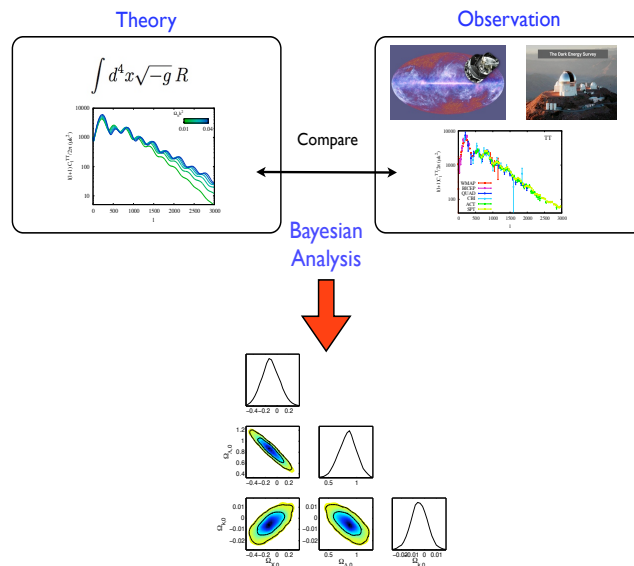


Updated Cosmology

with Python



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In progress

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Homework 2

HW 1.1.a: Describe some examples of non-homogeneous and non-isotropic universes

HW 1.1.b: Explain the Anthropic Principle: Why the Universe is how it is?

HW 1.2: hb.

1.- Compute the Volume of the 3D sphere [Eqn 1.11]. Hint:

$$V = \int_0^{2\pi} \int_0^\pi \int_0^R \frac{ar^2 \sin \theta}{(a^2 - r^2)^{1/2}} dr d\theta d\phi,$$

[the total volume V_{tot} is found when $R = a$].

2.- For this 3D-sphere, show that the line element can be written in the form

$$ds^2 = a^2[d\chi^2 + \sin^2 \chi(d\theta^2 + \sin^2 \theta d\phi^2)].$$

Then, calculate the area of the 2D sphere defined by $\chi = \chi_0$. Also find the total volume of the 3D space.

3.-By identifying a suitable coordinate transformation, show that the line element

$$ds^2 = (c^2 - a^2 t^2) dt^2 - 2at \, dt \, dx - dx^2 - dy^2 - dz^2.$$

can be reduced to the Minkowski line element [a is a constant].