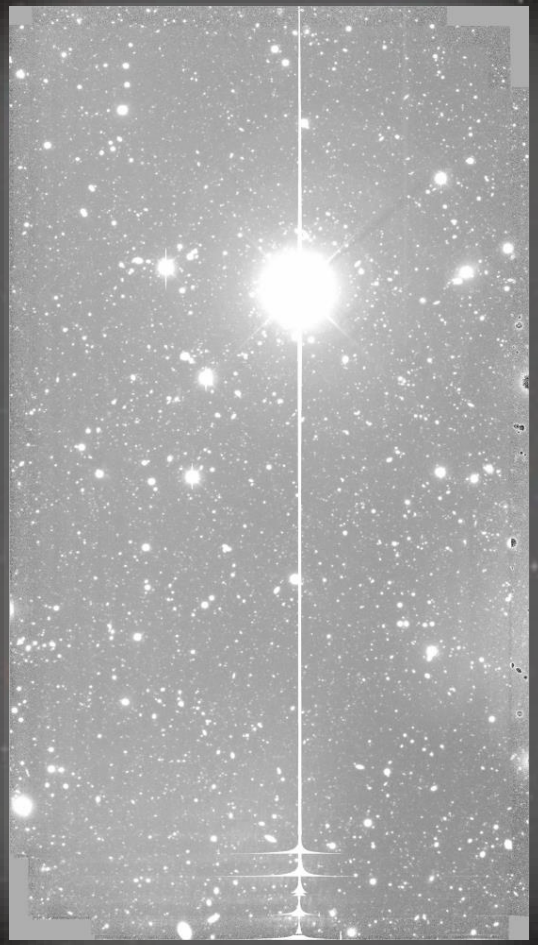
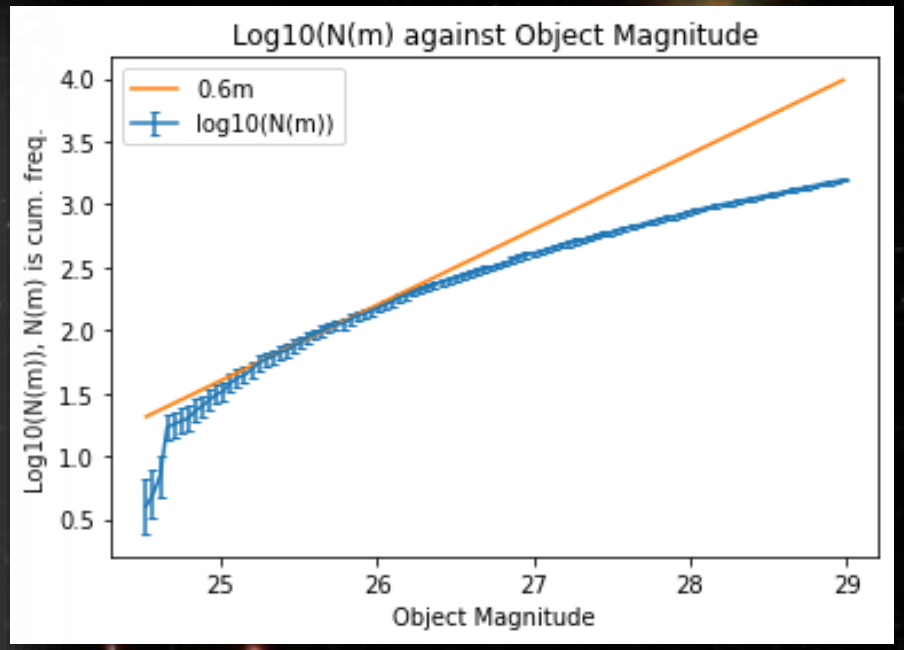
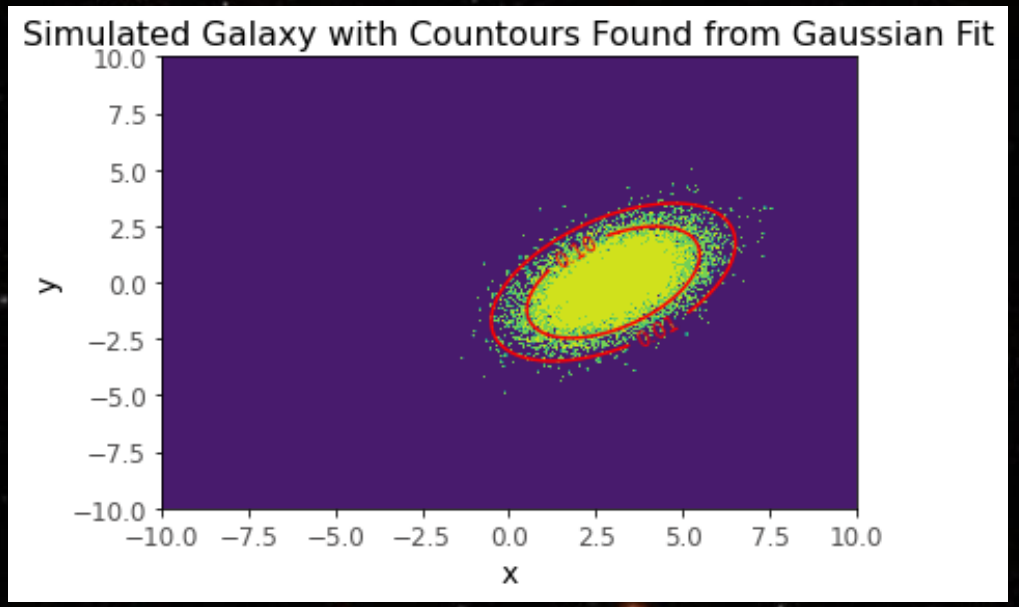
RESULTS







Index	Class	Num Objects	Avg Magnitude	Total Magnitude	Total Count	Count Error	Size	Centre
74	Star	1	N/A	12.03	16000	400	336	(4299,480)
41	Cluster	2	11.06	8.56	41500	600	910	(3596,285)
1180	Galaxy	1	N/A	24.30	5100	200	53	(4233,2020)

ASTRONOMICAL IMAGE PROCESSING

DAVID BATES & SUKORNO ASAD

FITS IMAGE

Fig. 1

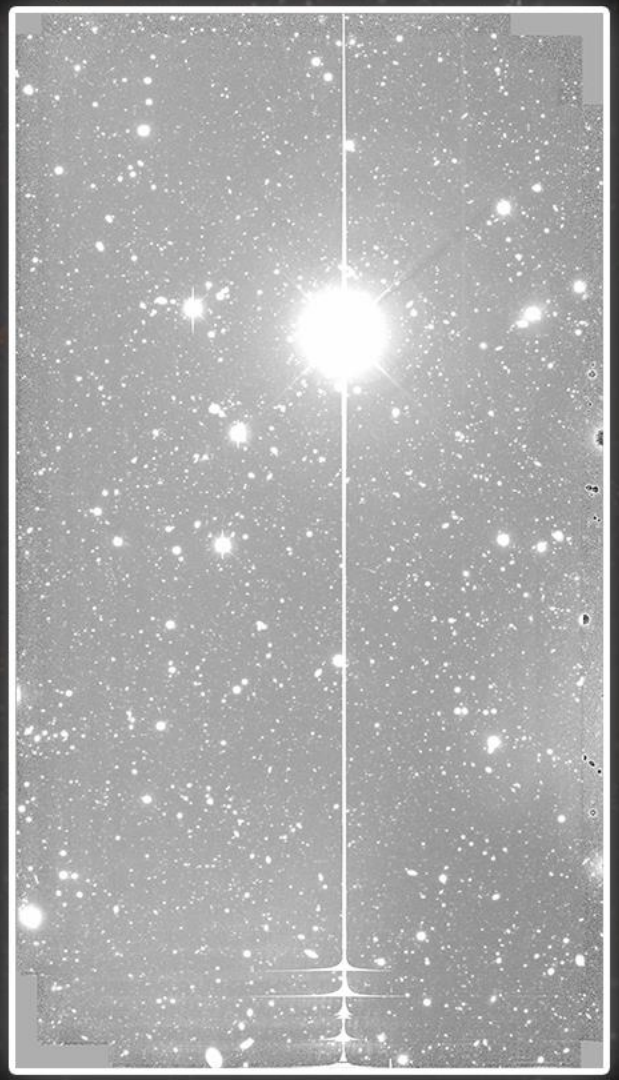
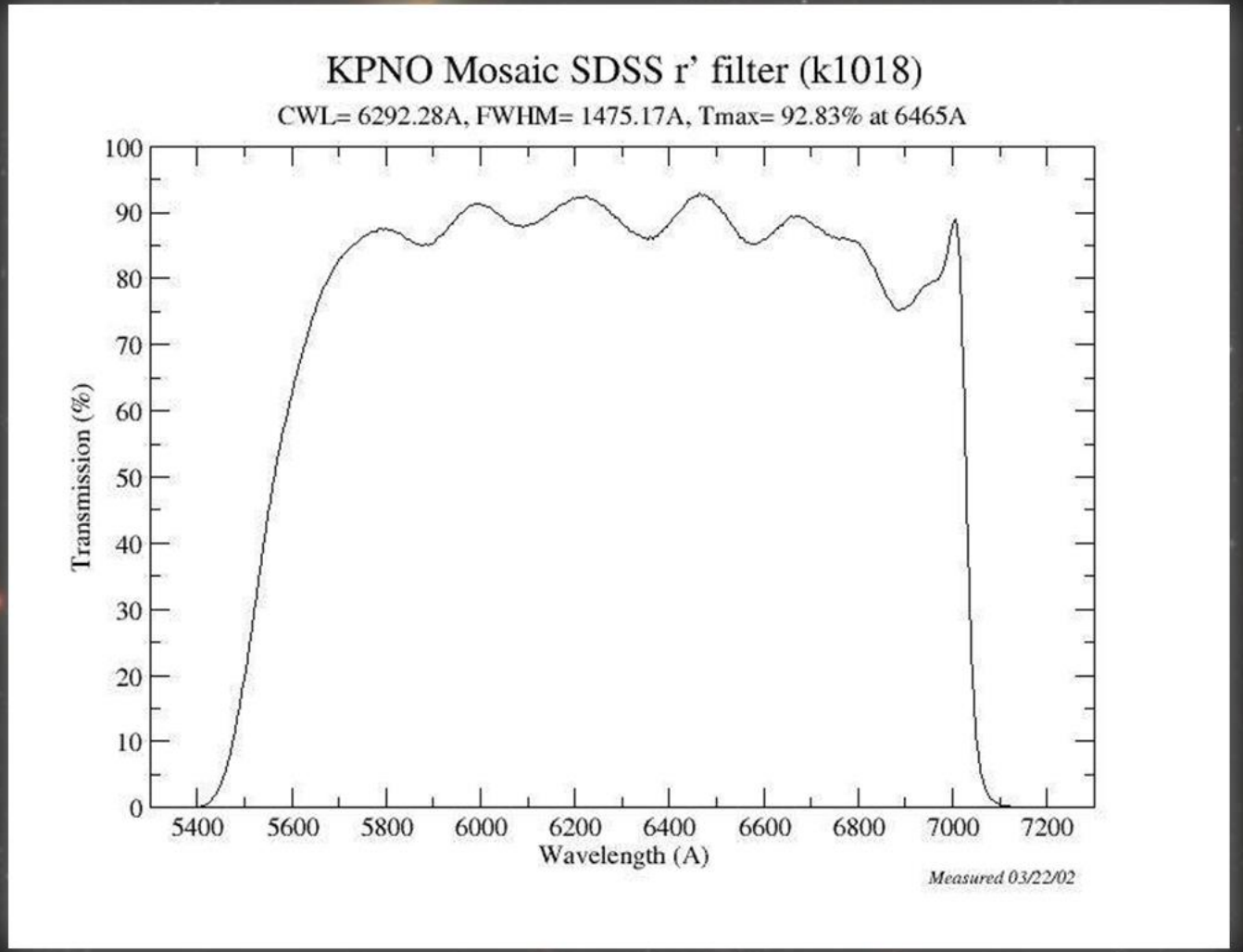


Fig. 2 [1]



[1] "R SDSS K1018," NOIRLab Science, https://noirlab.edu/science/filters/kp1018 (accessed Feb. 4, 2024).
[2] "Background information on CCD and CMOS technology," CCD and CMOS Technology, https://www.tedpella.com/cameras_html/ccd_cmos.aspx (accessed Feb. 4, 2024).
[3] "Saturation and the VUV Detector | VUV Analytics," VUV Analytics | Vacuum Ultraviolet Absorption Spectroscopy, Jul. 11, 2018. https://vuvanalytics.com/knowledge-base/saturation-and-vuv-detector/ (accessed Feb. 04, 2024)

FITS IMAGE

Fig. 1

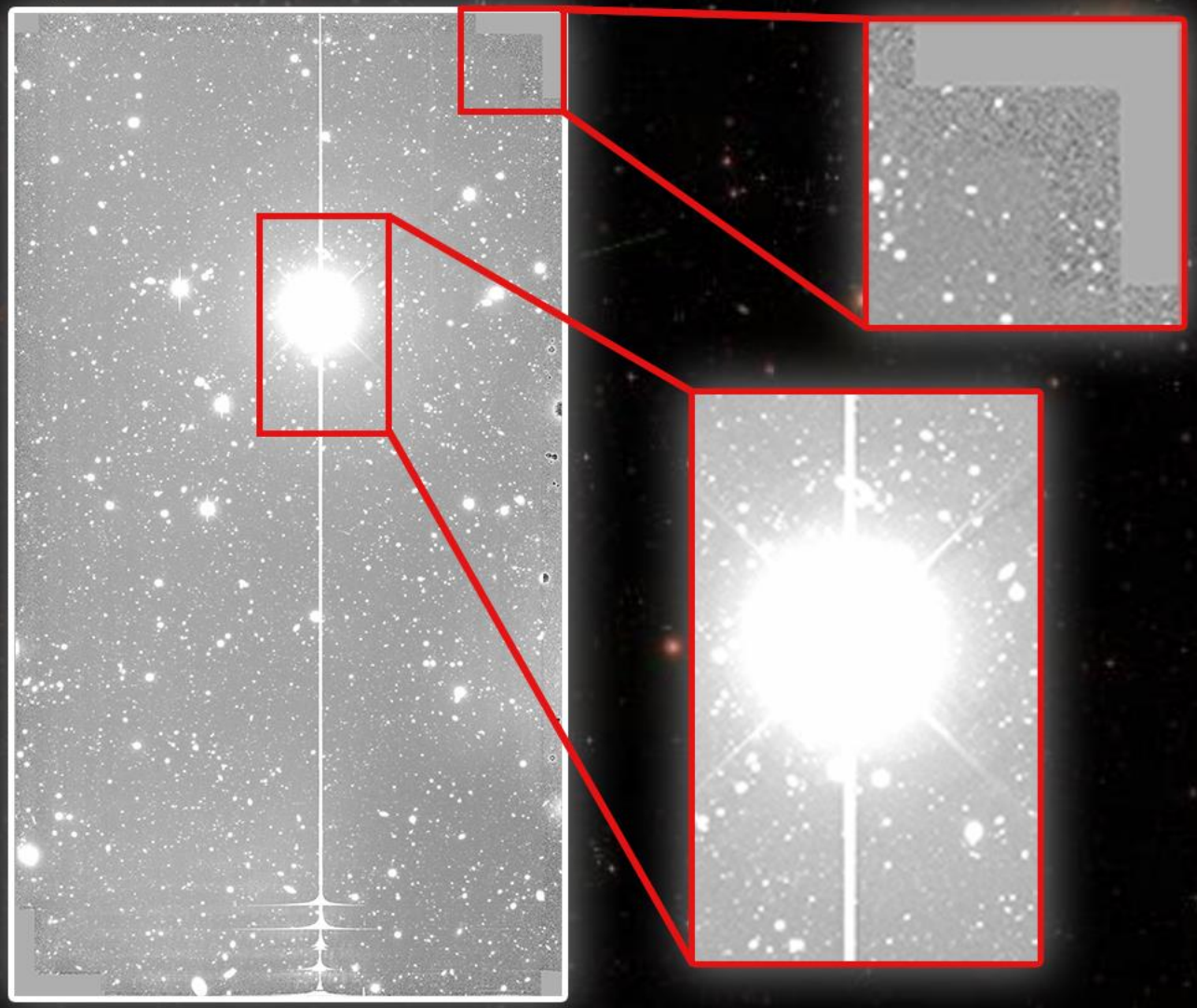


Fig. 3 [2]

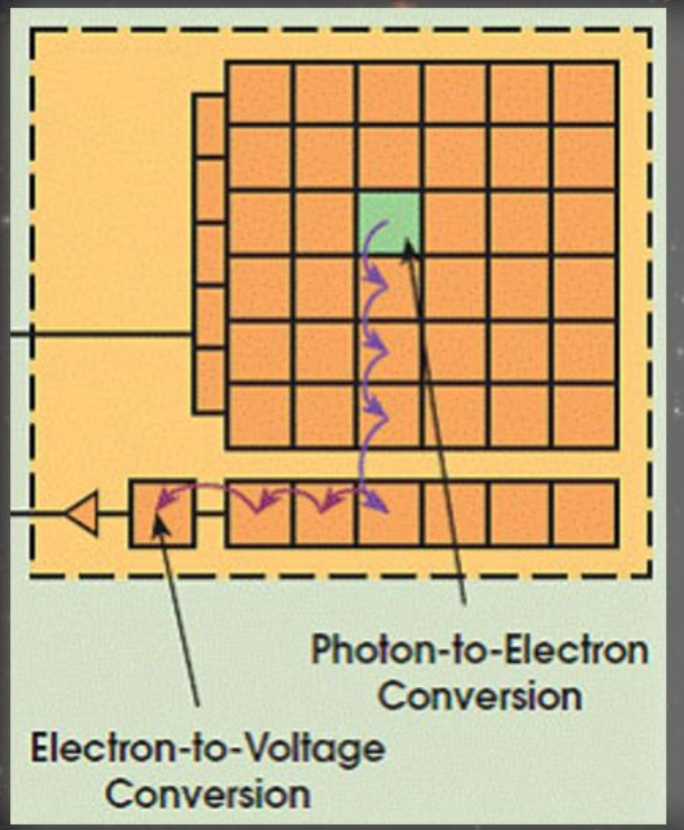
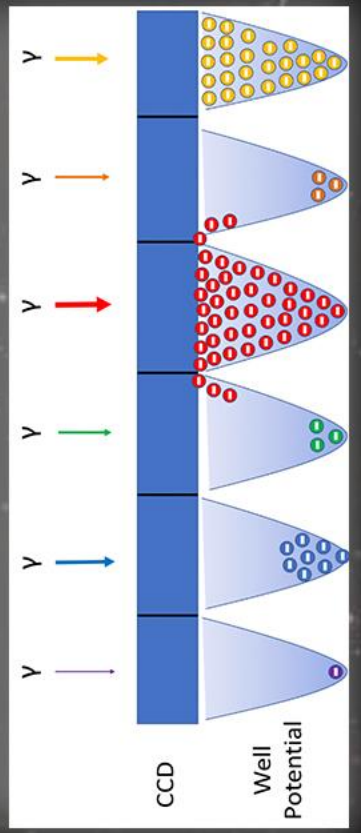


Fig. 4 [3]



[1] "R SDSS K1018," NOIRLab Science, https://noirlab.edu/science/filters/kp1018 (accessed Feb. 4, 2024).
[2] "Background information on CCD and CMOS technology," CCD and CMOS Technology, https://www.tedpella.com/cameras_html/ccd_cmos.aspx (accessed Feb. 4, 2024).
[3] "Saturation and the VUV Detector | VUV Analytics," VUV Analytics | Vacuum Ultraviolet Absorption Spectroscopy, Jul. 11, 2018. https://vuvanalytics.com/knowledge-base/saturation-and-vuv-detector/ (accessed Feb. 04, 2024)

AIMS

- Correct for background count
- Isolate and label objects
- Use pixel count of each object to find magnitude
- Store data for each object in a catalogue
- Categorise objects into either star or galaxy
- Plot log(N) cumulative freq. of object count against magnitude

BACKGROUND MASK

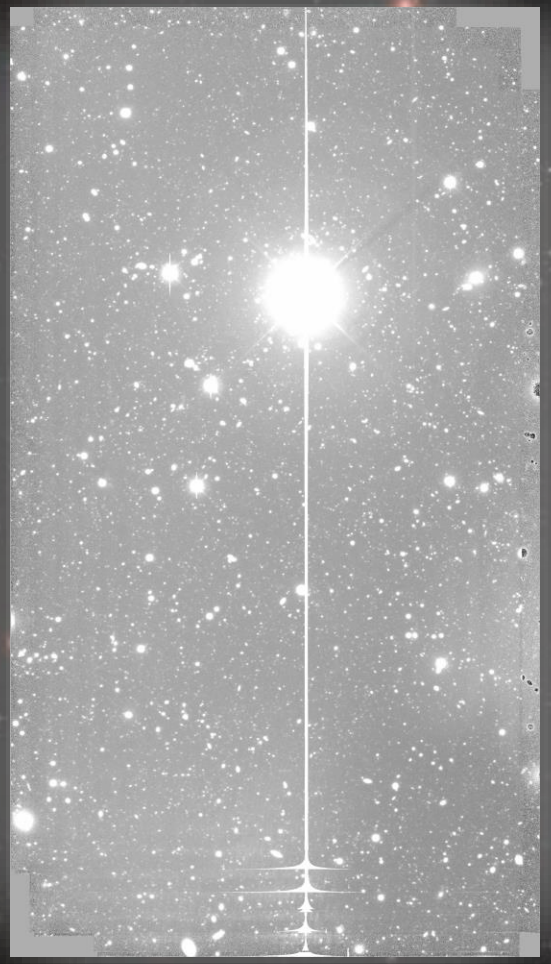


Fig. 1. The original image being analysed.

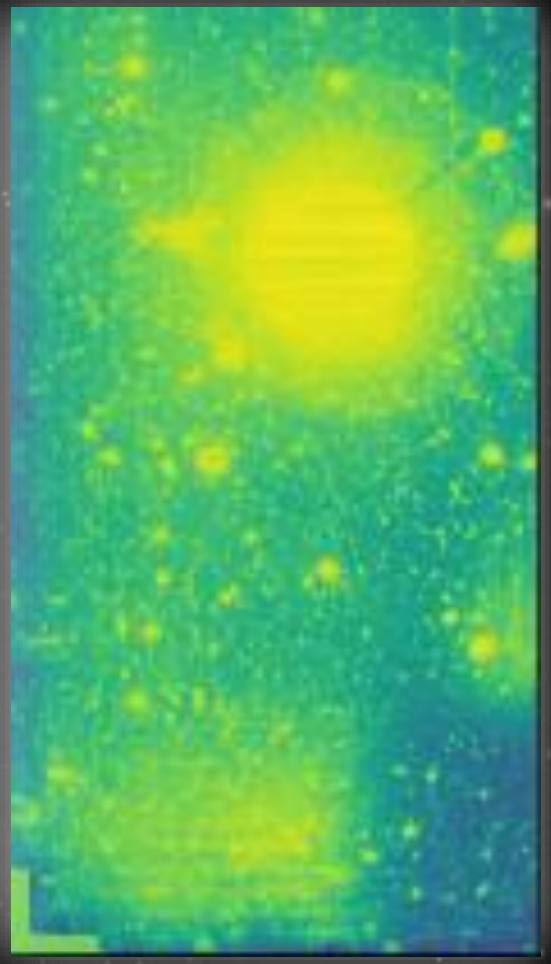


Fig. 2. The background mask applied. The bright region (top) is caused by the main star and other bright regions are brighter in the original image.

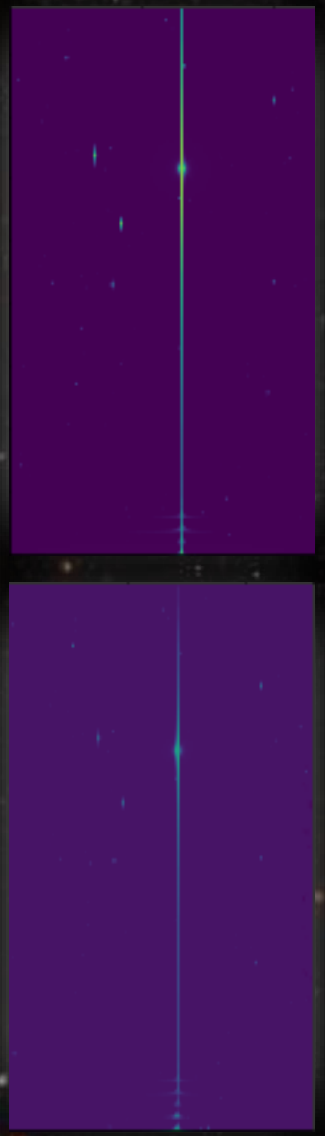


Fig. 3 & 4. The image to be analysed after background is removed (top) and before (bottom).

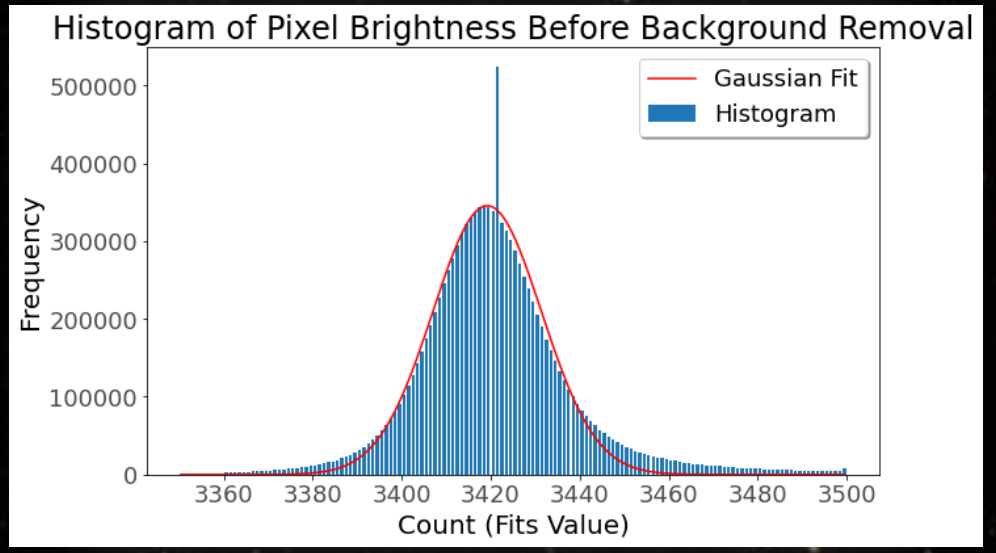
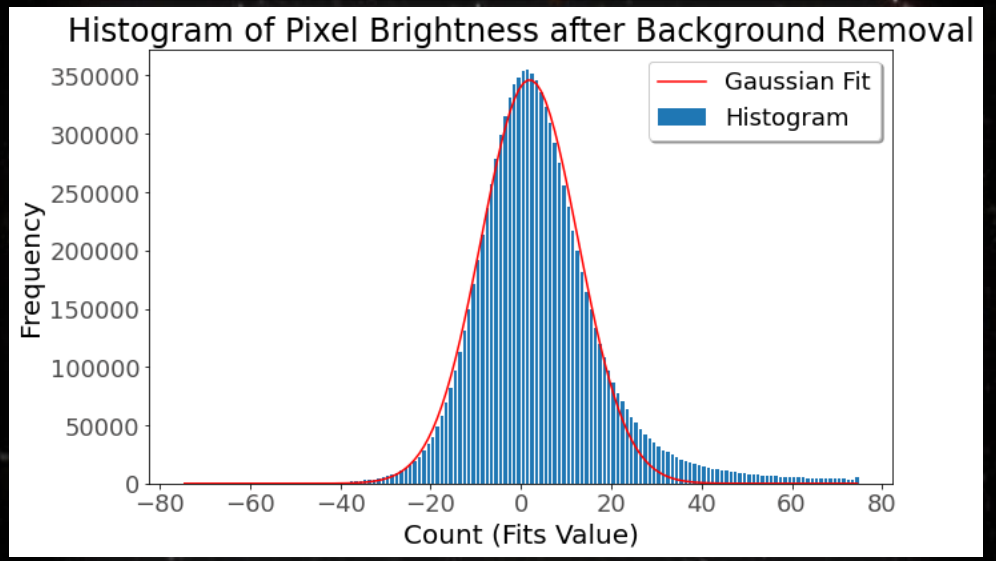


Fig. 5 (above) & 6. (below). The distribution of the background count before and after removal. The negative background count below are unphysical but are an artefact of the method. The negative values are part of the background so only positive counts are used for the analysis.



SIMULATED DATA

Fig. 1. Multivariate 2D Gaussian

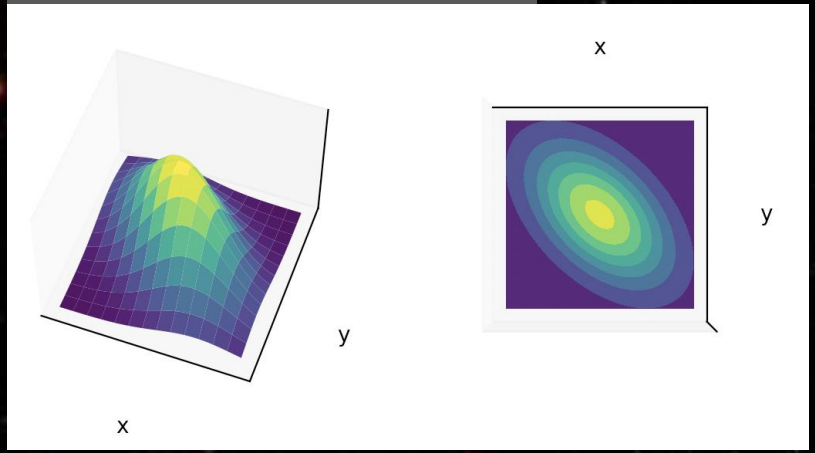


Fig. 2. Gaussian PDF to simulate a galaxy

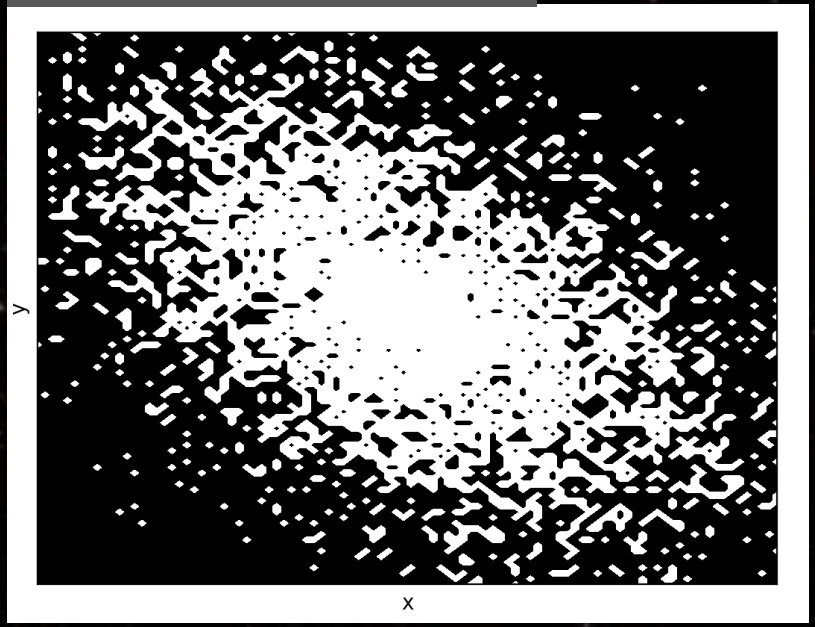
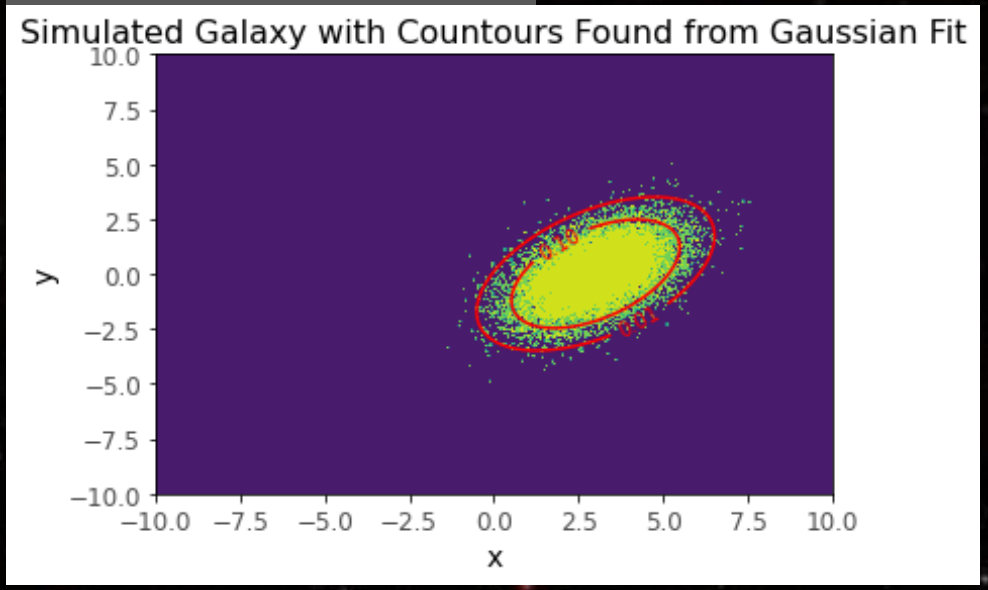


Fig. 3. Fit to Simulated Galaxy



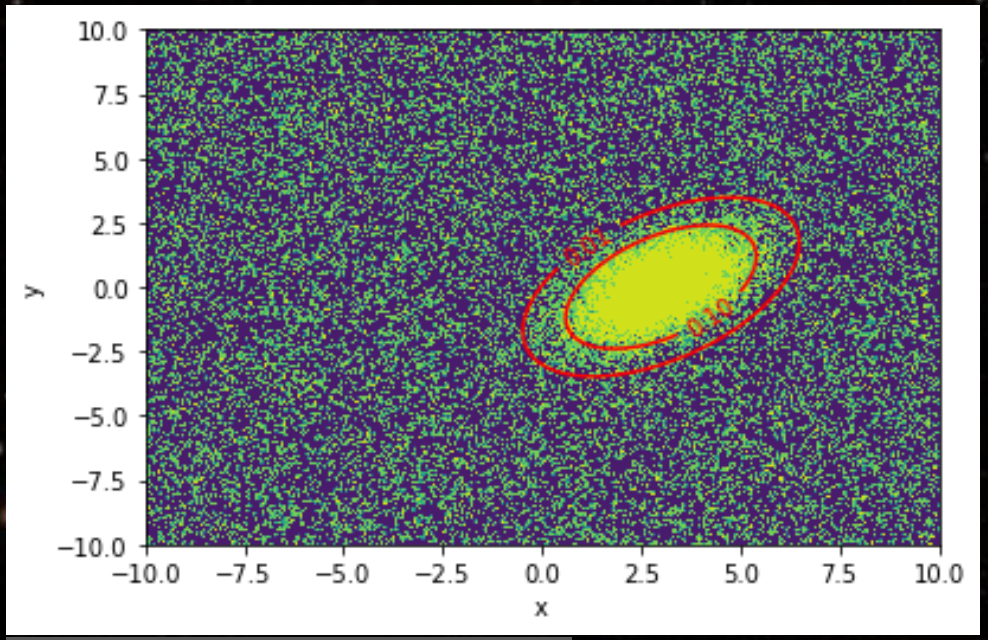


Fig. 4. Galaxy Fit with Simulated Background

OBJECT CATALOGUE

Index	Class	Num Objects	Avg Magnitude	Total Magnitude	Total Count	Count Error	Size	Centre
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1180	Galaxy	1	N/A	24.30	5100	200	53	(4233,2020)

Log(N) Plot

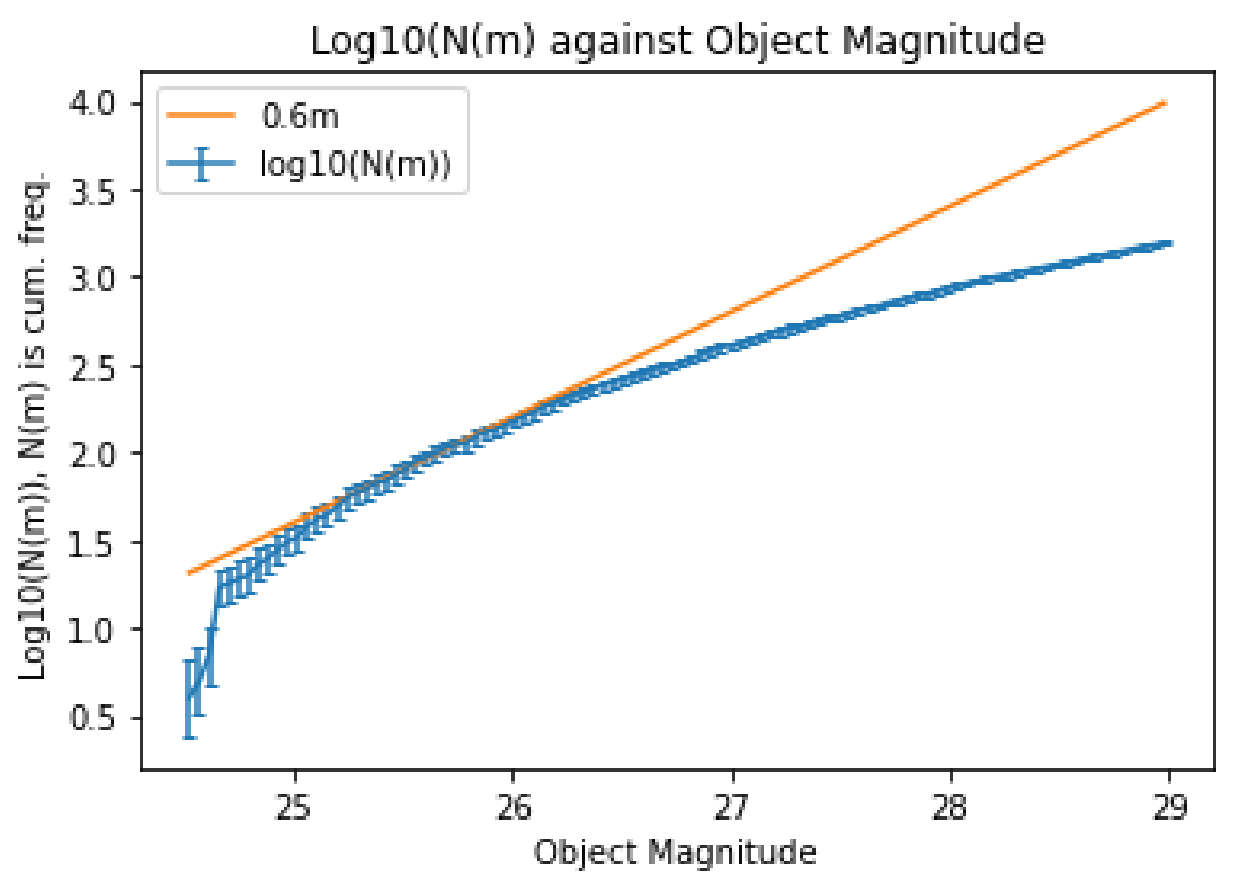


Fig. 1. Plot of Log10(N) against object magnitude where N is the cumulative frequency of objects brighter than m. The gradient 0.6m is shown which fits our data but highlights issues with our method compared to the deep-field distribution assumption

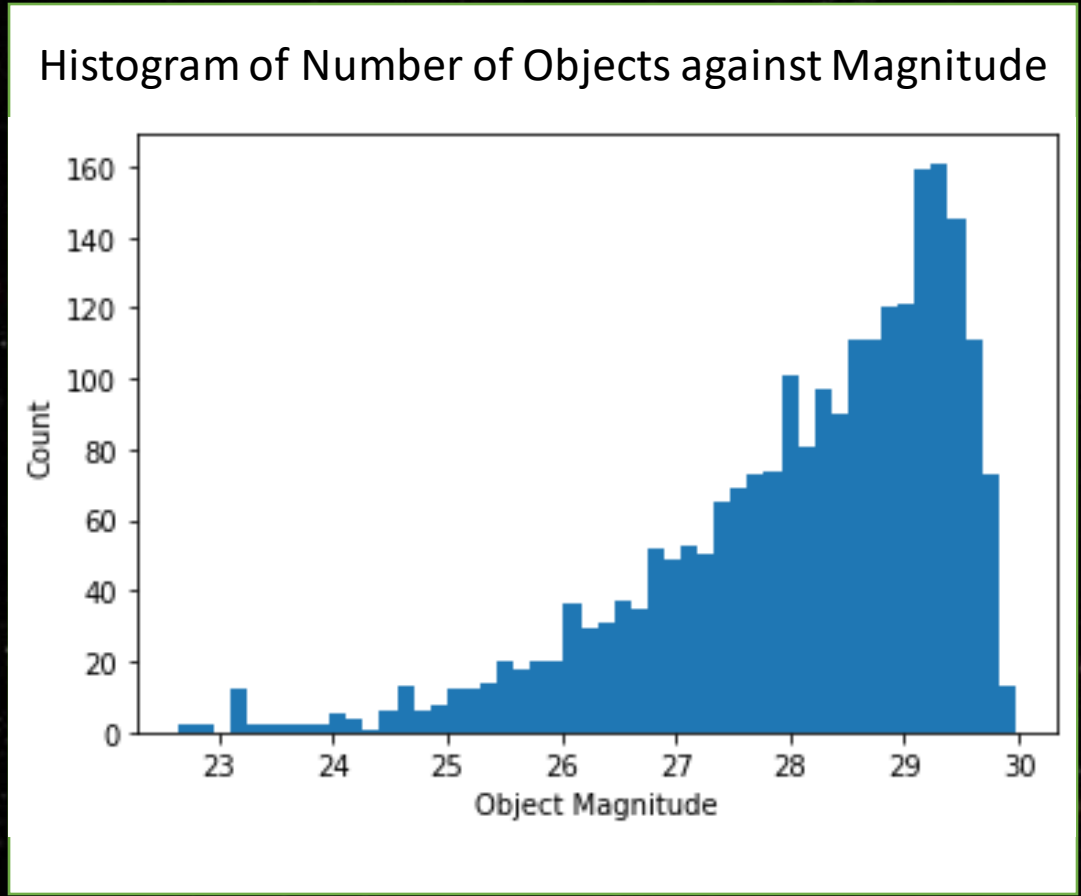
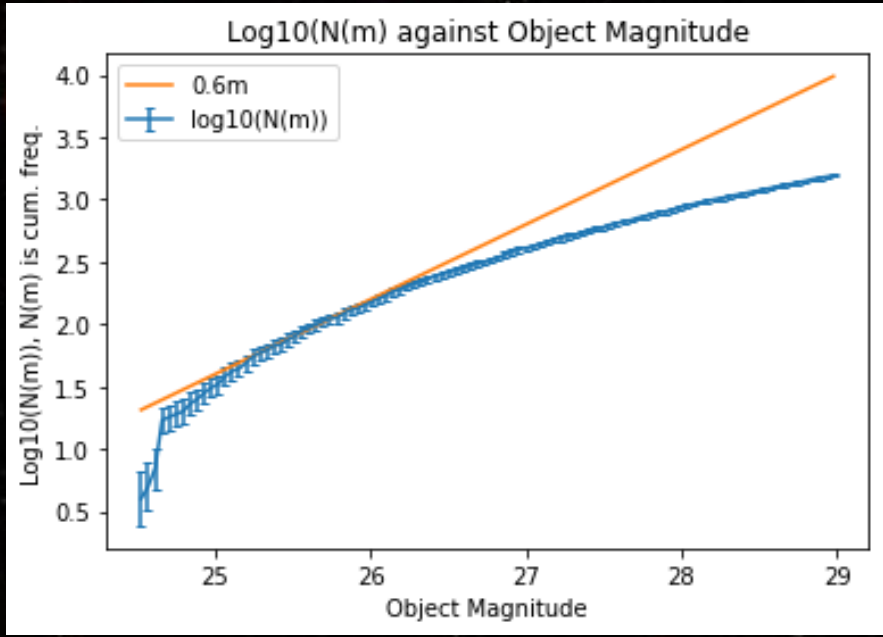


Fig. 2. Histogram showing the distribution of the magnitude of galaxies used in the cumulative log plot in Fig. 1.

Discussion



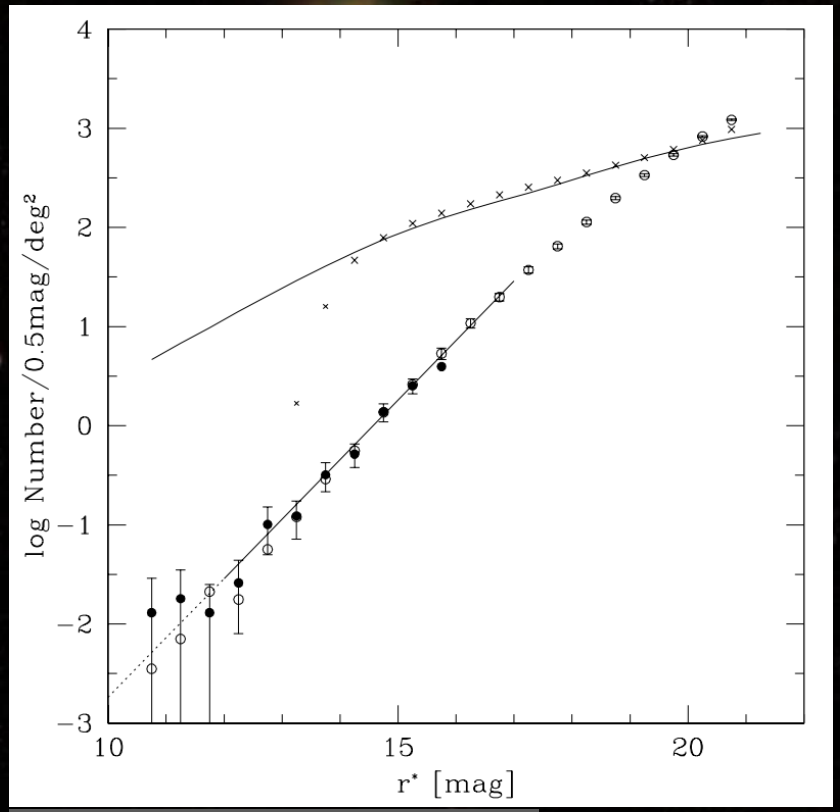
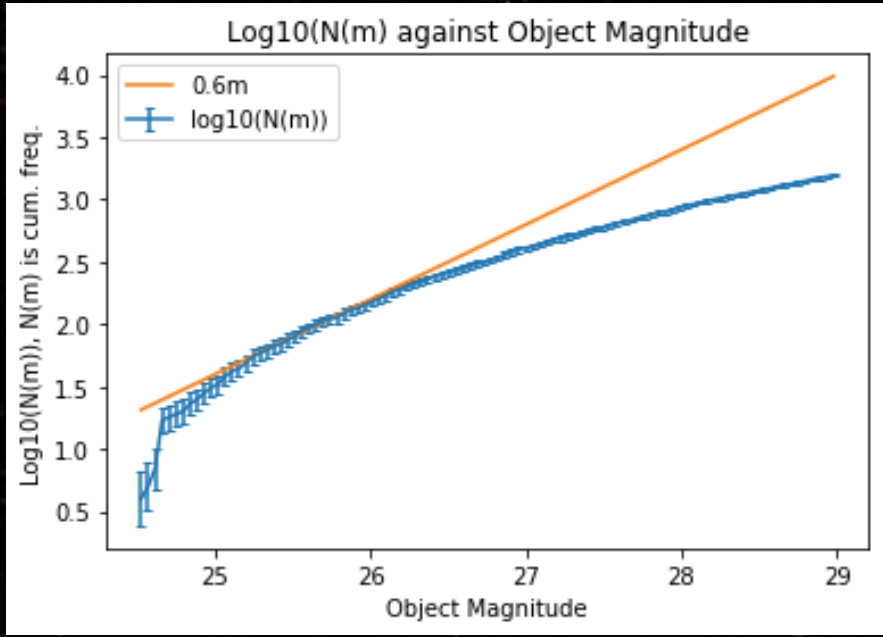


Fig. 1. Mosaic 1.1 KPNO R-band data [4]

- disagreements
- signs of galaxy evolution:
- deceleration q_0
- no-evolution models underpredict faint counts

[4] Yasuda, N., et al. "Galaxy number counts from the Sloan Digital Sky Survey commissioning data," in The Astronomical Journal, vol. 122, no. 3, pp. 1104, 2001.
[5] "Durham Physics Cosmology Research Galaxy Counts," star-www.dur.ac.uk. http://star-www.dur.ac.uk/~nm/pubhtml/counts/counts.html (Accessed Feb. 04, 2024)
[6] Metcalfe, N., et al. "Galaxy formation at high redshifts," in Nature, vol. 383, no. 6597, pp. 236–239, 1996.

Discussion



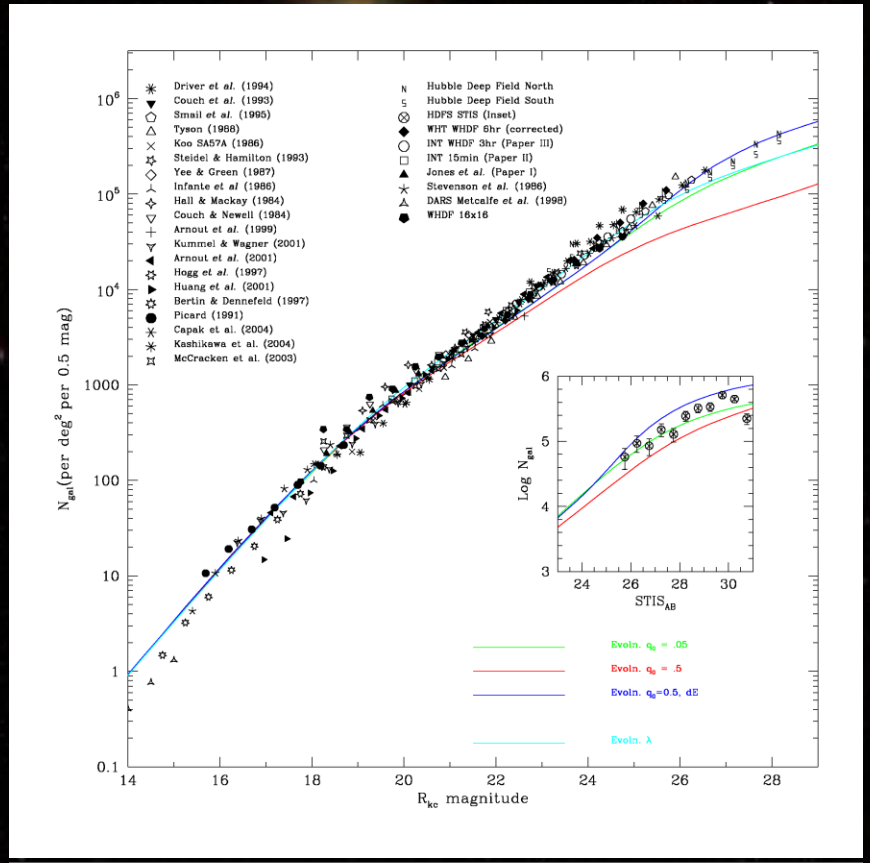
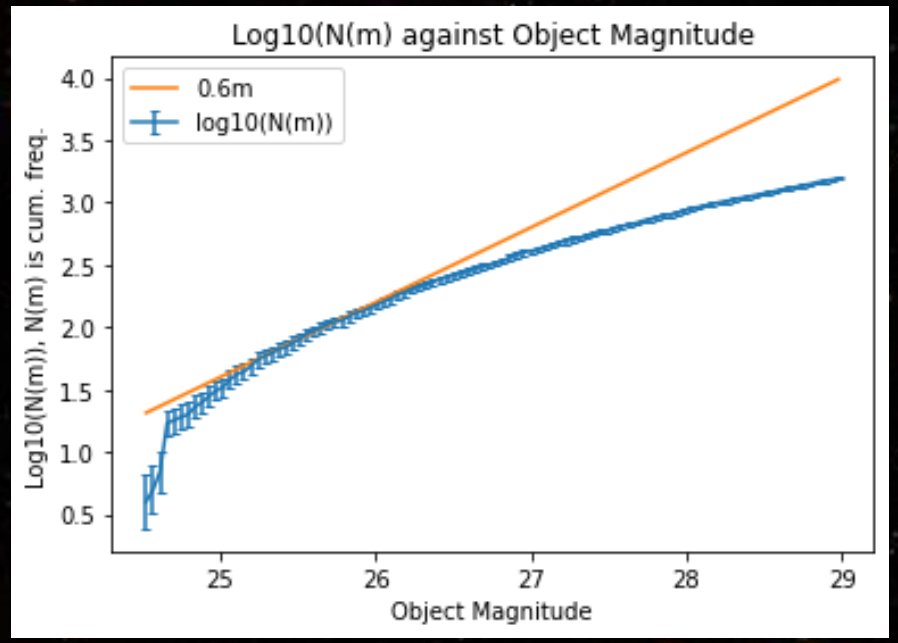


Fig. 1. Compilation of R-band data from different sources [5]

- disagreements
- signs of galaxy evolution:
- deceleration q_0
- no-evolution models underpredict faint counts

[4] Yasuda, N., et al. "Galaxy number counts from the Sloan Digital Sky Survey commissioning data," in The Astronomical Journal, vol. 122, no. 3, pp. 1104, 2001.
[5] "Durham Physics Cosmology Research Galaxy Counts," star-www.dur.ac.uk. http://star-www.dur.ac.uk/~nm/pubhtml/counts/counts.html (Accessed Feb. 04, 2024)
[6] Metcalfe, N., et al. "Galaxy formation at high redshifts," in Nature, vol. 383, no. 6597, pp. 236–239, 1996.

Discussion



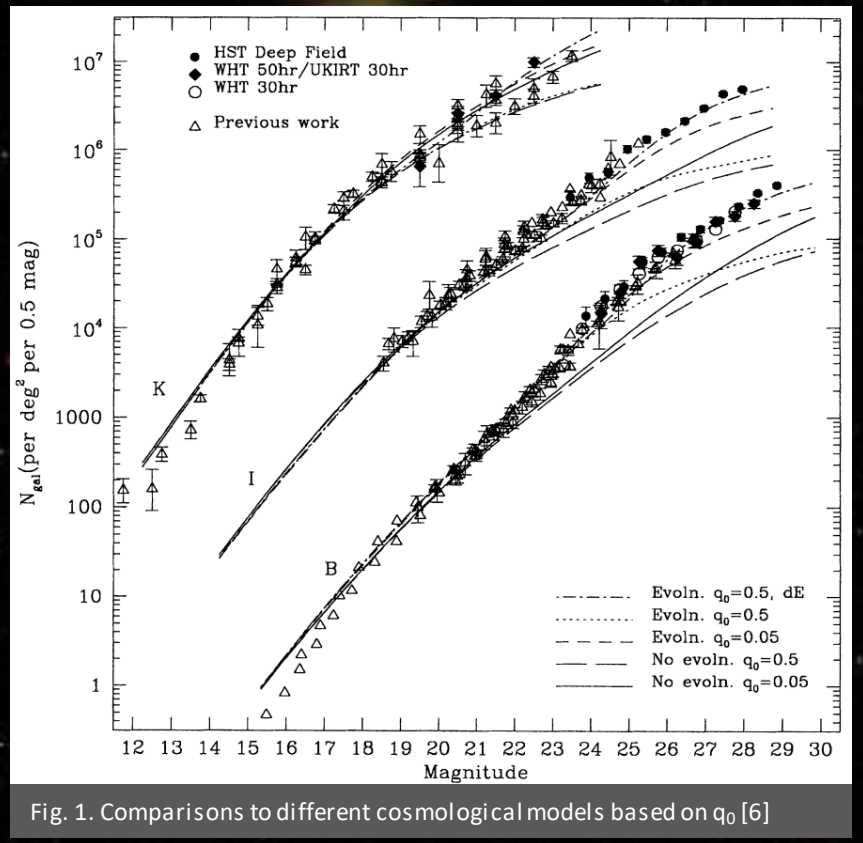


Fig. 1. Comparisons to different cosmological models based on q_0 [6]

- disagreements
- signs of galaxy evolution:
- deceleration q_0
- no-evolution models underpredict faint counts

[4] Yasuda, N., et al. "Galaxy number counts from the Sloan Digital Sky Survey commissioning data," in The Astronomical Journal, vol. 122, no. 3, pp. 1104, 2001.
[5] "Durham Physics Cosmology Research Galaxy Counts," star-www.dur.ac.uk. http://star-www.dur.ac.uk/~nm/pubhtml/counts/counts.html (Accessed Feb. 04, 2024)
[6] Metcalfe, N., et al. "Galaxy formation at high redshifts," in Nature, vol. 383, no. 6597, pp. 236–239, 1996.


THANK YOU
FOR LISTENING