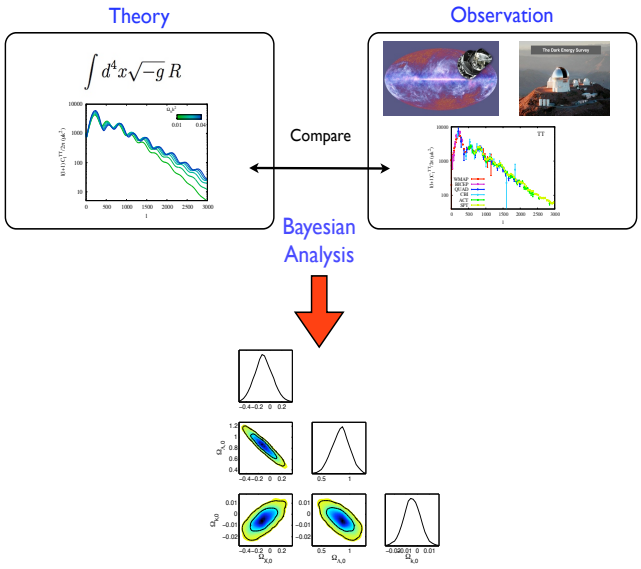
Updated Cosmology

with Python



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In progress

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HW 9

In HW 8 the likelihood function, for the CPL and CC, was computed from a grid of two parameters (see Figure).

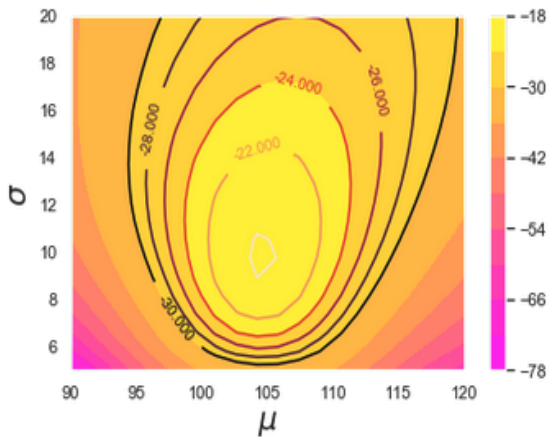

Figure 1: Likelihood grid.

a) Given the likehood as a fitness function, use the Genetic Algorithm to compute its optimal value. That is, find the combination of $\{w_0, w_a\}$ that maximises the likelihood (for cosmic chronomers), and compare it with the value previously found.

b) Compare the time that it takes to compute the grid and the GA.

c) Given the likelihood Taylor expansion, we found that the inverse of the Hessian matrix provides the covariance matrix. c.1) Compute the hessian matrix of the likelihood (you may try with statsmodels or numdifftool libraries), with respect to w_0, w_a.

c.2) Once the Hessian is obtained, compute the inverse matrix.

c.3) For the result, compute the eigenvalues and eigenvectors.

c.4) The eigenvects provide the direction of the semi axis -minor and major -, and the eigenvals the length, which together define an ellipse.

c.5) Plot the contour ellipses along with the grid. note: remember this approximation works for gaussian likelihoods.

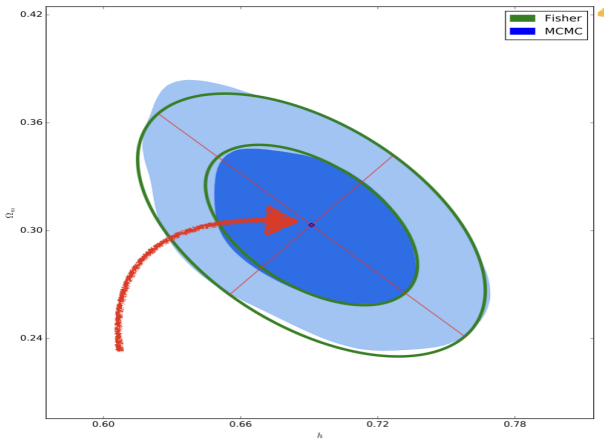

Figure 2: Likelihood grid and fisher approx.

Extra: Do the same with Supernovae.