Machine Learning for photometric redshifts

Christopher Bonnett

What is a redshift ?

What is a redshift ?

A cosmological distance measure

How do we measure it?

How do we measure it?



How do we measure it?



But I don't have a spectrograph

But I don't have a spectrograph



But I don't have a spectrograph









Regression problem — Predict a real number value



Sanchez et al

Regression problem — Predict a real number value

"For most LSST probes of dark energy, what will matter most is not the precision with which individual photometric redshifts are measured, but rather the degree to which we understand the actual redshift distributions of LSST samples; if photo-z 's are systematically biased or their errors are poorly understood, dark energy inference will be biased as well"

Backine Learning

Regression problem Predict a real number value

Classification problem — > To which class does object belong







CIFAR10

MNIST

Classification problem — To which class does an object belong

High S/N
Easy for humans
Mutually exclusive classes

Classification problem — > To which class does an object belong

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Classification problem

To which class does an object belong

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Binning of your PDF



Algorithms

Random Forests Neural Network Boosted Decision Trees

. . .



SO WONV not work?

Loads of faint galaxies in my photometric sample

Very few faint galaxies in my <u>spectroscopic sample</u>

Where does my signal come from: Faint galaxies (in Weak Lensing)





All spectra come for <u>small</u> regions on the sky...



Different <u>noise</u> properties

- Identify galaxy populations for which it will work
- Plan <u>spectroscopic surveys</u> obtain better coverage
- Work on image and catalogue level to obtain similar noise properties

