2024-03-07 lecture Gravitational wave data analysis: inroduction

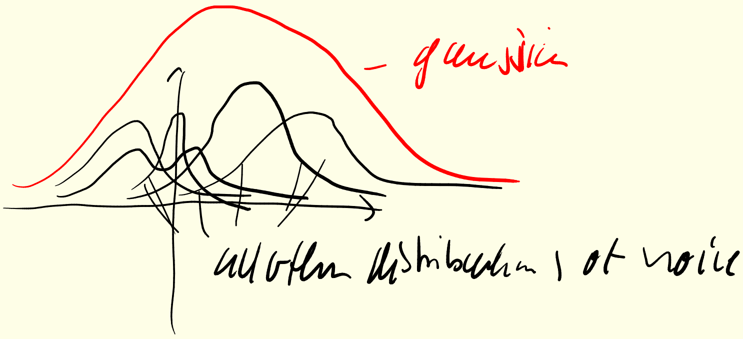
Hector Estelles Estrella

1. introduction
2. modelling the instrumental noise
3. matching filtering
4. searching for GW signals
5. parameter estimation

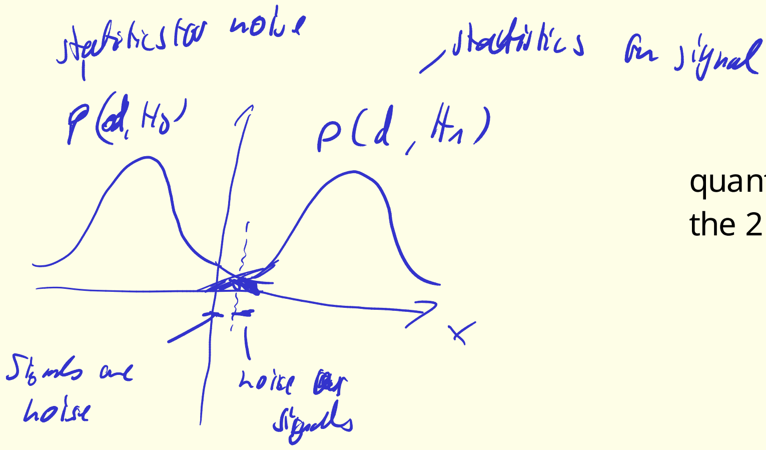
1. Introduction

2. modelling the instrumental noise

many sources are gaussian. We combine all noice source distribution to one noice distribution



3. matching filter

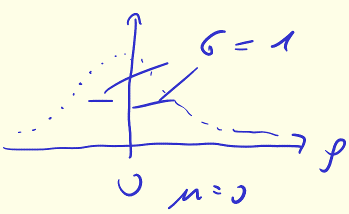


quantity to disquinish between the 2 signal and noise

if data and signal in phase it is best aligned and can be detected

convultion with the expected signal and the data, we need the signal to noise ratio

$$\langle d(t) \rangle = \underbrace{\langle n(t) \rangle}_{0} + \underbrace{\langle h(t) \rangle}_{h(t)}$$



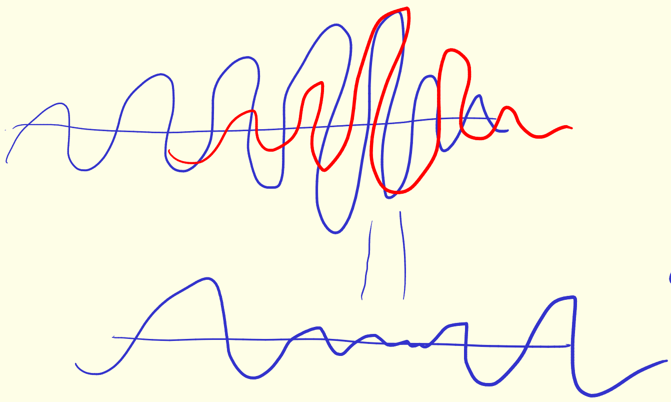
ρ signal to noise ratio

→ ρ-SNR   ρ ~ 20

→

4. Searching for GW signals

searching for combact binaries
produce good approximations of the signal



should give us a more precise graphical comparison with the signal and noise

for real GW $\hat{\rho} \simeq \rho$ for glitches $\hat{\rho} << \rho$

$\hat{\rho}$-weighted SNR with χ^2

5.Parameter estimation