Measuring the angular distribution of the cosmological parameters.

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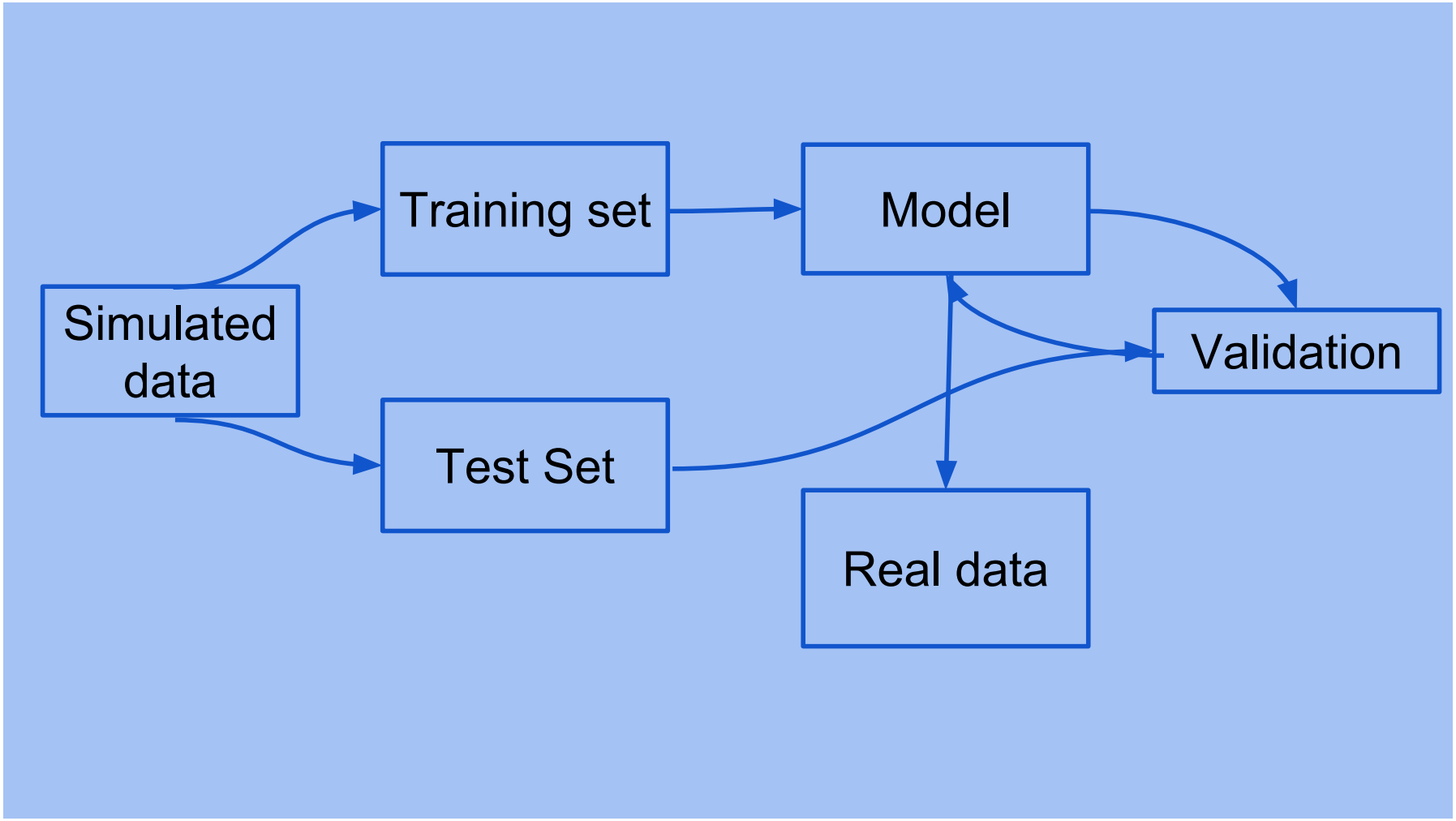
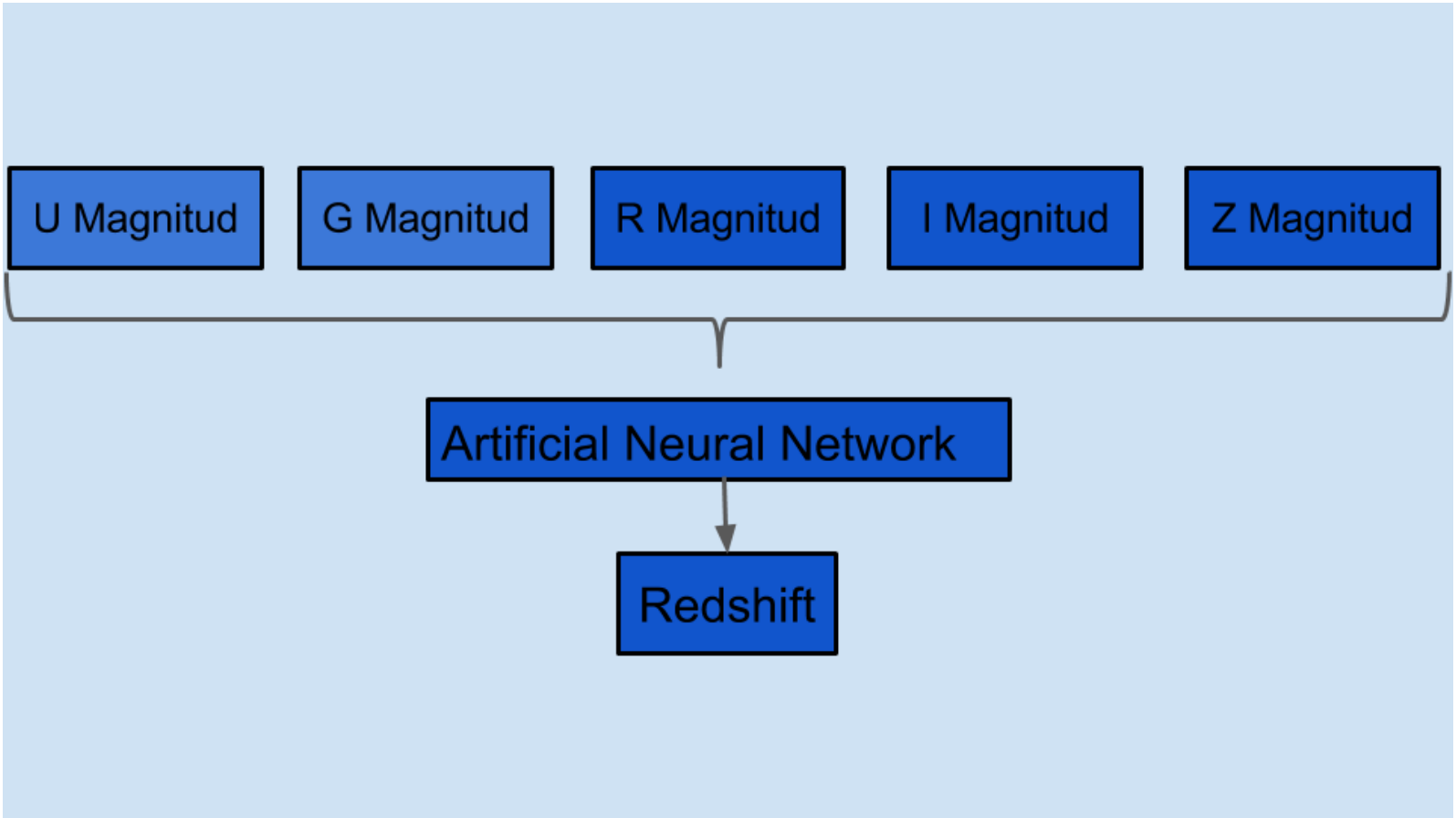
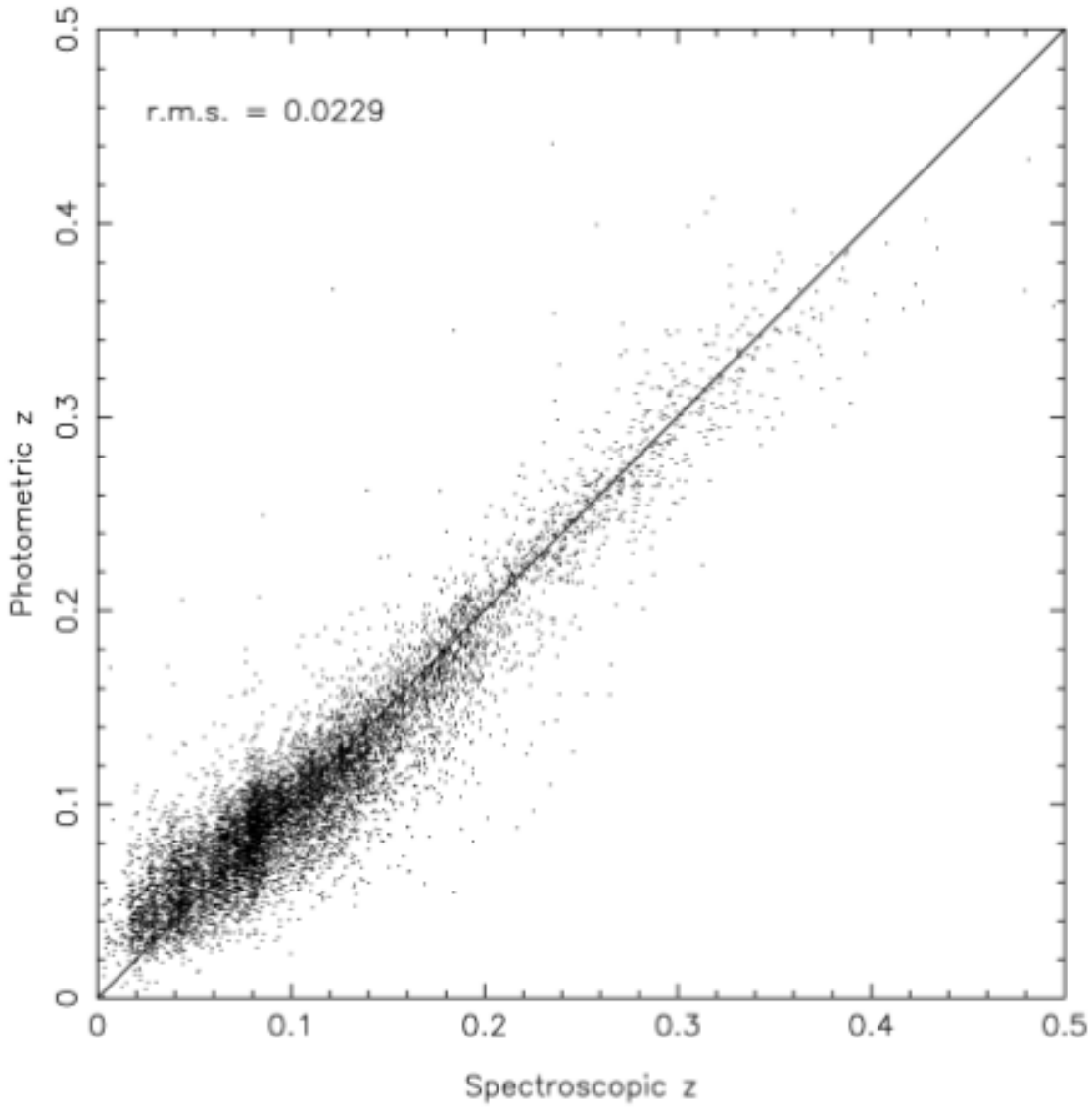
Supervised Learning.



Simple Example:ANNz

ANNz: Estimating photometric redshift using artificial neural network. Collister & Lahav 2003 (0311058)




r.m.s. = 0.0229
Photometric z
Spectroscopic z
0
0.1
0.2
0.3
0.4
0.5

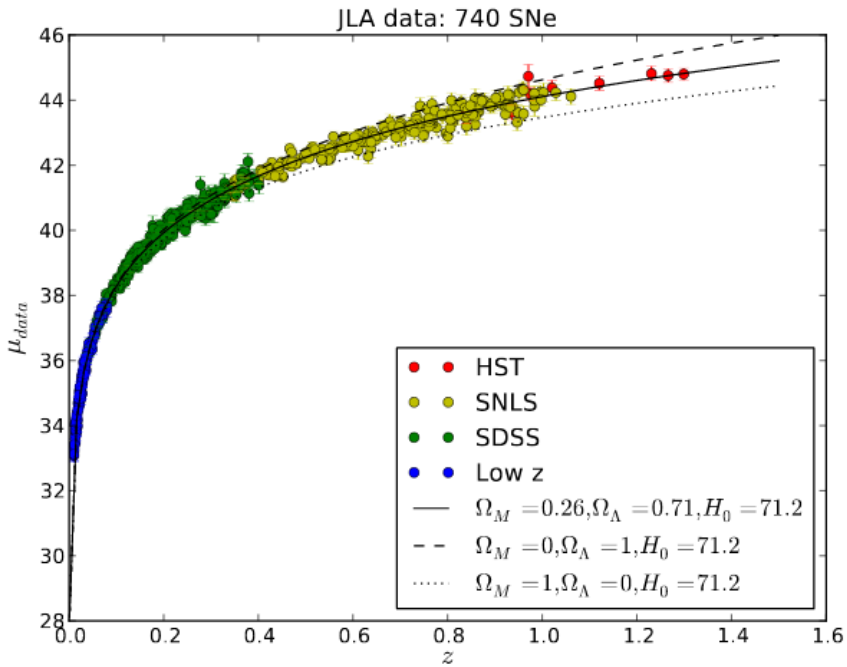
What are the cosmological parameters?

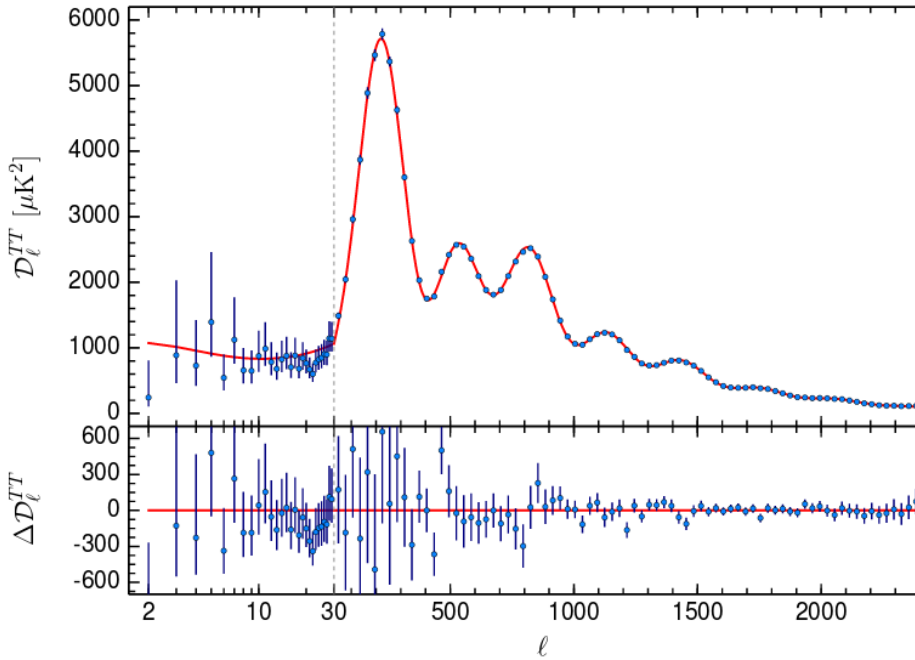
Homogeneous and isotropic Universe $\rightarrow$ FRW metric

$ds^2 = dt^2 - a^2(t)[\frac{dr^2}{1-kr^2} + r^2(d\theta^2 + sin^2\theta d\phi^2)]$

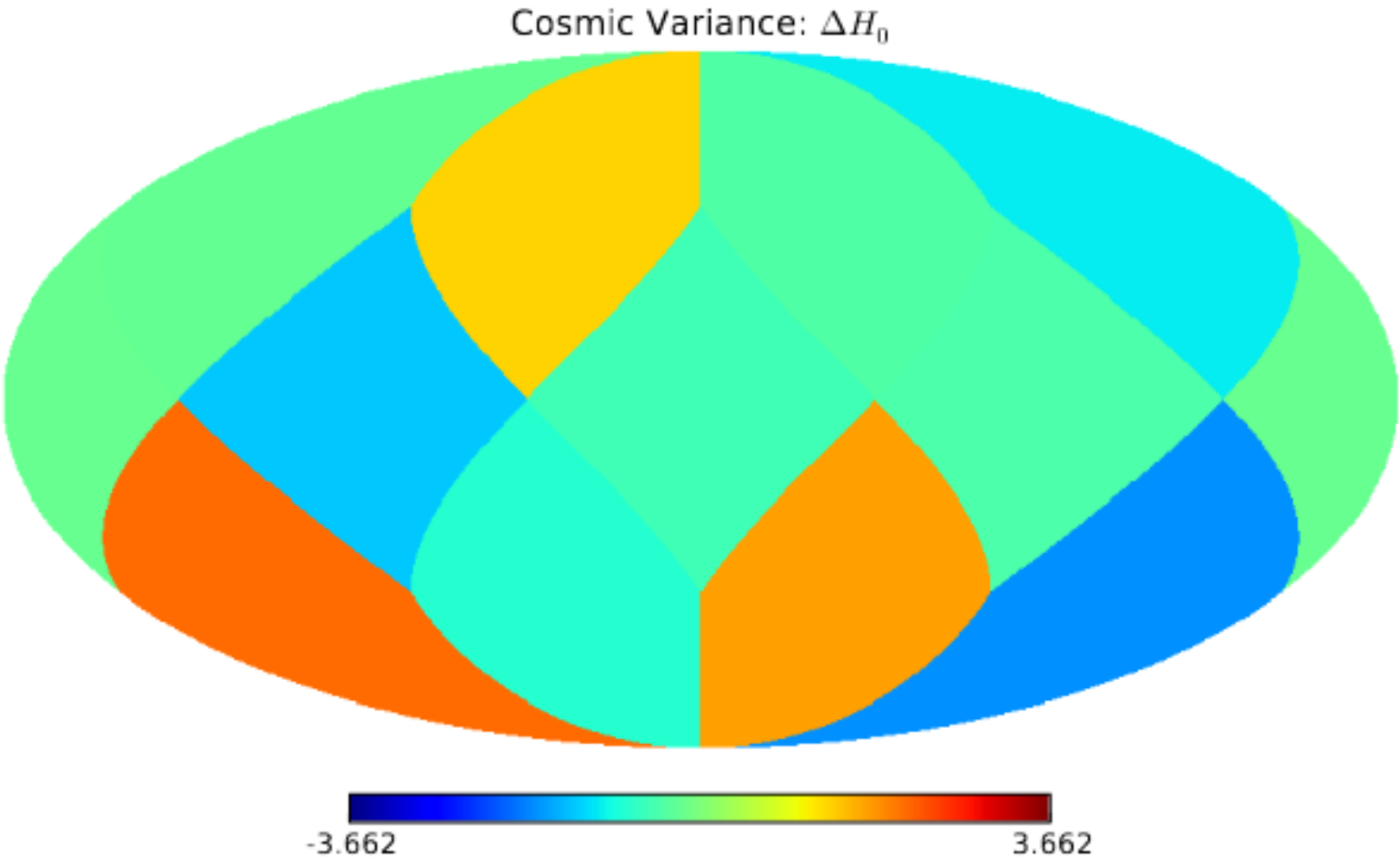
$(\frac{H}{H_0})^2 = \Omega_{rad} a^{-4} + \Omega_m a^{-3} + \Omega_\Lambda - Kc^2 a^{-2}$

How can we measure the cosmological parameters?





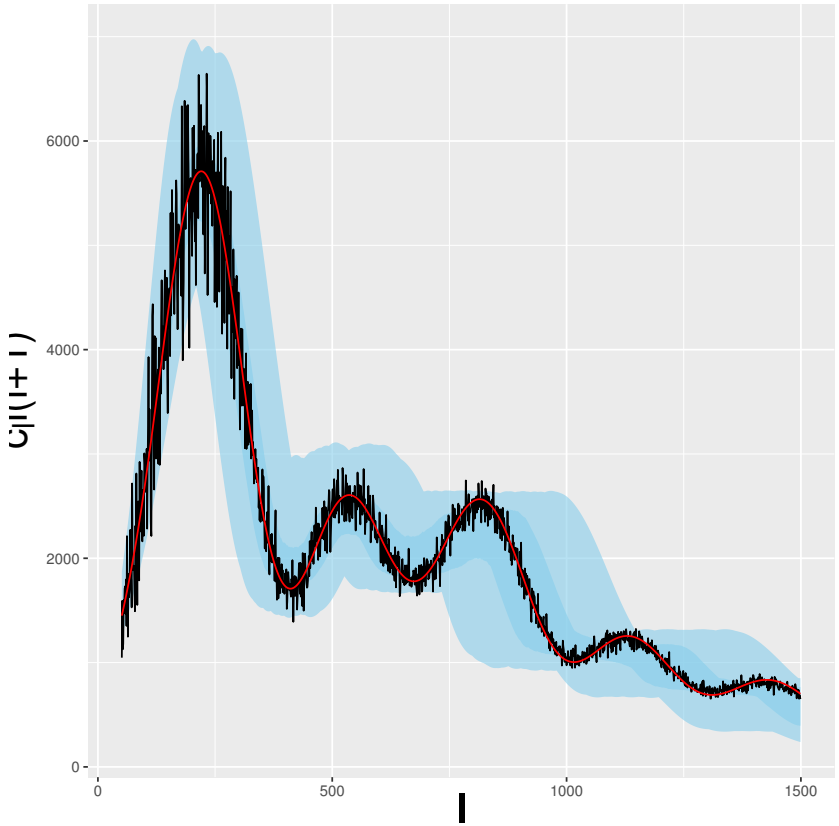
Carvalho & Marques 2015 (1512.07869) Planck Collaboration 2015 (1502.01589)



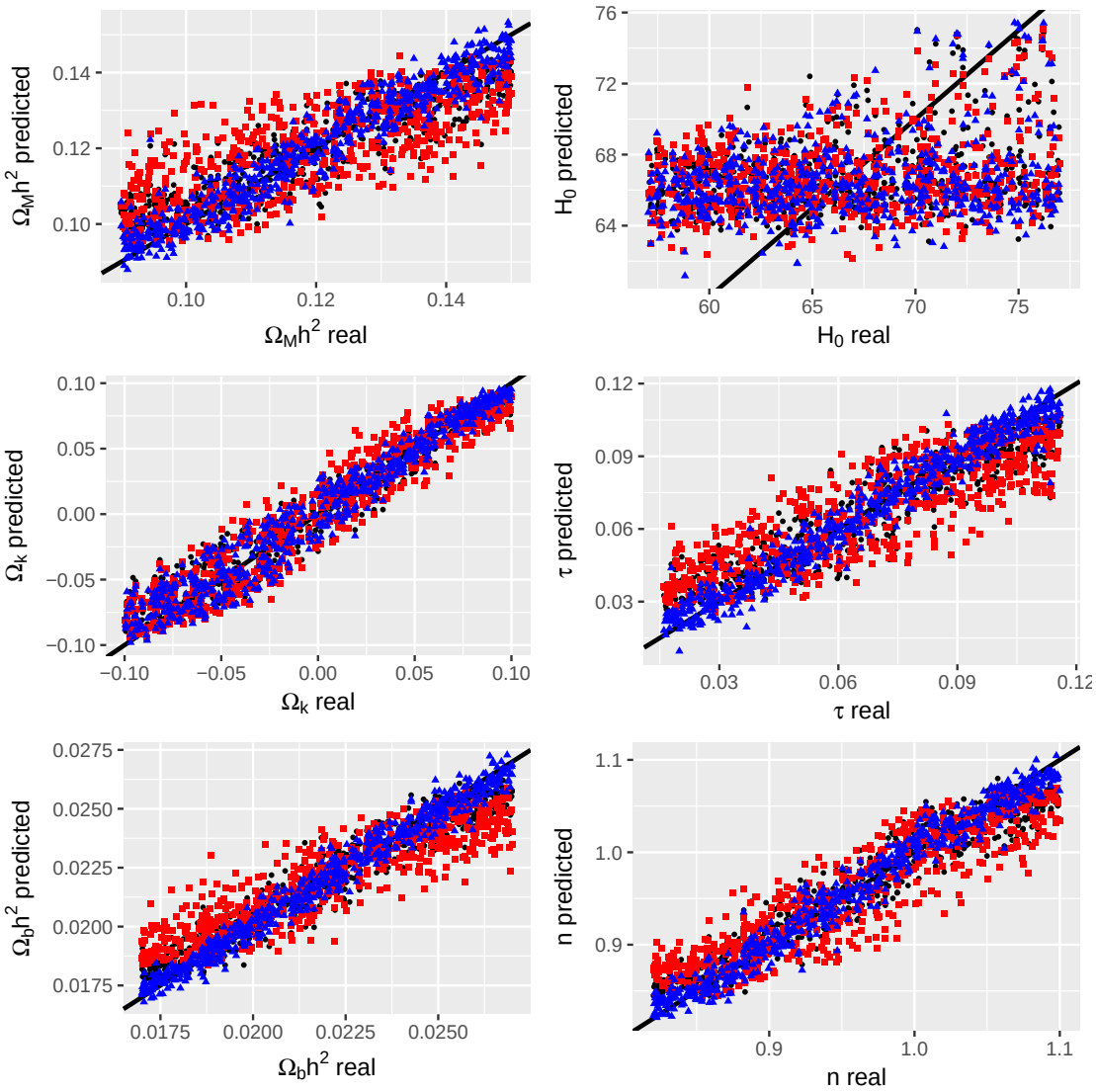
Carvalho & Marques (1512.07869)

The training sample.

CAMB: Code for Anisotropies in the Cosmic Background

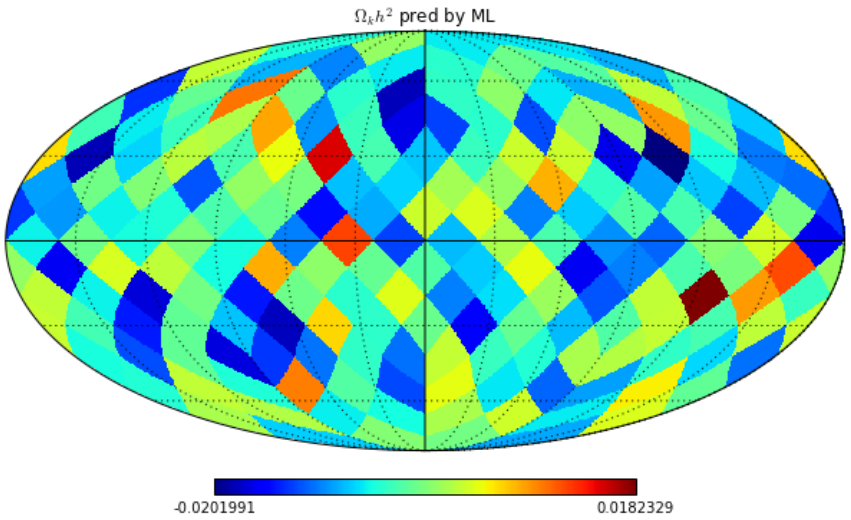


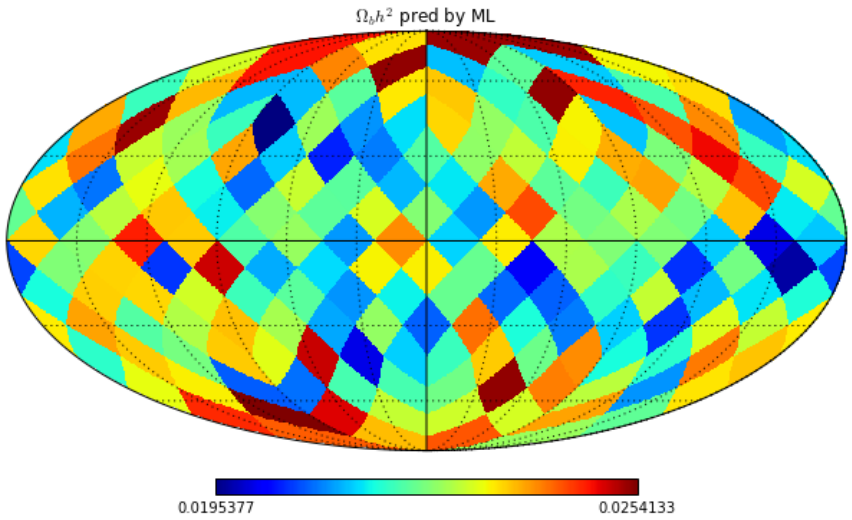
Studying different Machine Learning algorithms.

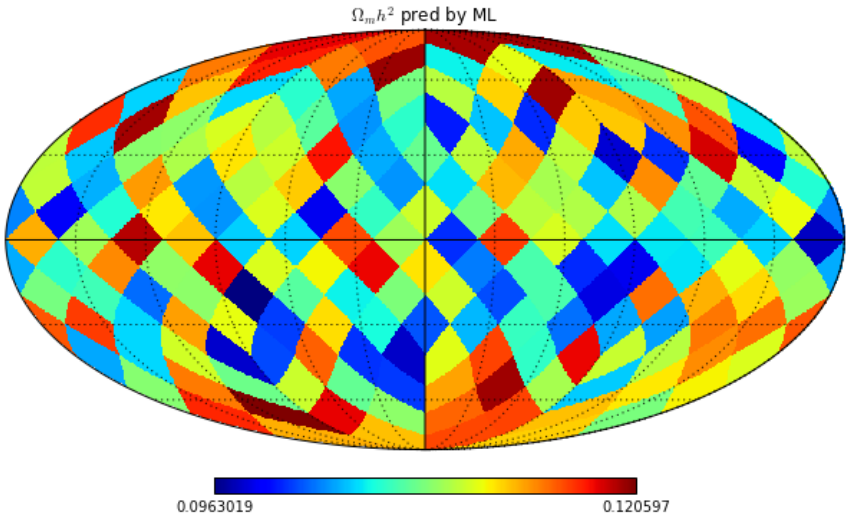


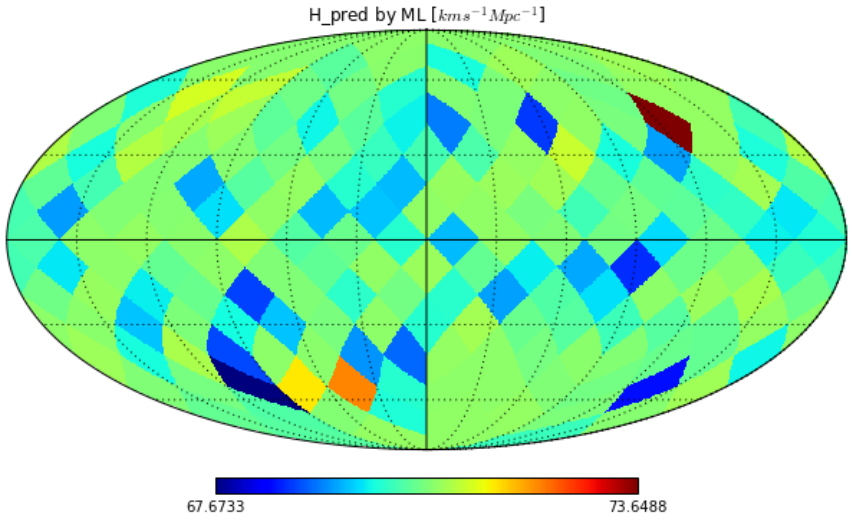
K-Nearest Neighbour
Random Forest
Support Vector Machine

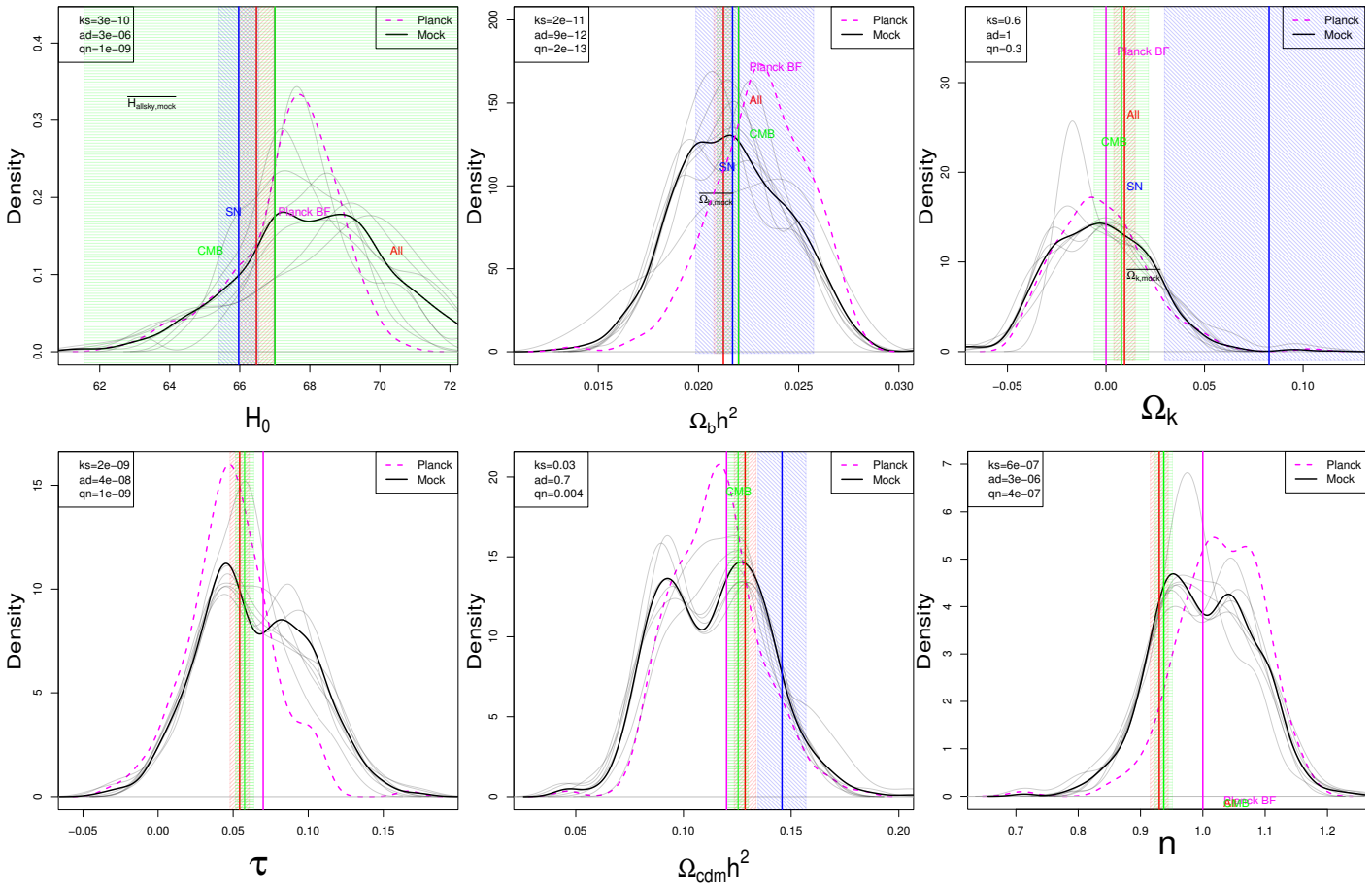
First Results.







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ad=3e−06
qn=1e−09
Planck
Mock
SN
CMB
Planck BF
All
Density
H0
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ad=9e−12
qn=2e−13
Ωbh2
ks=0.6
ad=1
qn=0.3
Ωk
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τ
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qn=0.004
Ωcdmh2
ks=6e−07
ad=3e−06
qn=4e−07
n

Final Remarks

- We developed a machine learning technique that estimate the cosmological parameters in a more efficient way, and allow us to measure the angular distribution of this parameters.
- This technique can be easily extended to use more cosmological information as features (BAO, correlation function, SZ emission, etc.).
- We do not found statistically significant departures from what is expected in an homogeneous and isotropic universe, with the possible exception of a bi-modal H_0 distribution.
- We will extend the parameters space and add polarization information in a forthcoming work.
- We will analyze the correlations between the angular distribution of the cosmological parameters and the large scale structure (voids, filaments, etc.)


THANK YOU!!