

Practice

Assignment 4 exercises

Written answers

# Regression Assignment

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```
rm(list = setdiff(ls(), lsf.str()))
```

```
# install.packages("reshape")  
library("reshape")
```

```
# install.packages("ggplot2")  
library("ggplot2")
```

```
# install.packages("GGally")  
library("GGally")
```

## Practice

copy and paste your work by following each example from the lab manual for this exercise

```
setwd("C:/SSDFiles/GitStuff/iiith/Sem 4-2 spring24/Behavioural Research - Statistical Methods/RegressionAssignment") # change this to your working directory where you've put the data files, etc for this session  
# setwd("~/Desktop/Work/BRSM_SP23/Lab")  
  
# Simulate data  $y <- b_1x_1 + b_2x_2 + b_0$  with Normally distributed residuals. You can assume sensible values for  $b_1$   $b_2$   $b_0$  as you please.  
dat<-read.csv("housing.csv")  
housem <- lm(dat$median_house_value ~ dat$total_rooms + dat$median_income)  
  
summary(housem)
```

```
##
## Call:
## lm(formula = dat$median_house_value ~ dat$total_rooms + dat$median_income)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -541275  -55944  -17010   36993  433865
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   45290.4598   1406.7797   32.194  <2e-16 ***
## dat$total_rooms    -0.1167     0.2726   -0.428    0.669
## dat$median_income 41820.3923    313.0120  133.606  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 83740 on 20637 degrees of freedom
## Multiple R-squared:  0.4735, Adjusted R-squared:  0.4734
## F-statistic:  9278 on 2 and 20637 DF,  p-value: < 2.2e-16
```

```
# Binary
mydata<-read.csv("binary.csv")
mydata$rank <- factor(mydata$rank)
fit <- glm(admit ~ gre + gpa + rank, data = mydata, family = "binomial")

summary(fit) # display results
```

```
##
## Call:
## glm(formula = admit ~ gre + gpa + rank, family = "binomial",
##      data = mydata)
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -3.989979    1.139951  -3.500 0.000465 ***
## gre          0.002264    0.001094   2.070 0.038465 *
## gpa          0.804038    0.331819   2.423 0.015388 *
## rank2       -0.675443    0.316490  -2.134 0.032829 *
## rank3       -1.340204    0.345306  -3.881 0.000104 ***
## rank4       -1.551464    0.417832  -3.713 0.000205 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 499.98  on 399  degrees of freedom
## Residual deviance: 458.52  on 394  degrees of freedom
## AIC: 470.52
##
## Number of Fisher Scoring iterations: 4
```

```
confint(fit) # 95% CI for the coefficients
```

```
##                2.5 %      97.5 %
## (Intercept) -6.2716202334 -1.792547080
## gre          0.0001375921  0.004435874
## gpa          0.1602959439  1.464142727
## rank2        -1.3008888002 -0.056745722
## rank3        -2.0276713127 -0.670372346
## rank4        -2.4000265384 -0.753542605
```

```
exp(coef(fit)) # exponentiated coefficients
```

```
## (Intercept)      gre      gpa      rank2      rank3      rank4
##  0.0185001    1.0022670  2.2345448  0.5089310  0.2617923  0.2119375
```

```
exp(confint(fit)) # 95% CI for exponentiated coefficients
```

```
##                2.5 %      97.5 %
## (Intercept) 0.001889165 0.1665354
## gre         1.000137602 1.0044457
## gpa         1.173858216 4.3238349
## rank2       0.272289674 0.9448343
## rank3       0.131641717 0.5115181
## rank4       0.090715546 0.4706961
```

```
predict(fit, type="response") # predicted values
```

##	1	2	3	4	5	6	7
##	0.17262654	0.29217496	0.73840825	0.17838461	0.11835391	0.36996994	0.41924616
##	8	9	10	11	12	13	14
##	0.21700328	0.20073518	0.51786820	0.37431440	0.40020025	0.72053858	0.35345462
##	15	16	17	18	19	20	21
##	0.69237989	0.18582508	0.33993917	0.07895335	0.54022772	0.57351182	0.16122101
##	22	23	24	25	26	27	28
##	0.43727108	0.12837525	0.19204860	0.43759396	0.68229503	0.57848091	0.20475422
##	29	30	31	32	33	34	35
##	0.42307349	0.45829857	0.21765393	0.28583616	0.22481919	0.42494837	0.34296523
##	36	37	38	39	40	41	42
##	0.21293277	0.48413281	0.13931720	0.26569575	0.11942769	0.18975965	0.33567002
##	43	44	45	46	47	48	49
##	0.31560404	0.17702923	0.32817441	0.18025548	0.36121718	0.11699101	0.07235381
##	50	51	52	53	54	55	56
##	0.15047417	0.31488795	0.11624726	0.23936553	0.37838478	0.24045684	0.39213236
##	57	58	59	60	61	62	63
##	0.18283980	0.10853139	0.30472142	0.12837525	0.33078459	0.16742893	0.28289780
##	64	65	66	67	68	69	70
##	0.33295972	0.30988311	0.39645173	0.27784995	0.51681586	0.57206626	0.69436828
##	71	72	73	74	75	76	77
##	0.33966212	0.07486000	0.15073716	0.46607599	0.24284830	0.38139149	0.20415281
##	78	79	80	81	82	83	84
##	0.42494837	0.43570986	0.65251556	0.16456653	0.31150713	0.20517359	0.08776685
##	85	86	87	88	89	90	91
##	0.21358749	0.25126279	0.34584314	0.37549461	0.55783057	0.51131037	0.49978497
##	92	93	94	95	96	97	98
##	0.63809471	0.57000341	0.26968427	0.40010880	0.37907977	0.22063013	0.33002244
##	99	100	101	102	103	104	105
##	0.31762762	0.14640896	0.11633954	0.24114689	0.11883427	0.28100436	0.50126183
##	106	107	108	109	110	111	112
##	0.35394219	0.61241920	0.25695415	0.11218813	0.30904921	0.17869743	0.13603549
##	113	114	115	116	117	118	119
##	0.10881750	0.48942091	0.35153649	0.32780508	0.29004920	0.47768876	0.68922540
##	120	121	122	123	124	125	126
##	0.09863460	0.38205848	0.19283124	0.13456621	0.14161529	0.35890251	0.16784107
##	127	128	129	130	131	132	133
##	0.55353632	0.29761787	0.29364378	0.12270194	0.32900715	0.27429792	0.35016196
##	134	135	136	137	138	139	140
##	0.15167362	0.26397051	0.20956391	0.16855273	0.37076538	0.37104174	0.56147017
##	141	142	143	144	145	146	147
##	0.48592324	0.24487554	0.27496207	0.21702497	0.18326999	0.15292361	0.30053113
##	148	149	150	151	152	153	154
##	0.13202601	0.36278299	0.58590453	0.69607194	0.26076336	0.48793196	0.22533437
##	155	156	157	158	159	160	161
##	0.27701027	0.12691355	0.20243105	0.49385024	0.40979572	0.33767745	0.31214097
##	162	163	164	165	166	167	168
##	0.40081797	0.44572710	0.21536268	0.33209361	0.69237989	0.12564635	0.33881603
##	169	170	171	172	173	174	175
##	0.27253083	0.25713529	0.16766865	0.13610230	0.27045353	0.47601029	0.17207711
##	176	177	178	179	180	181	182
##	0.36543032	0.20079352	0.20929210	0.22290898	0.09702710	0.29173405	0.21592659

##	183	184	185	186	187	188	189
##	0.53390445	0.41213948	0.10284874	0.51016205	0.23875288	0.26184001	0.28313813
##	190	191	192	193	194	195	196
##	0.30160149	0.29894660	0.33797096	0.29780561	0.14252603	0.37361105	0.37499458
##	197	198	199	200	201	202	203
##	0.20306181	0.11520619	0.25867413	0.23203530	0.29790835	0.31450637	0.69237989
##	204	205	206	207	208	209	210
##	0.19176895	0.62160882	0.37552455	0.62994688	0.59336886	0.17269671	0.36867073
##	211	212	213	214	215	216	217
##	0.23500145	0.28417171	0.21145148	0.23806753	0.39069474	0.18303592	0.29144726
##	218	219	220	221	222	223	224
##	0.49458858	0.36532833	0.37499458	0.18691983	0.35841190	0.38346629	0.32549498
##	225	226	227	228	229	230	231
##	0.37234438	0.29200523	0.40539785	0.13119209	0.30562595	0.42917277	0.17040039
##	232	233	234	235	236	237	238
##	0.20845157	0.25212831	0.09688336	0.65921863	0.30806878	0.40979572	0.41039144
##	239	240	241	242	243	244	245
##	0.10815929	0.27465027	0.19001218	0.56239934	0.19616746	0.33794240	0.41996550
##	246	247	248	249	250	251	252
##	0.40736827	0.39171070	0.24596016	0.29657173	0.29278619	0.20011793	0.17414395
##	253	254	255	256	257	258	259
##	0.43247252	0.18780755	0.26200847	0.23371984	0.30267400	0.32075797	0.33944941
##	260	261	262	263	264	265	266
##	0.46187255	0.34863249	0.24298996	0.16969339	0.32075797	0.26562483	0.14378335
##	267	268	269	270	271	272	273
##	0.15865328	0.26021896	0.41492493	0.12579904	0.48994106	0.19310678	0.45641226
##	274	275	276	277	278	279	280
##	0.54337733	0.27302605	0.28684953	0.22143462	0.55028996	0.16945136	0.34384116
##	281	282	283	284	285	286	287
##	0.49925174	0.13172559	0.21874547	0.13337693	0.28021662	0.17925207	0.60122274
##	288	289	290	291	292	293	294
##	0.25502619	0.23197657	0.05878643	0.38047126	0.35008696	0.46240272	0.73372225
##	295	296	297	298	299	300	301
##	0.29885443	0.17659931	0.45483793	0.23950580	0.34785059	0.27566478	0.36288468
##	302	303	304	305	306	307	308
##	0.28067279	0.22671860	0.51860565	0.07198547	0.19060160	0.44561844	0.37054412
##	309	310	311	312	313	314	315
##	0.28373804	0.12588934	0.30028221	0.44520022	0.30907647	0.19322270	0.17701800
##	316	317	318	319	320	321	322
##	0.15412239	0.18491373	0.29806393	0.18670880	0.46755914	0.14630641	0.32183935
##	323	324	325	326	327	328	329
##	0.12035456	0.17486941	0.12112920	0.66498227	0.38597852	0.35450549	0.33926538
##	330	331	332	333	334	335	336
##	0.11370930	0.39213236	0.27905234	0.34097123	0.21344965	0.20393972	0.59795326
##	337	338	339	340	341	342	343
##	0.16520993	0.16070084	0.45158492	0.26006097	0.14037382	0.12659514	0.22560760
##	344	345	346	347	348	349	350
##	0.29075910	0.18859648	0.14657301	0.35132030	0.42636137	0.25767548	0.27488628
##	351	352	353	354	355	356	357
##	0.57858815	0.23714608	0.18120291	0.43779599	0.40050290	0.49758253	0.38909423
##	358	359	360	361	362	363	364
##	0.57487559	0.25063922	0.37007654	0.59956970	0.50972425	0.35412991	0.29777892

```
##          365          366          367          368          369          370          371
## 0.49491656 0.11836196 0.12645014 0.26745319 0.63170496 0.56803162 0.39857395
##          372          373          374          375          376          377          378
## 0.31708679 0.37650752 0.53085361 0.41142403 0.18735742 0.41512421 0.58958954
##          379          380          381          382          383          384          385
## 0.20223990 0.21896113 0.46366743 0.34602886 0.34967678 0.67275941 0.18665107
##          386          387          388          389          390          391          392
## 0.35189341 0.52842881 0.34287938 0.33908140 0.40275050 0.40093595 0.48719398
##          393          394          395          396          397          398          399
## 0.22202911 0.43872524 0.25342327 0.48866999 0.16550430 0.18106222 0.46366743
##          400
## 0.30073055
```

```
residuals(fit, type="deviance") # residuals
```

##	1	2	3	4	5	6	7
##	-0.6156283	1.5686953	0.7787919	1.8567786	-0.5019254	1.4102011	1.3185576
##	8	9	10	11	12	13	14
##	-0.6994666	1.7920763	-1.2079220	-0.9684083	-1.0110978	0.8096373	-0.9339292
##	15	16	17	18	19	20	21
##	0.8574619	-0.6412177	-0.9115078	-0.4055727	-1.2466146	1.0544920	-0.5929722
##	22	23	24	25	26	27	28
##	1.2862363	-0.5242066	-0.6530748	1.2856623	0.8744062	1.0462789	1.7809800
##	29	30	31	32	33	34	35
##	1.3116473	-1.1072852	-0.7006541	-0.8205399	-0.7136651	1.3082718	-0.9165351
##	36	37	38	39	40	41	42
##	-0.6920139	-1.1505702	-0.5477760	1.6281299	2.0615742	-0.6487285	1.4775836
##	43	44	45	46	47	48	49
##	1.5187277	-0.6242349	-0.8919154	1.8511511	1.4270781	-0.4988384	-0.3875690
##	50	51	52	53	54	55	56
##	-0.5710988	-0.8696814	-0.4971478	-0.7397329	1.3941619	-0.7416713	1.3683244
##	57	58	59	60	61	62	63
##	-0.6354843	-0.4793434	-0.8525757	-0.5242066	1.4874730	-0.6053704	-0.8155206
##	64	65	66	67	68	69	70
##	1.4830602	-0.8612715	-1.0049172	-0.8068734	-1.2061156	-1.3029097	-1.5397236
##	71	72	73	74	75	76	77
##	-0.9110473	-0.3944875	-0.5716407	-1.1202694	-0.7459111	-0.9800843	-0.6757930
##	78	79	80	81	82	83	84
##	1.3082718	-1.0697539	0.9240349	-0.5996742	-0.8640027	-0.6776895	-0.4286250
##	85	86	87	88	89	90	91
##	1.7571048	-0.7607460	-0.9213122	-0.9703559	-1.2775462	1.1582560	-1.1770448
##	92	93	94	95	96	97	98
##	0.9479120	-1.2992136	-0.7928157	1.3535278	-0.9762711	-0.7060730	-0.8949984
##	99	100	101	102	103	104	105
##	-0.8742766	-0.5626777	-0.4973578	-0.7428958	-0.5030100	-0.8122807	1.1752674
##	106	107	108	109	110	111	112
##	1.4412645	0.9902911	-0.7707107	-0.4878430	-0.8598682	-0.6274770	-0.5407839
##	113	114	115	116	117	118	119
##	-0.4800126	-1.1594910	-0.9307519	-0.8912990	1.5733434	-1.1397295	0.8627710
##	120	121	122	123	124	125	126
##	-0.4557292	1.3872142	1.8143538	-0.5376326	-0.5526353	-0.9429462	-0.6061878
##	127	128	129	130	131	132	133
##	1.0875917	-0.8405685	-0.8338292	-0.5116805	1.4910907	-0.8007693	-0.9284741
##	134	135	136	137	138	139	140
##	-0.5735675	-0.7829241	-0.6858141	-0.6075976	-0.9625498	-0.9630061	1.0744269
##	141	142	143	144	145	146	147
##	-1.1535880	1.6775012	-0.8019118	-0.6995062	-0.6363124	-0.5761326	-0.8454987
##	148	149	150	151	152	153	154
##	-0.5321532	1.4240438	-1.3278996	0.8512371	-0.7773509	1.1979811	-0.7145961
##	155	156	157	158	159	160	161
##	-0.8054319	2.0318706	-0.6725875	1.1878745	-1.0269241	-0.9077473	-0.8650680
##	162	163	164	165	166	167	168
##	-1.0121164	1.2712580	-0.6964678	-0.8984512	-1.5355062	-0.5182091	-0.9096408
##	169	170	171	172	173	174	175
##	-0.7977263	-0.7710270	-0.6058460	-0.5409268	-0.7941438	1.2184546	-0.6145490
##	176	177	178	179	180	181	182
##	1.4189289	-0.6695311	1.7686291	-0.7102081	-0.4518025	-0.8305849	-0.6974993

##	183	184	185	186	187	188	189
##	-1.2356089	1.3314604	-0.4658987	-1.1947223	-0.7386437	-0.7792236	-0.8159315
##	190	191	192	193	194	195	196
##	-0.8473080	1.5540208	-0.9082355	-0.8408864	-0.5545529	1.4032391	-0.9695308
##	197	198	199	200	201	202	203
##	-0.6737628	2.0789573	-0.7737118	-0.7266519	-0.8410604	1.5210200	0.8574619
##	204	205	206	207	208	209	210
##	-0.6525447	0.9751352	1.3995938	-1.4100416	1.0217035	-0.6157661	-0.9590910
##	211	212	213	214	215	216	217
##	-0.7319581	-0.8176979	-0.6892914	-0.7374244	1.3710060	1.8428635	-0.8300973
##	218	219	220	221	222	223	224
##	1.1866162	-0.9535696	1.4006025	-0.6433126	-0.9421346	1.3845603	-0.8874415
##	225	226	227	228	229	230	231
##	-0.9651566	1.5690657	-1.0196693	-0.5303456	-0.8541013	1.3006888	-0.6112481
##	232	233	234	235	236	237	238
##	-0.6837605	-0.7622649	-0.4514500	0.9129075	-0.8582176	1.3357369	-1.0279070
##	239	240	241	242	243	244	245
##	-0.4784720	-0.8013755	-0.6492089	1.0728869	1.8048749	-0.9081880	-1.0437123
##	246	247	248	249	250	251	252
##	-1.0229195	-0.9971005	-0.7514121	-0.8387960	-0.8323728	-0.6682679	-0.6186029
##	253	254	255	256	257	258	259
##	1.2947869	1.8288453	1.6366908	-0.7296676	1.5460265	1.5080242	-0.9106938
##	260	261	262	263	264	265	266
##	-1.1132474	-0.9259387	-0.7461619	1.8834872	1.5080242	1.6282938	-0.5571927
##	267	268	269	270	271	272	273
##	-0.5877949	1.6408729	1.3263918	-0.5185460	1.1945461	-0.6550785	1.2524846
##	274	275	276	277	278	279	280
##	-1.2521165	-0.7985795	1.5803781	-0.7075342	1.0929867	1.8842449	1.4612156
##	281	282	283	284	285	286	287
##	-1.1761393	-0.5315025	-0.7026440	-0.5350722	1.5951127	-0.6285527	1.0087515
##	288	289	290	291	292	293	294
##	1.6531116	-0.7265467	-0.3480954	1.3902120	-0.9283498	-1.1141324	-1.6267854
##	295	296	297	298	299	300	301
##	-0.8426621	-0.6233977	-1.1015191	-0.7399821	-0.9246422	-0.8031201	-0.9495310
##	302	303	304	305	306	307	308
##	1.5940927	1.7228149	1.1459594	-0.3865434	-0.6503292	1.2714497	-0.9621845
##	309	310	311	312	313	314	315
##	-0.8169569	-0.5187452	-0.8450777	-1.0854934	-0.8599141	1.8132357	-0.6242130
##	316	317	318	319	320	321	322
##	1.9339122	1.8373165	1.5559224	1.8320508	-1.1227497	-0.5624641	-0.8813298
##	323	324	325	326	327	328	329
##	-0.5064314	-0.6200220	-0.5081680	-1.4788995	-0.9876491	1.4401607	-0.9103878
##	330	331	332	333	334	335	336
##	-0.4913457	-0.9977957	-0.8089360	-0.9132230	-0.6929625	1.7832167	1.0141427
##	337	338	339	340	341	342	343
##	-0.6009576	-0.5919258	-1.0961048	1.6412429	-0.5500139	2.0331066	-0.7150896
##	344	345	346	347	348	349	350
##	-0.8289271	-0.6465134	-0.5630192	-0.9303937	-1.0542824	-0.7719699	-0.8017815
##	351	352	353	354	355	356	357
##	1.0461017	-0.7357836	1.8483170	-1.0732106	1.3528003	1.1815192	-0.9927865
##	358	359	360	361	362	363	364
##	-1.3079552	1.6635749	-0.9614125	1.0114772	1.1609353	-0.9350475	-0.8408412



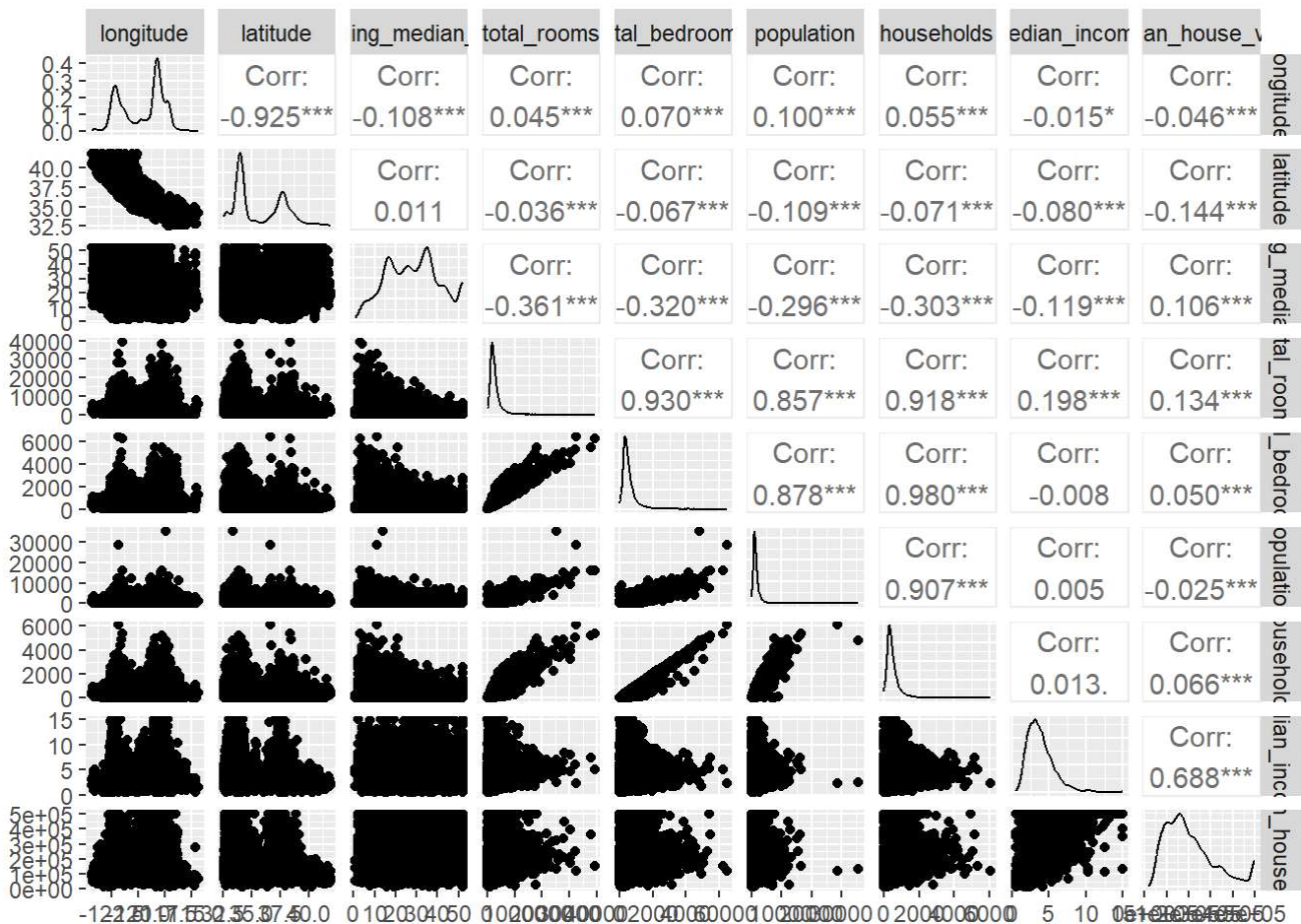
```
##          365          366          367          368          369          370          371
##  1.1860574 -0.5019436 -0.5199809 -0.7889588 -1.4134150 -1.2956874  1.3563644
##          372          373          374          375          376          377          378
##  1.5156383  1.3977248  1.1254057 -1.0296109 -0.6441489 -1.0357179  1.0279384
##          379          380          381          382          383          384          385
## -0.6722311 -0.7030368 -1.1162445  1.4568686 -0.9276700 -1.4946971  1.8322196
##          386          387          388          389          390          391          392
## -0.9313432  1.1294664 -0.9163926 -0.9100820 -1.0153032  1.3520012  1.1992439
##          393          394          395          396          397          398          399
##  1.7349045  1.2836525  1.6569214 -1.1582228 -0.6015442 -0.6320556 -1.1162445
##          400
## -0.8458358
```

# Assignment 4 exercises

## Part 1

```
nocat_dat <- dat[,0:9]
# nocat_dat
```

```
ggpairs(nocat_dat)
```



# Written answers

Write your answer here.