# Galaxy redshift estimations with transfer and multi-task learning

M. Eriksen [eriksen@pic.es], L.Cabayol, H.Guo - IFAE-PIC, Barcelona

- Cosmology requires redshift estimations for large number of galaxies.
- Image galaxies in different bands and determine redshift as an inverse problem.
- Challenge: Inferring galaxy distances with small and biased training samples.

PIC
port d'informació
científica
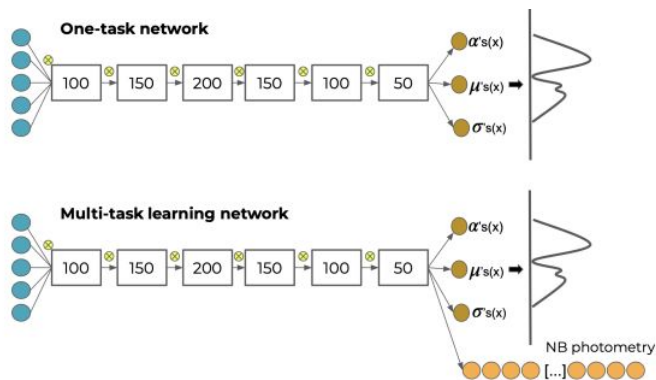
IFAE

Transfer learning from simulations
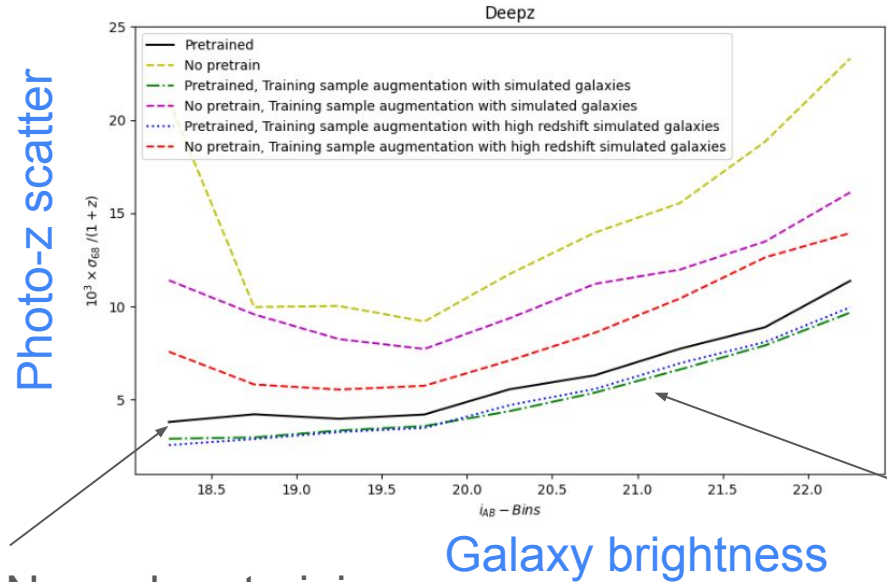
No simulated data

- Deepz is a deep neural network for photo-z estimation.
- Achieved state-of the art results on narrow-band photometry.
- Combining simulated data is key.

Better transfer learning scheme

Normal pretraining

Galaxy brightness

Photo-z scatter

arXiv: 2004.07979

Deepz

Legend:
- Pretrained
- No pretrain
- Pretrained, Training sample augmentation with simulated galaxies
- No pretrain, Training sample augmentation with simulated galaxies
- Pretrained, Training sample augmentation with high redshift simulated galaxies
- No pretrain, Training sample augmentation with high redshift simulated galaxies

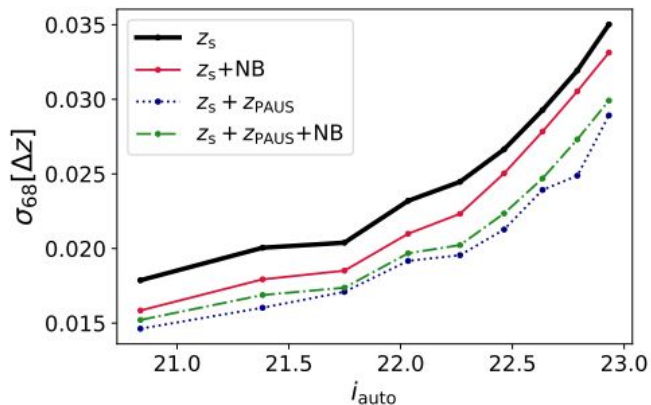$10^3 \times \sigma_{68}/(1+z)$

$i_{AB} - Bins$

Multi-task learning

Problem: How to benefit from PAUS NB, which only covers 0.3% sky-area of *Euclid*.

Solution: Multi-task learning, predicting PAUS narrow bands (top plot).

Result: Reduces the photo-z scatter for all galaxies (bottom plot).

arXiv: 2209.10161