The infrared emission of galaxies via machine learning techniques

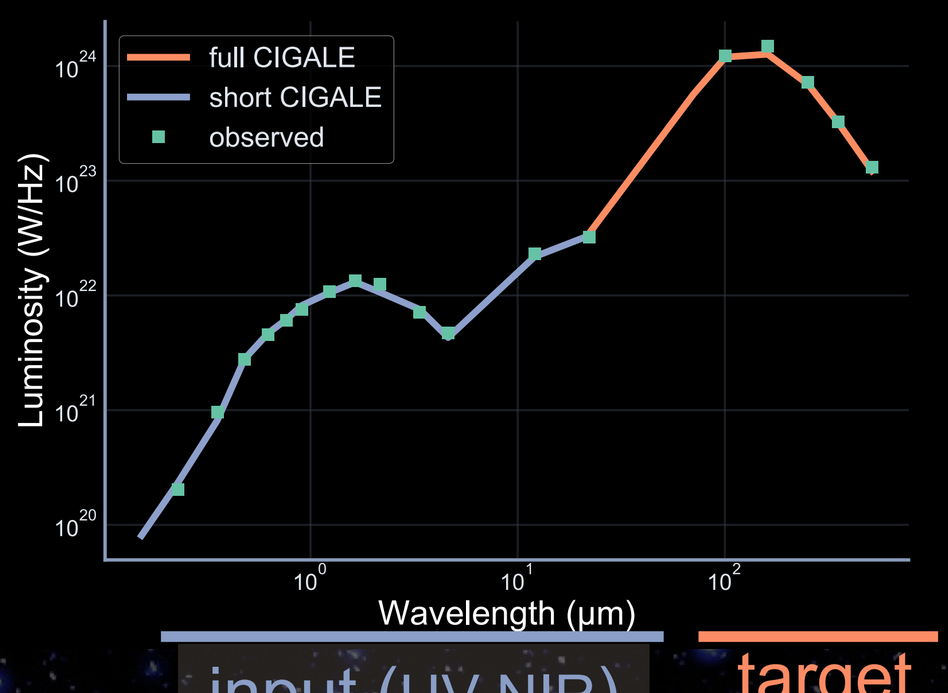
GHENT UNIVERSITY

Wouter Dobbels, Maarten Baes

Astronomical Observatory, Ghent, Belgium

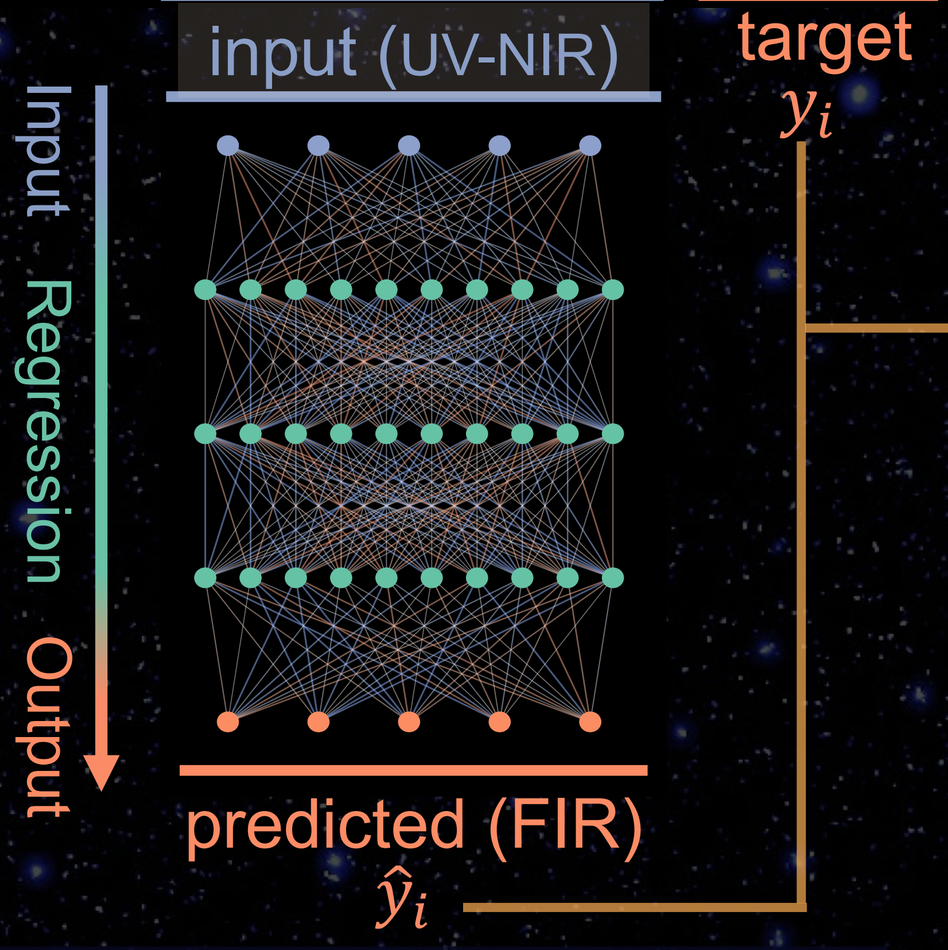
Dust absorbs roughly one third of all starlight
This energy is re-emitted at the far-infrared (FIR)
The optical extinction is thus connected to the FIR emission

Can we predict the FIR flux from UV-NIR fluxes?



1 - Data Preprocessing

- H-ATLAS + DustPedia (UV – FIR datasets)
- CIGALE fits SED through data, which avoids missing fluxes
- Split in *train* and *test* set (3249 + 1084 samples)
- $y_i = \log(F_i / F_{3.6})$

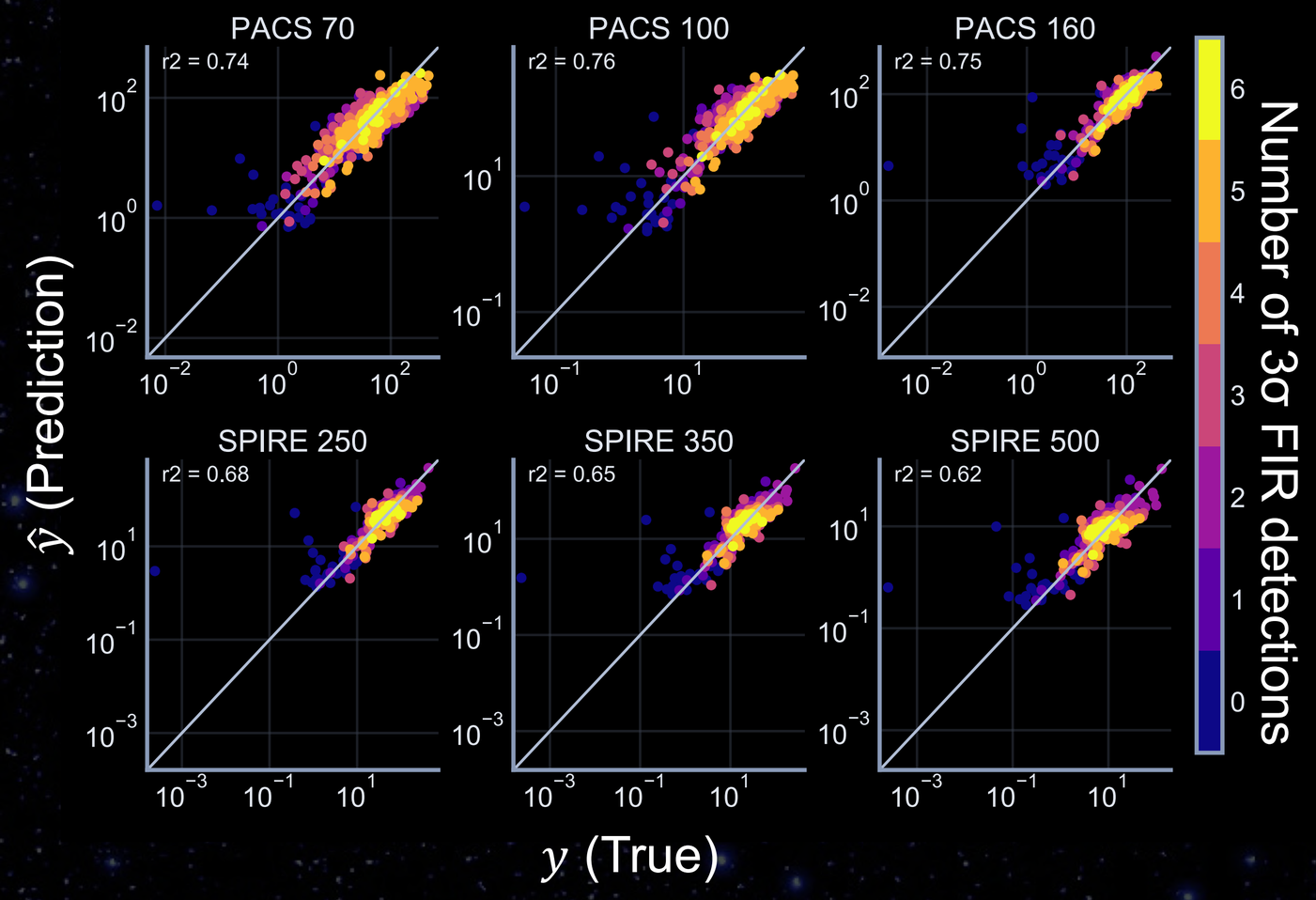


2 - Train Machine Learning

- Minimize loss $\mathcal{L} = \sum_{i \in FIR} (y_i - \hat{y}_i)^2$
- Try multiple neural network architectures

3 - Evaluate

- Mean prediction error: 26% (comparable to intrinsic errors)
- Worst samples can be explained through low S/N
- Acceptable even if input is restricted to $< 3\mu m$



Wouter.Dobbels@UGent.be

DustPedia

fwo Research Foundation Flanders Opening new horizons