Teammates:
Joaquin Carretero, Aayoshi Dutta, Shiv Goel, Himani Bhatia, and Shrunkhala Rajesh

HW2. Understanding of residual bootstrap and the data bootstrap.

Briefly explain your understanding of what is the residual bootstrap and the data bootstrap:

Residual Bootstrap:
- Fit a regression model on the original data to get coefficient estimates (β) and residuals (e).
- Resample the residuals with replacement to create new residuals (e*).
- Add the resampled residuals (e*) to the predicted values from the original model (ŷ) to create new response values (y*).
- Refit the model on y* and original predictors to get new coefficient estimates (β*).
- Repeat many times to get a bootstrap distribution of β*. Use this to construct confidence intervals.

Data Bootstrap:
- Resample the rows of the original data with replacement to create a new bootstrap dataset.
- Fit the model on this bootstrap dataset to get coefficient estimates (β*).
- Repeat many times to get a bootstrap distribution of β*. Use this to construct confidence intervals.

In summary, residual bootstrap resamples the residuals while keeping the original X data, while data bootstrap resamples the entire rows of data (X and y). Both provide ways to get bootstrap estimates of uncertainty in regression coefficients.

Result Tables:

Name	Boot strap	Quantile		
	Residuals	**25%**	**50%**	**75%**
Shiv	Screen_75_inch	-478.6979	-62.01891	326.5466
	Screen_85_inch	-512.5728	-87.87365	271.2251
	Resolution_4K	193.2723	521.65616	1142.4631
	Sony	-1492.0808	-720.23393	-365.5274
	Data Bootstrap			
	Screen_75_inch	-333.9882	-30.23344	366.7182
	Screen_85_inch	-434.3616	-52.1305	489.9909
	Resolution_4K	182.7976	518.20535	1164.9078
	Sony	-1839.9626	-747.98274	-261.8886

Name	Boot strap	Quantile		
	Residuals	**25%**	**50%**	**75%**
Shrunkhala	Screen_75_inch	47.03281	99.82143	156.8342
	Screen_85_inch	126.12196	182.05189	241.51
	Resolution_4K	436.48109	500	565.2215
	Sony	73.11044	121.69706	175.7967
	Data Bootstrap	**25%**	**50%**	**75%**
	Screen_75_inch	16.31853	97.76929	167.897
	Screen_85_inch	123.9532	175.88741	235.5812
	Resolution_4K	400.20352	484.79308	612.0329
	Sony	57.23382	122.94997	182.7871

Name	Boot strap	Quantile		
	Residuals	**25%**	**50%**	**75%**
Himani	Screen_75_inch	4116.836	6610.92	14020.647
	Screen_85_inch	5790.248	9227.679	19469.231
	Resolution_4K	1879.595	3037.088	6237.5
	Sony	1613.005	2621.324	5423.077
	Data Bootstrap	**25%**	**50%**	**75%**
	Screen_75_inch	3630.647	5569.865	11051.829
	Screen_85_inch	5233.875	8014.024	15768.11
	Resolution_4K	1686.826	2537.674	5515.212
	Sony	1348.386	2222.022	4530.949

Name	Boot strap	Quantile		
	Residuals	**25%**	**50%**	**75%**
Aayoshi	Screen_75_inch	207.2552	275.552	343.236
	Screen_85_inch	559.7771	643.4551	744.9864
	Resolution_4K	326.4428	387.5323	457.2629
	Sony	109.3106	163.7906	221.4538
	Data Bootstrap	**25%**	**50%**	**75%**
	Screen_75_inch	211.0356	278.0658	346.6039
	Screen_85_inch	521.5861	642.6544	789.8716
	Resolution_4K	317.346	385.9953	476.003
	Sony	102.3861	167.4597	248.456

Name	Boot strap	Quantile		
	Residuals	**25%**	**50%**	**75%**
Joaquin	Screen_75_inch	166.66667	166.66667	166.66667
	Screen_85_inch	83.33333	83.33333	83.33333
	Resolution_4K	1000	1000	1000
	Sony	250	250	250
	Data Bootstrap	**25%**	**50%**	**75%**
	Screen_75_inch	166.66667	166.66667	166.66667
	Screen_85_inch	83.33333	83.33333	83.33333
	Resolution_4K	1000	1000	1000
	Sony	250	250	250

Here are some insights on the results:

- For Shiv, the data bootstrap CIs are a bit narrower than the residual bootstrap CIs for most attributes. This suggests there may be more variability in the residuals than the raw data.

- Shrunkhala's CIs are quite narrow overall, especially for Sony. This indicates her preferences were relatively stable/consistent across profiles.

- Himani has very wide CIs, suggesting high variability in her preferences. Data bootstrap CIs are marginally narrower than residual bootstrap.

- Aayoshi's CIs are moderately wide, data bootstrap is slightly narrower. Preferences seem moderately variable.

- Joaquin's CIs are extremely narrow (just the point estimate), indicating his rankings were perfectly consistent across profiles. This results in identical CIs for both residual and data bootstrap.