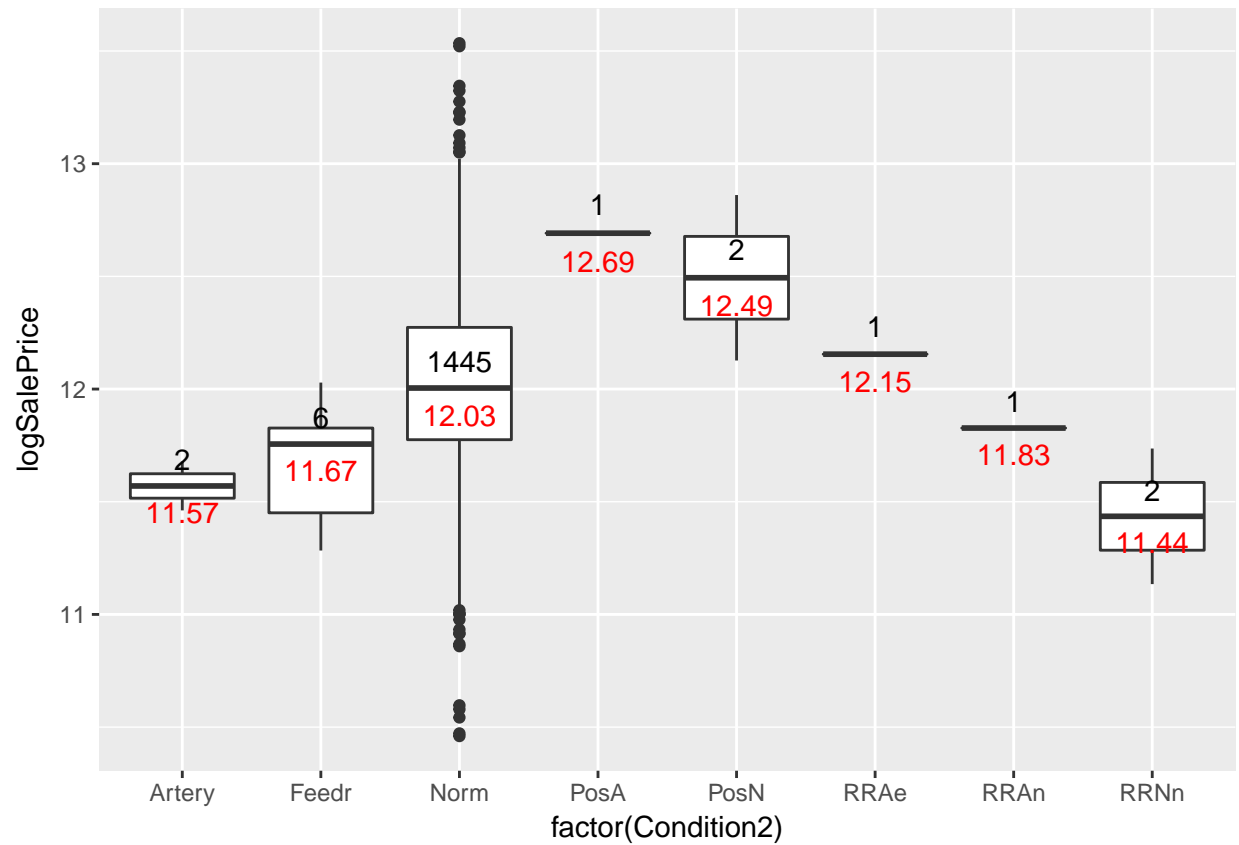
```
#Neighborhood
ggplot(Selected15, aes(factor(Neighborhood), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



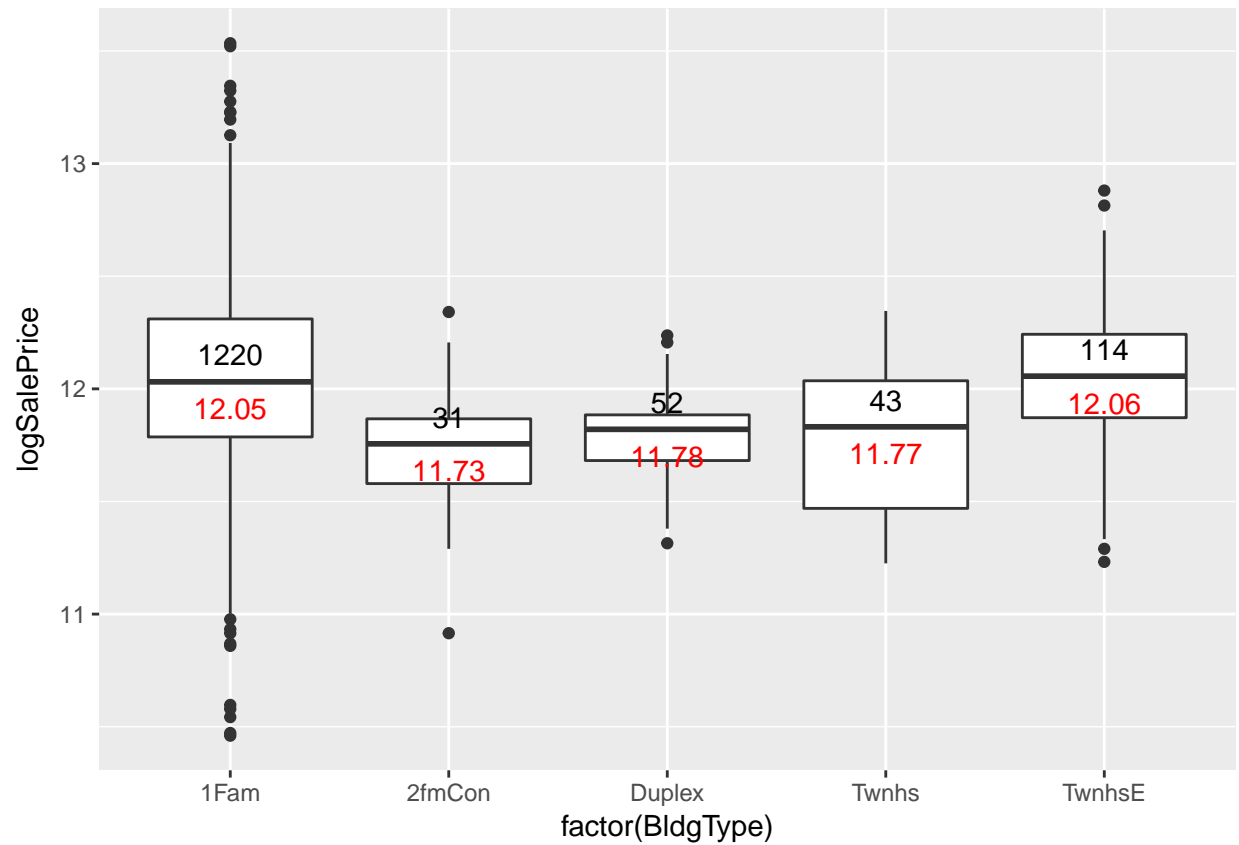
```
#Condition1
ggplot(Selected15, aes(factor(Condition1), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



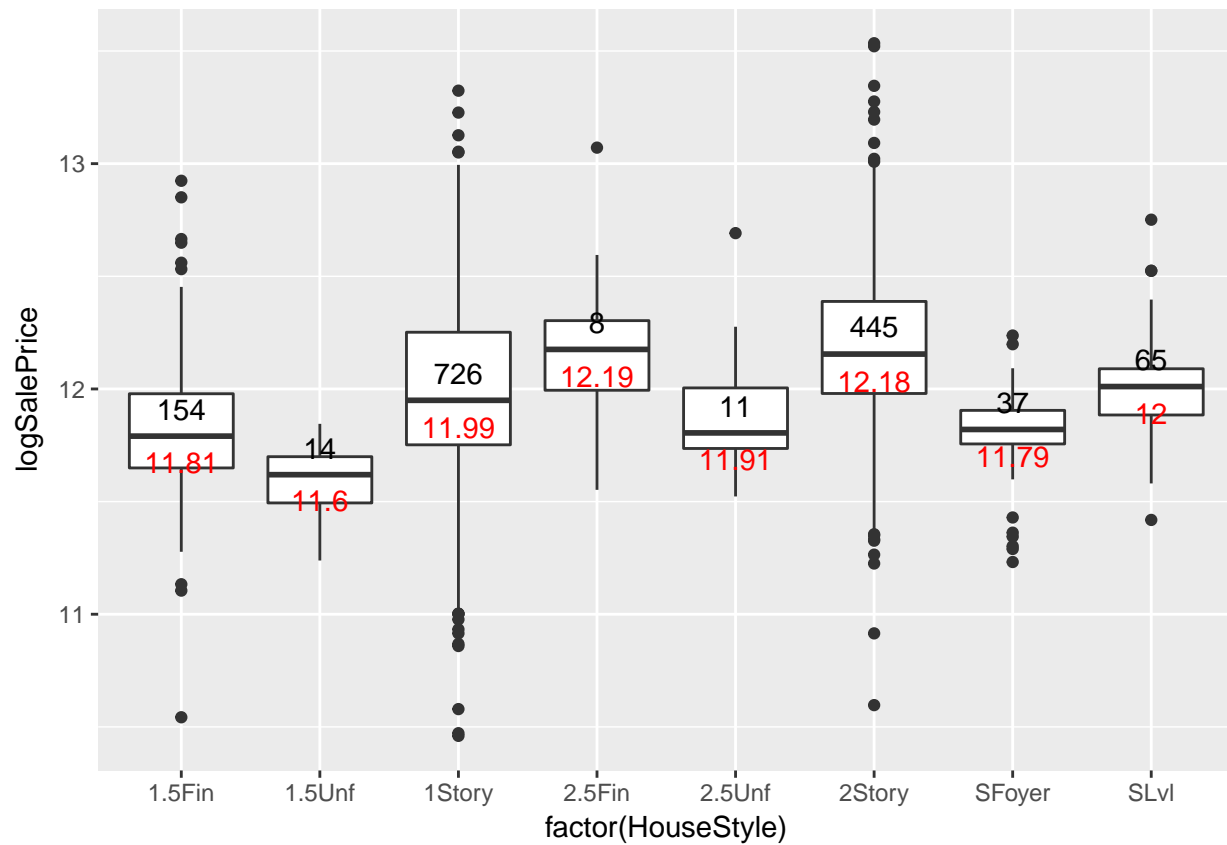
```
#Condition2
ggplot(Selected15, aes(factor(Condition2), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



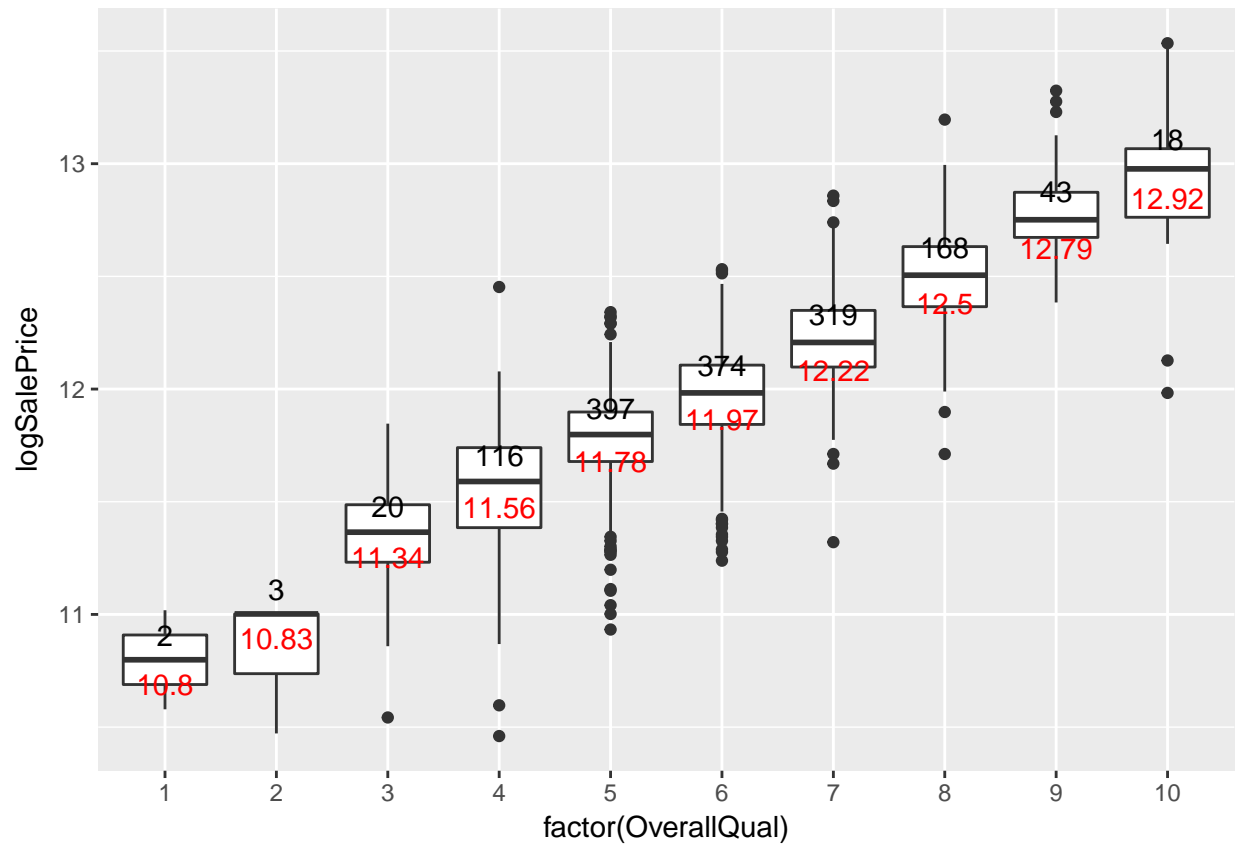
```
#BldgType
ggplot(Selected15, aes(factor(BldgType), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



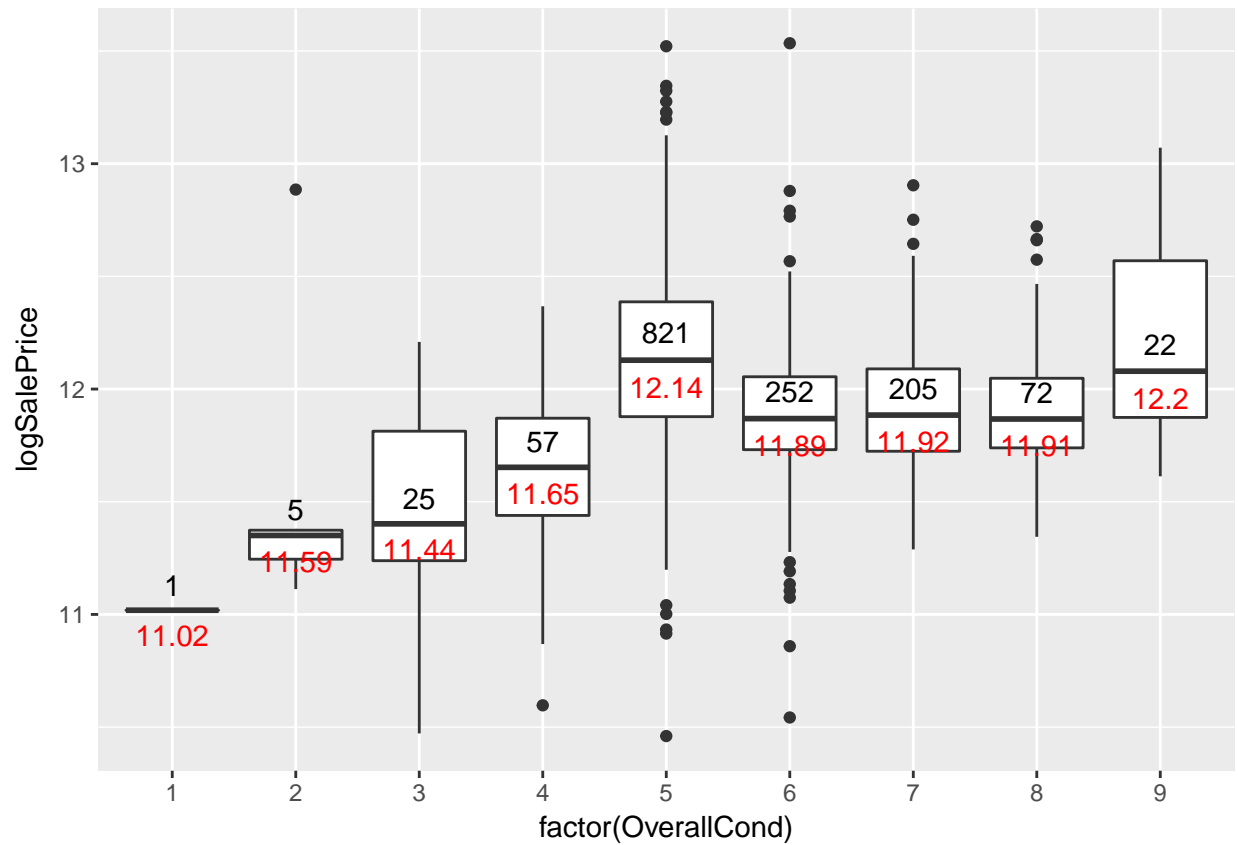
```
#HouseStyle
ggplot(Selected15, aes(factor(HouseStyle), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```

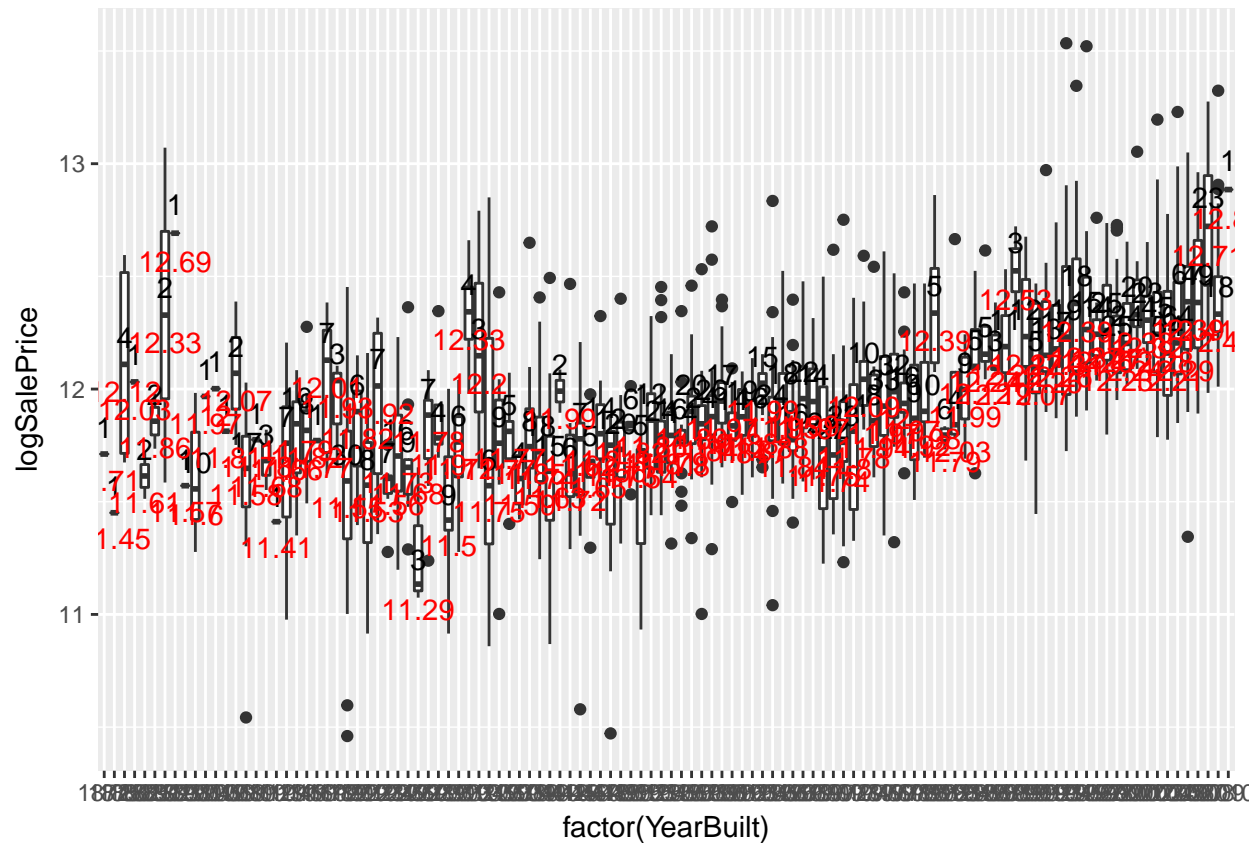
```
#OverallQual
ggplot(Selected15, aes(factor(OverallQual), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



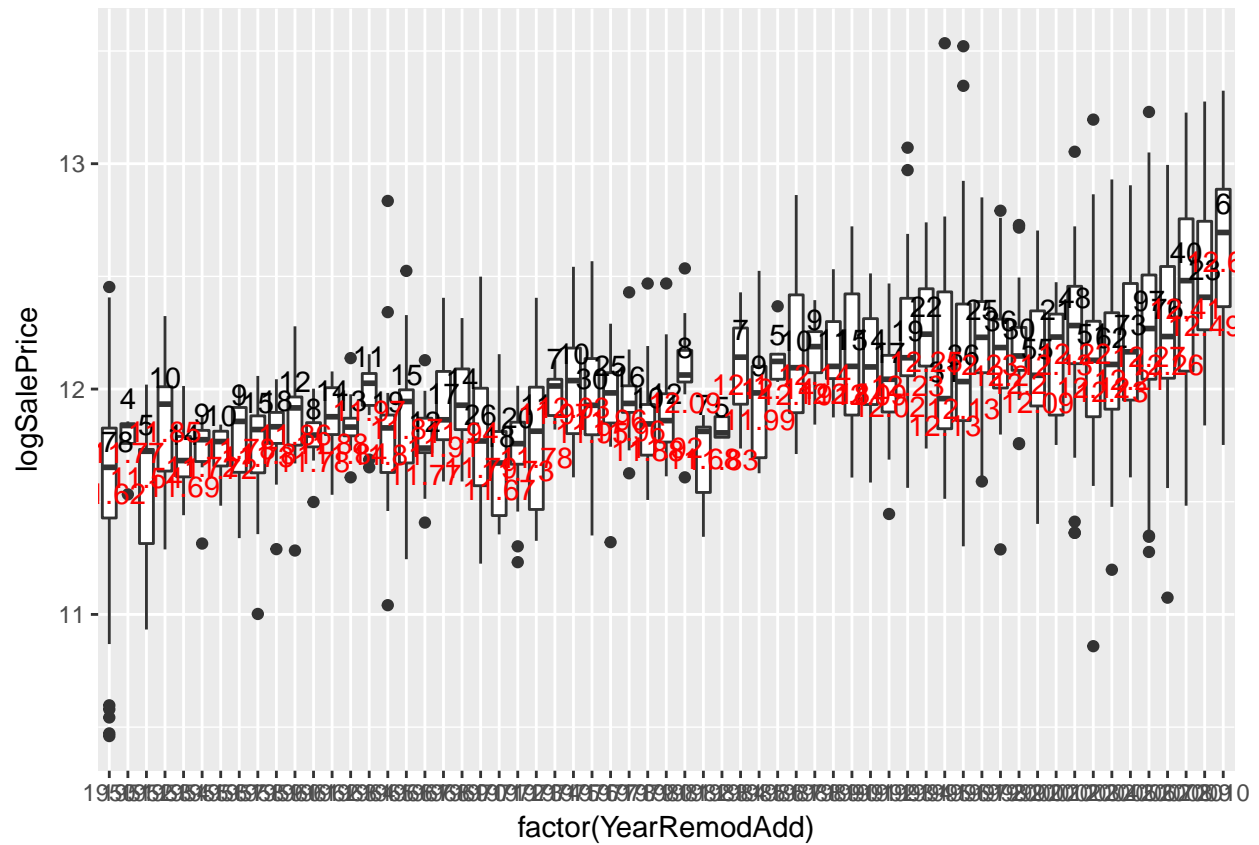
```
#OverallCond
ggplot(Selected15, aes(factor(OverallCond), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



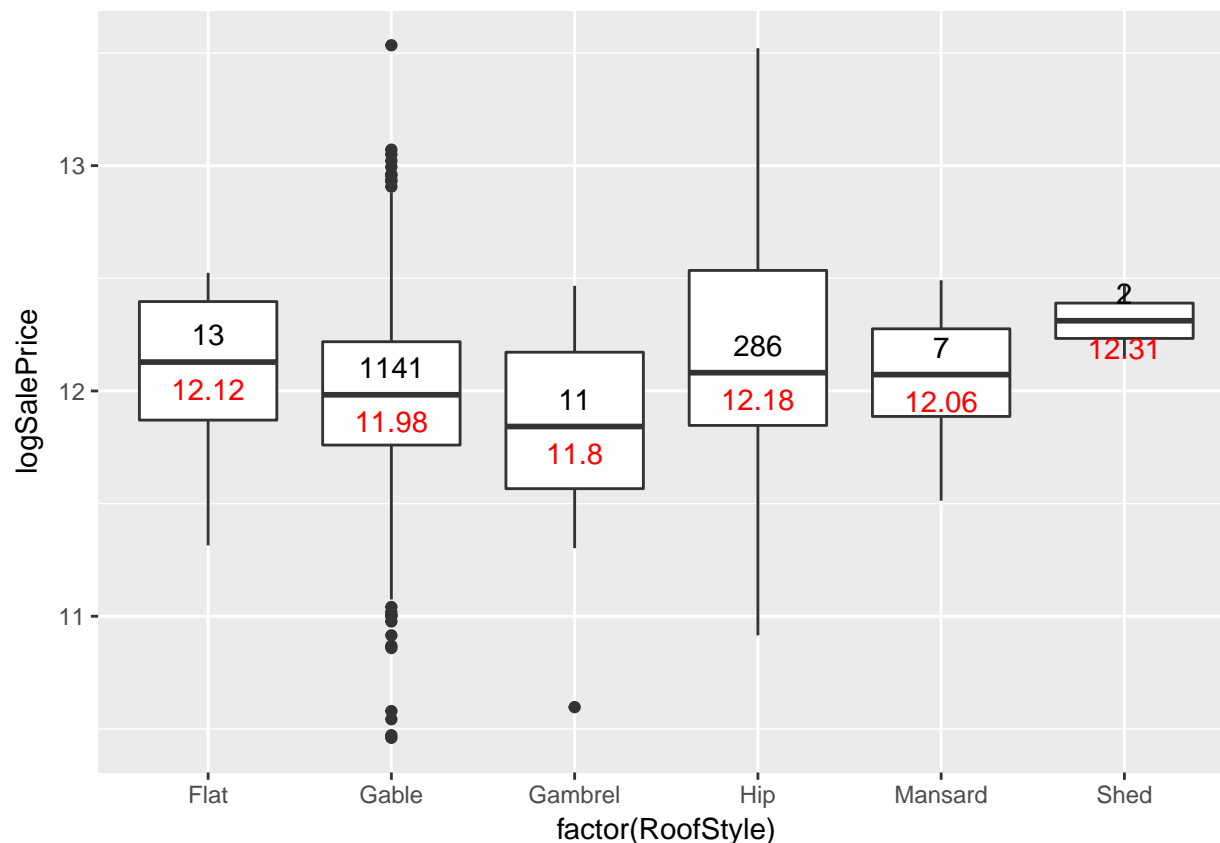
```
#YearBuilt: Too much levels (112), exe with caution
ggplot(Selected15, aes(factor(YearBuilt), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



```
#YearRemodAdd: Too much levels (61), exe with caution
ggplot(Selected15, aes(factor(YearRemodAdd), logSalePrice)) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



```
#RoofStyle:
ggplot(Selected15, aes(factor(RoofStyle), logSalePrice )) +
  geom_boxplot() +
  stat_summary(fun.data = give.n, geom = "text", fun.y = median) +
  stat_summary(fun.data = mean.n, geom = "text", fun.y = mean, colour = "red")
```



```
# aov1 = aov(Selected15$logSalePrice ~ Selected15$RoofStyle)
# summary(aov1)
#
# correlate(Selected15)
```

```
library(dplyr)
#Ref: https://stackoverflow.com/questions/9167452/sort-xtable-output-by-p-value-from-glm-model-summary
# 1. chi-sq test
# 2. add interaction to lm
# 3. detect non-linearity
# 3. add power term to lm
# 4. diagnostics
```

```
library(xtable)
```

```
##
## Attaching package: 'xtable'
## The following object is masked from 'package:formattable':
##
## digits
```

```
idx <- order(coef(summary(mod1))[,4]) # sort out the p-values
out <- coef(summary(mod1))[idx,]      # reorder coef, SE, etc. by increasing p
out
```

```
##
## Estimate Std. Error t value Pr(>|t|)
## (Intercept) 10.3706236413 0.33522806 30.936025282 3.779693e-155
```

## OverallQual10	1.7092409695	0.20593274	8.299996308	2.763663e-16
## OverallQual9	1.5541970511	0.20194264	7.696230307	2.904199e-14
## BldgTypeTwnhs	-0.2755489144	0.03818642	-7.215887708	9.453772e-13
## BldgTypeTwnhsE	-0.1735515268	0.02552929	-6.798133658	1.663373e-11
## OverallQual8	1.3400274378	0.19951521	6.716417406	2.863484e-11
## OverallQual7	1.1674083724	0.19848821	5.881499723	5.260185e-09
## HouseStyle1Story	-0.1213514065	0.02119284	-5.726057529	1.296748e-08
## OverallQual6	1.0358112703	0.19835023	5.222133070	2.081938e-07
## OverallQual5	0.9210582191	0.19815928	4.648070059	3.719372e-06
## MSZoningRM	0.3064028730	0.06927271	4.423139993	1.060623e-05
## MSZoningRL	0.3163273051	0.07430421	4.257192482	2.230867e-05
## OverallQual4	0.8214954149	0.19788420	4.151394697	3.537078e-05
## YearBuilt2005	0.8019530345	0.19323351	4.150175740	3.555700e-05
## YearBuilt2006	0.7911864397	0.19283682	4.102880655	4.354613e-05
## YearBuilt2007	0.7882351756	0.19382632	4.066708567	5.077774e-05
## YearBuilt2003	0.7724085117	0.19376193	3.986379145	7.112044e-05
## YearBuilt2000	0.7835315625	0.19674560	3.982460385	7.228813e-05
## YearBuilt2004	0.7536285213	0.19329077	3.898936992	1.019439e-04
## YearBuilt1995	0.7518300271	0.19756607	3.805461239	1.486492e-04
## YearBuilt1997	0.7463507289	0.19927842	3.745266103	1.887165e-04
## YearBuilt2008	0.7406024677	0.19845915	3.731762819	1.990046e-04
## YearBuilt1989	0.8219231681	0.22241952	3.695373394	2.294185e-04
## YearBuilt2001	0.7192070323	0.19687974	3.653027094	2.702984e-04
## HouseStyleSFoyer	-0.1400291387	0.03850597	-3.636557002	2.879716e-04
## YearBuilt2002	0.7101844927	0.19596744	3.623992371	3.021768e-04
## YearBuilt1999	0.7111953872	0.19710068	3.608284872	3.208598e-04
## YearBuilt1996	0.7188204084	0.19972082	3.599126067	3.322477e-04
## YearBuilt1963	0.7857708327	0.22164112	3.545239418	4.072913e-04
## HouseStyleSLvl	-0.1105345080	0.03120534	-3.542166743	4.120155e-04
## YearBuilt1998	0.6949821404	0.19691866	3.529285267	4.323839e-04
## YearBuilt1992	0.7060864438	0.20251489	3.486590218	5.068239e-04
## YearBuilt1959	0.6962807957	0.20030600	3.476085646	5.268900e-04
## OverallQual3	0.6887352527	0.20111199	3.424635539	6.363274e-04
## YearBuilt1994	0.6719523705	0.19672492	3.415695176	6.573791e-04
## YearBuilt1880	0.7054361400	0.20887163	3.377367005	7.551900e-04
## YearBuilt1990	0.6781653902	0.20188529	3.359161996	8.062420e-04
## YearBuilt1957	0.6543325481	0.19780682	3.307937170	9.676065e-04
## YearBuilt2009	0.6764880660	0.20782661	3.255059980	1.165197e-03
## YearBuilt1972	0.6505672998	0.20042022	3.246016289	1.202517e-03
## YearBuilt1967	0.6845688215	0.21287481	3.215828272	1.335244e-03
## YearBuilt1993	0.6326004354	0.19938565	3.172748102	1.548191e-03
## YearBuilt1968	0.6473877908	0.20429264	3.168923722	1.568534e-03
## YearBuilt1977	0.6385989836	0.20358591	3.136754396	1.749668e-03
## YearBuilt1976	0.6361417815	0.20420269	3.115246811	1.881306e-03
## YearBuilt1948	0.6055275428	0.19527572	3.100884981	1.974216e-03
## YearBuilt1955	0.6191289050	0.20005943	3.094724989	2.015344e-03
## YearBuilt1923	0.6205353730	0.20069813	3.091884177	2.034575e-03
## YearBuilt1974	0.6416510134	0.20795877	3.085472259	2.078602e-03
## YearBuilt1932	0.6479994938	0.21023931	3.082199484	2.101410e-03
## YearRemodAdd1993	0.1736174777	0.05639585	3.078550564	2.127110e-03
## YearBuilt1954	0.6104418673	0.19855054	3.074491031	2.156041e-03
## YearBuilt1987	0.6317150267	0.20614065	3.064485440	2.228897e-03
## YearBuilt1960	0.5994344448	0.19731242	3.037996517	2.432817e-03
## YearBuilt1966	0.6257602249	0.20823693	3.005039678	2.710357e-03

## YearBuilt1965	0.6000252503	0.19975136	3.003860609	2.720803e-03
## MSZoningFV	0.2607999278	0.08717572	2.991657929	2.831096e-03
## YearRemodAdd2002	0.1313189022	0.04399073	2.985149475	2.891579e-03
## YearBuilt1979	0.6661825704	0.22566810	2.952045829	3.217892e-03
## NeighborhoodEdwards	-0.1634953259	0.05578829	-2.930638667	3.446442e-03
## YearBuilt1956	0.5967274237	0.20505341	2.910107300	3.679444e-03
## YearBuilt1978	0.6142472407	0.21234851	2.892637359	3.888898e-03
## YearRemodAdd1995	0.1319090393	0.04564749	2.889732763	3.924755e-03
## LandSlopeMod	0.0852453540	0.02951478	2.888225643	3.943479e-03
## YearBuilt1988	0.5777191953	0.20097330	2.874606767	4.116393e-03
## YearBuilt1991	0.6032448834	0.21048388	2.865990847	4.229314e-03
## YearBuilt1915	0.5660584884	0.19769455	2.863298366	4.265175e-03
## YearBuilt1958	0.5553017357	0.19479032	2.850766534	4.435745e-03
## YearBuilt1969	0.6480652372	0.22850609	2.836096132	4.643271e-03
## Condition2PosN	-0.5791438325	0.20472092	-2.828943118	4.747616e-03
## YearBuilt1985	0.6416490648	0.22720696	2.824073068	4.819869e-03
## YearRemodAdd1987	0.2064770992	0.07363724	2.803976632	5.128678e-03
## YearBuilt1970	0.5753175767	0.20526883	2.802751778	5.148066e-03
## YearBuilt1964	0.5915900273	0.21111622	2.802200683	5.156811e-03
## YearBuilt1961	0.5789001586	0.20682118	2.799037140	5.207271e-03
## YearBuilt1971	0.5886818719	0.21081476	2.792412953	5.314380e-03
## LandContourLow	0.1311682669	0.04714270	2.782366683	5.480626e-03
## YearBuilt1952	0.5723668771	0.20575769	2.781752021	5.490949e-03
## YearRemodAdd1997	0.1440845835	0.05196231	2.772867377	5.642130e-03
## NeighborhoodOldTown	-0.1869404654	0.06768830	-2.761784158	5.835988e-03
## YearBuilt1951	0.6325992488	0.22925787	2.759334890	5.879631e-03
## LandContourLvl	0.0773000509	0.02829908	2.731539453	6.395960e-03
## Condition1PosN	0.1526285742	0.05587909	2.731407655	6.398503e-03
## HouseStyle1.5Unf	-0.1476272774	0.05407511	-2.730041171	6.424919e-03
## YearBuilt1950	0.5275882359	0.19416815	2.717171847	6.678563e-03
## YearBuilt1982	0.5649591877	0.20885495	2.705031367	6.926067e-03
## YearBuilt1904	0.6943556443	0.25737786	2.697806470	7.077245e-03
## MSZoningRH	0.2410802653	0.09031126	2.669437390	7.699959e-03
## NeighborhoodIDOTRR	-0.2048528463	0.07681247	-2.666921609	7.757487e-03
## YearBuilt1980	0.5842766304	0.21908405	2.666906251	7.757839e-03
## YearBuilt1918	0.5315640274	0.20095015	2.645253191	8.269166e-03
## YearRemodAdd2009	0.2050958243	0.07765107	2.641249247	8.366958e-03
## YearBuilt1986	0.5502674630	0.21122339	2.605144538	9.296652e-03
## YearRemodAdd1999	0.1386799946	0.05343997	2.595061401	9.572273e-03
## YearBuilt1984	0.5388477265	0.20868782	2.582075609	9.937974e-03
## YearRemodAdd1994	0.1293835008	0.05069531	2.552179028	1.082768e-02
## YearBuilt1916	0.4967682828	0.19606230	2.533726669	1.141155e-02
## NeighborhoodGilbert	-0.1411350294	0.05611711	-2.515008922	1.203225e-02
## YearBuilt1919	0.5427134623	0.21666170	2.504888800	1.238018e-02
## YearRemodAdd1988	0.1837275800	0.07342400	2.502282335	1.247122e-02
## YearBuilt1936	0.4888130477	0.19553773	2.499840073	1.255706e-02
## YearBuilt1949	0.4917791506	0.19697352	2.496676480	1.266904e-02
## YearRemodAdd1998	0.1225552904	0.04920155	2.490882637	1.287641e-02
## YearBuilt1892	0.5771083762	0.23387730	2.467568981	1.374156e-02
## YearRemodAdd2010	0.2710838363	0.11081778	2.446212466	1.457878e-02
## YearBuilt1981	0.5187957202	0.21278771	2.438090655	1.490880e-02
## YearBuilt1900	0.4803238496	0.19867081	2.417687106	1.576711e-02
## NeighborhoodCrawfor	0.1495151199	0.06184926	2.417411739	1.577899e-02
## YearBuilt1937	0.4935446036	0.20628905	2.392490527	1.688690e-02

## HouseStyle2Story	-0.0520619254	0.02184871	-2.382837014	1.733409e-02
## YearBuilt1908	0.5593535222	0.23566177	2.373543795	1.777438e-02
## YearBuilt1975	0.5022930100	0.21164743	2.373253477	1.778829e-02
## YearBuilt1939	0.4759180326	0.20058286	2.372675466	1.781602e-02
## YearBuilt1940	0.4589888990	0.19421874	2.363257524	1.827313e-02
## YearBuilt1945	0.4795363101	0.20298286	2.362447251	1.831294e-02
## YearBuilt1953	0.4956096524	0.21062810	2.353008242	1.878225e-02
## YearBuilt1973	0.5416103693	0.23134960	2.341090558	1.938983e-02
## NeighborhoodSawyer	-0.1392580183	0.05951056	-2.340055715	1.944339e-02
## YearBuilt1942	0.5278853405	0.22832476	2.311993370	2.094599e-02
## YearRemodAdd2008	0.1112576019	0.04858530	2.289943551	2.219677e-02
## NeighborhoodStoneBr	0.1380451279	0.06055189	2.279782168	2.279475e-02
## YearBuilt1921	0.4634263046	0.20335850	2.278863758	2.284948e-02
## YearBuilt2010	0.6794176680	0.29822670	2.278191967	2.288958e-02
## YearBuilt1911	0.5989003989	0.26289327	2.278112316	2.289434e-02
## NeighborhoodBrDale	-0.1870578718	0.08220400	-2.275532581	2.304895e-02
## YearBuilt1962	0.4753159013	0.20984715	2.265057689	2.368610e-02
## NeighborhoodMeadowV	-0.1760632729	0.07848618	-2.243239093	2.506252e-02
## NeighborhoodNoRidge	0.1384426337	0.06197114	2.233985562	2.566690e-02
## YearBuilt1928	0.4463756316	0.20078696	2.223130537	2.639193e-02
## YearBuilt1983	0.5081515248	0.23015587	2.207858213	2.744197e-02
## YearBuilt1905	0.5748103954	0.26051916	2.206403530	2.754384e-02
## YearBuilt1885	0.5040332942	0.22908113	2.200239294	2.797916e-02
## YearBuilt1890	0.4963713509	0.22649665	2.191517404	2.860524e-02
## YearRemodAdd1981	0.2016390095	0.09553263	2.110681966	3.500525e-02
## YearRemodAdd2001	0.1108665580	0.05272383	2.102778968	3.569208e-02
## YearBuilt1925	0.4036817470	0.19329602	2.088412074	3.697017e-02
## YearBuilt1922	0.4206846014	0.20145721	2.088208209	3.698858e-02
## YearBuilt1946	0.4210674718	0.20320556	2.072125739	3.846601e-02
## YearBuilt1935	0.4148704304	0.20349833	2.038692046	4.169868e-02
## NeighborhoodCollgCr	-0.1045610363	0.05148933	-2.030732059	4.250139e-02
## YearBuilt1914	0.4064141431	0.20126969	2.019251594	4.368214e-02
## NeighborhoodVeenker	0.1536953969	0.07631925	2.013848491	4.424737e-02
## YearBuilt1920	0.3826338222	0.19116477	2.001591696	4.555253e-02
## Condition1PosA	0.1523182328	0.07755444	1.964016814	4.975774e-02
## OverallQual2	0.4313358813	0.22010958	1.959641560	5.026794e-02
## YearRemodAdd1962	0.2017242387	0.10308865	1.956803619	5.060122e-02
## YearBuilt1934	0.4118543192	0.21579758	1.908521468	5.656126e-02
## YearBuilt1947	0.3838767056	0.20489038	1.873571175	6.123143e-02
## NeighborhoodNridgHt	0.0963974478	0.05146601	1.873031390	6.130599e-02
## YearBuilt1938	0.3850154171	0.20917127	1.840670687	6.591558e-02
## YearBuilt1917	0.4786533519	0.26328867	1.817979332	6.931550e-02
## YearBuilt1941	0.3531718922	0.19488220	1.812232654	7.019906e-02
## YearRemodAdd1975	0.1592634050	0.08789202	1.812034796	7.022965e-02
## YearRemodAdd1990	0.1078614553	0.05973133	1.805776789	7.120268e-02
## YearBuilt1931	0.3636799740	0.20225154	1.798156735	7.240239e-02
## YearBuilt1924	0.3541979605	0.20032799	1.768090243	7.729882e-02
## HouseStyle2.5Fin	0.1468754844	0.08308028	1.767874227	7.733495e-02
## Condition1Norm	0.0565146177	0.03220729	1.754715223	7.956217e-02
## LandSlopeSev	0.1162165909	0.06766939	1.717417363	8.615988e-02
## NeighborhoodNames	-0.0932204951	0.05590073	-1.667607751	9.565345e-02
## Condition2PosA	0.5138960359	0.31020041	1.656658167	9.784894e-02
## NeighborhoodBrkSide	-0.1108552484	0.06734790	-1.646009001	1.000227e-01
## YearBuilt1929	0.3419236319	0.20880314	1.637540695	1.017786e-01

## NeighborhoodMitchel	-0.0952770757	0.05856616	-1.626828052	1.040351e-01
## OverallCond3	-0.4450082527	0.27392049	-1.624589126	1.045117e-01
## YearBuilt1926	0.3212934799	0.19790976	1.623434195	1.047582e-01
## YearBuilt1910	0.3119357849	0.19286925	1.617343236	1.060659e-01
## YearBuilt1930	0.3190173609	0.19766768	1.613907571	1.068093e-01
## YearRemodAdd1960	0.1234342143	0.07718158	1.599270293	1.100227e-01
## YearRemodAdd1989	0.1143655528	0.07334242	1.559337108	1.191792e-01
## YearRemodAdd2004	0.0589126961	0.03978970	1.480601743	1.389741e-01
## YearBuilt1912	0.3216755771	0.22080080	1.456858731	1.454159e-01
## YearRemodAdd1980	0.1464408876	0.10317274	1.419375837	1.560481e-01
## LotShapeReg	-0.0166928035	0.01186073	-1.407401270	1.595663e-01
## YearBuilt1927	0.3080216810	0.21922786	1.405029837	1.602701e-01
## YearRemodAdd2006	0.0491784800	0.03544858	1.387318823	1.656011e-01
## YearBuilt1906	0.3591327881	0.26102650	1.375848015	1.691244e-01
## OverallCond2	-0.3727863919	0.29546798	-1.261681175	2.073077e-01
## YearRemodAdd1991	0.0840470242	0.06671864	1.259723218	2.080132e-01
## YearRemodAdd1986	0.1600279539	0.12820146	1.248253721	2.121806e-01
## YearRemodAdd2000	0.0519899455	0.04183178	1.242833595	2.141709e-01
## YearBuilt1898	0.3307838634	0.27230746	1.214744039	2.247017e-01
## YearRemodAdd1953	0.1196644663	0.10130836	1.181190469	2.377601e-01
## LotShapeIR2	0.0359680993	0.03070475	1.171418004	2.416624e-01
## LandContourHLS	0.0449183229	0.03895955	1.152947539	2.491606e-01
## YearRemodAdd1959	-0.0889447029	0.07876181	-1.129287192	2.590015e-01
## YearRemodAdd1996	0.0505181748	0.04520842	1.117450625	2.640244e-01
## YearRemodAdd1961	0.1057789993	0.10161290	1.040999680	2.980845e-01
## OverallCond4	-0.2831014002	0.27786350	-1.018850617	3.084784e-01
## YearRemodAdd1970	0.0742794931	0.07292307	1.018600724	3.085970e-01
## OverallCond5	-0.2818150542	0.27737277	-1.016015558	3.098259e-01
## Condition2RRNn	-0.2074501295	0.20829554	-0.995941290	3.194786e-01
## LotShapeIR3	0.0588516976	0.05921777	0.993818245	3.205109e-01
## YearRemodAdd1963	-0.1220565798	0.12389667	-0.985148171	3.247491e-01
## YearRemodAdd1973	0.1258945161	0.13009537	0.967709435	3.333837e-01
## YearBuilt1882	0.2708630958	0.28346088	0.955557236	3.394876e-01
## YearRemodAdd2003	0.0386103148	0.04098120	0.942147013	3.463062e-01
## NeighborhoodClearCr	0.0618828805	0.06703307	0.923169364	3.561038e-01
## Condition1RRAn	0.0468042653	0.05126971	0.912902790	3.614763e-01
## BldgType2fmCon	0.0348045279	0.03836096	0.907290213	3.644347e-01
## YearRemodAdd2007	0.0335278176	0.03786772	0.885393122	3.761213e-01
## NeighborhoodBlueste	-0.1273758598	0.15129416	-0.841908620	4.000062e-01
## YearRemodAdd1983	0.0959031158	0.11526979	0.831988305	4.055804e-01
## OverallCond8	-0.2266388692	0.27820790	-0.814638513	4.154402e-01
## OverallCond6	-0.2220940339	0.27781372	-0.799435072	4.241957e-01
## YearRemodAdd2005	0.0300661225	0.03802324	0.790730058	4.292571e-01
## NeighborhoodSawyerW	-0.0441506897	0.05778451	-0.764057487	4.449826e-01
## YearRemodAdd1964	0.0813824000	0.10940508	0.743863054	4.571043e-01
## YearRemodAdd1984	0.0713024063	0.09619677	0.741214169	4.587080e-01
## RoofStyleGable	-0.0441061593	0.05978033	-0.737803821	4.607773e-01
## YearRemodAdd1967	-0.0781988779	0.10790528	-0.724699297	4.687772e-01
## OverallCond7	-0.1950594255	0.27767858	-0.702464796	4.825250e-01
## Condition1Feedr	0.0267689713	0.03840870	0.696950651	4.859681e-01
## YearBuilt1875	0.1791025374	0.26384034	0.678829236	4.973764e-01
## UtilitiesNoSeWa	-0.1209096589	0.18344524	-0.659104927	5.099543e-01
## YearRemodAdd1951	0.1014474728	0.15519923	0.653659652	5.134558e-01
## Condition2RRAn	-0.1492514996	0.23175188	-0.644014188	5.196888e-01

```
## YearRemodAdd1966      0.0590040681 0.09457663 0.623875741 5.328273e-01
## YearRemodAdd1982      0.0513334632 0.08252140 0.622062462 5.340185e-01
## NeighborhoodNWAmes   -0.0364979151 0.05870869 -0.621678281 5.342710e-01
## YearRemodAdd1974      0.0594206624 0.10124240 0.586914796 5.573709e-01
## YearRemodAdd1955      0.0486368182 0.08393719 0.579443017 5.623986e-01
## Condition2Feedr      -0.0994450867 0.17370571 -0.572491759 5.670957e-01
## YearRemodAdd1972      -0.0396901045 0.06988157 -0.567962397 5.701663e-01
## YearRemodAdd1954      -0.0440229677 0.07886878 -0.558179923 5.768252e-01
## YearBuilt1913         -0.1430141685 0.26059590 -0.548796700 5.832466e-01
## HouseStyle2.5Unf      0.0396378259 0.07306220 0.542521672 5.875595e-01
## YearRemodAdd1976      0.0394459014 0.07887685 0.500094773 6.170997e-01
## Condition2RRAE       0.1439956125 0.30808352 0.467391480 6.403043e-01
## OverallCond9         -0.1297714524 0.28097309 -0.461864344 6.442620e-01
## Condition2Norm       -0.0639529884 0.14672899 -0.435857883 6.630179e-01
## RoofStyleMansard     -0.0408161119 0.09485621 -0.430294590 6.670583e-01
## BldgTypeDuplex       0.0126776774 0.02980637 0.425334491 6.706688e-01
## YearRemodAdd1978      0.0409528982 0.09903122 0.413535208 6.792881e-01
## YearRemodAdd1956      0.0412017218 0.10829657 0.380452691 7.036765e-01
## YearRemodAdd1977      0.0310315869 0.08222672 0.377390534 7.059499e-01
## YearRemodAdd1968      0.0281852323 0.08316813 0.338894638 7.347481e-01
## Condition1RRAE       -0.0197246260 0.06605571 -0.298605940 7.652922e-01
## YearRemodAdd1965      0.0217982669 0.07533490 0.289351492 7.723622e-01
## YearRemodAdd1992      0.0186683988 0.06479789 0.288101940 7.733183e-01
## YearRemodAdd1958      -0.0190272466 0.06907479 -0.275458639 7.830111e-01
## YearRemodAdd1979      -0.0312664782 0.11734920 -0.266439638 7.899462e-01
## YearRemodAdd1969      0.0319007273 0.12831479 0.248613024 8.037025e-01
## Condition1RRNn       0.0197348976 0.09137566 0.215975422 8.290435e-01
## YearRemodAdd1957      -0.0172063421 0.08332931 -0.206486082 8.364461e-01
## NeighborhoodSWISU    -0.0139795023 0.07164731 -0.195115512 8.453354e-01
## RoofStyleShed        0.0374703754 0.19888018 0.188406786 8.505895e-01
## NeighborhoodSomerst -0.0108996139 0.06279196 -0.173582950 8.622224e-01
## YearRemodAdd1985      0.0165428659 0.10183461 0.162448360 8.709800e-01
## YearRemodAdd1971      -0.0100202146 0.10356165 -0.096756037 9.229362e-01
## RoofStyleGambrel     -0.0069213133 0.08394133 -0.082454174 9.342993e-01
## RoofStyleHip         -0.0035236735 0.06051686 -0.058226311 9.535780e-01
## NeighborhoodNPkVill -0.0025773126 0.08003920 -0.032200628 9.743174e-01
## Condition1RRNe       -0.0033404788 0.13778542 -0.024244066 9.806619e-01
## NeighborhoodTimber    0.0001251704 0.05927716 0.002111612 9.983155e-01
```

```
catego <- dplyr::select(Selected15,-Id,-SalePrice,-logSalePrice)
#chisq.test(catego)
```

```
# BldgType ~HouseStyle
# Condition1~Condition2
# LandContour~LandSlope~LotShape
# OverallQual~OverallCond
# YearBuilt~YearRemodAdd
# RoofStyle~?
```

```
#Ref: https://stackoverflow.com/questions/7382039/chi-square-analysis-using-for-loop-in-r
#Chisq test for each pair:
```

```
library(plyr)
```

```
combos <- combn(ncol(catego),2)
```



```
## Warning in chisq.test(catego[, x[1]], catego[, x[2]]): Chi-squared
## approximation may be incorrect
```

```
View(ChiSqEachPair)
```

```
DependCatego = subset(ChiSqEachPair, p.value > 0.05)
```

```
View(DependCatego)
```

```
colDependCatego <- subset(DependCatego, select = c(Row, Column))
```

```
View(colDependCatego)
```

May suffer from curse of dimensionality, please add additional randomized sample to increase sample size

```
mod1Interaction <- lm(logSalePrice ~ . + Utilities*BldgType + Utilities*OverallQual + Utilities*OverallCondition)
```

```
sumMod1Interaction = summary(mod1Interaction)
```

```
library(xtable)
```

```
idxInteraction <- order(coef(summary(mod1Interaction))[, 4]) # sort out the p-values
```

```
outInteraction <- coef(summary(mod1Interaction))[idxInteraction,] # reorder coef, SE, etc. by index
```

```
outInteraction
```

##	Estimate	Std. Error	t value
## (Intercept)	9.650282101	0.54937011	17.56608506
## OverallQual10	1.730744087	0.20969715	8.25354120
## OverallQual9	1.581232647	0.20577349	7.68433618
## BldgTypeTwnhs	-0.275660066	0.03775539	-7.30121159
## BldgTypeTwnhsE	-0.176441031	0.02549123	-6.92163666
## OverallQual8	1.375496916	0.20343292	6.76142744
## OverallQual7	1.202444987	0.20222278	5.94614017
## OverallQual6	1.088102731	0.20219996	5.38132016
## OverallQual5	0.979565560	0.20195235	4.85047854
## HouseStyle1Story	-0.103779805	0.02234661	-4.64409608
## YearBuilt2005	0.867704272	0.19149697	4.53116452
## YearBuilt2006	0.857484649	0.19117985	4.48522508
## YearBuilt2007	0.856019349	0.19204851	4.45730800
## OverallQual4	0.878705329	0.20177716	4.35483052
## YearBuilt2000	0.838465276	0.19483973	4.30335879
## YearBuilt2003	0.817621608	0.19180781	4.26271285
## YearBuilt2004	0.813691087	0.19156115	4.24768330
## YearBuilt1995	0.804633551	0.19583567	4.10871799
## YearBuilt1997	0.806573801	0.19805173	4.07254107
## YearBuilt2008	0.801290911	0.19684612	4.07064630
## YearBuilt2001	0.781043040	0.19483644	4.00871138
## YearBuilt2002	0.766012287	0.19394124	3.94971317
## YearBuilt1992	0.783087582	0.20080886	3.89966646
## YearBuilt1999	0.760568677	0.19529715	3.89441776
## MSZoningRL	0.315926373	0.08151922	3.87548331
## MSZoningRM	0.296740258	0.07685613	3.86098379
## YearBuilt1989	0.856372339	0.22205877	3.85651208
## YearBuilt1996	0.762195574	0.19845034	3.84073697
## YearBuilt1968	0.777809206	0.20504883	3.79328780
## YearBuilt1998	0.733909838	0.19498978	3.76383750
## YearBuilt1994	0.732385776	0.19483062	3.75908965

## YearBuilt1963	0.812959541	0.22001328	3.69504762
## YearBuilt1959	0.727553768	0.19819623	3.67087601
## YearBuilt2009	0.746469311	0.20610512	3.62178930
## YearBuilt1993	0.706594187	0.19791119	3.57025888
## YearBuilt1990	0.706686392	0.19980298	3.53691621
## YearBuilt1957	0.691940974	0.19572247	3.53531703
## OverallQual3	0.714987377	0.20450042	3.49626353
## OverallCond7:RoofStyleHip	-0.837907185	0.24170884	-3.46659722
## YearBuilt1974	0.709198680	0.20652005	3.43404272
## OverallCond6:RoofStyleHip	-0.906512518	0.26495511	-3.42138152
## YearBuilt1972	0.672007243	0.19821602	3.39027722
## YearBuilt1977	0.679300314	0.20186683	3.36509134
## YearBuilt1976	0.673554962	0.20302722	3.31755994
## YearRemodAdd1987	0.241494858	0.07365367	3.27878913
## OverallCond7:RoofStyleGable	-0.859870912	0.26505693	-3.24409901
## YearBuilt1955	0.641171545	0.19849563	3.23015439
## OverallCond6:RoofStyleGable	-0.925644118	0.28887049	-3.20435682
## YearBuilt1967	0.677351612	0.21216926	3.19250582
## HouseStyleSFoyer	-0.123568543	0.03884870	-3.18076356
## YearBuilt1948	0.611259154	0.19301340	3.16692606
## YearBuilt1987	0.644170410	0.20353208	3.16495767
## YearBuilt1985	0.701340699	0.22466446	3.12172513
## YearBuilt1991	0.646872246	0.20817389	3.10736493
## YearBuilt1965	0.612583301	0.19776547	3.09752409
## YearBuilt1932	0.644274400	0.20835873	3.09214017
## YearBuilt1956	0.622766936	0.20288242	3.06959535
## YearBuilt1966	0.633347645	0.20648430	3.06729195
## YearBuilt1923	0.606414920	0.19866361	3.05247099
## YearBuilt1988	0.604067197	0.19897987	3.03582060
## YearBuilt1961	0.623677580	0.20574735	3.03127876
## YearBuilt1969	0.684031482	0.22616308	3.02450554
## LandContourLow	0.147053993	0.04878647	3.01423747
## YearBuilt1880	0.626713572	0.20876012	3.00207514
## YearBuilt1982	0.621979722	0.20721016	3.00168551
## YearBuilt1978	0.628896391	0.20973436	2.99853767
## YearBuilt1979	0.665259536	0.22450025	2.96329084
## YearBuilt1970	0.604263977	0.20397731	2.96240783
## YearBuilt1951	0.667645640	0.22663280	2.94593559
## YearBuilt1954	0.576959158	0.19677704	2.93204511
## YearBuilt1958	0.561170642	0.19269048	2.91229047
## YearBuilt1964	0.606575044	0.20925894	2.89868163
## YearBuilt1950	0.555741549	0.19187612	2.89635599
## YearBuilt2010	0.921820549	0.31855384	2.89376689
## YearBuilt1980	0.626847970	0.21691756	2.88979820
## YearBuilt1984	0.596057161	0.20647373	2.88684254
## YearRemodAdd2002	0.126697736	0.04425367	2.86298837
## OverallCond4:RoofStyleGambrel	-0.722832299	0.25393576	-2.84651638
## YearRemodAdd1988	0.209509838	0.07379658	2.83901823
## MSZoningFV	0.263995096	0.09350759	2.82324786
## HouseStyleSLvl	-0.091173023	0.03229696	-2.82296000
## HouseStyle2.5Fin	0.280489366	0.09995154	2.80625354
## YearBuilt1918	0.553346300	0.19871945	2.78456028
## OverallCond6:RoofStyleGambrel	-0.913231344	0.33195767	-2.75104755
## YearBuilt1908	0.729151159	0.26594902	2.74169518

## YearBuilt1915	0.534888393	0.19615441	2.72687421
## NeighborhoodGilbert	-0.151630260	0.05565839	-2.72430185
## NeighborhoodEdwards	-0.669000067	0.24658274	-2.71308557
## YearBuilt1960	0.533175637	0.19652851	2.71296836
## YearBuilt1952	0.562537516	0.20753888	2.71051636
## YearBuilt1975	0.571523605	0.21152929	2.70186505
## YearBuilt1986	0.561401238	0.20859785	2.69130885
## YearBuilt1904	0.683717272	0.25412648	2.69046058
## RoofStyleHip	0.609414631	0.22659904	2.68939639
## YearBuilt1981	0.565285972	0.21029000	2.68812578
## YearRemodAdd1998	0.132649449	0.04937772	2.68642292
## YearRemodAdd1999	0.144368467	0.05432898	2.65730113
## RoofStyleGambrel	0.743649182	0.28024699	2.65354926
## YearBuilt1949	0.512204849	0.19476848	2.62981387
## YearBuilt1939	0.524835553	0.19959870	2.62945377
## YearBuilt1971	0.549413251	0.21160266	2.59643835
## OverallCond7:RoofStyleGambrel	-0.821655540	0.31714603	-2.59077984
## YearBuilt1916	0.500509588	0.19358551	2.58547034
## YearBuilt1936	0.497414864	0.19316858	2.57502992
## YearBuilt1940	0.492564977	0.19204904	2.56478749
## YearBuilt1900	0.504671549	0.19693884	2.56258011
## NeighborhoodCrawfor	0.163012683	0.06369232	2.55937736
## YearRemodAdd1960	0.217802712	0.08569852	2.54149904
## YearRemodAdd1995	0.117727446	0.04641408	2.53645960
## YearBuilt1937	0.512649728	0.20399726	2.51302262
## YearRemodAdd1997	0.134170228	0.05350979	2.50739610
## YearBuilt1973	0.568895208	0.22868509	2.48767945
## RoofStyleGable	0.630043973	0.25389334	2.48153017
## YearBuilt1953	0.514767538	0.20848614	2.46907324
## YearBuilt1905	0.634992008	0.25792177	2.46195588
## YearRemodAdd2009	0.189770492	0.07751895	2.44805306
## YearBuilt1962	0.502649639	0.20754183	2.42191963
## OverallCond3:RoofStyleGambrel	-0.930273239	0.38836017	-2.39538786
## MSZoningRH	0.231787037	0.09734163	2.38117061
## OverallCond3:RoofStyleGable	-0.769939482	0.32460351	-2.37193828
## NeighborhoodSawyer	-0.140479734	0.05924402	-2.37120523
## YearBuilt1942	0.532919395	0.22564612	2.36174855
## YearBuilt1892	0.550218335	0.23299580	2.36149469
## YearBuilt1919	0.512287479	0.21776295	2.35250064
## NeighborhoodOldTown	-0.160099169	0.06806943	-2.35199798
## YearRemodAdd2010	0.258298511	0.11001008	2.34795322
## YearBuilt1945	0.473390740	0.20186773	2.34505411
## YearBuilt1946	0.469703156	0.20148849	2.33116623
## OverallCond3:RoofStyleHip	-0.727553066	0.31352929	-2.32052666
## YearBuilt1890	0.517598713	0.22391984	2.31153577
## NeighborhoodIDOTRR	-0.178493503	0.07758809	-2.30052716
## YearBuilt1928	0.454732682	0.19949132	2.27946102
## YearRemodAdd1993	0.132354203	0.05813631	2.27661853
## YearBuilt1911	0.587847230	0.25947402	2.26553407
## LandContourLvl	0.067319319	0.02974424	2.26327269
## NeighborhoodMeadowV	-0.175806204	0.07784434	-2.25843260
## YearBuilt1983	0.515460822	0.22901333	2.25078960
## YearBuilt1922	0.446226521	0.19954558	2.23621349
## NeighborhoodStoneBr	0.133122257	0.05980097	2.22608855

## NeighborhoodNoRidge	0.135773252	0.06121706	2.21789879
## HouseStyle1.5Unf	-0.124768349	0.05699755	-2.18901267
## YearBuilt1920	0.412072780	0.18904228	2.17979167
## YearRemodAdd1994	0.114852089	0.05298163	2.16777191
## Condition1PosN	0.122857681	0.05674313	2.16515497
## YearBuilt1925	0.411386207	0.19122590	2.15131012
## NeighborhoodBrDale	-0.175231296	0.08154205	-2.14896839
## YearBuilt1935	0.432014112	0.20129601	2.14616335
## YearBuilt1921	0.437468302	0.20407763	2.14363669
## YearRemodAdd2008	0.104116437	0.04865776	2.13977031
## YearBuilt1914	0.425835024	0.19907829	2.13903300
## OverallCond5:RoofStyleGable	-0.580753312	0.27417272	-2.11820241
## NeighborhoodCollgCr	-0.107633469	0.05097145	-2.11164232
## NeighborhoodEdwards:Condition2Norm	0.513350222	0.24377543	2.10583247
## YearRemodAdd1990	0.124422813	0.05971691	2.08354414
## OverallQual2	0.461785027	0.22167225	2.08318828
## YearBuilt1947	0.418404291	0.20342146	2.05683458
## YearRemodAdd1981	0.195690228	0.09525703	2.05433889
## LandSlopeMod:HouseStyle2.5Fin	-0.381194049	0.18976858	-2.00873112
## YearRemodAdd1962	0.204608646	0.10239547	1.99821975
## YearBuilt1941	0.385058442	0.19270737	1.99815109
## OverallCond5:RoofStyleHip	-0.495702903	0.24890437	-1.99153954
## YearRemodAdd2001	0.102874188	0.05242797	1.96220052
## YearBuilt1931	0.391633345	0.20017559	1.95644908
## YearBuilt1917	0.501768682	0.25984622	1.93102168
## OverallCond7	0.780713469	0.40616811	1.92214368
## YearBuilt1938	0.394052955	0.20690822	1.90448188
## YearBuilt1930	0.373931928	0.19634887	1.90442615
## OverallCond6	0.823765724	0.43346363	1.90042639
## YearBuilt1885	0.439527418	0.23188393	1.89546306
## YearRemodAdd1991	0.127724405	0.06814323	1.87435221
## NeighborhoodVeenker	0.138407760	0.07553173	1.83244515
## YearBuilt1924	0.360814121	0.19807866	1.82156984
## YearBuilt1934	0.388850579	0.21524708	1.80653124
## YearRemodAdd1989	0.132541063	0.07350749	1.80309597
## NeighborhoodNridgHt	0.089184610	0.05081872	1.75495569
## NeighborhoodMitchel	-0.100316750	0.05814379	-1.72532170
## YearBuilt1910	0.324688424	0.19100808	1.69986748
## YearBuilt1926	0.326374393	0.19612493	1.66411478
## YearBuilt1929	0.342101049	0.20689716	1.65348355
## YearRemodAdd1986	0.209645987	0.12774071	1.64118382
## Condition1PosA	0.133295731	0.08367267	1.59306169
## YearBuilt1906	0.406411301	0.25804618	1.57495569
## RoofStyleShed	-0.384920492	0.24720679	-1.55707894
## YearBuilt1927	0.342026300	0.22263334	1.53627622
## LotShapeReg	-0.017871757	0.01184287	-1.50907261
## YearRemodAdd2004	0.059484149	0.03983959	1.49309151
## YearRemodAdd1975	0.137985264	0.09489576	1.45407191
## NeighborhoodNames	-0.080768538	0.05596347	-1.44323681
## OverallCond6:RoofStyleMansard	-0.351385614	0.25099681	-1.39996045
## YearRemodAdd1980	0.136949316	0.10272781	1.33312792
## LandSlopeSev	0.249478698	0.19091250	1.30676985
## HouseStyle2Story	-0.030387340	0.02328724	-1.30489206
## YearRemodAdd1996	0.060365403	0.04644853	1.29961925

## LandSlopeMod:HouseStyle1Story	-0.116154935	0.09170151	-1.26666325
## LandSlopeMod:HouseStyleSLvl	-0.176679357	0.14036110	-1.25874871
## YearRemodAdd1959	-0.097897814	0.07837447	-1.24910331
## YearRemodAdd2003	0.050938946	0.04110351	1.23928464
## NeighborhoodIDOTRR:Condition2Feedr	0.408218509	0.33201397	1.22952208
## YearBuilt1898	0.328030920	0.26954928	1.21696084
## Condition2PosN	-0.475096356	0.39479022	-1.20341471
## YearRemodAdd2000	0.050522746	0.04224107	1.19605731
## OverallCond2	-0.362488423	0.30900738	-1.17307368
## Condition1Norm	0.038686230	0.03322107	1.16450881
## LandSlopeMod:HouseStyle1.5Unf	-0.298797645	0.26335634	-1.13457549
## YearBuilt1912	0.249439019	0.22190947	1.12405758
## Condition2RR Ae	0.518757119	0.47594825	1.08994439
## YearRemodAdd1973	0.135956607	0.12841154	1.05875696
## YearRemodAdd1953	0.106613653	0.10081869	1.05747909
## OverallCond4:RoofStyleGable	-0.132649646	0.12725325	-1.04240673
## LandSlopeSev:HouseStyle2Story	-0.240240805	0.23057443	-1.04192302
## YearRemodAdd2006	0.037401231	0.03590899	1.04155617
## Condition2Feedr:YearRemodAdd1960	-0.299140805	0.29008329	-1.03122383
## LandSlopeSev:HouseStyleSLvl	-0.286202733	0.27857626	-1.02737661
## Condition2RRNn	-0.293316395	0.29162029	-1.00581613
## NeighborhoodClearCr	0.068015116	0.06819194	0.99740697
## OverallCond3	0.448797617	0.45017963	0.99693008
## LotShapeIR2	0.031529737	0.03178964	0.99182418
## YearRemodAdd1983	0.115467190	0.11650473	0.99109448
## OverallCond5	0.407584846	0.41895928	0.97285075
## NeighborhoodSawyerW	-0.053696441	0.05737953	-0.93581184
## YearRemodAdd1970	0.069794045	0.07510080	0.92933823
## YearRemodAdd1963	-0.113811788	0.12569591	-0.90545340
## Condition2PosA	0.395536417	0.44031273	0.89830793
## NeighborhoodBrkSide	-0.253719557	0.29353135	-0.86436953
## YearRemodAdd1968	-0.076264143	0.08909377	-0.85599859
## Condition2RRAn	-0.331547914	0.38909008	-0.85211094
## Condition2Feedr:YearRemodAdd1993	0.236322227	0.28015055	0.84355438
## NeighborhoodBlueste	-0.125487280	0.14937486	-0.84008300
## LandContourHLS	0.034725050	0.04197389	0.82730130
## YearBuilt1882	0.225339940	0.28193983	0.79924834
## YearRemodAdd1964	0.086863053	0.10981786	0.79097382
## YearRemodAdd1961	0.080263279	0.10386314	0.77277923
## HouseStyle2.5Unf	0.056392857	0.07345598	0.76770952
## YearRemodAdd1966	0.070251955	0.09501281	0.73939456
## Condition2Feedr:YearRemodAdd1991	-0.247814887	0.33656729	-0.73630117
## YearRemodAdd1955	0.062479464	0.08493434	0.73562075
## Condition1RRAn	0.037910680	0.05240000	0.72348624
## YearBuilt1875	0.181246375	0.26186008	0.69214969
## YearRemodAdd1978	0.068322000	0.09893234	0.69059320
## NeighborhoodBrkSide:Condition2Norm	0.183685791	0.28541717	0.64356951
## LandSlopeMod:BldgTypeTwnhsE	0.079621364	0.12517262	0.63609250
## Condition1RR Ae	-0.041952521	0.06608231	-0.63485255
## LandSlopeMod:Condition1Feedr	-0.132693065	0.21486678	-0.61755971
## YearRemodAdd1951	0.094236302	0.15491213	0.60832099
## LotShapeIR3	0.035229063	0.05897034	0.59740311
## Condition2Norm	-0.206760599	0.34737462	-0.59520929
## YearRemodAdd1976	0.045930095	0.07980674	0.57551650

## LandSlopeMod:Condition1Norm	0.106882876	0.18914360	0.56508851
## Condition1Feedr	0.022165894	0.03994300	0.55493817
## YearRemodAdd1954	0.045128304	0.08148049	0.55385413
## UtilitiesNoSeWa	-0.096499305	0.18143884	-0.53185584
## YearRemodAdd1984	0.049446358	0.09577788	0.51626072
## LandSlopeSev:BldgType2fmCon	0.135717504	0.26362261	0.51481739
## YearBuilt1913	-0.129797124	0.25721245	-0.50463002
## LandSlopeMod:Condition1PosA	0.146999755	0.29263562	0.50233036
## NeighborhoodNWAmes	-0.028942238	0.05838582	-0.49570662
## YearRemodAdd2007	0.018920220	0.03844058	0.49219393
## YearRemodAdd1971	0.052933804	0.10934604	0.48409440
## YearRemodAdd2005	0.017401164	0.03841621	0.45296416
## YearRemodAdd1972	-0.028228755	0.06961278	-0.40551107
## NeighborhoodTimber	-0.023428039	0.05882378	-0.39827497
## YearRemodAdd1957	-0.031444571	0.08282169	-0.37966590
## YearRemodAdd1977	0.030875442	0.08219937	0.37561654
## Condition1RRNn	0.039409571	0.10915525	0.36104144
## OverallCond8	-0.103737414	0.31452160	-0.32982604
## LandSlopeMod:Condition2Norm	0.155563777	0.47566065	0.32704781
## YearRemodAdd1967	-0.034044993	0.10933653	-0.31137804
## Condition2Feedr	-0.113127697	0.40160093	-0.28169182
## YearRemodAdd1969	0.035686914	0.12709413	0.28079119
## NeighborhoodSomerst	-0.017430710	0.06232167	-0.27968940
## BldgTypeDuplex	0.008402607	0.03004714	0.27964746
## YearRemodAdd1956	0.029826427	0.10760410	0.27718672
## RoofStyleMansard	-0.045410917	0.17051184	-0.26632119
## OverallCond8:RoofStyleGambrel	-0.053545852	0.21728828	-0.24642770
## YearRemodAdd1965	0.017612078	0.07594665	0.23190065
## Condition1RRNe	-0.031553383	0.13638643	-0.23135280
## LandSlopeMod	-0.099419954	0.43900021	-0.22646903
## BldgType2fmCon	0.008705081	0.04014779	0.21682592
## NeighborhoodBrkSide:Condition2Feedr	-0.080566215	0.40314460	-0.19984446
## NeighborhoodSWISU	0.013975687	0.07231793	0.19325343
## YearRemodAdd1974	0.016491423	0.10179729	0.16200256
## LandSlopeMod:BldgType2fmCon	0.023844348	0.15095842	0.15795308
## OverallCond5:RoofStyleMansard	0.033646007	0.23818332	0.14126097
## NeighborhoodNPkVill	-0.010296984	0.07914768	-0.13009838
## YearRemodAdd1979	0.013735300	0.12037286	0.11410629
## YearRemodAdd1985	0.010561964	0.10108879	0.10448205
## OverallCond8:RoofStyleGable	0.012984567	0.12771589	0.10166759
## LandSlopeMod:HouseStyle2Story	0.006452252	0.09379994	0.06878738
## OverallCond4	-0.021214375	0.31287805	-0.06780397
## LandSlopeSev:HouseStyle1Story	0.007121503	0.20732337	0.03434974
## YearRemodAdd1982	-0.002760065	0.08706080	-0.03170273
## OverallCond9	-0.008030371	0.29240915	-0.02746279
## YearRemodAdd1992	-0.001291754	0.06457816	-0.02000295
## LandSlopeMod:Condition1RRNn	-0.004672430	0.28582394	-0.01634723
## YearRemodAdd1958	-0.000412814	0.07013179	-0.00588626
##	Pr(> t)		
## (Intercept)	1.845582e-61		
## OverallQual10	4.125211e-16		
## OverallQual9	3.250613e-14		
## BldgTypeTwnhs	5.269760e-13		
## BldgTypeTwnhsE	7.356496e-12		

## OverallQual8	2.156185e-11
## OverallQual7	3.624258e-09
## OverallQual6	8.933680e-08
## OverallQual5	1.398487e-06
## HouseStyle1Story	3.803797e-06
## YearBuilt2005	6.469865e-06
## YearBuilt2006	8.003717e-06
## YearBuilt2007	9.099827e-06
## OverallQual4	1.448793e-05
## YearBuilt2000	1.823415e-05
## YearBuilt2003	2.182814e-05
## YearBuilt2004	2.332070e-05
## YearBuilt1995	4.256957e-05
## YearBuilt1997	4.964599e-05
## YearBuilt2008	5.004582e-05
## YearBuilt2001	6.493123e-05
## YearBuilt2002	8.294001e-05
## YearBuilt1992	1.018271e-04
## YearBuilt1999	1.040280e-04
## MSZoningRL	1.123471e-04
## MSZoningRM	1.191383e-04
## YearBuilt1989	1.213097e-04
## YearBuilt1996	1.292722e-04
## YearBuilt1968	1.562988e-04
## YearBuilt1998	1.756635e-04
## YearBuilt1994	1.789894e-04
## YearBuilt1963	2.300534e-04
## YearBuilt1959	2.526662e-04
## YearBuilt2009	3.051576e-04
## YearBuilt1993	3.711555e-04
## YearBuilt1990	4.207415e-04
## YearBuilt1957	4.232688e-04
## OverallQual3	4.895748e-04
## OverallCond7:RoofStyleHip	5.462941e-04
## YearBuilt1974	6.155569e-04
## OverallCond6:RoofStyleHip	6.446402e-04
## YearBuilt1972	7.216097e-04
## YearBuilt1977	7.901077e-04
## YearBuilt1976	9.361158e-04
## YearRemodAdd1987	1.073343e-03
## OverallCond7:RoofStyleGable	1.211689e-03
## YearBuilt1955	1.271811e-03
## OverallCond6:RoofStyleGable	1.390363e-03
## YearBuilt1967	1.448174e-03
## HouseStyleSFoyer	1.507636e-03
## YearBuilt1948	1.580596e-03
## YearBuilt1987	1.591235e-03
## YearBuilt1985	1.842205e-03
## YearBuilt1991	1.933311e-03
## YearBuilt1965	1.998118e-03
## YearBuilt1932	2.034412e-03
## YearBuilt1956	2.193067e-03
## YearBuilt1966	2.209900e-03
## YearBuilt1923	2.321079e-03

## YearBuilt1988	2.452084e-03
## YearBuilt1961	2.488977e-03
## YearBuilt1969	2.544940e-03
## LandContourLow	2.631980e-03
## YearBuilt1880	2.738598e-03
## YearBuilt1982	2.742078e-03
## YearBuilt1978	2.770342e-03
## YearBuilt1979	3.105520e-03
## YearBuilt1970	3.114374e-03
## YearBuilt1951	3.283810e-03
## YearBuilt1954	3.433179e-03
## YearBuilt1958	3.656285e-03
## YearBuilt1964	3.817576e-03
## YearBuilt1950	3.845778e-03
## YearBuilt2010	3.877398e-03
## YearBuilt1980	3.926326e-03
## YearBuilt1984	3.963129e-03
## YearRemodAdd2002	4.271827e-03
## OverallCond4:RoofStyleGambrel	4.497568e-03
## YearRemodAdd1988	4.603866e-03
## MSZoningFV	4.834907e-03
## HouseStyleSLvl	4.839220e-03
## HouseStyle2.5Fin	5.095594e-03
## YearBuilt1918	5.446822e-03
## OverallCond6:RoofStyleGambrel	6.032562e-03
## YearBuilt1908	6.205867e-03
## YearBuilt1915	6.489715e-03
## NeighborhoodGilbert	6.540155e-03
## NeighborhoodEdwards	6.764237e-03
## YearBuilt1960	6.766614e-03
## YearBuilt1952	6.816528e-03
## YearBuilt1975	6.995293e-03
## YearBuilt1986	7.219124e-03
## YearBuilt1904	7.237387e-03
## RoofStyleHip	7.260357e-03
## YearBuilt1981	7.287868e-03
## YearRemodAdd1998	7.324886e-03
## YearRemodAdd1999	7.984638e-03
## RoofStyleGambrel	8.073402e-03
## YearBuilt1949	8.655732e-03
## YearBuilt1939	8.664849e-03
## YearBuilt1971	9.538155e-03
## OverallCond7:RoofStyleGambrel	9.695479e-03
## YearBuilt1916	9.845201e-03
## YearBuilt1936	1.014564e-02
## YearBuilt1940	1.044829e-02
## YearBuilt1900	1.051456e-02
## NeighborhoodCrawfor	1.061138e-02
## YearRemodAdd1960	1.116657e-02
## YearRemodAdd1995	1.132766e-02
## YearBuilt1937	1.210431e-02
## YearRemodAdd1997	1.229765e-02
## YearBuilt1973	1.299697e-02
## RoofStyleGable	1.322216e-02

## YearBuilt1953	1.368896e-02
## YearBuilt1905	1.396217e-02
## YearRemodAdd2009	1.450977e-02
## YearBuilt1962	1.559062e-02
## OverallCond3:RoofStyleGambrel	1.675990e-02
## MSZoningRH	1.741764e-02
## OverallCond3:RoofStyleGable	1.785681e-02
## NeighborhoodSawyer	1.789209e-02
## YearBuilt1942	1.835277e-02
## YearBuilt1892	1.836528e-02
## YearBuilt1919	1.881329e-02
## NeighborhoodOldTown	1.883861e-02
## YearRemodAdd2010	1.904344e-02
## YearBuilt1945	1.919144e-02
## YearBuilt1946	1.991449e-02
## OverallCond3:RoofStyleHip	2.048442e-02
## YearBuilt1890	2.097708e-02
## NeighborhoodIDOTRR	2.159437e-02
## YearBuilt1928	2.281986e-02
## YearRemodAdd1993	2.298976e-02
## YearBuilt1911	2.366287e-02
## LandContourLvl	2.380228e-02
## NeighborhoodMeadowV	2.410305e-02
## YearBuilt1983	2.458472e-02
## YearBuilt1922	2.552652e-02
## NeighborhoodStoneBr	2.619896e-02
## NeighborhoodNoRidge	2.675405e-02
## HouseStyle1.5Unf	2.879383e-02
## YearBuilt1920	2.947259e-02
## YearRemodAdd1994	3.037803e-02
## Condition1PosN	3.057830e-02
## YearBuilt1925	3.165683e-02
## NeighborhoodBrDale	3.184245e-02
## YearBuilt1935	3.206602e-02
## YearBuilt1921	3.226855e-02
## YearRemodAdd2008	3.258060e-02
## YearBuilt1914	3.264040e-02
## OverallCond5:RoofStyleGable	3.436920e-02
## NeighborhoodCollgCr	3.492962e-02
## NeighborhoodEdwards:Condition2Norm	3.543245e-02
## YearRemodAdd1990	3.741921e-02
## OverallQual2	3.745169e-02
## YearBuilt1947	3.992441e-02
## YearRemodAdd1981	4.016560e-02
## LandSlopeMod:HouseStyle2.5Fin	4.479605e-02
## YearRemodAdd1962	4.592494e-02
## YearBuilt1941	4.593240e-02
## OverallCond5:RoofStyleHip	4.665478e-02
## YearRemodAdd2001	4.997690e-02
## YearBuilt1931	5.065091e-02
## YearBuilt1917	5.372276e-02
## OverallCond7	5.483134e-02
## YearBuilt1938	5.709357e-02
## YearBuilt1930	5.710083e-02

## OverallCond6	5.762385e-02
## YearBuilt1885	5.827841e-02
## YearRemodAdd1991	6.113198e-02
## NeighborhoodVeenker	6.714026e-02
## YearBuilt1924	6.877662e-02
## YearBuilt1934	7.109335e-02
## YearRemodAdd1989	7.163145e-02
## NeighborhoodNridgHt	7.952973e-02
## NeighborhoodMitchel	8.473470e-02
## YearBuilt1910	8.942279e-02
## YearBuilt1926	9.635842e-02
## YearBuilt1929	9.850190e-02
## YearRemodAdd1986	1.010292e-01
## Condition1PosA	1.114176e-01
## YearBuilt1906	1.155382e-01
## RoofStyleShed	1.197233e-01
## YearBuilt1927	1.247422e-01
## LotShapeReg	1.315514e-01
## YearRemodAdd2004	1.356840e-01
## YearRemodAdd1975	1.461957e-01
## NeighborhoodNames	1.492226e-01
## OverallCond6:RoofStyleMansard	1.617914e-01
## YearRemodAdd1980	1.827505e-01
## LandSlopeSev	1.915488e-01
## HouseStyle2Story	1.921873e-01
## YearRemodAdd1996	1.939886e-01
## LandSlopeMod:HouseStyle1Story	2.055289e-01
## LandSlopeMod:HouseStyleSLvl	2.083733e-01
## YearRemodAdd1959	2.118782e-01
## YearRemodAdd2003	2.154897e-01
## NeighborhoodIDOTRR:Condition2Feedr	2.191244e-01
## YearBuilt1898	2.238656e-01
## Condition2PosN	2.290604e-01
## YearRemodAdd2000	2.319176e-01
## OverallCond2	2.410060e-01
## Condition1Norm	2.444563e-01
## LandSlopeMod:HouseStyle1.5Unf	2.567866e-01
## YearBuilt1912	2.612202e-01
## Condition2RRAe	2.759630e-01
## YearRemodAdd1973	2.899299e-01
## YearRemodAdd1953	2.905122e-01
## OverallCond4:RoofStyleGable	2.974394e-01
## LandSlopeSev:HouseStyle2Story	2.976635e-01
## YearRemodAdd2006	2.978336e-01
## Condition2Feedr:YearRemodAdd1960	3.026499e-01
## LandSlopeSev:HouseStyleSLvl	3.044564e-01
## Condition2RRNn	3.147129e-01
## NeighborhoodClearCr	3.187741e-01
## OverallCond3	3.190055e-01
## LotShapeIR2	3.214893e-01
## YearRemodAdd1983	3.218452e-01
## OverallCond5	3.308294e-01
## NeighborhoodSawyerW	3.495640e-01
## YearRemodAdd1970	3.529063e-01

## YearRemodAdd1963	3.654125e-01
## Condition2PosA	3.692070e-01
## NeighborhoodBrkSide	3.875629e-01
## YearRemodAdd1968	3.921746e-01
## Condition2RRAn	3.943277e-01
## Condition2Feedr:YearRemodAdd1993	3.990916e-01
## NeighborhoodBlueste	4.010342e-01
## LandContourHLS	4.082357e-01
## YearBuilt1882	4.243093e-01
## YearRemodAdd1964	4.291203e-01
## YearRemodAdd1961	4.398098e-01
## HouseStyle2.5Unf	4.428153e-01
## YearRemodAdd1966	4.598164e-01
## Condition2Feedr:YearRemodAdd1991	4.616957e-01
## YearRemodAdd1955	4.621096e-01
## Condition1RRAn	4.695264e-01
## YearBuilt1875	4.889813e-01
## YearRemodAdd1978	4.899588e-01
## NeighborhoodBrkSide:Condition2Norm	5.199813e-01
## LandSlopeMod:BldgTypeTwnhsE	5.248411e-01
## Condition1RR Ae	5.256492e-01
## LandSlopeMod:Condition1Feedr	5.369863e-01
## YearRemodAdd1951	5.430932e-01
## LotShapeIR3	5.503544e-01
## Condition2Norm	5.518192e-01
## YearRemodAdd1976	5.650532e-01
## LandSlopeMod:Condition1Norm	5.721224e-01
## Condition1Feedr	5.790435e-01
## YearRemodAdd1954	5.797850e-01
## UtilitiesNoSeWa	5.949272e-01
## YearRemodAdd1984	6.057703e-01
## LandSlopeSev:BldgType2fmCon	6.067783e-01
## YearBuilt1913	6.139142e-01
## LandSlopeMod:Condition1PosA	6.155301e-01
## NeighborhoodNWAmes	6.201949e-01
## YearRemodAdd2007	6.226750e-01
## YearRemodAdd1971	6.284099e-01
## YearRemodAdd2005	6.506589e-01
## YearRemodAdd1972	6.851763e-01
## NeighborhoodTimber	6.905005e-01
## YearRemodAdd1957	7.042626e-01
## YearRemodAdd1977	7.072704e-01
## Condition1RRNn	7.181339e-01
## OverallCond8	7.415907e-01
## LandSlopeMod:Condition2Norm	7.436905e-01
## YearRemodAdd1967	7.555690e-01
## Condition2Feedr	7.782299e-01
## YearRemodAdd1969	7.789204e-01
## NeighborhoodSomerst	7.797655e-01
## BldgTypeDuplex	7.797976e-01
## YearRemodAdd1956	7.816859e-01
## RoofStyleMansard	7.900390e-01
## OverallCond8:RoofStyleGambrel	8.053946e-01
## YearRemodAdd1965	8.166559e-01

## Condition1RRNe	8.170814e-01
## LandSlopeMod	8.208764e-01
## BldgType2fmCon	8.283820e-01
## NeighborhoodBrkSide:Condition2Feedr	8.416371e-01
## NeighborhoodSWISU	8.467942e-01
## YearRemodAdd1974	8.713319e-01
## LandSlopeMod:BldgType2fmCon	8.745211e-01
## OverallCond5:RoofStyleMansard	8.876882e-01
## NeighborhoodNPkVill	8.965111e-01
## YearRemodAdd1979	9.091732e-01
## YearRemodAdd1985	9.168048e-01
## OverallCond8:RoofStyleGable	9.190380e-01
## LandSlopeMod:HouseStyle2Story	9.451707e-01
## OverallCond4	9.459533e-01
## LandSlopeSev:HouseStyle1Story	9.726041e-01
## YearRemodAdd1982	9.747146e-01
## OverallCond9	9.780953e-01
## YearRemodAdd1992	9.840444e-01
## LandSlopeMod:Condition1RRNn	9.869602e-01
## YearRemodAdd1958	9.953045e-01