Analisis canonico

2022-04-22

Analisis Canonico

Instalar paqueterias

```
library(tidyverse)
```

Preparacion de la matriz

Se utiliza la matriz penguins.xlsx/Importar la matriz de datos.

```
library(readxl)
penguins <- read_excel("penguins.xlsx")
```

Visualizacion de la database

```
install.packages("knitr")
library(knitr)
kable(penguins)
```

ID	especie	isla	largo_pico_mm	grosor_pico_mm	largo_aleta_mm	masa_corporal_g	genero	año
i1	Adelie	Torgersen	39.1	18.7	181	3750	male	2007
i2	Adelie	Torgersen	39.5	17.4	186	3800	female	2007
i3	Adelie	Torgersen	40.3	18.0	195	3250	female	2007
i4	Adelie	Torgersen	37.8	18.1	190	3700	female	2007
i5	Adelie	Torgersen	36.7	19.3	193	3450	female	2007
i6	Adelie	Torgersen	39.3	20.6	190	3650	male	2007
i7	Adelie	Torgersen	38.9	17.8	181	3625	female	2007
i8	Adelie	Torgersen	39.2	19.6	195	4675	male	2007
i9	Adelie	Torgersen	34.1	18.1	193	3475	female	2007
i10	Adelie	Torgersen	42.0	20.2	190	4250	male	2007
i11	Adelie	Torgersen	37.8	17.1	186	3300	female	2007
i12	Adelie	Torgersen	37.8	17.3	180	3700	female	2007
i13	Adelie	Torgersen	41.1	17.6	182	3200	female	2007
i14	Adelie	Torgersen	38.6	21.2	191	3800	male	2007
i15	Adelie	Torgersen	34.6	21.1	198	4400	male	2007
i16	Adelie	Torgersen	36.6	17.8	185	3700	female	2007
i17	Adelie	Torgersen	38.7	19.0	195	3450	female	2007
i18	Adelie	Torgersen	42.5	20.7	197	4500	male	2007
i19	Adelie	Torgersen	34.4	18.4	184	3325	female	2007
i20	Adelie	Torgersen	46.0	21.5	194	4200	male	2007
i21	Adelie	Biscoe	37.8	18.3	174	3400	female	2007
i22	Adelie	Biscoe	37.7	18.7	180	3600	male	2007
i23	Adelie	Biscoe	35.9	19.2	189	3800	female	2007
i24	Adelie	Biscoe	38.2	18.1	185	3950	male	2007
i25	Adelie	Biscoe	38.8	17.2	180	3800	male	2007

ID	especie	isla	largo_pico_mm	grosor_pico_mm	largo_aleta_mm	masa_corporal_g	genero	año
i26	Adelie	Biscoe	35.3	18.9	187	3800	female	2007
i27	Adelie	Biscoe	40.6	18.6	183	3550	male	2007
i28	Adelie	Biscoe	40.5	17.9	187	3200	female	2007
i29	Adelie	Biscoe	37.9	18.6	172	3150	female	2007
i30	Adelie	Biscoe	40.5	18.9	180	3950	male	2007
i31	Adelie	Dream	39.5	16.7	178	3250	female	2007
i32	Adelie	Dream	37.2	18.1	178	3900	male	2007
i33	Adelie	Dream	39.5	17.8	188	3300	female	2007
i34	Adelie	Dream	40.9	18.9	184	3900	male	2007
i35	Adelie	Dream	36.4	17.0	195	3325	female	2007
i36	Adelie	Dream	39.2	21.1	196	4150	male	2007
i37	Adelie	Dream	38.8	20.0	190	3950	male	2007
i38	Adelie	Dream	42.2	18.5	180	3550	female	2007
i39	Adelie	Dream	37.6	19.3	181	3300	female	2007
i40	Adelie	Dream	39.8	19.1	184	4650	male	2007
i41	Adelie	Dream	36.5	18.0	182	3150	female	2007
i42	Adelie	Dream	40.8	18.4	195	3900	male	2007
i43	Adelie	Dream	36.0	18.5	186	3100	female	2007
i44	Adelie	Dream	44.1	19.7	196	4400	male	2007
i45	Adelie	Dream	37.0	16.9	185	3000	female	2007
i46	Adelie	Dream	39.6	18.8	190	4600	male	2007
i47	Adelie	Dream	41.1	19.0	182	3425	male	2007
i48	Adelie	Dream	37.5	18.9	179	2975	female	2007
i49	Adelie	Dream	36.0	17.9	190	3450	female	2007
i50	Adelie	Dream	42.3	21.2	191	4150	male	2007
i51	Adelie	Biscoe	39.6	17.7	186	3500	female	2008
i52	Adelie	Biscoe	40.1	18.9	188	4300	male	2008
i53	Adelie	Biscoe	35.0	17.9	190	3450	female	2008
i54	Adelie	Biscoe	42.0	19.5	200	4050	male	2008
i55	Adelie	Biscoe	34.5	18.1	187	2900	female	2008
i56	Adelie	Biscoe	41.4	18.6	191	3700	male	2008
i57	Adelie	Biscoe	39.0	17.5	186	3550	female	2008
i58	Adelie	Biscoe	40.6	18.8	193	3800	male	2008
i59	Adelie	Biscoe	36.5	16.6	181	2850	female	2008
i60	Adelie	Biscoe	37.6	19.1	194	3750	male	2008
i61	Adelie	Biscoe	35.7	16.9	185	3150	female	2008
i62	Adelie	Biscoe	41.3	21.1	195	4400	male	2008
i63	Adelie	Biscoe	37.6	17.0	185	3600	female	2008
i64	Adelie	Biscoe	41.1	18.2	192	4050	male	2008
i65	Adelie	Biscoe	36.4	17.1	184	2850	female	2008
i66	Adelie	Biscoe	41.6	18.0	192	3950	male	2008
i67	Adelie	Biscoe	35.5	16.2	195	3350	female	2008
i68	Adelie	Biscoe	41.1	19.1	188	4100	male	2008
i69	Adelie	Torgersen	35.9	16.6	190	3050	female	2008
i70	Adelie	Torgersen	41.8	19.4	198	4450	male	2008
i71	Adelie	Torgersen	33.5	19.0	190	3600	female	2008
i72	Adelie	Torgersen	39.7	18.4	190	3900	male	2008
i73	Adelie	Torgersen	39.6	17.2	196	3550	female	2008
i74	Adelie	Torgersen	45.8	18.9	197	4150	male	2008
i75	Adelie	Torgersen	35.5	17.5	190	3700	female	2008
i76	Adelie	Torgersen	42.8	18.5	195	4250	male	2008
i77	Adelie	Torgersen	40.9	16.8	191	3700	female	2008

ID	especie	isla	largo_pico_mm	grosor_pico_mm	largo_aleta_mm	masa_corporal_g	genero	año
i78	Adelie	Torgersen	37.2	19.4	184	3900	male	2008
i79	Adelie	Torgersen	36.2	16.1	187	3550	female	2008
i80	Adelie	Torgersen	42.1	19.1	195	4000	male	2008
i81	Adelie	Torgersen	34.6	17.2	189	3200	female	2008
i82	Adelie	Torgersen	42.9	17.6	196	4700	male	2008
i83	Adelie	Torgersen	36.7	18.8	187	3800	female	2008
i84	Adelie	Torgersen	35.1	19.4	193	4200	male	2008
i85	Adelie	Dream	37.3	17.8	191	3350	female	2008
i86	Adelie	Dream	41.3	20.3	194	3550	male	2008
i87	Adelie	Dream	36.3	19.5	190	3800	male	2008
i88	Adelie	Dream	36.9	18.6	189	3500	female	2008
i89	Adelie	Dream	38.3	19.2	189	3950	male	2008
i90	Adelie	Dream	38.9	18.8	190	3600	female	2008
i91	Adelie	Dream	35.7	18.0	202	3550	female	2008
i92	Adelie	Dream	41.1	18.1	205	4300	male	2008
i93	Adelie	Dream	34.0	17.1	185	3400	female	2008
i94	Adelie	Dream	39.6	18.1	186	4450	male	2008
i95	Adelie	Dream	36.2	17.3	187	3300	female	2008
i96	Adelie	Dream	40.8	18.9	208	4300	male	2008
i97	Adelie	Dream	38.1	18.6	190	3700	female	2008
i98	Adelie	Dream	40.3	18.5	196	4350	male	2008
i99	Adelie	Dream	33.1	16.1	178	2900	female	2008
i100	Adelie	Dream	43.2	18.5	192	4100	male	2008
i101	Adelie	Biscoe	35.0	17.9	192	3725	female	2009
i102	Adelie	Biscoe	41.0	20.0	203	4725	male	2009
i103	Adelie	Biscoe	37.7	16.0	183	3075	female	2009
i104	Adelie	Biscoe	37.8	20.0	190	4250	male	2009
i105	Adelie	Biscoe	37.9	18.6	193	2925	female	2009
i106	Adelie	Biscoe	39.7	18.9	184	3550	male	2009
i107	Adelie	Biscoe	38.6	17.2	199	3750	female	2009
i108	Adelie	Biscoe	38.2	20.0	190	3900	male	2009
i109	Adelie	Biscoe	38.1	17.0	181	3175	female	2009
i110	Adelie	Biscoe	43.2	19.0	197	4775	male	2009
i111	Adelie	Biscoe	38.1	16.5	198	3825	female	2009
i112	Adelie	Biscoe	45.6	20.3	191	4600	male	2009
i113	Adelie	Biscoe	39.7	17.7	193	3200	female	2009
i114	Adelie	Biscoe	42.2	19.5	197	4275	male	2009
i115	Adelie	Biscoe	39.6	20.7	191	3900	female	2009
i116	Adelie	Biscoe	42.7	18.3	196	4075	male	2009
i117	Adelie	Torgersen	38.6	17.0	188	2900	female	2009
i118	Adelie	Torgersen	37.3	20.5	199	3775	male	2009
i119	Adelie	Torgersen	35.7	17.0	189	3350	female	2009
i120	Adelie	Torgersen	41.1	18.6	189	3325	male	2009
i121	Adelie	Torgersen	36.2	17.2	187	3150	female	2009
i122	Adelie	Torgersen	37.7	19.8	198	3500	male	2009
i123	Adelie	Torgersen	40.2	17.0	176	3450	female	2009
i124	Adelie	Torgersen	41.4	18.5	202	3875	male	2009
i125	Adelie	Torgersen	35.2	15.9	186	3050	female	2009
i126	Adelie	Torgersen	40.6	19.0	199	4000	male	2009
i127	Adelie	Torgersen	38.8	17.6	191	3275	female	2009
i128	Adelie	Torgersen	41.5	18.3	195	4300	male	2009
i129	Adelie	Torgersen	39.0	17.1	191	3050	female	2009

ID	especie	isla	largo_pico_mm	grosor_pico_mm	largo_aleta_mm	masa_corporal_g	genero	año
i130	Adelie	Torgersen	44.1	18.0	210	4000	male	2009
i131	Adelie	Torgersen	38.5	17.9	190	3325	female	2009
i132	Adelie	Torgersen	43.1	19.2	197	3500	male	2009
i133	Adelie	Dream	36.8	18.5	193	3500	female	2009
i134	Adelie	Dream	37.5	18.5	199	4475	male	2009
i135	Adelie	Dream	38.1	17.6	187	3425	female	2009
i136	Adelie	Dream	41.1	17.5	190	3900	male	2009
i137	Adelie	Dream	35.6	17.5	191	3175	female	2009
i138	Adelie	Dream	40.2	20.1	200	3975	male	2009
i139	Adelie	Dream	37.0	16.5	185	3400	female	2009
i140	Adelie	Dream	39.7	17.9	193	4250	male	2009
i141	Adelie	Dream	40.2	17.1	193	3400	female	2009
i142	Adelie	Dream	40.6	17.2	187	3475	male	2009
i143	Adelie	Dream	32.1	15.5	188	3050	female	2009
i144	Adelie	Dream	40.7	17.0	190	3725	male	2009
i145	Adelie	Dream	37.3	16.8	192	3000	female	2009
i146	Adelie	Dream	39.0	18.7	185	3650	male	2009
i147	Adelie	Dream	39.2	18.6	190	4250	male	2009
i148	Adelie	Dream	36.6	18.4	184	3475	female	2009
i149	Adelie	Dream	36.0	17.8	195	3450	female	2009
i150	Adelie	Dream	37.8	18.1	193	3750	male	2009
i151	Adelie	Dream	36.0	17.1	187	3700	female	2009
i152	Adelie	Dream	41.5	18.5	201	4000	male	2009
i153	Gentoo	Biscoe	46.1	13.2	211	4500	female	2007
i154	Gentoo	Biscoe	50.0	16.3	230	5700	male	2007
i155	Gentoo	Biscoe	48.7	14.1	210	4450	female	2007
i156	Gentoo	Biscoe	50.0	15.2	218	5700	male	2007
i157	Gentoo	Biscoe	47.6	14.5	215	5400	male	2007
i158	Gentoo	Biscoe	46.5	13.5	210	4550	female	2007
i159	Gentoo	Biscoe	45.4	14.6	211	4800	female	2007
i160	Gentoo	Biscoe	46.7	15.3	219	5200	male	2007
i161	Gentoo	Biscoe	43.3	13.4	209	4400	female	2007
i162	Gentoo	Biscoe	46.8	15.4	215	5150	male	2007
i163	Gentoo	Biscoe	40.9	13.7	214	4650	female	2007
i164	Gentoo	Biscoe	49.0	16.1	216	5550	male	2007
i165	Gentoo	Biscoe	45.5	13.7	214	4650	female	2007
i166	Gentoo	Biscoe	48.4	14.6	213	5850	male	2007
i167	Gentoo	Biscoe	45.8	14.6	210	4200	female	2007
i168	Gentoo	Biscoe	49.3	15.7	217	5850	male	2007
i169	Gentoo	Biscoe	42.0	13.5	210	4150	female	2007
i170	Gentoo	Biscoe	49.2	15.2	221	6300	male	2007
i171	Gentoo	Biscoe	46.2	14.5	209	4800	female	2007
i172	Gentoo	Biscoe	48.7	15.1	222	5350	male	2007
i173	Gentoo	Biscoe	50.2	14.3	218	5700	male	2007
i174	Gentoo	Biscoe	45.1	14.5	215	5000	female	2007
i175	Gentoo	Biscoe	46.5	14.5	213	4400	female	2007
i176	Gentoo	Biscoe	46.3	15.8	215	5050	male	2007
i177	Gentoo	Biscoe	42.9	13.1	215	5000	female	2007
i178	Gentoo	Biscoe	46.1	15.1	215	5100	male	2007
i179	Gentoo	Biscoe	44.5	14.3	216	4100	female	2007
i180	Gentoo	Biscoe	47.8	15.0	215	5650	male	2007
i181	Gentoo	Biscoe	48.2	14.3	210	4600	female	2007

ID	especie	isla	largo_pico_mm	grosor_pico_mm	largo_aleta_mm	masa_corporal_g	genero	año
i182	Gentoo	Biscoe	50.0	15.3	220	5550	male	2007
i183	Gentoo	Biscoe	47.3	15.3	222	5250	male	2007
i184	Gentoo	Biscoe	42.8	14.2	209	4700	female	2007
i185	Gentoo	Biscoe	45.1	14.5	207	5050	female	2007
i186	Gentoo	Biscoe	59.6	17.0	230	6050	male	2007
i187	Gentoo	Biscoe	49.1	14.8	220	5150	female	2008
i188	Gentoo	Biscoe	48.4	16.3	220	5400	male	2008
i189	Gentoo	Biscoe	42.6	13.7	213	4950	female	2008
i190	Gentoo	Biscoe	44.4	17.3	219	5250	male	2008
i191	Gentoo	Biscoe	44.0	13.6	208	4350	female	2008
i192	Gentoo	Biscoe	48.7	15.7	208	5350	male	2008
i193	Gentoo	Biscoe	42.7	13.7	208	3950	female	2008
i194	Gentoo	Biscoe	49.6	16.0	225	5700	male	2008
i195	Gentoo	Biscoe	45.3	13.7	210	4300	female	2008
i196	Gentoo	Biscoe	49.6	15.0	216	4750	male	2008
i197	Gentoo	Biscoe	50.5	15.9	222	5550	male	2008
i198	Gentoo	Biscoe	43.6	13.9	217	4900	female	2008
i199	Gentoo	Biscoe	45.5	13.9	210	4200	female	2008
i200	Gentoo	Biscoe	50.5	15.9	225	5400	male	2008
i201	Gentoo	Biscoe	44.9	13.3	213	5100	female	2008
i202	Gentoo	Biscoe	45.2	15.8	215	5300	male	2008
i203	Gentoo	Biscoe	46.6	14.2	210	4850	female	2008
i204	Gentoo	Biscoe	48.5	14.1	220	5300	male	2008
i205	Gentoo	Biscoe	45.1	14.4	210	4400	female	2008
i206	Gentoo	Biscoe	50.1	15.0	225	5000	male	2008
i207	Gentoo	Biscoe	46.5	14.4	217	4900	female	2008
i208	Gentoo	Biscoe	45.0	15.4	220	5050	male	2008
i209	Gentoo	Biscoe	43.8	13.9	208	4300	female	2008
i210	Gentoo	Biscoe	45.5	15.0	220	5000	male	2008
i211	Gentoo	Biscoe	43.2	14.5	208	4450	female	2008
i212	Gentoo	Biscoe	50.4	15.3	224	5550	male	2008
i213	Gentoo	Biscoe	45.3	13.8	208	4200	female	2008
i214	Gentoo	Biscoe	46.2	14.9	221	5300	male	2008
i215	Gentoo	Biscoe	45.7	13.9	214	4400	female	2008
i216	Gentoo	Biscoe	54.3	15.7	231	5650	male	2008
i217	Gentoo	Biscoe	45.8	14.2	219	4700	female	2008
i218	Gentoo	Biscoe	49.8	16.8	230	5700	male	2008
i219	Gentoo	Biscoe	46.2	14.4	214	4650	female	2008
i220	Gentoo	Biscoe	49.5	16.2	229	5800	male	2008
i221	Gentoo	Biscoe	43.5	14.2	220	4700	female	2008
i222	Gentoo	Biscoe	50.7	15.0	223	5550	male	2008
i223	Gentoo	Biscoe	47.7	15.0	216	4750	female	2008
i224	Gentoo	Biscoe	46.4	15.6	221	5000	male	2008
i225	Gentoo	Biscoe	48.2	15.6	221	5100	male	2008
i226	Gentoo	Biscoe	46.5	14.8	217	5200	female	2008
i227	Gentoo	Biscoe	46.4	15.0	216	4700	female	2008
i228	Gentoo	Biscoe	48.6	16.0	230	5800	male	2008
i229	Gentoo	Biscoe	47.5	14.2	209	4600	female	2008
i230	Gentoo	Biscoe	51.1	16.3	220	6000	male	2008
i231	Gentoo	Biscoe	45.2	13.8	215	4750	female	2008
i232	Gentoo	Biscoe	45.2	16.4	223	5950	male	2008
i233	Gentoo	Biscoe	49.1	14.5	212	4625	female	2009

ID	especie	isla	largo_pico_mm	grosor_pico_mm	largo_aleta_mm	masa_corporal_g	genero	año
i234	Gentoo	Biscoe	52.5	15.6	221	5450	male	2009
i235	Gentoo	Biscoe	47.4	14.6	212	4725	female	2009
i236	Gentoo	Biscoe	50.0	15.9	224	5350	male	2009
i237	Gentoo	Biscoe	44.9	13.8	212	4750	female	2009
i238	Gentoo	Biscoe	50.8	17.3	228	5600	male	2009
i239	Gentoo	Biscoe	43.4	14.4	218	4600	female	2009
i240	Gentoo	Biscoe	51.3	14.2	218	5300	male	2009
i241	Gentoo	Biscoe	47.5	14.0	212	4875	female	2009
i242	Gentoo	Biscoe	52.1	17.0	230	5550	male	2009
i243	Gentoo	Biscoe	47.5	15.0	218	4950	female	2009
i244	Gentoo	Biscoe	52.2	17.1	228	5400	male	2009
i245	Gentoo	Biscoe	45.5	14.5	212	4750	female	2009
i246	Gentoo	Biscoe	49.5	16.1	224	5650	male	2009
i247	Gentoo	Biscoe	44.5	14.7	214	4850	female	2009
i248	Gentoo	Biscoe	50.8	15.7	226	5200	male	2009
i249	Gentoo	Biscoe	49.4	15.8	216	4925	male	2009
i250	Gentoo	Biscoe	46.9	14.6	222	4875	female	2009
i251	Gentoo	Biscoe	48.4	14.4	203	4625	female	2009
i252	Gentoo	Biscoe	51.1	16.5	225	5250	male	2009
i253	Gentoo	Biscoe	48.5	15.0	219	4850	female	2009
i254	Gentoo	Biscoe	55.9	17.0	228	5600	male	2009
i255	Gentoo	Biscoe	47.2	15.5	215	4975	female	2009
i256	Gentoo	Biscoe	49.1	15.0	228	5500	male	2009
i257	Gentoo	Biscoe	47.3	13.8	216	4725	female	2009
i258	Gentoo	Biscoe	46.8	16.1	215	5500	male	2009
i259	Gentoo	Biscoe	41.7	14.7	210	4700	female	2009
i260	Gentoo	Biscoe	53.4	15.8	219	5500	male	2009
i261	Gentoo	Biscoe	43.3	14.0	208	4575	female	2009
i262	Gentoo	Biscoe	48.1	15.1	209	5500	male	2009
i263	Gentoo	Biscoe	50.5	15.2	216	5000	female	2009
i264	Gentoo	Biscoe	49.8	15.9	229	5950	male	2009
i265	Gentoo	Biscoe	43.5	15.2	213	4650	female	2009
i266	Gentoo	Biscoe	51.5	16.3	230	5500	male	2009
i267	Gentoo	Biscoe	46.2	14.1	217	4375	female	2009
i268	Gentoo	Biscoe	55.1	16.0	230	5850	male	2009
i269	Gentoo	Biscoe	44.5	15.7	217	4875	female	2009
i270	Gentoo	Biscoe	48.8	16.2	222	6000	male	2009
i271	Gentoo	Biscoe	47.2	13.7	214	4925	female	2009
i272	Gentoo	Biscoe	50.8	15.9	222	4875	male	2009
i273	Gentoo	Biscoe	46.8	14.3	215	4850	female	2009
i274	Gentoo	Biscoe	50.4	15.7	222	5750	male	2009
i275	Gentoo	Biscoe	45.2	14.8	212	5200	female	2009
i276	Gentoo	Biscoe	49.9	16.1	213	5400	male	2009
i277	Chinstrap	Dream	46.5	17.9	192	3500	female	2007
i278	Chinstrap	Dream	50.0	19.5	196	3900	male	2007
i279	Chinstrap	Dream	51.3	19.2	193	3650	male	2007
i280	Chinstrap	Dream	45.4	18.7	188	3525	female	2007
i281	Chinstrap	Dream	52.7	19.8	197	3725	male	2007
i282	Chinstrap	Dream	45.2	17.8	198	3950	female	2007
i283	Chinstrap	Dream	46.1	18.2	178	3250	female	2007
i284	Chinstrap	Dream	51.3	18.2	197	3750	male	2007
i285	Chinstrap	Dream	46.0	18.9	195	4150	female	2007

ID	especie	isla	largo_pico_mm	grosor_pico_mm	largo_aleta_mm	masa_corporal_g	genero	año
i286	Chinstrap	Dream	51.3	19.9	198	3700	male	2007
i287	Chinstrap	Dream	46.6	17.8	193	3800	female	2007
i288	Chinstrap	Dream	51.7	20.3	194	3775	male	2007
i289	Chinstrap	Dream	47.0	17.3	185	3700	female	2007
i290	Chinstrap	Dream	52.0	18.1	201	4050	male	2007
i291	Chinstrap	Dream	45.9	17.1	190	3575	female	2007
i292	Chinstrap	Dream	50.5	19.6	201	4050	male	2007
i293	Chinstrap	Dream	50.3	20.0	197	3300	male	2007
i294	Chinstrap	Dream	58.0	17.8	181	3700	female	2007
i295	Chinstrap	Dream	46.4	18.6	190	3450	female	2007
i296	Chinstrap	Dream	49.2	18.2	195	4400	male	2007
i297	Chinstrap	Dream	42.4	17.3	181	3600	female	2007
i298	Chinstrap	Dream	48.5	17.5	191	3400	male	2007
i299	Chinstrap	Dream	43.2	16.6	187	2900	female	2007
i300	Chinstrap	Dream	50.6	19.4	193	3800	male	2007
i301	Chinstrap	Dream	46.7	17.9	195	3300	female	2007
i302	Chinstrap	Dream	52.0	19.0	197	4150	male	2007
i303	Chinstrap	Dream	50.5	18.4	200	3400	female	2008
i304	Chinstrap	Dream	49.5	19.0	200	3800	male	2008
i305	Chinstrap	Dream	46.4	17.8	191	3700	female	2008
i306	Chinstrap	Dream	52.8	20.0	205	4550	male	2008
i307	Chinstrap	Dream	40.9	16.6	187	3200	female	2008
i308	Chinstrap	Dream	54.2	20.8	201	4300	male	2008
i309	Chinstrap	Dream	42.5	16.7	187	3350	female	2008
i310	Chinstrap	Dream	51.0	18.8	203	4100	male	2008
i311	Chinstrap	Dream	49.7	18.6	195	3600	male	2008
i312	Chinstrap	Dream	47.5	16.8	199	3900	female	2008
i313	Chinstrap	Dream	47.6	18.3	195	3850	female	2008
i314	Chinstrap	Dream	52.0	20.7	210	4800	male	2008
i315	Chinstrap	Dream	46.9	16.6	192	2700	female	2008
i316	Chinstrap	Dream	53.5	19.9	205	4500	male	2008
i317	Chinstrap	Dream	49.0	19.5	210	3950	male	2008
i318	Chinstrap	Dream	46.2	17.5	187	3650	female	2008
i319	Chinstrap	Dream	50.9	19.1	196	3550	male	2008
i320	Chinstrap	Dream	45.5	17.0	196	3500	female	2008
i321	Chinstrap	Dream	50.9	17.9	196	3675	female	2009
i322	Chinstrap	Dream	50.8	18.5	201	4450	male	2009
i323	Chinstrap	Dream	50.1	17.9	190	3400	female	2009
i324	Chinstrap	Dream	49.0	19.6	212	4300	male	2009
i325	Chinstrap	Dream	51.5	18.7	187	3250	male	2009
i326	Chinstrap	Dream	49.8	17.3	198	3675	female	2009
i327	Chinstrap	Dream	48.1	16.4	199	3325	female	2009
i328	Chinstrap	Dream	51.4	19.0	201	3950	male	2009
i329	Chinstrap	Dream	45.7	17.3	193	3600	female	2009
i330	Chinstrap	Dream	50.7	19.7	203	4050	male	2009
i331	Chinstrap	Dream	42.5	17.3	187	3350	female	2009
i332	Chinstrap	Dream	52.2	18.8	197	3450	male	2009
i333	Chinstrap	Dream	45.2	16.6	191	3250	female	2009
i334	Chinstrap	Dream	49.3	19.9	203	4050	male	2009
i335	Chinstrap	Dream	50.2	18.8	202	3800	male	2009
i336	Chinstrap	Dream	45.6	19.4	194	3525	female	2009
i337	Chinstrap	Dream	51.9	19.5	206	3950	male	2009

ID	especie	isla	largo_pico_mm	grosor_pico_mm	largo_aleta_mm	masa_corporal_g	genero	año
i338	Chinstrap	Dream	46.8	16.5	189	3650	female	2009
i339	Chinstrap	Dream	45.7	17.0	195	3650	female	2009
i340	Chinstrap	Dream	55.8	19.8	207	4000	male	2009
i341	Chinstrap	Dream	43.5	18.1	202	3400	female	2009
i342	Chinstrap	Dream	49.6	18.2	193	3775	male	2009
i343	Chinstrap	Dream	50.8	19.0	210	4100	male	2009
i344	Chinstrap	Dream	50.2	18.7	198	3775	female	2009

Exploracion de la matriz

```
dim(penguins)
```

```
## [1] 344   9
```

```
colnames(penguins)
```

```
## [1] "ID"              "especie"         "isla"            "largo_pico_mm"
## [5] "grosor_pico_mm"  "largo_aleta_mm"  "masa_corporal_g" "genero"
## [9] "año"
```

```
str(penguins)
```

```
## tibble [344 x 9] (S3: tbl_df/tbl/data.frame)
##  $ ID             : chr [1:344] "i1" "i2" "i3" "i4" ...
##  $ especie        : chr [1:344] "Adelie" "Adelie" "Adelie" "Adelie" ...
##  $ isla           : chr [1:344] "Torgersen" "Torgersen" "Torgersen" "Torgersen" ...
##  $ largo_pico_mm  : num [1:344] 39.1 39.5 40.3 37.8 36.7 39.3 38.9 39.2 34.1 42 ...
##  $ grosor_pico_mm : num [1:344] 18.7 17.4 18 18.1 19.3 20.6 17.8 19.6 18.1 20.2 ...
##  $ largo_aleta_mm : num [1:344] 181 186 195 190 193 190 181 195 193 190 ...
##  $ masa_corporal_g: num [1:344] 3750 3800 3250 3700 3450 ...
##  $ genero         : chr [1:344] "male" "female" "female" "female" ...
##  $ año            : num [1:344] 2007 2007 2007 2007 2007 ...
```

```
anyNA(penguins)
```

```
## [1] FALSE
```

Escalamiento de la matriz

Generacion de variables X

```
X <- penguins %>%
  select(grosor_pico_mm, largo_pico_mm) %>%
  scale()
head(X)
```

```
##      grosor_pico_mm largo_pico_mm
## [1,]      0.7863145    -0.8825216
## [2,]      0.1267012    -0.8093460
## [3,]      0.4311381    -0.6629947
## [4,]      0.4818776    -1.1203424
## [5,]      1.0907514    -1.3215754
## [6,]      1.7503647    -0.8459338
```

Generacion de variables Y

```
Y <- penguins %>%
  select(largo_aleta_mm,masa_corporal_g) %>%
  scale()
head(Y)
```

```
##      largo_aleta_mm masa_corporal_g
## [1,]     -1.4166210      -0.5646829
## [2,]     -1.0614850      -0.5022529
## [3,]     -0.4222402      -1.1889828
## [4,]     -0.7773762      -0.6271129
## [5,]     -0.5642946      -0.9392628
## [6,]     -0.7773762      -0.6895429
```

Analisis canonico con un par de variables

Libreria

```
install.packages("CCA")
library("CCA")
```

Analisis

```
ac<-cancor(X,Y)
```

Visualizacion de la matriz X

```
ac$xcoef
```

```
##                       [,1]       [,2]
## grosor_pico_mm  0.03098538 0.04615243
## largo_pico_mm  -0.03746177 0.04107014
```

Visualizacion de la matriz Y

```
ac$ycoef
```

```
##                         [,1]       [,2]
## largo_aleta_mm  -0.055220261 -0.0951545
## masa_corporal_g  0.001411466  0.1100076
```

Visualizacion de la correlacion canonica

```
ac$cor
```

```
## [1] 0.79268475 0.09867305
```

Obtencion de la matriz de variables canonicas se obtiene multiplicando los coeficientes por cada una de las variables (X1 y Y1)

```
ac1_X <- as.matrix(X) %*% ac$xcoef[, 1]
ac1_Y <- as.matrix(Y) %*% ac$ycoef[, 1]
```

Visualizacion de los primeros 20 datos

```
ac1_X[1:20,]
```

```
##  [1] 0.05742508 0.03424542 0.03819593 0.05690117 0.08330590 0.08592589
##  [7] 0.04464608 0.07088939 0.08225809 0.06113346 0.04117935 0.04432371
## [13] 0.02642463 0.10015624 0.12599695 0.06040849 0.06488291 0.06556776
## [19] 0.08491867 0.05415894
```

```
ac1_Y[1:20,]
```

```
##  [1] 0.07742915 0.05790657 0.02163800 0.04204177 0.02983476 0.04195365
##  [7] 0.07720886 0.02414936 0.02987882 0.04301106 0.05702539 0.08126317
## [13] 0.07253771 0.03829586 0.01189829 0.06165247 0.02199048 0.01599667
## [19] 0.06491373 0.02723438
```

Correlacion canonica entre variable X1 y Y1

```
cor(ac1_X,ac1_Y)
```

```
##           [,1]
## [1,] 0.7926848
```

Verificacion de la correlacion canonica

```
assertthat::are_equal(ac$cor[1],
                      cor(ac1_X,ac1_Y)[1])
```

```
## [1] TRUE
```

Analisis canonico con dos pares de variables

Calculo de las variables X2 y Y2

```
ac2_X <- as.matrix(X) %*% ac$xcoef[, 2]
ac2_Y <- as.matrix(Y) %*% ac$ycoef[, 2]
```

Agregamos las variables generadas a la matriz original de penguins

```
ac_df <- penguins %>%
  mutate(ac1_X=ac1_X,
         ac1_Y=ac1_Y,
         ac2_X=ac2_X,
         ac2_Y=ac2_Y)
```

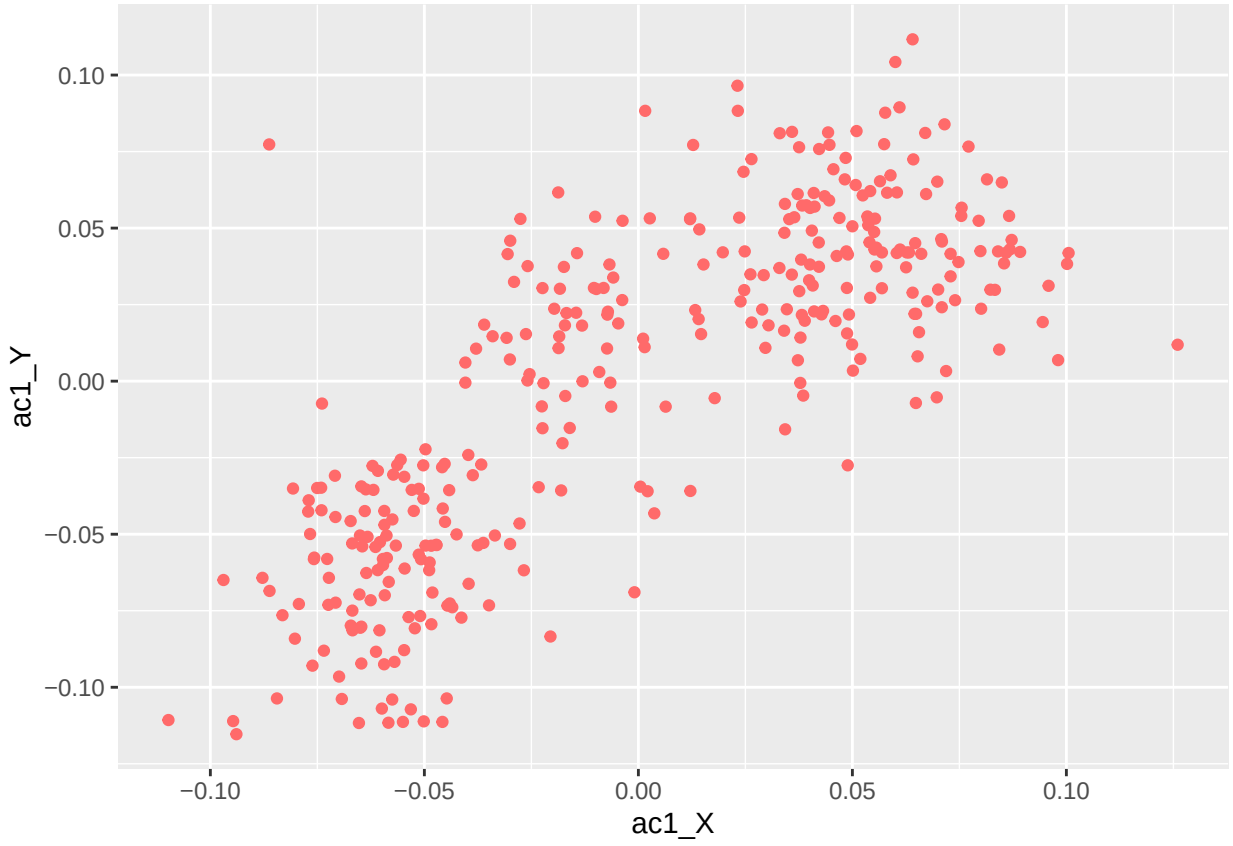
Visualizacion de los nombres de las variables

```
colnames(ac_df)
```

```
##  [1] "ID"              "especie"         "isla"            "largo_pico_mm"
##  [5] "grosor_pico_mm"  "largo_aleta_mm"  "masa_corporal_g" "genero"
##  [9] "año"             "ac1_X"           "ac1_Y"           "ac2_X"
## [13] "ac2_Y"
```

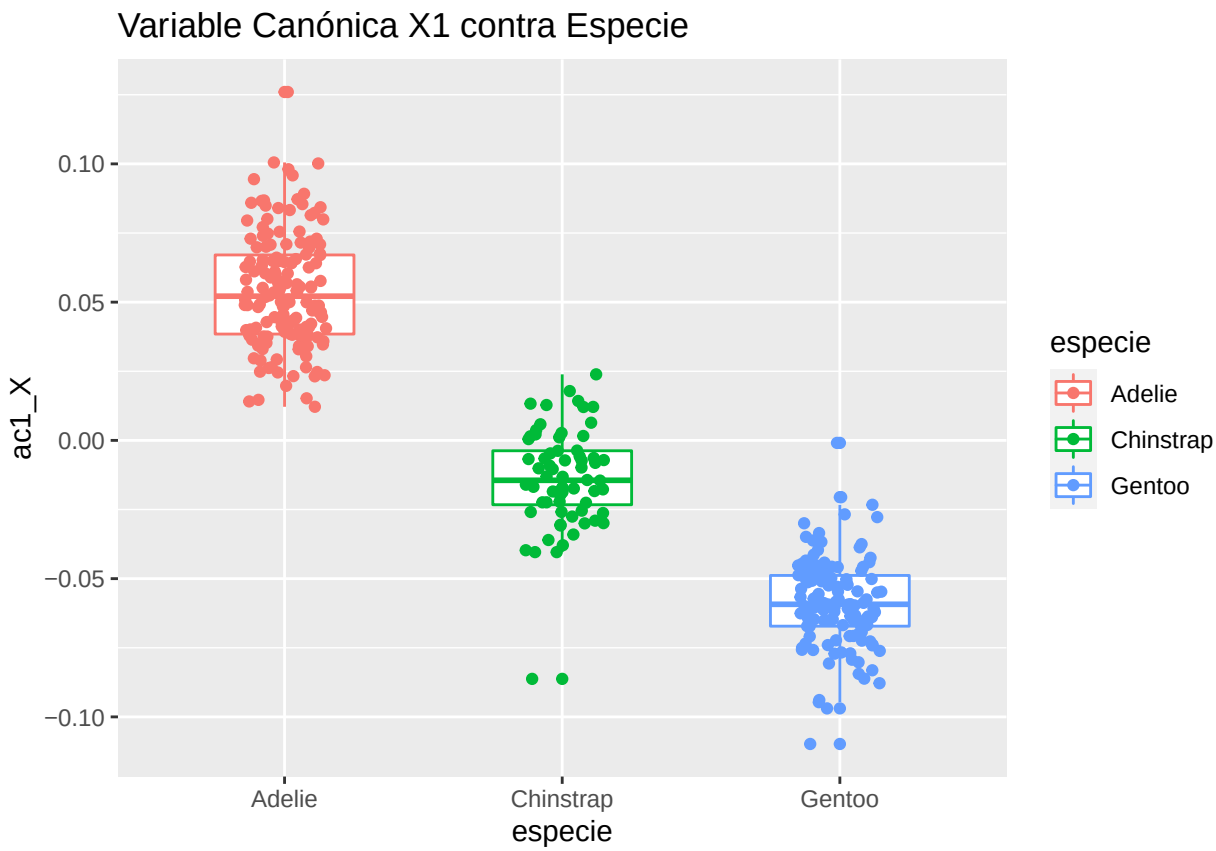
Generacion del grafico scater plot para la visualizacion de X1 y Y1

```
ac_df %>%
  ggplot(aes(x=ac1_X,y=ac1_Y))+
  geom_point(color="indianred1")
```



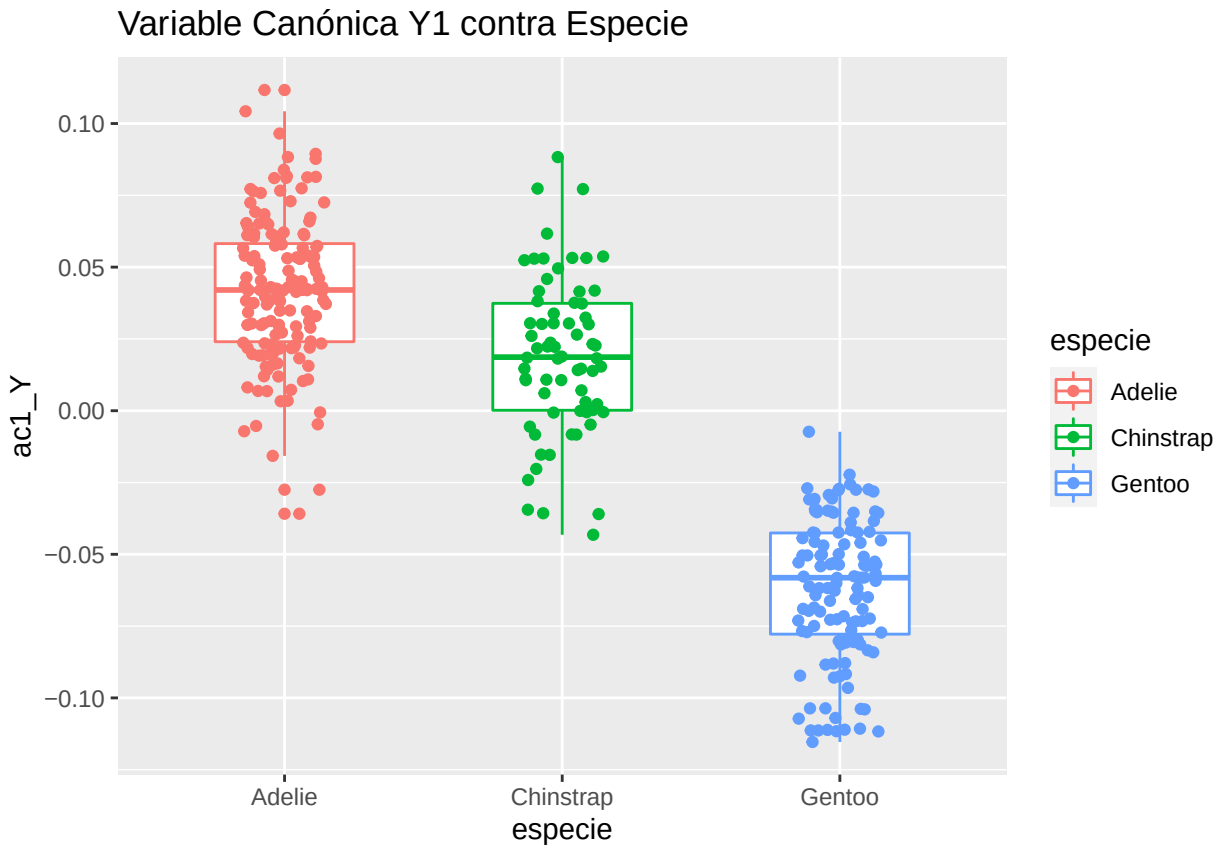
Generacion de un boxplot

```
ac_df %>%
  ggplot(aes(x=especie,y=ac1_X, color=especie))+
  geom_boxplot(width=0.5)+
  geom_jitter(width=0.15)+
  ggtitle("Variable Canónica X1 contra Especie")
```

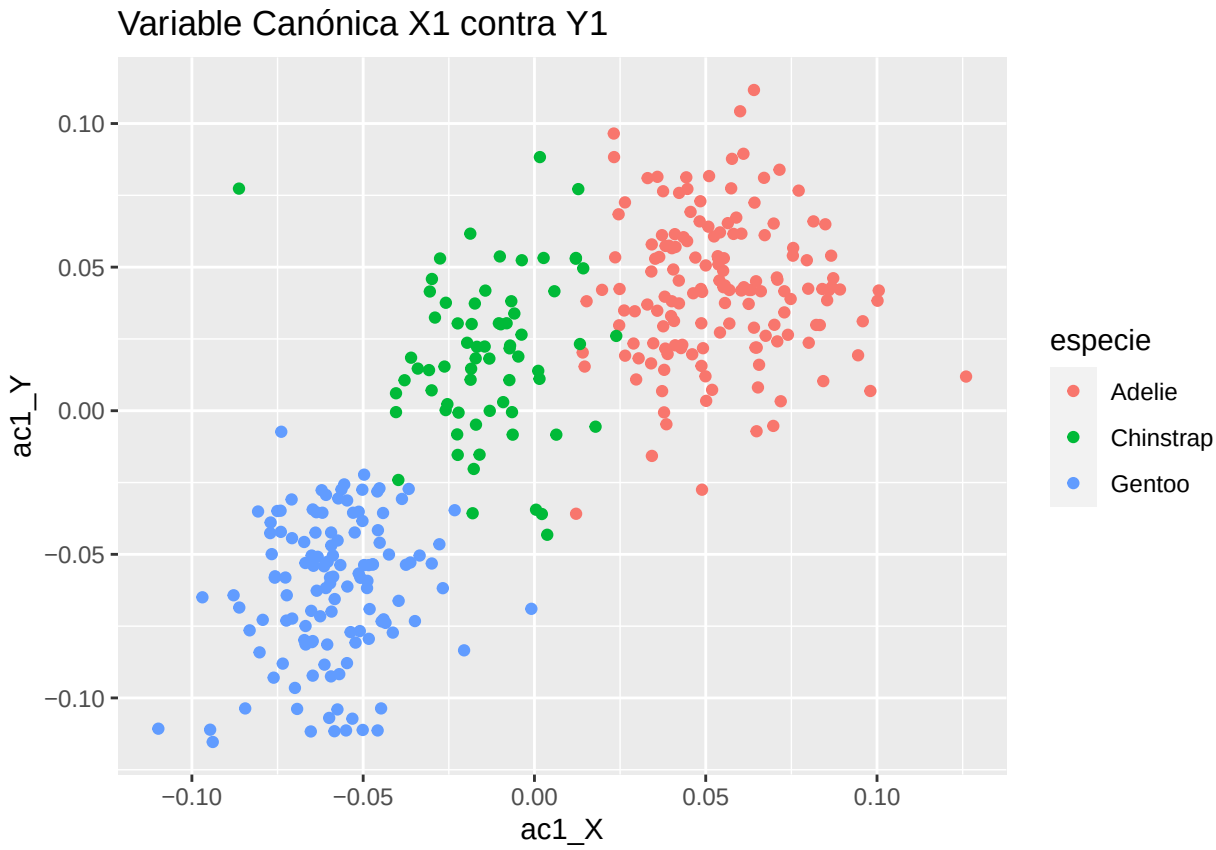


Interpretación: se observa una correlacion entre la variable canónica X1 y la variable latente Especie

```
ac_df %>%
  ggplot(aes(x=especie,y=ac1_Y, color=especie))+
  geom_boxplot(width=0.5)+
  geom_jitter(width=0.15)+
  ggtitle("Variable Canónica Y1 contra Especie")
```

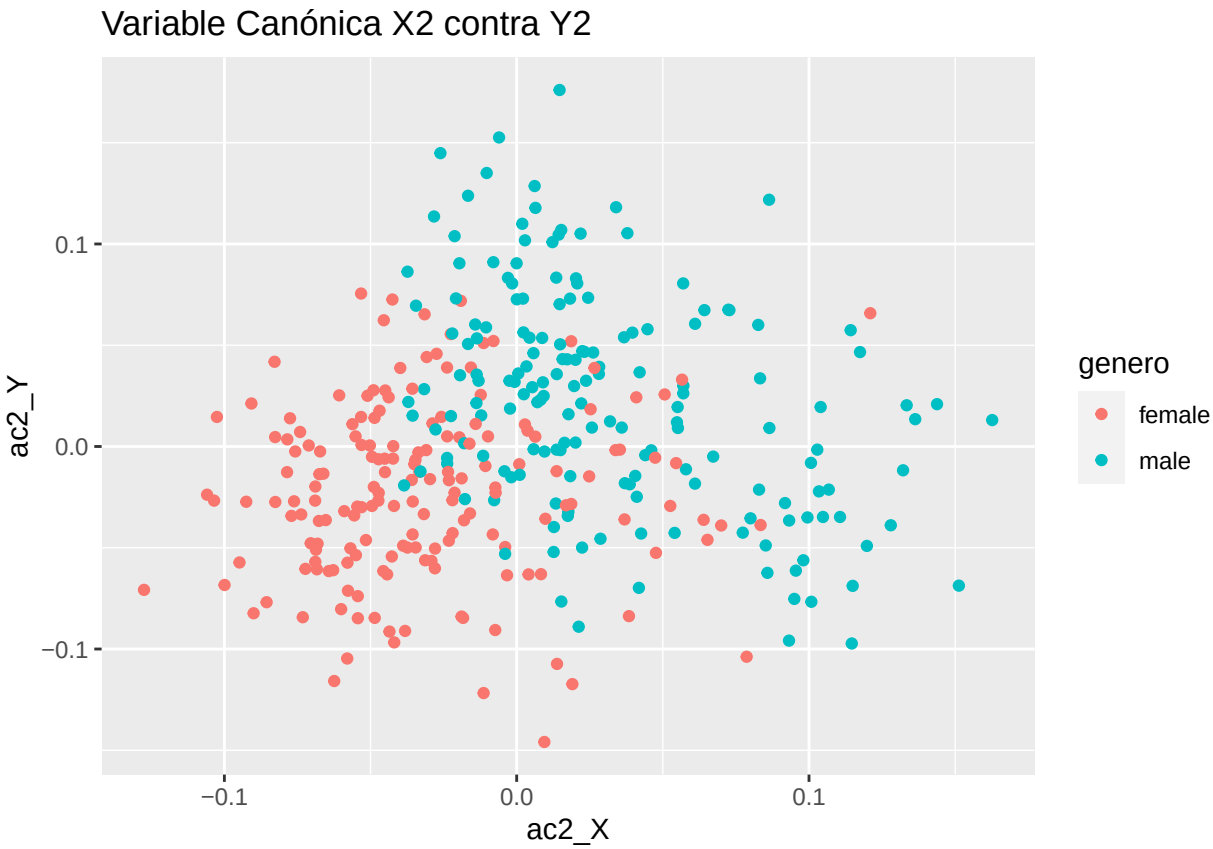



```
ac_df %>%
  ggplot(aes(x=ac1_X,y=ac1_Y, color=especie))+
  geom_point()+
  ggtitle("Variable Canónica X1 contra Y1")
```



Scarter plot con las variables canonicas X2 y Y2 separadas por genero.

```
ac_df %>%
  ggplot(aes(x=ac2_X,y=ac2_Y, color=genero))+
  geom_point()+
  ggtitle("Variable Canónica X2 contra Y2")
```



Interpretacion: No de identifica correlacion entre el conjunto de variables X2 y Y2 separadas por genero.