Working Title

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Abstract

1 Introduction

The detection of gravitational waves (GW) in Feburary(ref) opened a new era of astronomy; however, it is only in sync with electromagnetic astronomy that the most physics can be discovered. Electromagnetic counterparts are expected from binary sources involving matter i.e. neutron star-neutron star and neutron star-black hole. Because of this, GW detectors will work in conjunction with electromagnetic telescopes to observe a GW source. Some of these will yield weak, nearly isotropic electromagnetic counterparts and others will not. GW detectors will identify sources characterized by its chirp mass:

$$M_c = \frac{(m_1 m_2)^{3/5}}{(m_1 + m_2)} \tag{1}$$

Figure 1 is the full data set in terms of chirp mass. The electromagnetic counterparts events are seperated from the other events by color. This report is organized as follows. Section 2 describes the developement of the chirp mass distribution, Section 3 descibes a

electromagnetic followup classifier based on the data, and Section 4 will state our conclusions. See Section **??** and Appendix A. Example text citation is Dominik et al. (2012), or in parenthesis with a page number (Dominik et al. 2012, pg 2).

2 Chirp Mass Distribution

3 Classifying GW Events that have Electromagnetic Countparts

The GW observatory, the Laser Interferometer Gravitational Wave Observatory (LIGO), can provide very rapid mass estimates of candidate GW events. Since most of these detections are mostly binary black holes and electromagnetic followup is extremely expensive, only a few events can be followed up. We have therefore trained a classifier to determine if an event will have a electromagnetic followup. We trained this classifier on the first half of the data. We simply took the mid-way point betweewn the maximum chirp mass for the electromagnetic counterpart group and the other group.

4 Conclusions

References

[1]M. Dominik, K. Belczynski, C. Fryer, D. E. Holz, E. Berti, T. Bulik, I. Mandel, and R. O'Shaughnessy, "Double Compact Objects. I. The Significance of the Common Envelope on Merger Rates", ApJ **759**, 52, 52 (2012).

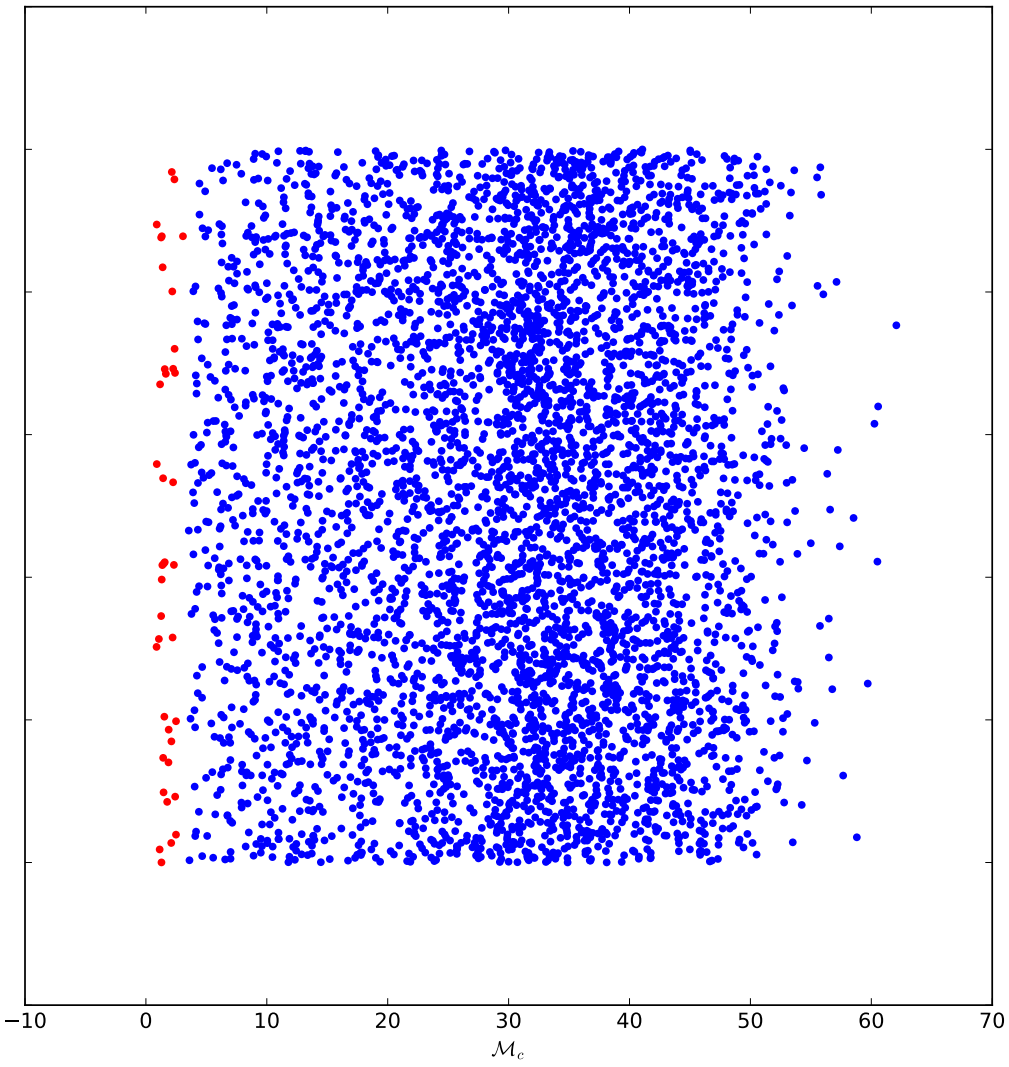

Figure 1: This figure shows all the 5000 events' chirp mass. Here the y-axis is a uniform random number between zero and one. The events that have an electromagnetic counterpart are in red, and the events without a electromagnetic counterpart are in blue.

Appendices

A Example