CMBFAST

Floor Terra

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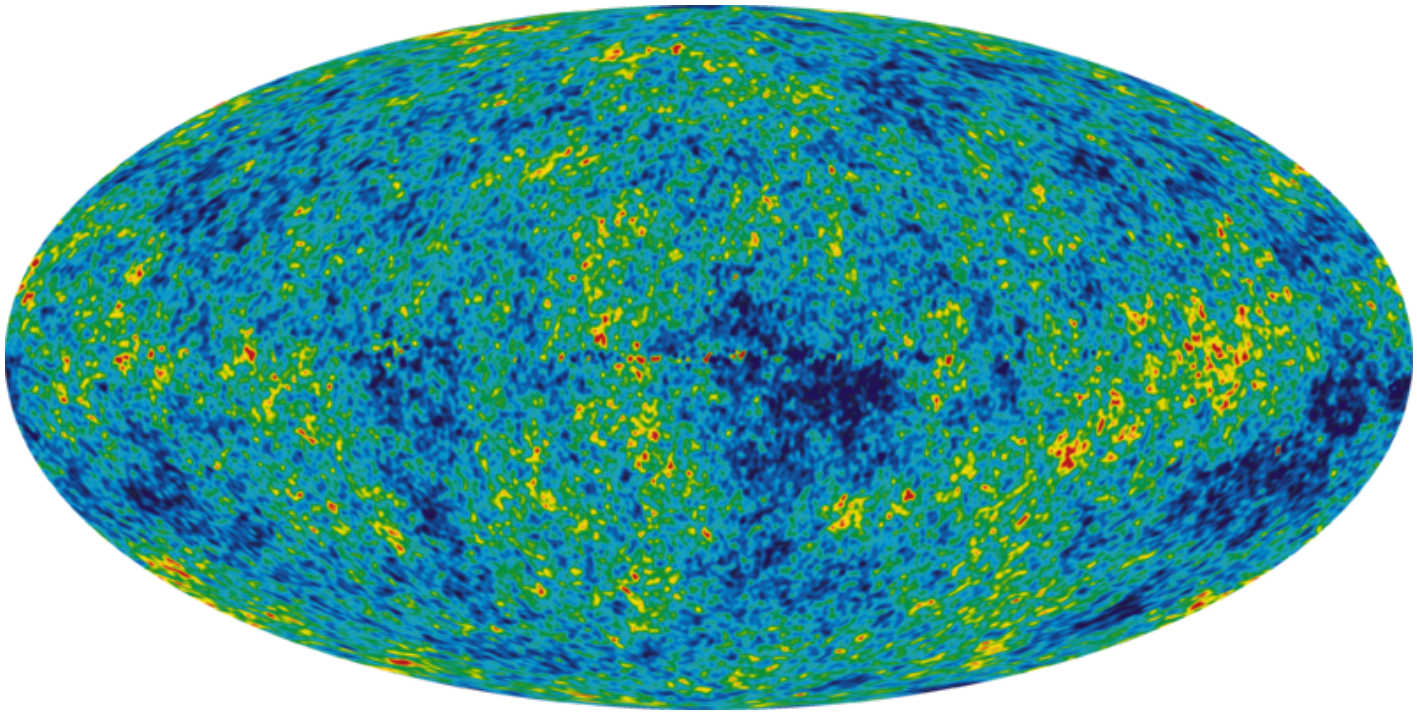
The big bang

A simple model

- The universe starts small, hot and dense
- The universe expands and cools
- Recombination ($z = 1100,\ T = 4000K$)
- Surface of last scattering
- Universe expands while photons travel freely
- CMB is measured by Arno Penzias and Robert Woodrow Wilson ($z = 1,\ T = 2.725K$)

WMAP

What do we see today?



WMAP

The data

- Mean temperature $T = 2.725K$
- Variations of XXX

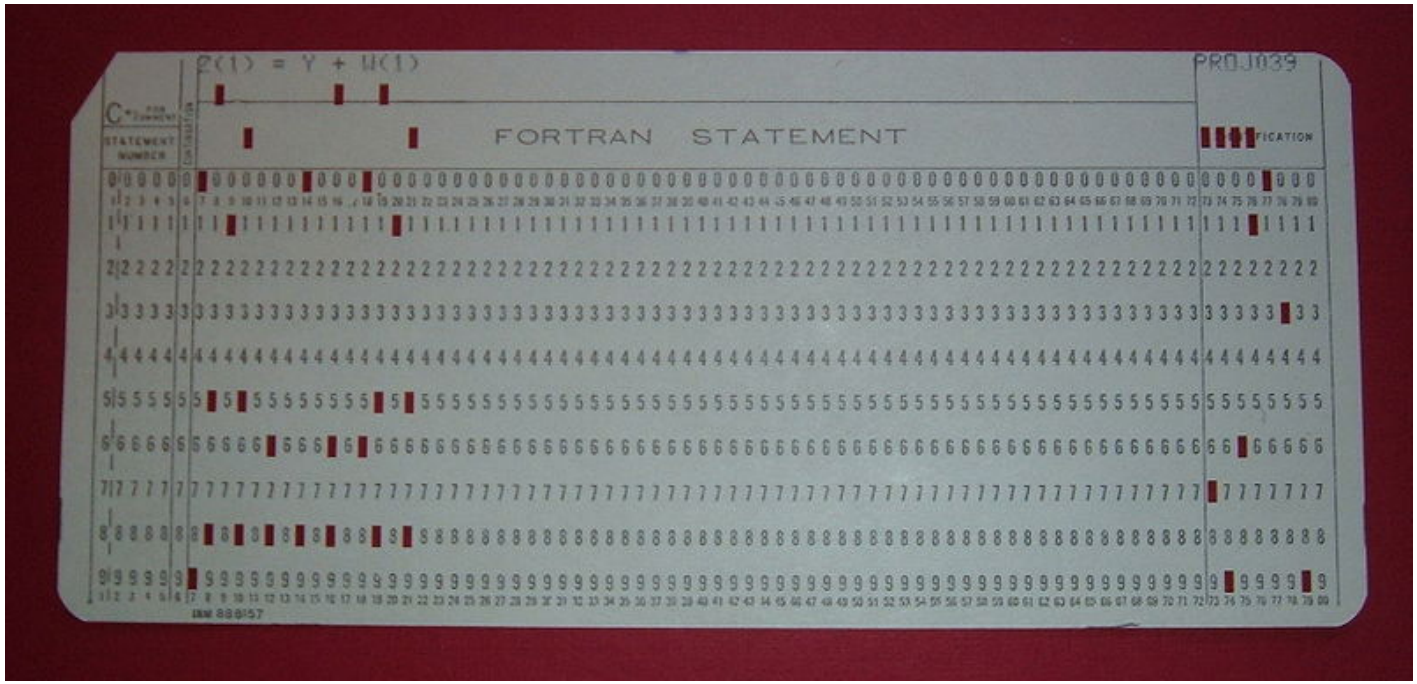
The CMBFAST code

A line-of-sight integration approach to cosmic microwave background anisotropies

- Written by Uros Seljak and Matias Zaldarriaga.
- Article published in 1996
- The first fast CMB code
- Written in the FORTRAN programming language

The problems with CMBFAST

FORTRAN



The problems with CMBFAST

Interactive

- CMBFAST is designed for interactive use
- This makes it hard to automate
  - Parameter fitting
  - batch processing
  - Play with the code (educational use)

py-cmbfast

A python wrapper around the CMBFAST code

- Suited for both interactive and scripted use
- Easy to use

```
from libcmb import CMB
cmb = CMB()
cmb.jlgen(1500, 3000) # Generate a tal
```