

# Untitled

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```
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.1 --
## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.5     v dplyr   1.0.7
## v tidyr   1.1.4     v stringr 1.4.0
## v readr   2.0.2     v forcats 0.5.1

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()   masks stats::lag()

library(caret)

## Loading required package: lattice

##
## Attaching package: 'caret'

## The following object is masked from 'package:purrr':
## 
##     lift

setwd("~/CSP571ProjectGroup")
df <- read_csv("df.csv")

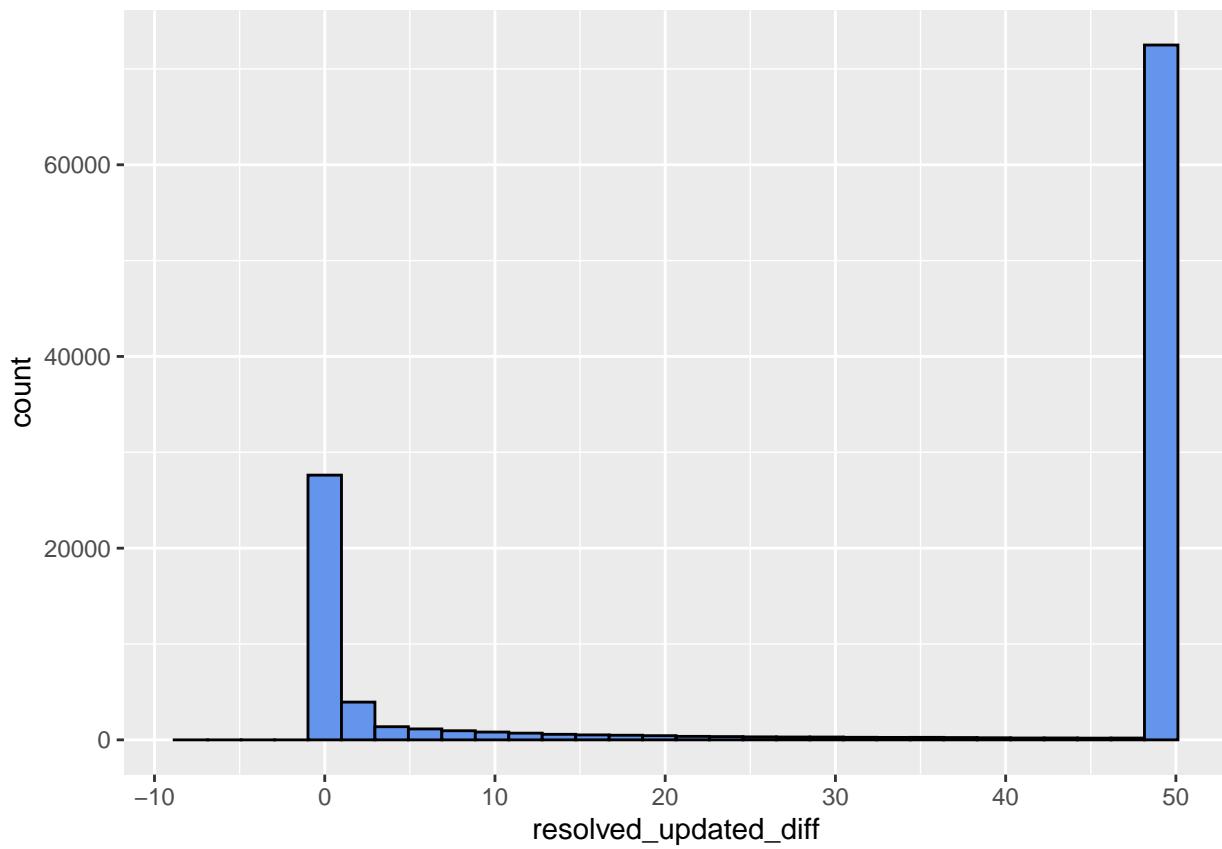
## Rows: 114661 Columns: 15

## -- Column specification -----
## Delimiter: ","
## chr (9): number, incident_state, sys_updated_by, contact_type, category, sub...
## dbl (5): reassignment_count, reopen_count, sys_mod_count, problem_id, resolv...
## lgl (1): made_sla

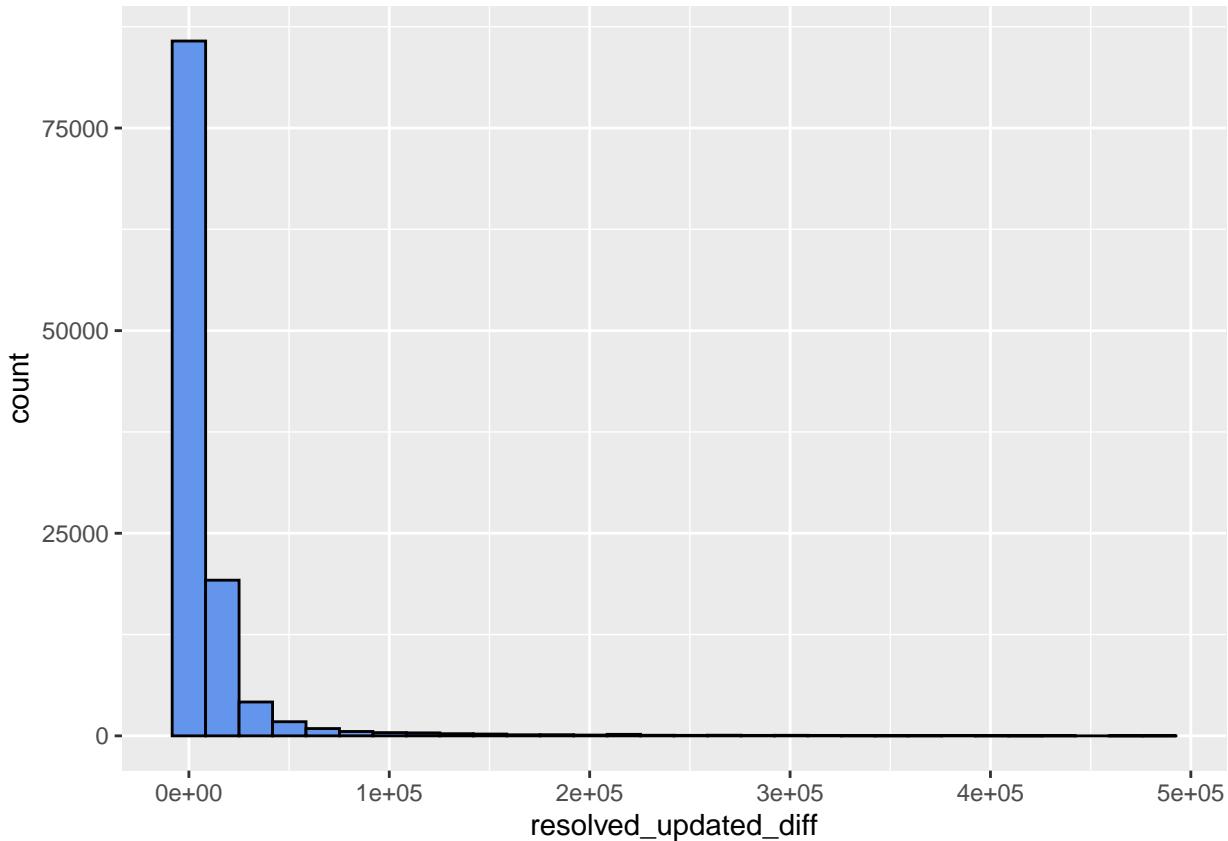
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.

attach(df)

df %>%
  mutate(resolved_updated_diff= ifelse(resolved_updated_diff > 50, 50, resolved_updated_diff)) %>%
  ggplot(aes(resolved_updated_diff)) +
  geom_histogram(bins = 30, col = "black", fill = "cornflowerblue")
```



```
df %>%
  ggplot(aes(resolved_updated_diff)) +
  geom_histogram(bins = 30, col = "black", fill = "cornflowerblue")
```



```

df %>% filter(resolved_updated_diff > 100000)

## # A tibble: 2,178 x 15
##   number      incident_state reassignment_co~ reopen_count sys_mod_count made_sla
##   <chr>        <chr>          <dbl>           <dbl>           <dbl> <lgl>
## 1 INC0000298 Active            0               0             0 TRUE 
## 2 INC0000298 Awaiting User~    0               0             1 TRUE 
## 3 INC0000307 Active            0               0             0 TRUE 
## 4 INC0000307 Awaiting User~    0               0             1 TRUE 
## 5 INC0000324 Active            0               0             0 TRUE 
## 6 INC0000324 Active            0               0             7 TRUE 
## 7 INC0000324 Awaiting User~    0               0             8 TRUE 
## 8 INC0000337 Awaiting User~    0               0             0 TRUE 
## 9 INC0000341 Awaiting User~    0               0             0 TRUE 
## 10 INC0000341 Active           0               0             7 TRUE 
## # ... with 2,168 more rows, and 9 more variables: sys_updated_by <chr>,
## #   contact_type <chr>, category <chr>, subcategory <chr>, problem_id <dbl>,
## #   urgency <chr>, impact <chr>, priority <chr>, resolved_updated_diff <dbl>
df %>% filter(number == 'INC0000341') %>% select(number, incident_state, resolved_updated_diff)

## # A tibble: 7 x 3
##   number      incident_state      resolved_updated_diff
##   <chr>        <chr>                  <dbl>
## 1 INC0000341 Awaiting User Info     223160
## 2 INC0000341 Active                 193115
## 3 INC0000341 Active                 193104
## 4 INC0000341 Active                 193104

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## 5 INC0000341 Awaiting User Info          193024
## 6 INC0000341 Awaiting User Info          0
## 7 INC0000341 Resolved                  0

The one observation where resolution time is less than zero will be considered an outlier. Observations with
high resolution time of more than 4 months do not seem like outliers.

df <- df %>% filter(resolved_updated_diff >= 0)

dfm = subset(df, select=-c(sys_updated_by))
train_idx = createDataPartition(dfm$resolved_updated_diff, p = 0.8, list=F)
df_train = dfm[train_idx,]
df_test = dfm[-train_idx,]

lm_full_data <- lm(resolved_updated_diff ~ incident_state + reassignment_count + reopen_count + made_sla + category + subcategory + problem_id + impact + urgency + priority, data = df_train)
summary(lm_full_data)

##
## Call:
## lm(formula = resolved_updated_diff ~ incident_state + reassignment_count +
##      reopen_count + made_sla + reopen_count + category + subcategory +
##      problem_id + impact + urgency + priority, data = df_train)
##
## Residuals:
##    Min      1Q  Median      3Q     Max
## -110012   -8412   -4254    2688   460224
##
## Coefficients: (7 not defined because of singularities)
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 -4178.57   20046.20 -0.208 0.834881
## incident_stateAwaiting Evidence  16218.34   4941.28  3.282 0.001030 ***
## incident_stateAwaiting Problem  15526.04   1452.56 10.689 < 2e-16 ***
## incident_stateAwaiting User Info  2104.59   296.64  7.095 1.30e-12 ***
## incident_stateAwaiting Vendor  19385.60   1206.92 16.062 < 2e-16 ***
## incident_stateNew            1673.52   228.39  7.328 2.36e-13 ***
## incident_stateResolved       -9918.49   250.69 -39.565 < 2e-16 ***
## reassignment_count           171.59    53.77  3.191 0.001416 **
## reopen_count                  206.58   447.18  0.462 0.644104
## made_slaTRUE                  16328.93  13736.63  1.189 0.234555
## categoryCategory 12          -10395.03  23978.71 -0.434 0.664645
## categoryCategory 13          17340.05  10397.16  1.668 0.095365 .
## categoryCategory 14          -12086.09  21312.21 -0.567 0.570650
## categoryCategory 15          11496.40  21584.70  0.533 0.594299
## categoryCategory 16          -6201.53  30615.31 -0.203 0.839477
## categoryCategory 17          20765.02  10302.79  2.015 0.043858 *
## categoryCategory 19          21850.45  10300.53  2.121 0.033900 *
## categoryCategory 2           -13564.13  16061.16 -0.845 0.398376
## categoryCategory 20          17429.37  10148.21  1.717 0.085894 .
## categoryCategory 21          -11995.18  10485.84 -1.144 0.252652
## categoryCategory 22          16480.79  12277.78  1.342 0.179493
## categoryCategory 23          20560.16  10132.07  2.029 0.042439 *
## categoryCategory 24          25368.58  10134.08  2.503 0.012306 *
## categoryCategory 25          6764.43   8128.67  0.832 0.405316
## categoryCategory 26          16415.90  10133.49  1.620 0.105243

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## categoryCategory 28	18763.66	10145.22	1.850	0.064388	.
## categoryCategory 29	6447.82	10675.03	0.604	0.545839	
## categoryCategory 3	-13394.15	28382.45	-0.472	0.636988	
## categoryCategory 30	16382.50	13107.25	1.250	0.211346	
## categoryCategory 31	-788.99	8545.30	-0.092	0.926435	
## categoryCategory 32	16795.49	10145.81	1.655	0.097844	.
## categoryCategory 33	18716.39	9831.91	1.904	0.056961	.
## categoryCategory 34	59559.88	10169.49	5.857	4.74e-09	***
## categoryCategory 35	15125.01	10380.25	1.457	0.145093	
## categoryCategory 37	23919.52	10161.79	2.354	0.018581	*
## categoryCategory 38	19957.64	10401.86	1.919	0.055030	.
## categoryCategory 4	-7449.90	16189.51	-0.460	0.645396	
## categoryCategory 40	18255.89	10248.33	1.781	0.074858	.
## categoryCategory 41	-5730.23	13963.73	-0.410	0.681539	
## categoryCategory 42	24119.78	10125.45	2.382	0.017217	*
## categoryCategory 43	18871.70	10393.37	1.816	0.069413	.
## categoryCategory 44	15599.85	10172.44	1.534	0.125146	
## categoryCategory 45	31045.99	10124.23	3.067	0.002166	**
## categoryCategory 46	23186.62	10123.26	2.290	0.021999	*
## categoryCategory 47	23673.77	11100.31	2.133	0.032951	*
## categoryCategory 48	10032.86	15143.57	0.663	0.507642	
## categoryCategory 49	8257.47	30615.26	0.270	0.787378	
## categoryCategory 5	-10428.41	11235.45	-0.928	0.353322	
## categoryCategory 50	-9252.74	12285.91	-0.753	0.451381	
## categoryCategory 51	16550.67	10155.71	1.630	0.103170	
## categoryCategory 52	-9942.79	12706.62	-0.782	0.433929	
## categoryCategory 53	18695.28	10124.97	1.846	0.064830	.
## categoryCategory 54	-5000.09	9729.54	-0.514	0.607317	
## categoryCategory 55	29325.35	10224.28	2.868	0.004129	**
## categoryCategory 56	-2730.71	10379.19	-0.263	0.792478	
## categoryCategory 57	19365.58	10155.80	1.907	0.056543	.
## categoryCategory 58	-14944.93	19845.58	-0.753	0.451415	
## categoryCategory 59	-2299.27	15031.75	-0.153	0.878429	
## categoryCategory 6	-10459.67	21053.46	-0.497	0.619321	
## categoryCategory 61	22831.80	10161.67	2.247	0.024652	*
## categoryCategory 62	35130.89	16842.51	2.086	0.036995	*
## categoryCategory 63	12815.21	11639.09	1.101	0.270878	
## categoryCategory 7	21417.94	10497.84	2.040	0.041331	*
## categoryCategory 8	17433.93	10750.81	1.622	0.104884	
## categoryCategory 9	19941.95	10131.41	1.968	0.049033	*
## categoryNone	-1004.40	15056.98	-0.067	0.946815	
## subcategorySubcategory 10	-3833.67	13561.71	-0.283	0.777420	
## subcategorySubcategory 100	-25087.63	14569.11	-1.722	0.085078	.
## subcategorySubcategory 101	-21825.54	12293.57	-1.775	0.075842	.
## subcategorySubcategory 102	-23652.36	13538.67	-1.747	0.080637	.
## subcategorySubcategory 103	-29219.63	11874.05	-2.461	0.013865	*
## subcategorySubcategory 104	-2702.49	15852.57	-0.170	0.864636	
## subcategorySubcategory 105	-28971.75	12232.64	-2.368	0.017867	*
## subcategorySubcategory 106	-27637.09	12078.05	-2.288	0.022128	*
## subcategorySubcategory 107	-21929.52	12126.63	-1.808	0.070551	.
## subcategorySubcategory 109	-27515.81	13093.99	-2.101	0.035608	*
## subcategorySubcategory 11	-32040.93	14872.18	-2.154	0.031210	*
## subcategorySubcategory 110	-30070.29	12008.63	-2.504	0.012280	*
## subcategorySubcategory 111	-22101.73	14866.90	-1.487	0.137113	

## subcategorySubcategory 112	-39225.20	11946.66	-3.283	0.001026	**
## subcategorySubcategory 113	-18221.38	12204.45	-1.493	0.135438	
## subcategorySubcategory 114	-24990.85	11850.56	-2.109	0.034962	*
## subcategorySubcategory 115	-2798.01	14561.71	-0.192	0.847626	
## subcategorySubcategory 116	-29910.06	22406.93	-1.335	0.181926	
## subcategorySubcategory 117	-31645.78	11914.67	-2.656	0.007908	**
## subcategorySubcategory 118	-30956.48	12494.02	-2.478	0.013225	*
## subcategorySubcategory 119	-8120.27	16465.32	-0.493	0.621891	
## subcategorySubcategory 12	-34726.24	14466.76	-2.400	0.016378	*
## subcategorySubcategory 120	-32812.63	12362.16	-2.654	0.007949	**
## subcategorySubcategory 122	-24054.36	14620.99	-1.645	0.099933	.
## subcategorySubcategory 123	-30253.31	11886.98	-2.545	0.010927	*
## subcategorySubcategory 124	-35526.87	29442.19	-1.207	0.227564	
## subcategorySubcategory 125	-28448.76	11866.47	-2.397	0.016514	*
## subcategorySubcategory 126	-2108.57	14176.69	-0.149	0.881763	
## subcategorySubcategory 127	-28531.75	11985.16	-2.381	0.017287	*
## subcategorySubcategory 128	-12575.44	29493.40	-0.426	0.669831	
## subcategorySubcategory 129	556.31	14762.41	0.038	0.969940	
## subcategorySubcategory 13	-32509.95	12056.07	-2.697	0.007007	**
## subcategorySubcategory 130	-28255.68	11952.00	-2.364	0.018076	*
## subcategorySubcategory 131	-11698.60	38069.32	-0.307	0.758618	
## subcategorySubcategory 132	-24281.04	12311.96	-1.972	0.048595	*
## subcategorySubcategory 134	-22906.12	11926.22	-1.921	0.054779	.
## subcategorySubcategory 135	-29274.93	11867.00	-2.467	0.013630	*
## subcategorySubcategory 136	NA	NA	NA	NA	
## subcategorySubcategory 138	-22499.41	13372.91	-1.682	0.092483	.
## subcategorySubcategory 14	-11038.42	22764.93	-0.485	0.627758	
## subcategorySubcategory 140	-33983.32	16141.06	-2.105	0.035260	*
## subcategorySubcategory 141	-25567.10	29416.39	-0.869	0.384770	
## subcategorySubcategory 142	-25416.86	13841.13	-1.836	0.066312	.
## subcategorySubcategory 144	-36318.55	12899.66	-2.815	0.004872	**
## subcategorySubcategory 145	-24914.67	11956.81	-2.084	0.037188	*
## subcategorySubcategory 146	-27692.22	11969.36	-2.314	0.020692	*
## subcategorySubcategory 149	-46637.75	17982.11	-2.594	0.009500	**
## subcategorySubcategory 150	-19865.26	11842.46	-1.677	0.093456	.
## subcategorySubcategory 151	-69966.74	12060.35	-5.801	6.60e-09	***
## subcategorySubcategory 152	-25205.90	15840.24	-1.591	0.111555	
## subcategorySubcategory 153	-20324.61	11925.03	-1.704	0.088316	.
## subcategorySubcategory 154	-4916.19	11895.23	-0.413	0.679395	
## subcategorySubcategory 155	-28756.80	14593.96	-1.970	0.048789	*
## subcategorySubcategory 156	-30292.99	13823.97	-2.191	0.028430	*
## subcategorySubcategory 157	-25620.26	22790.22	-1.124	0.260941	
## subcategorySubcategory 158	-15332.20	14233.60	-1.077	0.281401	
## subcategorySubcategory 159	-29994.37	12009.44	-2.498	0.012507	*
## subcategorySubcategory 16	-27502.87	11913.60	-2.309	0.020972	*
## subcategorySubcategory 160	-15027.83	29577.79	-0.508	0.611400	
## subcategorySubcategory 161	-41762.68	14068.90	-2.968	0.002994	**
## subcategorySubcategory 162	-64049.74	12751.78	-5.023	5.10e-07	***
## subcategorySubcategory 163	-18597.54	12023.37	-1.547	0.121919	
## subcategorySubcategory 164	-26919.62	11828.35	-2.276	0.022857	*
## subcategorySubcategory 165	NA	NA	NA	NA	
## subcategorySubcategory 166	-32206.42	13372.93	-2.408	0.016028	*
## subcategorySubcategory 167	-28249.33	12499.39	-2.260	0.023820	*
## subcategorySubcategory 168	-27332.74	11893.94	-2.298	0.021562	*

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## subcategorySubcategory 169      -19186.63   14340.49  -1.338 0.180921
## subcategorySubcategory 17       -35722.15   12907.90  -2.767 0.005651 ** 
## subcategorySubcategory 170      -27659.55   11873.98  -2.329 0.019839 * 
## subcategorySubcategory 171      13771.47    12452.01  1.106 0.268745
## subcategorySubcategory 172      -22552.62   12773.85  -1.766 0.077478 .
## subcategorySubcategory 173      -28367.75   17914.17  -1.584 0.113303
## subcategorySubcategory 174      -26975.57   11816.43  -2.283 0.022439 *
## subcategorySubcategory 175      -26198.56   11834.06  -2.214 0.026843 *
## subcategorySubcategory 176      -4567.68    15048.31  -0.304 0.761483
## subcategorySubcategory 177      -1451.86    11477.17  -0.127 0.899336
## subcategorySubcategory 178      -29245.38   12061.08  -2.425 0.015320 *
## subcategorySubcategory 179      -36352.82   29400.47  -1.236 0.216287
## subcategorySubcategory 18       -31151.53   14841.73  -2.099 0.035827 *
## subcategorySubcategory 181      -46073.77   12230.82  -3.767 0.000165 *** 
## subcategorySubcategory 182      -24290.26   12140.25  -2.001 0.045416 *
## subcategorySubcategory 183      -34762.99   11963.41  -2.906 0.003664 ** 
## subcategorySubcategory 184      -30949.33   11970.40  -2.585 0.009726 ** 
## subcategorySubcategory 185      -32187.30   11919.99  -2.700 0.006929 ** 
## subcategorySubcategory 186      -2991.68    15189.94  -0.197 0.843866
## subcategorySubcategory 187      -26578.87   17914.20  -1.484 0.137898
## subcategorySubcategory 188      27123.74    17940.03  1.512 0.130560
## subcategorySubcategory 189      -35631.86   12101.60  -2.944 0.003237 ** 
## subcategorySubcategory 191      -20577.40   11948.14  -1.722 0.085032 .
## subcategorySubcategory 192      -45177.20   19137.33  -2.361 0.018243 *
## subcategorySubcategory 193      -10607.88   16461.91  -0.644 0.519325
## subcategorySubcategory 194      -31933.04   12547.73  -2.545 0.010932 *
## subcategorySubcategory 195      -10190.96   15025.30  -0.678 0.497613
## subcategorySubcategory 196      -42597.64   16947.95  -2.513 0.011958 *
## subcategorySubcategory 197      -58199.50   12778.53  -4.554 5.26e-06 *** 
## subcategorySubcategory 198      -30261.40   12353.65  -2.450 0.014304 *
## subcategorySubcategory 199      -33649.61   13416.65  -2.508 0.012142 *
## subcategorySubcategory 2        -29957.19   18246.00  -1.642 0.100625
## subcategorySubcategory 20       -24362.52   12116.14  -2.011 0.044355 *
## subcategorySubcategory 200      -35907.93   11878.63  -3.023 0.002504 ** 
## subcategorySubcategory 202      -23341.57   11897.70  -1.962 0.049782 *
## subcategorySubcategory 203      -23208.57   14675.22  -1.581 0.113772
## subcategorySubcategory 204      -32737.81   16876.63  -1.940 0.052403 .
## subcategorySubcategory 205      -67067.12   13636.10  -4.918 8.74e-07 *** 
## subcategorySubcategory 207      64094.45    13840.02  4.631 3.64e-06 *** 
## subcategorySubcategory 208      -22018.33   12114.73  -1.817 0.069146 .
## subcategorySubcategory 209      -32135.07   13546.16  -2.372 0.017682 *
## subcategorySubcategory 210      -5507.67    17947.54  -0.307 0.758938
## subcategorySubcategory 211      -35013.59   29416.00  -1.190 0.233935
## subcategorySubcategory 212      -36740.61   15176.03  -2.421 0.015481 *
## subcategorySubcategory 213      -26769.37   15179.76  -1.763 0.077821 .
## subcategorySubcategory 215      -28774.71   12048.27  -2.388 0.016929 *
## subcategorySubcategory 216      -31389.12   15229.25  -2.061 0.039296 *
## subcategorySubcategory 217      -30063.02   14604.62  -2.058 0.039549 *
## subcategorySubcategory 218      -27111.49   12254.16  -2.212 0.026939 *
## subcategorySubcategory 219      -28983.48   12624.75  -2.296 0.021692 *
## subcategorySubcategory 22       -11266.27   17179.92  -0.656 0.511967
## subcategorySubcategory 220      -14254.35   11882.74  -1.200 0.230304
## subcategorySubcategory 222      -8583.10    14529.96  -0.591 0.554711
## subcategorySubcategory 223      -32247.36   11822.22  -2.728 0.006379 ** 

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## subcategorySubcategory 224	-33668.90	11914.43	-2.826	0.004716	**
## subcategorySubcategory 225	1424.62	13141.83	0.108	0.913676	
## subcategorySubcategory 226	-33204.88	13417.19	-2.475	0.013333	*
## subcategorySubcategory 227	-24946.80	16189.37	-1.541	0.123336	
## subcategorySubcategory 228	-35949.80	12014.72	-2.992	0.002771	**
## subcategorySubcategory 229	-29369.05	11907.89	-2.466	0.013652	*
## subcategorySubcategory 23	-29494.55	12550.81	-2.350	0.018775	*
## subcategorySubcategory 230	6125.44	12946.85	0.473	0.636127	
## subcategorySubcategory 231	-18646.66	11876.07	-1.570	0.116394	
## subcategorySubcategory 232	-25440.49	13713.94	-1.855	0.063588	.
## subcategorySubcategory 233	-28538.80	12109.75	-2.357	0.018441	*
## subcategorySubcategory 234	35674.27	15176.89	2.351	0.018747	*
## subcategorySubcategory 235	-1618.66	13063.89	-0.124	0.901392	
## subcategorySubcategory 236	-37247.51	29400.53	-1.267	0.205194	
## subcategorySubcategory 237	-37932.67	15176.83	-2.499	0.012443	*
## subcategorySubcategory 24	-14356.75	22639.07	-0.634	0.525979	
## subcategorySubcategory 240	7584.75	12947.26	0.586	0.557999	
## subcategorySubcategory 241	-47441.52	29400.17	-1.614	0.106607	
## subcategorySubcategory 242	-26843.45	12089.14	-2.220	0.026390	*
## subcategorySubcategory 243	-26995.00	12123.55	-2.227	0.025973	*
## subcategorySubcategory 244	-34249.00	12715.77	-2.693	0.007073	**
## subcategorySubcategory 245	-12579.88	12771.98	-0.985	0.324647	
## subcategorySubcategory 246	-25260.02	12564.84	-2.010	0.044395	*
## subcategorySubcategory 247	-23643.57	12046.29	-1.963	0.049681	*
## subcategorySubcategory 248	-25235.44	11945.40	-2.113	0.034641	*
## subcategorySubcategory 249	-12026.33	11990.20	-1.003	0.315857	
## subcategorySubcategory 25	-27063.74	12048.90	-2.246	0.024696	*
## subcategorySubcategory 250	-29629.52	12123.95	-2.444	0.014532	*
## subcategorySubcategory 251	-25836.80	11863.33	-2.178	0.029418	*
## subcategorySubcategory 252	-19791.64	12106.86	-1.635	0.102106	
## subcategorySubcategory 253	-45418.96	12998.47	-3.494	0.000476	***
## subcategorySubcategory 254	-29828.21	12599.69	-2.367	0.017917	*
## subcategorySubcategory 255	-24236.77	11907.03	-2.036	0.041803	*
## subcategorySubcategory 256	-33652.00	12946.14	-2.599	0.009341	**
## subcategorySubcategory 257	-6775.89	12263.31	-0.553	0.580585	
## subcategorySubcategory 258	-32849.78	12114.82	-2.712	0.006698	**
## subcategorySubcategory 259	-30453.79	11930.01	-2.553	0.010691	*
## subcategorySubcategory 260	-8528.95	12283.70	-0.694	0.487477	
## subcategorySubcategory 261	-18333.49	12207.58	-1.502	0.133149	
## subcategorySubcategory 262	-36305.14	13200.64	-2.750	0.005956	**
## subcategorySubcategory 264	79534.48	29400.17	2.705	0.006827	**
## subcategorySubcategory 269	-28300.29	12908.09	-2.192	0.028350	*
## subcategorySubcategory 270	-20524.52	11979.51	-1.713	0.086660	.
## subcategorySubcategory 271	-28972.61	11984.14	-2.418	0.015626	*
## subcategorySubcategory 273	-19319.25	13872.32	-1.393	0.163730	
## subcategorySubcategory 274	-34802.68	15598.43	-2.231	0.025673	*
## subcategorySubcategory 275	-25727.88	11842.32	-2.173	0.029818	*
## subcategorySubcategory 276	-9028.86	18795.29	-0.480	0.630959	
## subcategorySubcategory 277	-19810.32	13853.51	-1.430	0.152724	
## subcategorySubcategory 279	-27055.13	16019.96	-1.689	0.091254	.
## subcategorySubcategory 28	-26985.75	12077.01	-2.234	0.025454	*
## subcategorySubcategory 280	NA	NA	NA	NA	
## subcategorySubcategory 281	-26678.94	12718.94	-2.098	0.035945	*
## subcategorySubcategory 282	6985.85	19462.02	0.359	0.719635	

## subcategorySubcategory 283	-19321.83	12696.74	-1.522	0.128064
## subcategorySubcategory 285	-33968.89	12097.87	-2.808	0.004989 **
## subcategorySubcategory 287	-30515.60	13089.63	-2.331	0.019741 *
## subcategorySubcategory 288	-27875.30	16170.08	-1.724	0.084733 .
## subcategorySubcategory 289	-29433.51	12151.69	-2.422	0.015430 *
## subcategorySubcategory 29	-30693.81	11863.48	-2.587	0.009676 **
## subcategorySubcategory 291	-28549.98	14075.57	-2.028	0.042529 *
## subcategorySubcategory 292	-18698.09	14919.32	-1.253	0.210107
## subcategorySubcategory 294	-10729.25	12433.02	-0.863	0.388160
## subcategorySubcategory 295	-17734.43	14406.29	-1.231	0.218318
## subcategorySubcategory 296	-31330.34	13891.01	-2.255	0.024108 *
## subcategorySubcategory 298	-32664.30	17914.21	-1.823	0.068250 .
## subcategorySubcategory 299	-37557.05	13170.22	-2.852	0.004350 **
## subcategorySubcategory 3	-29407.93	11853.87	-2.481	0.013108 *
## subcategorySubcategory 30	-16143.60	12160.96	-1.327	0.184348
## subcategorySubcategory 300	-27612.70	11889.33	-2.322	0.020209 *
## subcategorySubcategory 301	-23230.76	12047.40	-1.928	0.053823 .
## subcategorySubcategory 302	-28784.31	12124.38	-2.374	0.017595 *
## subcategorySubcategory 303	-29065.76	11851.71	-2.452	0.014190 *
## subcategorySubcategory 304	-11830.47	18066.16	-0.655	0.512571
## subcategorySubcategory 305	40700.50	11996.27	3.393	0.000692 ***
## subcategorySubcategory 31	-25170.59	11872.35	-2.120	0.034000 *
## subcategorySubcategory 32	-21503.24	15675.16	-1.372	0.170128
## subcategorySubcategory 33	-32087.07	13747.91	-2.334	0.019600 *
## subcategorySubcategory 34	-32045.90	12990.85	-2.467	0.013634 *
## subcategorySubcategory 35	-36199.91	19532.75	-1.853	0.063844 .
## subcategorySubcategory 36	-31554.40	11869.27	-2.658	0.007850 **
## subcategorySubcategory 37	-26534.82	15830.75	-1.676	0.093711 .
## subcategorySubcategory 4	-23160.35	12280.81	-1.886	0.059312 .
## subcategorySubcategory 40	-17959.42	14117.58	-1.272	0.203330
## subcategorySubcategory 42	46277.57	12464.43	3.713	0.000205 ***
## subcategorySubcategory 43	-23159.65	11952.95	-1.938	0.052679 .
## subcategorySubcategory 44	-27406.54	11966.24	-2.290	0.022005 *
## subcategorySubcategory 45	NA	NA	NA	NA
## subcategorySubcategory 46	-27983.64	12803.45	-2.186	0.028845 *
## subcategorySubcategory 47	17450.35	12080.93	1.444	0.148615
## subcategorySubcategory 48	-19756.05	13904.76	-1.421	0.155375
## subcategorySubcategory 50	-27909.73	12547.65	-2.224	0.026131 *
## subcategorySubcategory 51	-43344.92	14853.82	-2.918	0.003523 **
## subcategorySubcategory 52	-32472.44	14151.95	-2.295	0.021761 *
## subcategorySubcategory 53	-4511.47	13994.37	-0.322	0.747168
## subcategorySubcategory 54	-22079.76	12015.28	-1.838	0.066119 .
## subcategorySubcategory 56	-17543.30	14962.75	-1.172	0.241014
## subcategorySubcategory 57	-27247.08	12366.28	-2.203	0.027573 *
## subcategorySubcategory 59	-23603.80	12057.16	-1.958	0.050273 .
## subcategorySubcategory 6	-21944.65	12071.60	-1.818	0.069087 .
## subcategorySubcategory 60	-23876.31	12049.03	-1.982	0.047528 *
## subcategorySubcategory 62	-6684.69	17949.73	-0.372	0.709587
## subcategorySubcategory 64	-20476.57	12090.23	-1.694	0.090336 .
## subcategorySubcategory 65	-20063.55	12382.52	-1.620	0.105169
## subcategorySubcategory 66	-27916.12	14611.55	-1.911	0.056065 .
## subcategorySubcategory 67	-33926.44	13915.02	-2.438	0.014766 *
## subcategorySubcategory 68	-8740.24	12514.65	-0.698	0.484929
## subcategorySubcategory 69	-31436.38	12029.47	-2.613	0.008969 **

```

## subcategorySubcategory 71          NA          NA          NA          NA
## subcategorySubcategory 72         -21511.94   12109.34  -1.776 0.075658 .
## subcategorySubcategory 74         -28328.16   12722.15  -2.227 0.025971 *
## subcategorySubcategory 75         -28220.43   11848.52  -2.382 0.017232 *
## subcategorySubcategory 77         -34752.84   13846.44  -2.510 0.012079 *
## subcategorySubcategory 78         -27790.49   13036.85  -2.132 0.033035 *
## subcategorySubcategory 8          NA          NA          NA          NA
## subcategorySubcategory 80         -28572.49   11898.51  -2.401 0.016337 *
## subcategorySubcategory 82         -29492.14   11896.12  -2.479 0.013172 *
## subcategorySubcategory 83         -32547.12   14340.20  -2.270 0.023232 *
## subcategorySubcategory 84         -12622.62   22407.41  -0.563 0.573216
## subcategorySubcategory 85         -20018.19   13637.21  -1.468 0.142132
## subcategorySubcategory 86         -27464.63   12177.13  -2.255 0.024109 *
## subcategorySubcategory 87         -1537.86    29263.07  -0.053 0.958088
## subcategorySubcategory 88         -2536.94    11887.96  -0.213 0.831012
## subcategorySubcategory 89         -28634.95   12248.44  -2.338 0.019397 *
## subcategorySubcategory 9          -27201.30   11852.41  -2.295 0.021735 *
## subcategorySubcategory 90         -31916.78   12231.42  -2.609 0.009071 **
## subcategorySubcategory 92         -26055.37   12640.62  -2.061 0.039283 *
## subcategorySubcategory 94         -20976.29   11882.36  -1.765 0.077512 .
## subcategorySubcategory 95         -37247.51   29400.53  -1.267 0.205194
## subcategorySubcategory 96         -8517.23    12867.03  -0.662 0.508010
## subcategorySubcategory 97         -35199.72   22409.79  -1.571 0.116249
## subcategorySubcategory 99         -19643.23   13638.77  -1.440 0.149800
## problem_id                      NA          NA          NA          NA
## impact2 - Medium                 -13363.38   7579.84  -1.763 0.077901 .
## impact3 - Low                   -22302.73   8865.28  -2.516 0.011880 *
## urgency2 - Medium               -13892.87   7479.71  -1.857 0.063256 .
## urgency3 - Low                  -25325.60   7724.25  -3.279 0.001043 **
## priority2 - High                12857.23   7568.13  1.699 0.089348 .
## priority3 - Moderate            31225.90   15022.86  2.079 0.037661 *
## priority4 - Low                 51992.57   16240.52  3.201 0.001368 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 26920 on 91410 degrees of freedom
## Multiple R-squared:  0.1623, Adjusted R-squared:  0.1593
## F-statistic:  55.5 on 319 and 91410 DF,  p-value: < 2.2e-16
lm_full_data_v2 <- lm(resolved_updated_diff ~ incident_state + reassignment_count + reopen_count + made_sla + reopen_count + category + problem_id + impact + urgency + priority, data = df_train)
summary(lm_full_data_v2)

##
## Call:
## lm(formula = resolved_updated_diff ~ incident_state + reassignment_count +
##     reopen_count + made_sla + reopen_count + category + problem_id +
##     impact + urgency + priority, data = df_train)
##
## Residuals:
##      Min       1Q   Median       3Q      Max 
## -79117  -9018  -5137   2290  462072 
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)    
## (Intercept) -18540.365  15080.108  -1.229  0.21890

```

## incident_stateAwaiting Evidence	25333.855	4982.443	5.085	3.69e-07	***
## incident_stateAwaiting Problem	17869.729	1474.586	12.118	< 2e-16	***
## incident_stateAwaiting User Info	2513.421	301.712	8.331	< 2e-16	***
## incident_stateAwaiting Vendor	25054.794	1220.818	20.523	< 2e-16	***
## incident_stateNew	1207.525	231.243	5.222	1.77e-07	***
## incident_stateResolved	-10193.641	255.527	-39.893	< 2e-16	***
## reassignment_count	218.730	53.580	4.082	4.46e-05	***
## reopen_count	-4.308	450.396	-0.010	0.99237	
## made_slaTRUE	18834.490	13809.838	1.364	0.17262	
## categoryCategory 12	2390.741	20389.723	0.117	0.90666	
## categoryCategory 13	554.634	6107.411	0.091	0.92764	
## categoryCategory 14	608.347	17006.145	0.036	0.97146	
## categoryCategory 15	-4897.341	20389.700	-0.240	0.81019	
## categoryCategory 16	711.377	20389.722	0.035	0.97217	
## categoryCategory 17	4669.310	6197.603	0.753	0.45121	
## categoryCategory 19	12058.814	6072.384	1.986	0.04705	*
## categoryCategory 2	-939.316	9143.965	-0.103	0.91818	
## categoryCategory 20	1722.935	6031.089	0.286	0.77513	
## categoryCategory 21	-1286.093	7144.511	-0.180	0.85714	
## categoryCategory 22	8877.510	6227.427	1.426	0.15400	
## categoryCategory 23	5143.647	6024.990	0.854	0.39326	
## categoryCategory 24	11675.001	6033.043	1.935	0.05297	.
## categoryCategory 25	5424.804	8319.017	0.652	0.51434	
## categoryCategory 26	2585.669	6018.376	0.430	0.66747	
## categoryCategory 28	4108.250	6062.257	0.678	0.49798	
## categoryCategory 29	16621.987	8409.375	1.977	0.04809	*
## categoryCategory 3	-2430.817	28201.940	-0.086	0.93131	
## categoryCategory 30	3293.299	10255.142	0.321	0.74811	
## categoryCategory 31	4810.997	6929.415	0.694	0.48750	
## categoryCategory 32	2066.545	6027.412	0.343	0.73171	
## categoryCategory 33	18182.831	6523.163	2.787	0.00531	**
## categoryCategory 34	46689.575	6037.811	7.733	1.06e-14	***
## categoryCategory 35	1077.235	6067.395	0.178	0.85908	
## categoryCategory 37	6933.278	6027.503	1.150	0.25003	
## categoryCategory 38	5175.931	6322.321	0.819	0.41297	
## categoryCategory 4	9904.141	9314.918	1.063	0.28767	
## categoryCategory 40	4832.522	6037.230	0.800	0.42345	
## categoryCategory 41	6729.806	7647.551	0.880	0.37886	
## categoryCategory 42	5341.166	6019.598	0.887	0.37492	
## categoryCategory 43	6377.773	6124.195	1.041	0.29769	
## categoryCategory 44	4316.365	6065.806	0.712	0.47672	
## categoryCategory 45	18431.569	6040.133	3.052	0.00228	**
## categoryCategory 46	11687.114	6020.410	1.941	0.05223	.
## categoryCategory 47	9063.751	7606.156	1.192	0.23341	
## categoryCategory 48	3192.007	10977.662	0.291	0.77123	
## categoryCategory 49	21138.659	28201.474	0.750	0.45352	
## categoryCategory 5	684.431	9144.139	0.075	0.94033	
## categoryCategory 50	-314.199	7335.665	-0.043	0.96584	
## categoryCategory 51	3032.771	6055.309	0.501	0.61648	
## categoryCategory 52	1184.137	10977.994	0.108	0.91410	
## categoryCategory 53	3979.778	6018.925	0.661	0.50848	
## categoryCategory 54	3672.778	6692.001	0.549	0.58312	
## categoryCategory 55	25995.050	6127.374	4.242	2.21e-05	***
## categoryCategory 56	19614.268	6291.427	3.118	0.00182	**

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## categoryCategory 57          4909.909  6027.499  0.815  0.41531
## categoryCategory 58          -2814.702 15032.694 -0.187  0.85147
## categoryCategory 59          4176.335  8237.073  0.507  0.61214
## categoryCategory 6           831.241   15031.606  0.055  0.95590
## categoryCategory 61          5775.871  6031.494  0.958  0.33826
## categoryCategory 62          5650.249  8610.061  0.656  0.51167
## categoryCategory 63          1072.154  7086.182  0.151  0.87974
## categoryCategory 7           6699.959  6461.850  1.037  0.29981
## categoryCategory 8           2326.987  6372.456  0.365  0.71499
## categoryCategory 9           5579.786  6025.800  0.926  0.35446
## categoryNone                11058.510  7131.127  1.551  0.12097
## problem_id                  NA         NA        NA        NA
## impact2 - Medium            -991.417  7715.740 -0.128  0.89776
## impact3 - Low               -13198.513 9019.271 -1.463  0.14337
## urgency2 - Medium           -1444.225  7615.831 -0.190  0.84960
## urgency3 - Low              -12665.020 7862.863 -1.611  0.10724
## priority2 - High            15.540    7704.657  0.002  0.99839
## priority3 - Moderate        5846.333  15296.425  0.382  0.70231
## priority4 - Low              31630.434 16528.442  1.914  0.05566 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 27550 on 91657 degrees of freedom
## Multiple R-squared:  0.1199, Adjusted R-squared:  0.1192
## F-statistic: 173.5 on 72 and 91657 DF, p-value: < 2.2e-16
lm_full_data_v3 <- lm(resolved_updated_diff ~ incident_state + reassignment_count + reopen_count + made_sla + reopen_count + subcategory + problem_id + impact + urgency + priority, data = df_train)
summary(lm_full_data_v3)

##
## Call:
## lm(formula = resolved_updated_diff ~ incident_state + reassignment_count +
##     reopen_count + made_sla + reopen_count + subcategory + problem_id +
##     impact + urgency + priority, data = df_train)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -109151    -9440    -4373     2043    460042
##
## Coefficients: (1 not defined because of singularities)
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 -1363.36   14210.83 -0.096 0.923570
## incident_stateAwaiting Evidence  18776.71   4956.88  3.788 0.000152 ***
## incident_stateAwaiting Problem  16437.89   1464.44 11.225 < 2e-16 ***
## incident_stateAwaiting User Info  2002.23   299.24  6.691 2.23e-11 ***
## incident_stateAwaiting Vendor  25862.24   1201.69 21.522 < 2e-16 ***
## incident_stateNew            1580.23   230.05  6.869 6.50e-12 ***
## incident_stateResolved       -10216.32   253.07 -40.369 < 2e-16 ***
## reassignment_count           164.55    54.09  3.042 0.002350 **
## reopen_count                 72.65    448.73  0.162 0.871388
## made_slaTRUE                 10749.85  13864.98  0.775 0.438150
## subcategorySubcategory 10     -10400.88  6545.69 -1.589 0.112071
## subcategorySubcategory 100    -3737.30  9124.42 -0.410 0.682106
## subcategorySubcategory 101    1745.13   4460.86  0.391 0.695643
## subcategorySubcategory 102    -565.99   7261.61 -0.078 0.937873

```

## subcategorySubcategory 103	-9248.85	3157.61	-2.929 0.003401 **
## subcategorySubcategory 104	-12170.41	10086.45	-1.207 0.227585
## subcategorySubcategory 105	-7558.94	3694.51	-2.046 0.040760 *
## subcategorySubcategory 106	-1010.21	3922.65	-0.258 0.796769
## subcategorySubcategory 107	143.43	3412.84	0.042 0.966478
## subcategorySubcategory 109	-6341.38	6447.63	-0.984 0.325353
## subcategorySubcategory 11	-9031.45	9562.36	-0.944 0.344928
## subcategorySubcategory 110	-7602.46	3687.40	-2.062 0.039235 *
## subcategorySubcategory 111	-6748.08	7651.30	-0.882 0.377805
## subcategorySubcategory 112	22380.88	3367.26	6.647 3.02e-11 ***
## subcategorySubcategory 113	3036.77	4309.94	0.705 0.481063
## subcategorySubcategory 114	-3729.30	3142.83	-1.187 0.235386
## subcategorySubcategory 115	25273.36	9123.12	2.770 0.005602 **
## subcategorySubcategory 116	-8744.99	19475.80	-0.449 0.653419
## subcategorySubcategory 117	-10432.08	3381.74	-3.085 0.002037 **
## subcategorySubcategory 118	-7920.71	4995.87	-1.585 0.112867
## subcategorySubcategory 119	-8200.86	11516.98	-0.712 0.476425
## subcategorySubcategory 12	-11428.41	8746.51	-1.307 0.191343
## subcategorySubcategory 120	-9946.22	4644.38	-2.142 0.032232 *
## subcategorySubcategory 122	-2043.80	9157.77	-0.223 0.823399
## subcategorySubcategory 123	-3796.31	3162.07	-1.201 0.229918
## subcategorySubcategory 124	-3480.56	27376.42	-0.127 0.898832
## subcategorySubcategory 125	-8488.57	3127.90	-2.714 0.006652 **
## subcategorySubcategory 126	-11564.18	7092.98	-1.630 0.103027
## subcategorySubcategory 127	-7287.25	3625.94	-2.010 0.044460 *
## subcategorySubcategory 128	-15059.11	27375.50	-0.550 0.582256
## subcategorySubcategory 129	-2138.18	9135.44	-0.234 0.814944
## subcategorySubcategory 13	-11310.00	3857.59	-2.932 0.003370 **
## subcategorySubcategory 130	-6999.02	3512.55	-1.993 0.046311 *
## subcategorySubcategory 131	-15376.66	27375.57	-0.562 0.574327
## subcategorySubcategory 132	-6621.57	3991.28	-1.659 0.097117 .
## subcategorySubcategory 134	38153.61	3295.05	11.579 < 2e-16 ***
## subcategorySubcategory 135	-2836.33	3084.53	-0.920 0.357817
## subcategorySubcategory 136	-3480.56	27376.42	-0.127 0.898832
## subcategorySubcategory 138	-697.14	6941.84	-0.100 0.920006
## subcategorySubcategory 14	-10784.18	15998.03	-0.674 0.500253
## subcategorySubcategory 140	-12767.11	11513.59	-1.109 0.267488
## subcategorySubcategory 141	-3480.56	27376.42	-0.127 0.898832
## subcategorySubcategory 142	-4139.06	7881.86	-0.525 0.599489
## subcategorySubcategory 144	-9887.09	5969.94	-1.656 0.097696 .
## subcategorySubcategory 145	-2709.19	3511.90	-0.771 0.440454
## subcategorySubcategory 146	-5585.37	3442.56	-1.622 0.104711
## subcategorySubcategory 149	-14819.30	13937.03	-1.063 0.287647
## subcategorySubcategory 150	8737.95	3144.83	2.779 0.005462 **
## subcategorySubcategory 151	-7877.47	3754.46	-2.098 0.035893 *
## subcategorySubcategory 152	-3923.95	10720.67	-0.366 0.714353
## subcategorySubcategory 153	888.90	3419.31	0.260 0.794892
## subcategorySubcategory 154	56019.32	3179.94	17.616 < 2e-16 ***
## subcategorySubcategory 155	-9919.91	8756.25	-1.133 0.257261
## subcategorySubcategory 156	-10468.64	6946.89	-1.507 0.131826
## subcategorySubcategory 157	-4941.61	19475.62	-0.254 0.799702
## subcategorySubcategory 158	-10972.48	4898.83	-2.240 0.025105 *
## subcategorySubcategory 159	-7747.73	3581.58	-2.163 0.030527 *
## subcategorySubcategory 16	-2209.98	3263.43	-0.677 0.498282

## subcategorySubcategory 160	-15242.11	27375.50	-0.557	0.577680
## subcategorySubcategory 161	-9945.89	8132.59	-1.223	0.221345
## subcategorySubcategory 162	-1991.81	5623.91	-0.354	0.723214
## subcategorySubcategory 163	5821.46	3227.78	1.804	0.071305 .
## subcategorySubcategory 164	-3602.60	3054.26	-1.180	0.238189
## subcategorySubcategory 165	-7776.34	19475.84	-0.399	0.689687
## subcategorySubcategory 166	-8745.88	6940.58	-1.260	0.207634
## subcategorySubcategory 167	-9780.14	5142.31	-1.902	0.057188 .
## subcategorySubcategory 168	-6155.13	3305.00	-1.862	0.062554 .
## subcategorySubcategory 169	2058.12	8745.57	0.235	0.813951
## subcategorySubcategory 17	-11832.74	5972.97	-1.981	0.047589 *
## subcategorySubcategory 170	-4794.70	3085.11	-1.554	0.120153
## subcategorySubcategory 171	13549.40	3760.33	3.603	0.000314 ***
## subcategorySubcategory 172	-1341.29	5755.96	-0.233	0.815742
## subcategorySubcategory 173	-7197.41	13937.30	-0.516	0.605567
## subcategorySubcategory 174	-3553.64	3036.95	-1.170	0.241949
## subcategorySubcategory 175	-7255.69	3049.72	-2.379	0.017356 *
## subcategorySubcategory 176	-2815.16	5262.78	-0.535	0.592707
## subcategorySubcategory 177	2869.85	3494.23	0.821	0.411471
## subcategorySubcategory 178	-8010.97	3875.59	-2.067	0.038734 *
## subcategorySubcategory 179	-15141.11	27375.50	-0.553	0.580203
## subcategorySubcategory 18	-9935.45	9562.46	-1.039	0.298805
## subcategorySubcategory 181	15869.48	4281.58	3.706	0.000210 ***
## subcategorySubcategory 182	-5163.18	4040.60	-1.278	0.201314
## subcategorySubcategory 183	-8133.60	3550.45	-2.291	0.021974 *
## subcategorySubcategory 184	-8723.52	3444.26	-2.533	0.011318 *
## subcategorySubcategory 185	-9469.00	3261.68	-2.903	0.003696 **
## subcategorySubcategory 186	-3182.20	9562.25	-0.333	0.739295
## subcategorySubcategory 187	-5431.85	13937.75	-0.390	0.696743
## subcategorySubcategory 188	49038.09	13938.21	3.518	0.000435 ***
## subcategorySubcategory 189	-9199.31	3905.74	-2.355	0.018508 *
## subcategorySubcategory 191	7633.70	3526.24	2.165	0.030403 *
## subcategorySubcategory 192	-7589.14	7448.46	-1.019	0.308259
## subcategorySubcategory 193	-10788.90	11514.21	-0.937	0.348757
## subcategorySubcategory 194	-10666.90	5218.98	-2.044	0.040969 *
## subcategorySubcategory 195	-12622.92	9562.03	-1.320	0.186802
## subcategorySubcategory 196	-10737.49	12545.87	-0.856	0.392078
## subcategorySubcategory 197	3703.01	5685.01	0.651	0.514813
## subcategorySubcategory 198	-7794.36	4709.15	-1.655	0.097897 .
## subcategorySubcategory 199	-75.16	7093.66	-0.011	0.991547
## subcategorySubcategory 2	-10991.66	12539.27	-0.877	0.380718
## subcategorySubcategory 20	-3155.26	4047.02	-0.780	0.435600
## subcategorySubcategory 200	-2351.99	3251.51	-0.723	0.469464
## subcategorySubcategory 202	131.11	3308.73	0.040	0.968391
## subcategorySubcategory 203	-7832.05	7262.81	-1.078	0.280869
## subcategorySubcategory 204	-10213.46	12539.42	-0.815	0.415356
## subcategorySubcategory 205	-4949.49	7447.16	-0.665	0.506298
## subcategorySubcategory 207	96702.16	7881.08	12.270	< 2e-16 ***
## subcategorySubcategory 208	4563.60	4055.23	1.125	0.260439
## subcategorySubcategory 209	-12342.44	6940.70	-1.778	0.075363 .
## subcategorySubcategory 210	-5399.49	7454.81	-0.724	0.468886
## subcategorySubcategory 211	-13224.88	27376.24	-0.483	0.629041
## subcategorySubcategory 212	-11032.42	10086.49	-1.094	0.274054
## subcategorySubcategory 213	-5384.99	10089.95	-0.534	0.593552

## subcategorySubcategory 215	-7987.34	3484.89	-2.292	0.021908 *
## subcategorySubcategory 216	-9411.53	10115.20	-0.930	0.352148
## subcategorySubcategory 217	-8120.61	9132.26	-0.889	0.373886
## subcategorySubcategory 218	-5167.19	4348.88	-1.188	0.234771
## subcategorySubcategory 219	-7765.01	5405.53	-1.436	0.150865
## subcategorySubcategory 22	-11491.39	12539.78	-0.916	0.359462
## subcategorySubcategory 220	13545.66	3292.00	4.115	3.88e-05 ***
## subcategorySubcategory 222	-11006.67	8745.64	-1.259	0.208203
## subcategorySubcategory 223	-5523.08	3044.81	-1.814	0.069691 .
## subcategorySubcategory 224	-7018.43	3377.27	-2.078	0.037700 *
## subcategorySubcategory 225	22653.90	6546.53	3.460	0.000540 ***
## subcategorySubcategory 226	-11980.29	7093.25	-1.689	0.091228 .
## subcategorySubcategory 227	-2881.32	11543.82	-0.250	0.802899
## subcategorySubcategory 228	-8513.53	3700.02	-2.301	0.021397 *
## subcategorySubcategory 229	3660.08	3368.68	1.087	0.277259
## subcategorySubcategory 23	-6875.94	5138.27	-1.338	0.180840
## subcategorySubcategory 230	39719.68	6136.93	6.472	9.70e-11 ***
## subcategorySubcategory 231	7127.21	3244.42	2.197	0.028040 *
## subcategorySubcategory 232	8238.84	7651.54	1.077	0.281592
## subcategorySubcategory 233	-2752.76	4032.43	-0.683	0.494827
## subcategorySubcategory 234	69209.88	10086.98	6.861	6.87e-12 ***
## subcategorySubcategory 235	29666.49	7446.89	3.984	6.79e-05 ***
## subcategorySubcategory 236	-3480.56	27376.42	-0.127	0.898832
## subcategorySubcategory 237	-4317.36	10085.21	-0.428	0.668588
## subcategorySubcategory 24	-14603.60	19476.03	-0.750	0.453363
## subcategorySubcategory 240	41205.36	6138.29	6.713	1.92e-11 ***
## subcategorySubcategory 241	-13879.11	27375.50	-0.507	0.612163
## subcategorySubcategory 242	-1112.27	3967.97	-0.280	0.779239
## subcategorySubcategory 243	-1261.34	4073.78	-0.310	0.756847
## subcategorySubcategory 244	-8511.58	5623.59	-1.514	0.130144
## subcategorySubcategory 245	12497.20	5753.19	2.172	0.029842 *
## subcategorySubcategory 246	542.37	5265.84	0.103	0.917965
## subcategorySubcategory 247	2006.70	3831.20	0.524	0.600434
## subcategorySubcategory 248	469.88	3493.98	0.134	0.893021
## subcategorySubcategory 249	13690.42	3647.31	3.754	0.000174 ***
## subcategorySubcategory 25	-8035.48	3752.80	-2.141	0.032261 *
## subcategorySubcategory 250	-3874.28	4074.24	-0.951	0.341646
## subcategorySubcategory 251	-141.51	3195.15	-0.044	0.964673
## subcategorySubcategory 252	5990.78	4022.04	1.489	0.136362
## subcategorySubcategory 253	-12069.06	6245.85	-1.932	0.053321 .
## subcategorySubcategory 254	-3462.75	5354.78	-0.647	0.517851
## subcategorySubcategory 255	1466.99	3358.91	0.437	0.662296
## subcategorySubcategory 256	-7929.67	6137.00	-1.292	0.196323
## subcategorySubcategory 257	18946.61	4481.20	4.228	2.36e-05 ***
## subcategorySubcategory 258	-7151.03	4047.67	-1.767	0.077281 .
## subcategorySubcategory 259	-4742.13	3442.87	-1.377	0.168400
## subcategorySubcategory 260	17135.39	4537.51	3.776	0.000159 ***
## subcategorySubcategory 261	7389.26	4322.79	1.709	0.087386 .
## subcategorySubcategory 262	-2710.76	6666.36	-0.407	0.684278
## subcategorySubcategory 264	113096.89	27375.50	4.131	3.61e-05 ***
## subcategorySubcategory 269	-7021.08	6050.76	-1.160	0.245904
## subcategorySubcategory 270	3851.44	3493.75	1.102	0.270300
## subcategorySubcategory 271	-7766.31	3623.15	-2.144	0.032074 *
## subcategorySubcategory 273	2565.34	7878.89	0.326	0.744731

## subcategorySubcategory 274	-13539.62	10721.89	-1.263	0.206664
## subcategorySubcategory 275	-6781.69	3083.48	-2.199	0.027855 *
## subcategorySubcategory 276	-7269.33	12539.34	-0.580	0.562104
## subcategorySubcategory 277	-853.61	3633.24	-0.235	0.814252
## subcategorySubcategory 279	-9779.10	11513.61	-0.849	0.395688
## subcategorySubcategory 28	-9297.78	3172.98	-2.930	0.003387 **
## subcategorySubcategory 280	-12363.52	13938.83	-0.887	0.375090
## subcategorySubcategory 281	-6719.76	4282.41	-1.569	0.116616
## subcategorySubcategory 282	2091.67	8745.54	0.239	0.810974
## subcategorySubcategory 283	6020.52	5508.53	1.093	0.274420
## subcategorySubcategory 285	-7471.22	3893.66	-1.919	0.055010 .
## subcategorySubcategory 287	-9160.03	6434.96	-1.423	0.154601
## subcategorySubcategory 288	-5987.73	11514.34	-0.520	0.603049
## subcategorySubcategory 289	-5051.17	3686.40	-1.370	0.170622
## subcategorySubcategory 29	-3084.58	3205.00	-0.962	0.335838
## subcategorySubcategory 291	-8497.15	7449.75	-1.141	0.254041
## subcategorySubcategory 292	151.71	6673.06	0.023	0.981862
## subcategorySubcategory 294	51108.94	4841.33	10.557	< 2e-16 ***
## subcategorySubcategory 295	1870.64	8424.18	0.222	0.824271
## subcategorySubcategory 296	-3885.14	7885.66	-0.493	0.622237
## subcategorySubcategory 298	-11448.11	13937.53	-0.821	0.411428
## subcategorySubcategory 299	-11050.07	6545.59	-1.688	0.091382 .
## subcategorySubcategory 3	-6309.84	3131.78	-2.015	0.043931 *
## subcategorySubcategory 30	11065.12	4159.70	2.660	0.007814 **
## subcategorySubcategory 300	-8287.70	3223.69	-2.571	0.010146 *
## subcategorySubcategory 301	-4122.20	3746.26	-1.100	0.271182
## subcategorySubcategory 302	-8914.04	3300.46	-2.701	0.006918 **
## subcategorySubcategory 303	-7872.27	3147.29	-2.501	0.012376 *
## subcategorySubcategory 304	-14357.27	13937.28	-1.030	0.302950
## subcategorySubcategory 305	65675.84	3601.89	18.234	< 2e-16 ***
## subcategorySubcategory 31	1473.66	3218.56	0.458	0.647051
## subcategorySubcategory 32	10292.55	10721.20	0.960	0.337048
## subcategorySubcategory 33	-10185.89	7652.58	-1.331	0.183179
## subcategorySubcategory 34	-10800.11	6229.50	-1.734	0.082974 .
## subcategorySubcategory 35	-15248.03	16005.47	-0.953	0.340757
## subcategorySubcategory 36	-6202.44	3095.01	-2.004	0.045072 *
## subcategorySubcategory 37	-8065.25	10733.52	-0.751	0.452409
## subcategorySubcategory 4	1234.77	4101.62	0.301	0.763382
## subcategorySubcategory 40	855.73	4556.32	0.188	0.851025
## subcategorySubcategory 42	73879.89	4994.69	14.792	< 2e-16 ***
## subcategorySubcategory 43	-2425.75	3133.75	-0.774	0.438888
## subcategorySubcategory 44	-6626.78	3182.44	-2.082	0.037318 *
## subcategorySubcategory 45	-10994.65	7447.48	-1.476	0.139869
## subcategorySubcategory 46	-6713.29	5819.19	-1.154	0.248648
## subcategorySubcategory 47	45372.38	3962.30	11.451	< 2e-16 ***
## subcategorySubcategory 48	-2116.00	7655.28	-0.276	0.782233
## subcategorySubcategory 50	-6671.85	5220.29	-1.278	0.201230
## subcategorySubcategory 51	-9953.84	9581.22	-1.039	0.298858
## subcategorySubcategory 52	-10030.29	8419.20	-1.191	0.233516
## subcategorySubcategory 53	-10939.86	7879.21	-1.388	0.165005
## subcategorySubcategory 54	-3942.29	3548.34	-1.111	0.266561
## subcategorySubcategory 56	-28.22	9686.25	-0.003	0.997675
## subcategorySubcategory 57	-9085.63	4618.44	-1.967	0.049157 *
## subcategorySubcategory 59	-5502.03	3691.00	-1.491	0.136055

```

## subcategorySubcategory 6      -2853.00    3826.40  -0.746 0.455904
## subcategorySubcategory 60     -5731.93    3663.15  -1.565 0.117644
## subcategorySubcategory 62     11418.04    13938.11  0.819 0.412677
## subcategorySubcategory 64     -2391.78    3799.88  -0.629 0.529065
## subcategorySubcategory 65     -1919.25    4663.06  -0.412 0.680644
## subcategorySubcategory 66     -9800.34    9121.90  -1.074 0.282658
## subcategorySubcategory 67     -4078.12    7900.09  -0.516 0.605708
## subcategorySubcategory 68     12513.87    5139.50   2.435 0.014900 *
## subcategorySubcategory 69     -11082.18   3413.84  -3.246 0.001170 **
## subcategorySubcategory 71     -9596.07    15997.80 -0.600 0.548617
## subcategorySubcategory 72      4144.62    4030.09  1.028 0.303755
## subcategorySubcategory 74     -5861.81    5624.27  -1.042 0.297305
## subcategorySubcategory 75     -5162.11    3113.71  -1.658 0.097348 .
## subcategorySubcategory 77     -6726.89    7879.08  -0.854 0.393237
## subcategorySubcategory 78     -6588.71    6327.81  -1.041 0.297771
## subcategorySubcategory 8      10773.89   27375.50  0.394 0.693907
## subcategorySubcategory 80     -7313.01    3321.69  -2.202 0.027696 *
## subcategorySubcategory 82     -8249.66    3313.74  -2.490 0.012793 *
## subcategorySubcategory 83     -11322.04   8745.76  -1.295 0.195470
## subcategorySubcategory 84      8717.01    19477.05  0.448 0.654477
## subcategorySubcategory 85      1924.95    7447.13  0.258 0.796035
## subcategorySubcategory 86     -4342.99    3671.38  -1.183 0.236840
## subcategorySubcategory 87     -9378.84    19475.84 -0.482 0.630118
## subcategorySubcategory 88     24829.44    3300.49   7.523 5.40e-14 ***
## subcategorySubcategory 89     -8714.68    4382.32  -1.989 0.046748 *
## subcategorySubcategory 9      -7866.23    3081.26  -2.553 0.010684 *
## subcategorySubcategory 90     -8592.61    3942.52  -2.179 0.029299 *
## subcategorySubcategory 92     -8396.32    4929.79  -1.703 0.088538 .
## subcategorySubcategory 94      6379.59    3286.56  1.941 0.052248 .
## subcategorySubcategory 95     -3480.56    27376.42 -0.127 0.898832
## subcategorySubcategory 96      9951.87    5332.20  1.866 0.061992 .
## subcategorySubcategory 97     -12787.99   19475.80 -0.657 0.511434
## subcategorySubcategory 99      -29.39    6137.60 -0.005 0.996179
## problem_id                  NA        NA        NA        NA
## impact2 - Medium           -14664.01   7657.65 -1.915 0.055502 .
## impact3 - Low               -25032.31   8950.23 -2.797 0.005162 **
## urgency2 - Medium          -15109.94   7557.21 -1.999 0.045567 *
## urgency3 - Low              -26779.22   7802.72 -3.432 0.000599 ***
## priority2 - High            14342.06   7646.07  1.876 0.060694 .
## priority3 - Moderate        34084.34   15177.92  2.246 0.024729 *
## priority4 - Low             56778.84   16400.28  3.462 0.000536 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 27210 on 91460 degrees of freedom
## Multiple R-squared:  0.1437, Adjusted R-squared:  0.1412
## F-statistic: 57.06 on 269 and 91460 DF,  p-value: < 2.2e-16
lm_full_data_v4 <- lm(resolved_updated_diff ~ incident_state + reassignment_count + reopen_count + made_sla + reopen_count + problem_id + impact +
summary(lm_full_data_v4)

##
## Call:
## lm(formula = resolved_updated_diff ~ incident_state + reassignment_count +
##     reopen_count + made_sla + reopen_count + problem_id + impact +

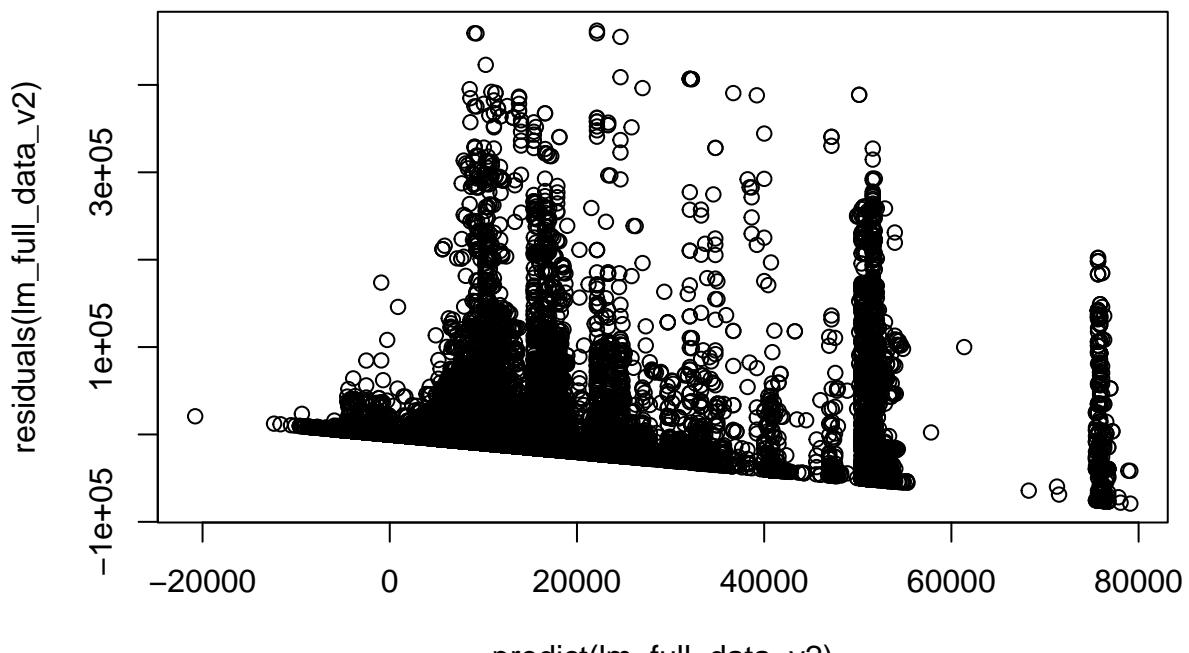
```

```

##      urgency + priority, data = df_train)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -64689 -10717  -5808     -9 473490
##
## Coefficients: (1 not defined because of singularities)
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)                  2488.61   14337.19   0.174 0.862198
## incident_stateAwaiting Evidence  31512.71    5144.39   6.126 9.07e-10 ***
## incident_stateAwaiting Problem  20331.86   1525.41  13.329 < 2e-16 ***
## incident_stateAwaiting User Info 2274.74    311.65   7.299 2.92e-13 ***
## incident_stateAwaiting Vendor  48871.49   1206.50  40.507 < 2e-16 ***
## incident_stateNew            1097.53    238.49   4.602 4.19e-06 ***
## incident_stateResolved       -10708.92   264.17 -40.538 < 2e-16 ***
## reassignment_count           253.78     55.05   4.610 4.03e-06 ***
## reopen_count                 -693.96   465.96  -1.489 0.136410
## made_slaTRUE                 5638.80   14318.49   0.394 0.693721
## problem_id                   NA        NA        NA        NA
## impact2 - Medium            -16228.11   8002.32  -2.028 0.042571 *
## impact3 - Low                -29402.06   9345.94  -3.146 0.001656 **
## urgency2 - Medium           -16626.24   7899.88  -2.105 0.035327 *
## urgency3 - Low               -27129.80   8154.84  -3.327 0.000879 ***
## priority2 - High             14691.38   7991.60   1.838 0.066014 .
## priority3 - Moderate         35444.78   15866.47   2.234 0.025489 *
## priority4 - Low              62699.80   17134.01   3.659 0.000253 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 28630 on 91713 degrees of freedom
## Multiple R-squared:  0.04947,   Adjusted R-squared:  0.0493
## F-statistic: 298.3 on 16 and 91713 DF,  p-value: < 2.2e-16
z <- predict(lm_full_data_v4, df_test)

## Warning in predict.lm(lm_full_data_v4, df_test): prediction from a rank-
## deficient fit may be misleading
plot(predict(lm_full_data_v2), residuals(lm_full_data_v2))

```



```
plot(predict(lm_full_data_v4), residuals(lm_full_data_v4))
```

