Gravitational waves from colliding black holes

Chris Pedersen

April 5, 2017

Abstract

Words

1 Introduction

Gravitational wave history

1.1 Gravitational Waves

Fundamental theory

1.2 LIGO

Overview of detectors

1.3 Precession

Precessing binaries and effective spin parameters

1.4 Bayesian Inference

Bayes theorem and how it is used in PE

1.5 MCMC

Overview of MCMCs that will be used for inference

1.6 Astrophysical implications

Binary formation models and how estimating chi p is significant for distinguishing bewteen them

2 Matching

Describe matching, and how matches are used to run targeted software injections. Then identify parameter combinations where we are particularly sensitive to chi p, and those where we are not

3 Software injections

Describe software injections

3.1 Signal extraction

Data whitening - basically LOSC stuff, how we go from raw data to a signal - move this to intro?

3.2 Inference pipeline

Describe the structure of the inference pipeline

3.3 Inference runs

Posteriors and discussion of inference results

3.4 Impact of Virgo

A look at how Virgo will influence PE, especially chi p estimation

4 Conclusions and implications

Summary of results on PE and estimation of chi p, and a prospect on Virgo's impact.