ASTR 400B: Homework 3

Due on Feb 6, 2020

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2. Mass Breakdown

This is raw output from pandas.DataFrame.to_latex(), with rows sorted alphabetically:

Galaxy Name	Halo Mass	Disk Mass	Bulge Mass	Total	f_bar
M31	1.921	0.120	0.019	2.060	0.068
M33	0.187	0.009	0.000	0.196	0.047
MW	1.975	0.075	0.010	2.060	0.041
All	4.082	0.204	0.029	4.316	0.054

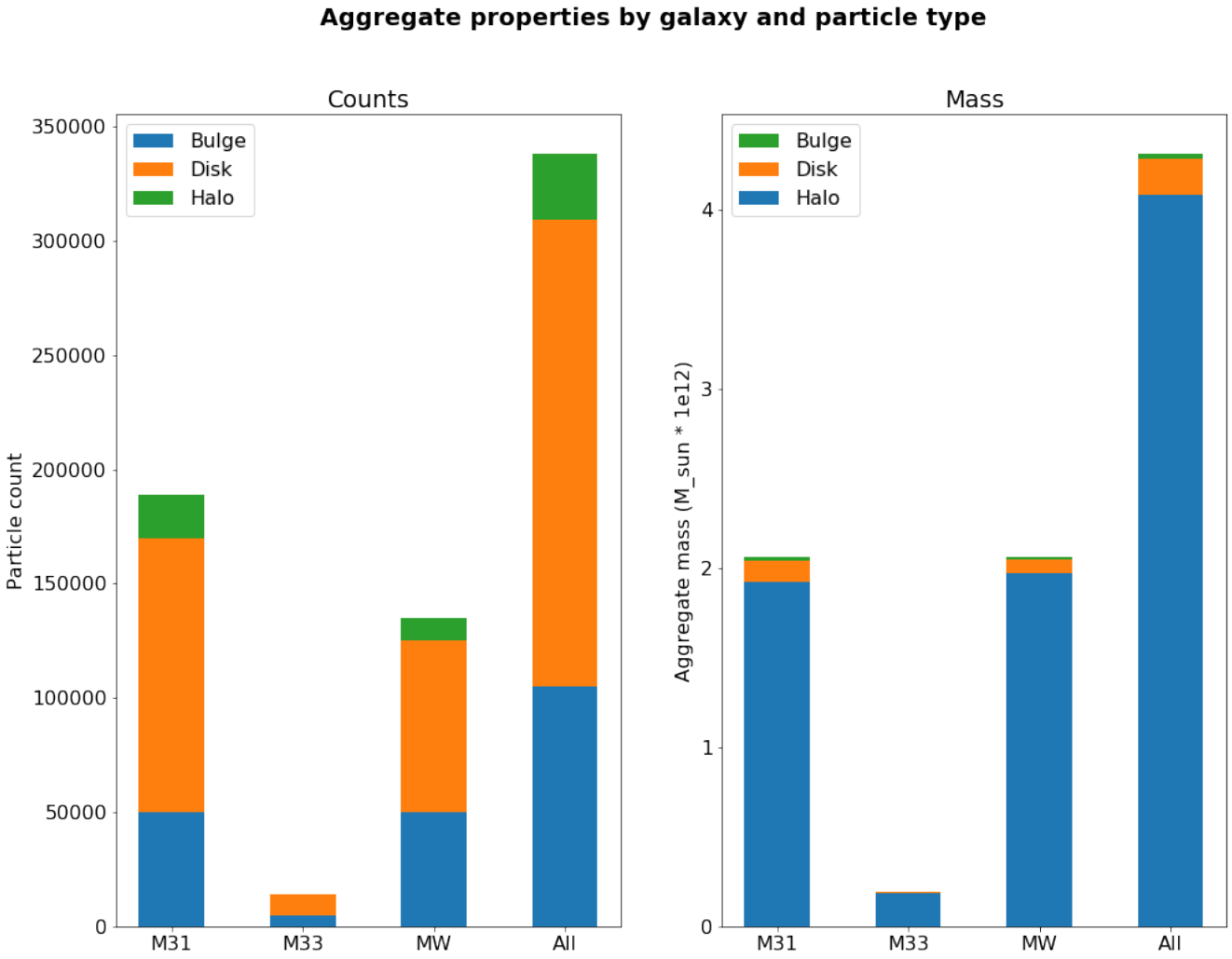
With a bit of manual formatting:

Galaxy Name	**Halo Mass** ($M_\odot \times 10^{12}$)	**Disk Mass** ($M_\odot \times 10^{12}$)	**Bulge Mass** ($M_\odot \times 10^{12}$)	**Total** ($M_\odot \times 10^{12}$)	$\mathbf{f_{bar}}$
MW	1.975	0.075	0.010	2.060	0.041
M31	1.921	0.120	0.019	2.060	0.068
M33	0.187	0.009	0.000	0.196	0.047
Local Group	4.082	0.204	0.029	4.316	0.054

Compare that with particle counts:

Galaxy Name	**Halo Count**	**Disk Count**	**Bulge Count**	**Total**
MW	50000	75000	10000	135000
M31	50000	120000	19000	189000
M33	5000	9300	0	14300
All	105000	204300	29000	338300

The DM halo contains fewer but more massive particles. This may be easier to see on stacked bar charts showing the distribution:



3. Questions

1. Total mass: M31 and the MW have the same total mass in this simulation. Dark matter in the halo dominates in most cases, but especially for the MW.

2. Stellar mass: Disk + bulge mass is about 60% higher for M31 than the MW. Assuming a roughly similar distribution of star types and ages, M31 is likely to be more luminous.

3. Dark matter mass:

4. Baryon fraction: