ULTRAVIOLET ASTRONOMY IN THE XXI CENTURY

e-Workshop 2020 – October 27-29

JcUVa

Downloaded from the JCUVA server hosting the workshop

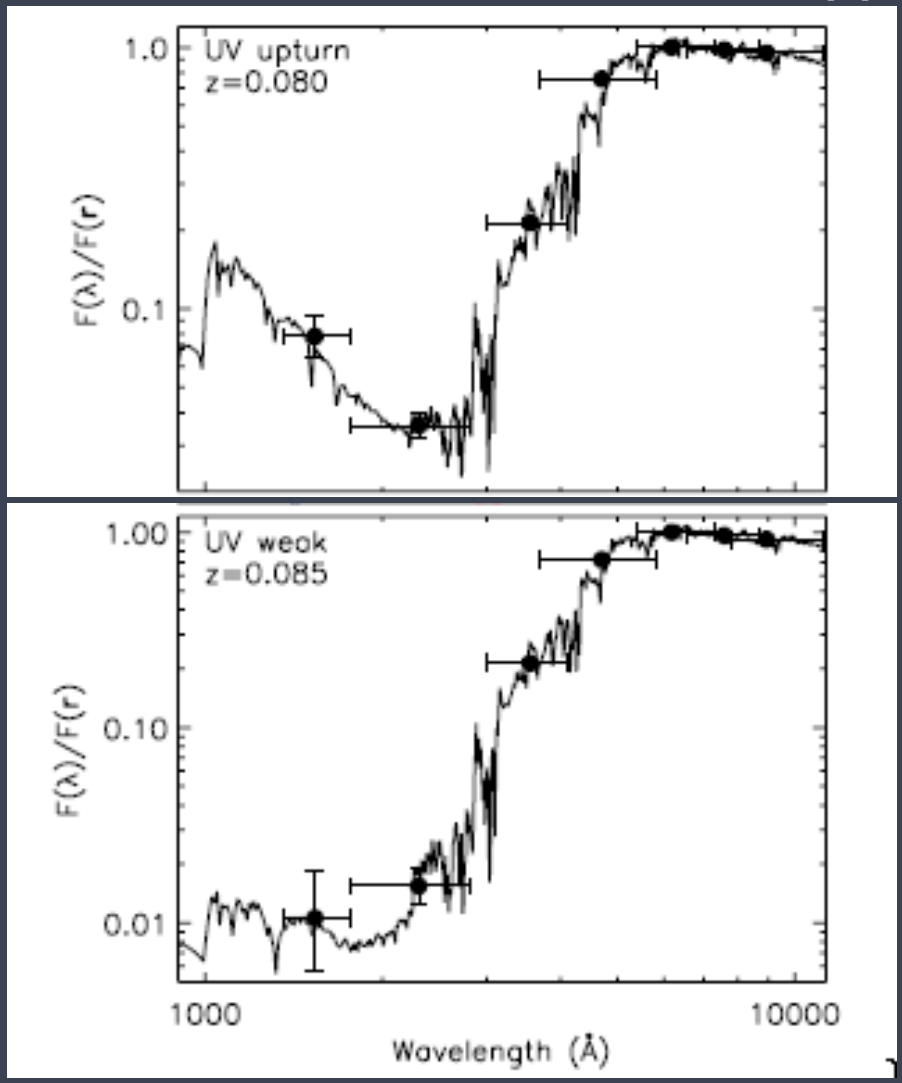
Assessing the evolution of the UV upturn

Instituto de Astronomia, Geofísica e Ciências Atmosféricas
Universidade de São Paulo

by **Maria Luiza Linhares Dantas**
on **October 27, 2020**

» Overview: UV upturn

Unexpected up-rise of the fluxes of early-type galaxies between the Lyman limit and 2,500Å approximately.



Example of spectra showing UV upturn and UV weak systems (Yi et al., 2011).

» UV upturn evolution

Previous works focused on the **strength** of the UV upturn in z.
Some of them are:

* Brown et al. 1998, 2000;
* Rich et al. 2005;
* Ree et al. 2007;
* Ali et al. 2018.

Here, we focus on the **fraction** of UV upturn hosting systems.

» Some advertisement!

Monthly Notices
of the
ROYAL ASTRONOMICAL SOCIETY

MNRAS **492,** 2996–3011 (2020)
Advance Access publication 2019 December 24

doi:10.1093/mnras/stz3609

UV bright red-sequence galaxies: how do UV upturn systems evolve in redshift and stellar mass?

M. L. L. Dantas [1,2★] P. R. T. Coelho [1] R. S. de Souza [3] and T. S. Gonçalves [4]

[1] *Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, R. do Matão 1226, 05508-090, São Paulo, Brazil*
[2] *Departamento de Física Teórica, Universidad Autónoma de Madrid, E-28049, Madrid, Spain*
[3] *Department of Physics & Astronomy, University of North Carolina at Chapel Hill, NC 27599, USA*
[4] *Observatório do Valongo, Universidade Federal of Rio de Janeiro, Ladeira Pedro Antônio 43, Rio de Janeiro, RJ 20080-090, Brazil*

Accepted 2019 December 23. Received 2019 December 17; in original form 2019 August 18

» The sample

Surveys
Galaxy Mass Assembly (GAMA) – DR3
Galaxy Evolution Explorer (GALEX) – GR6/plus7
Sloan Digital Sky Survey (SDSS) – DR7

All bands had to be measured: FUV, NUV, *ugriz*.

» The sample

Surveys
Galaxy Mass Assembly (GAMA) - DR3
Galaxy Evolution Explorer (GALEX) - GR6/plus7
Sloan Digital Sky Survey (SDSS) - DR7

All bands had to be measured: FUV, NUV, *ugriz*.

Treatment
Extinction (Fitzpatrick, 1999)
K-corrections (Blanton & Roweis, 2007)
Offsets (SDSS – Doi, 2010)

» The sample

Surveys
Galaxy Mass Assembly (GAMA) – DR3
Galaxy Evolution Explorer (GALEX) – GR6/plus7
Sloan Digital Sky Survey (SDSS) – DR7

All bands had to be measured: FUV, NUV, *ugriz*.

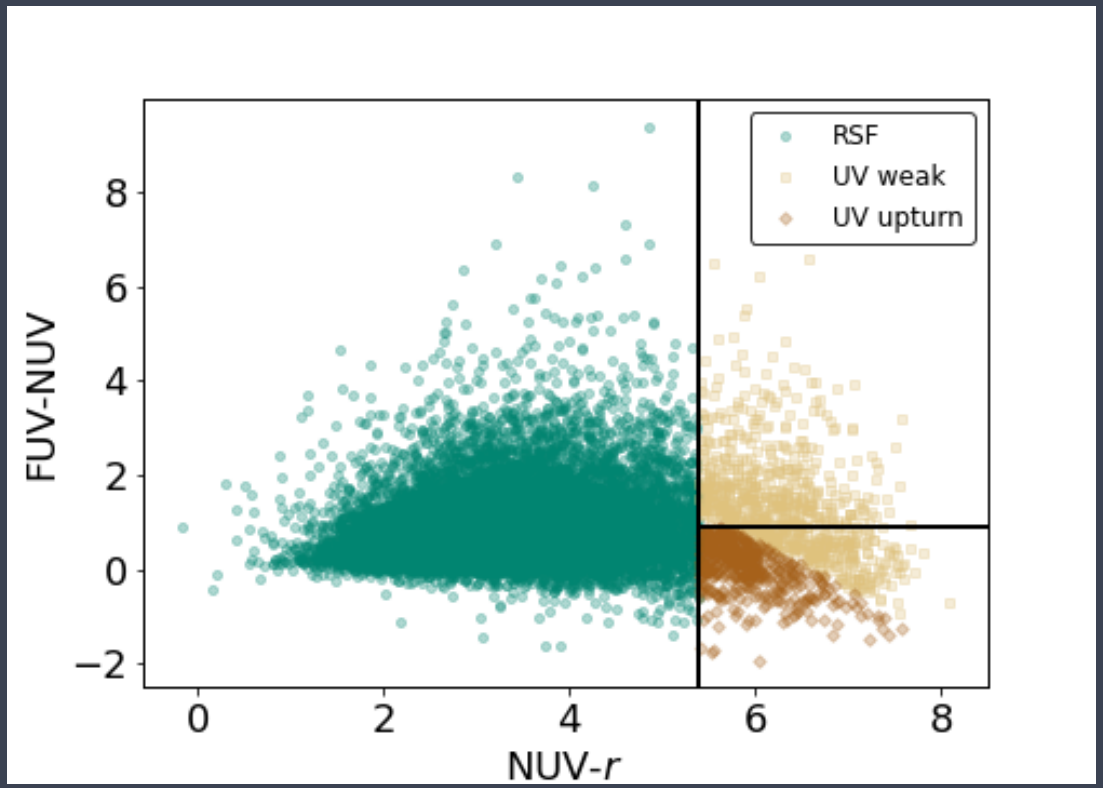
Treatment
Extinction (Fitzpatrick, 1999)
K-corrections (Blanton & Roweis, 2007)
Offsets (SDSS – Doi, 2010)

Datasets

Complete sample:	14 331 objects
Final sample (UV weak and UV upturn):	506 objects

296 UV weak and 210 UV upturn

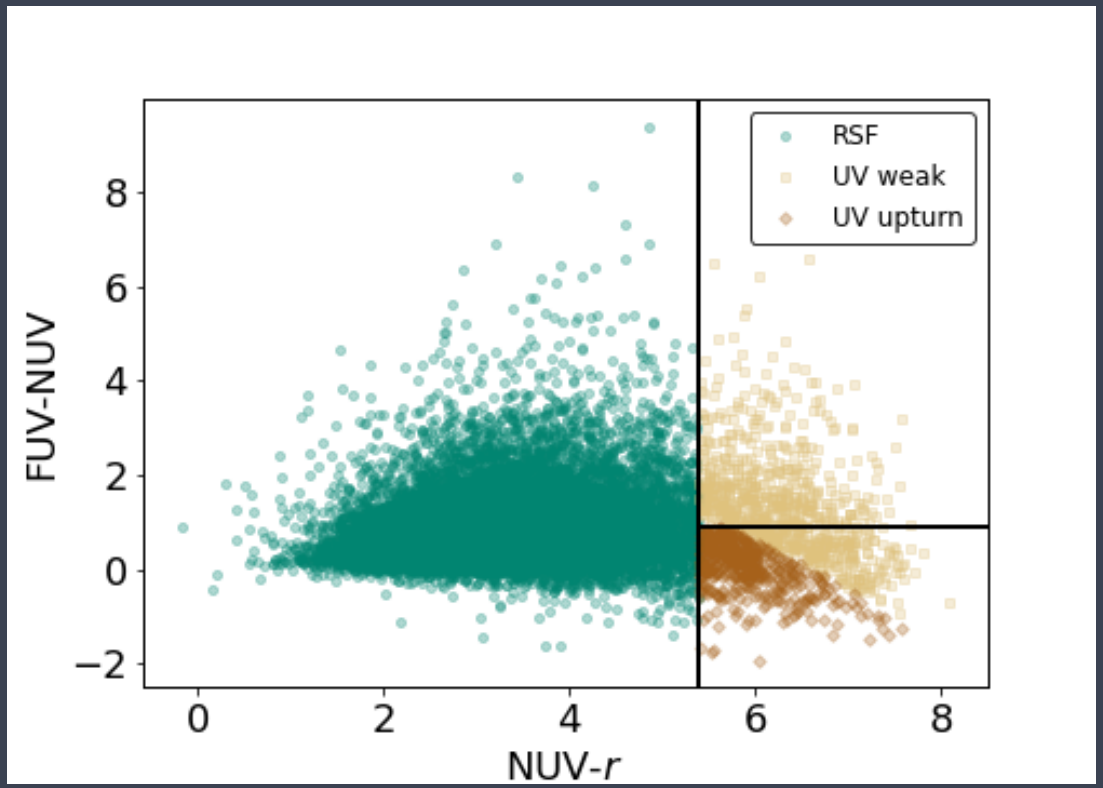
» Overview: photometric classification of UV bright galaxies



1. NUV-r > 5.4: **UV bright RSGs**

UV classes according to Yi et al. (2011)

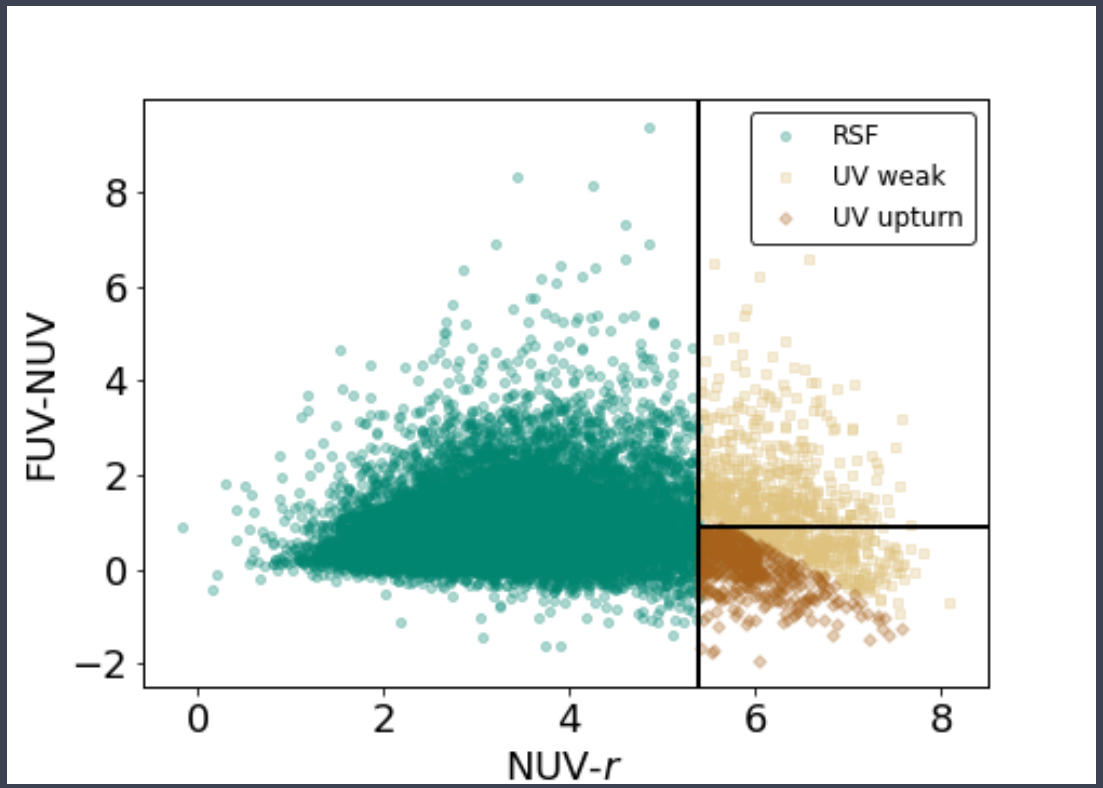
» Overview: photometric classification of UV bright galaxies



1. NUV-r > 5.4: **UV bright RSGs**
2. FUV-NUV < 0.9: **UV upturn #1**

UV classes according to Yi et al. (2011)

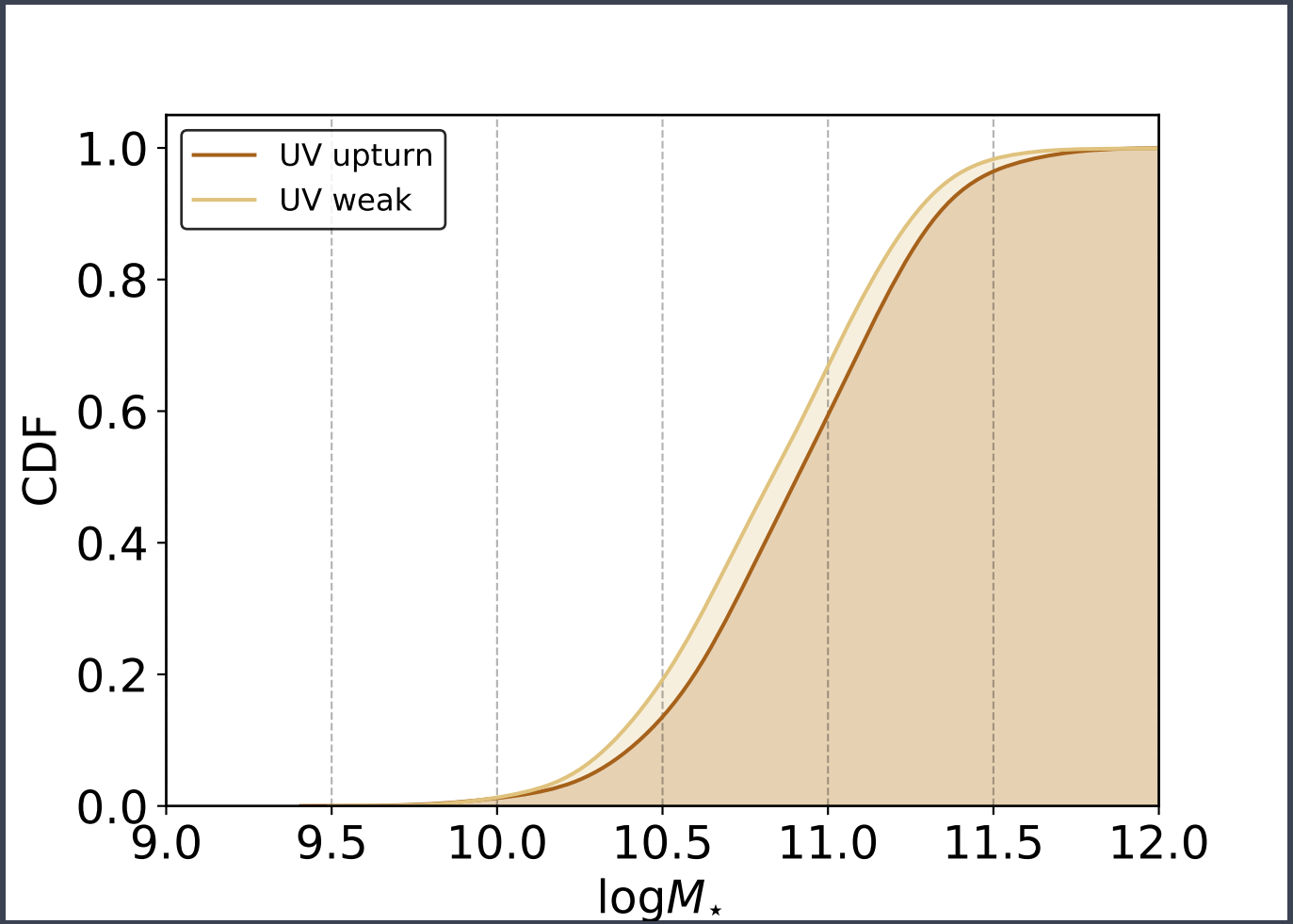
» Overview: photometric classification of UV bright galaxies



1. NUV-r > 5.4: **UV bright RSGs**
2. FUV-NUV < 0.9: **UV upturn #1**
3. FUV-r < 6.6: **UV upturn #2**

UV classes according to Yi et al. (2011)

» Mass distribution



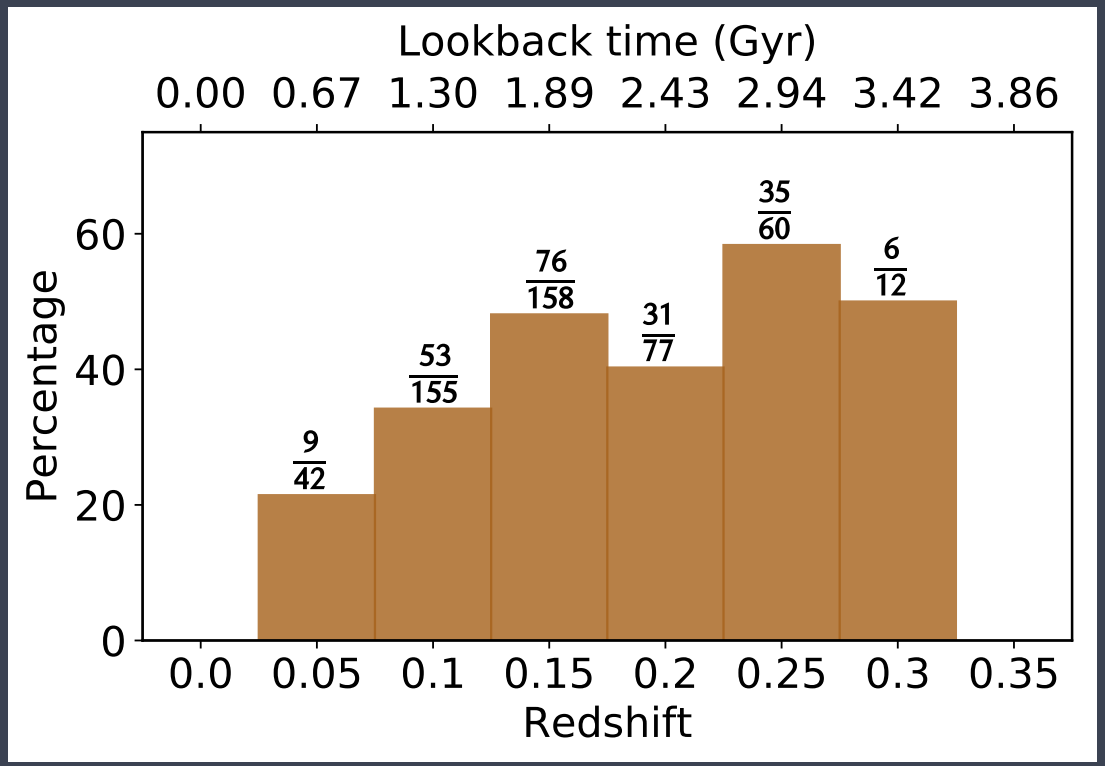
CDF for log $M_\star$

» Hypothesis

Does the fraction of UV upturn galaxies evolve?

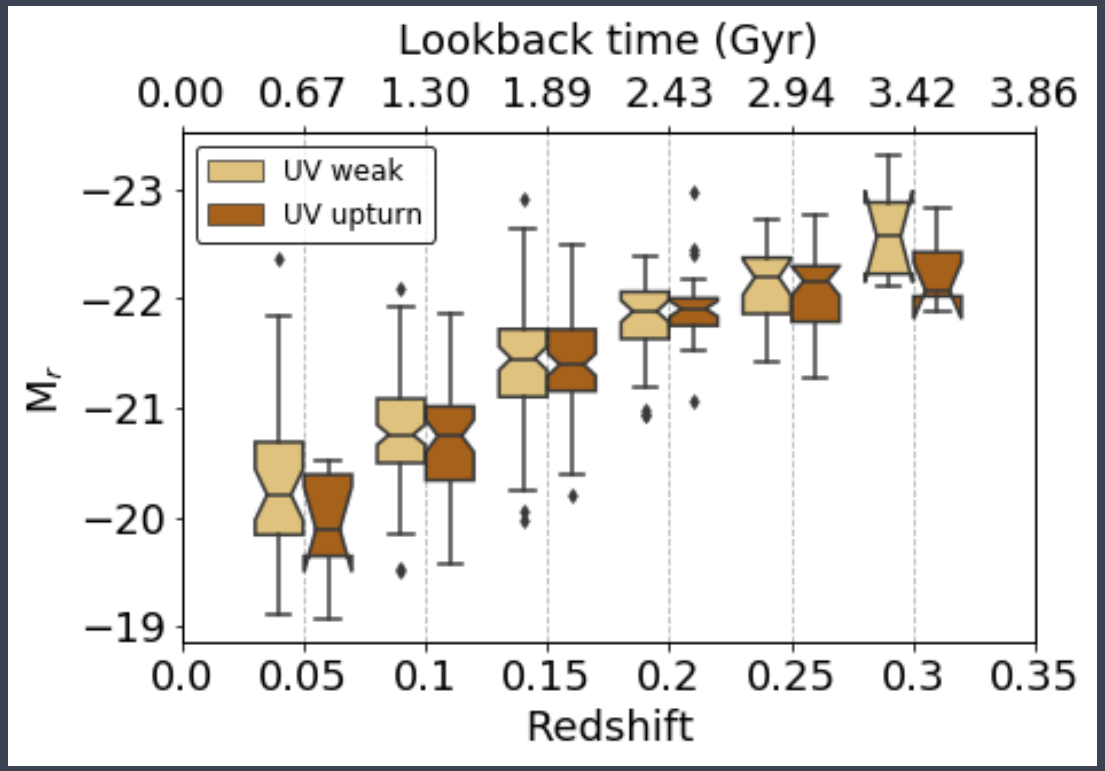
» Hypothesis

Does the fraction of UV upturn galaxies evolve?



Bar-plot featuring the fraction of UV upturn systems over the entire population of UV bright RSGs.

» Distribution of UV bright RSGs



Boxplots featuring the distribution of UV weak and UV upturn systems in terms of M_r in bins of z.

» Model

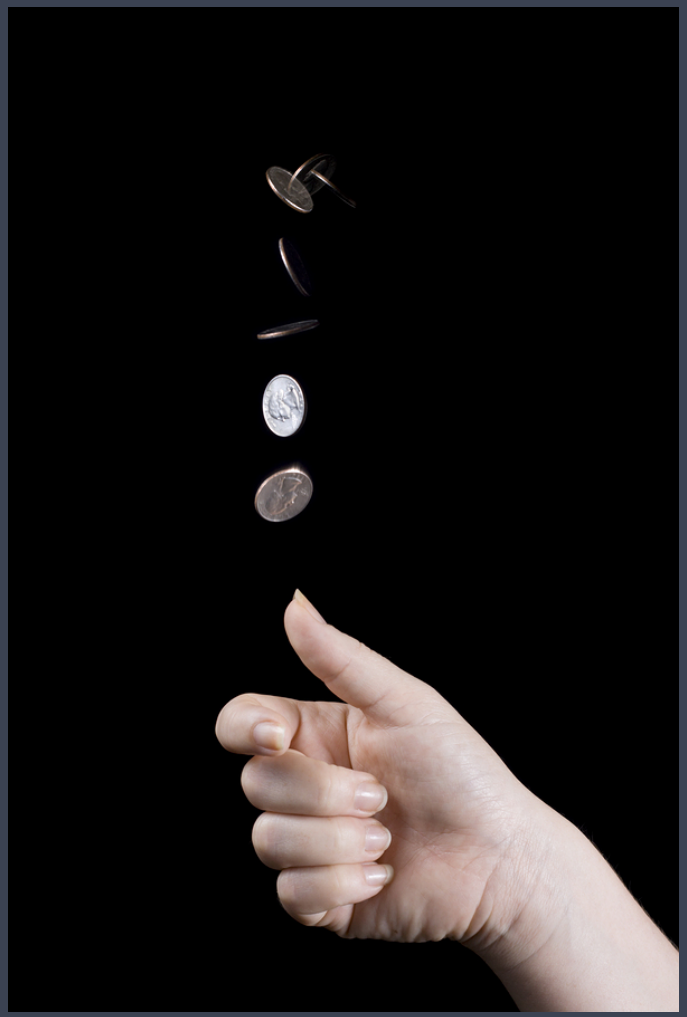
Bernoulli model: *a particular case of* the **Binomial** model

Ideal for binary data

In this case:

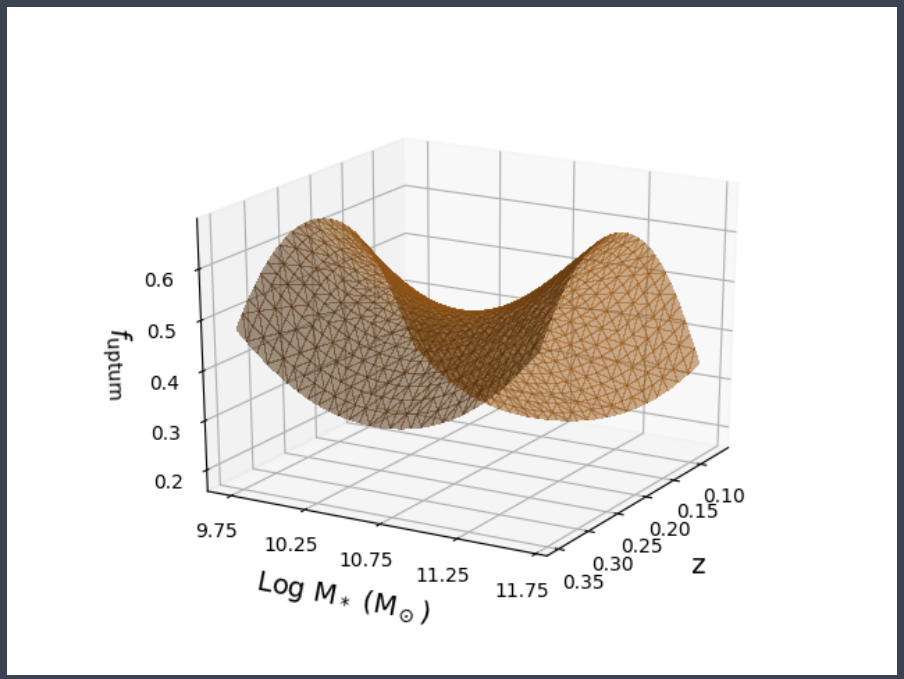
* UV upturn systems: 1
* UV weak systems: 0

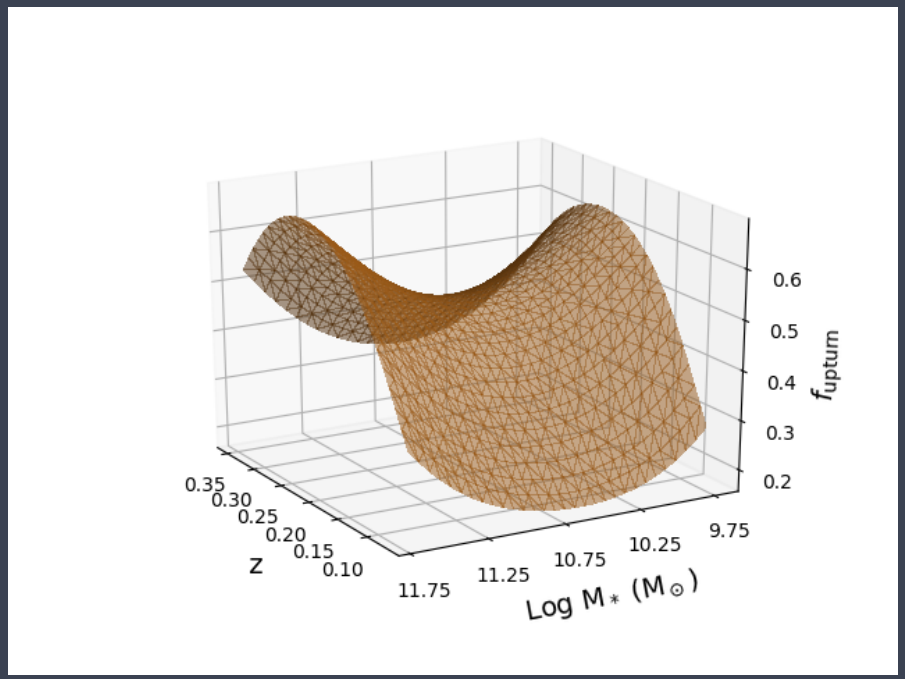
Model also used in **de Souza, Dantas et al. (2016)**



Coin flipping: only two results possible, heads or tails.

» Evolution of the UV upturn: results - 3D perspective

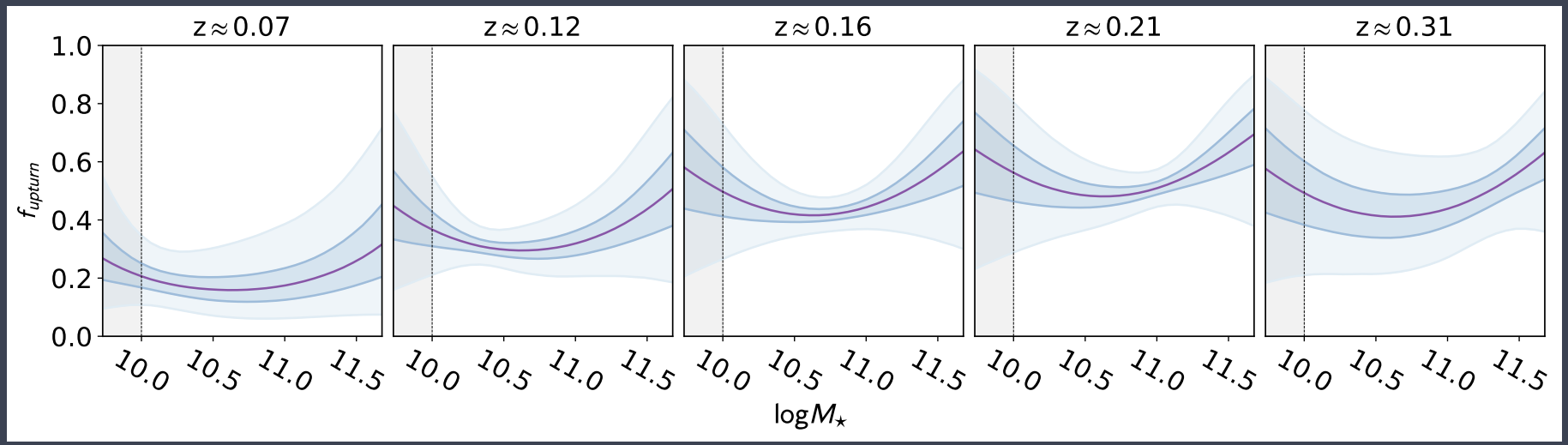




3D perspectives of the regression results.

» Evolution of the UV upturn: results

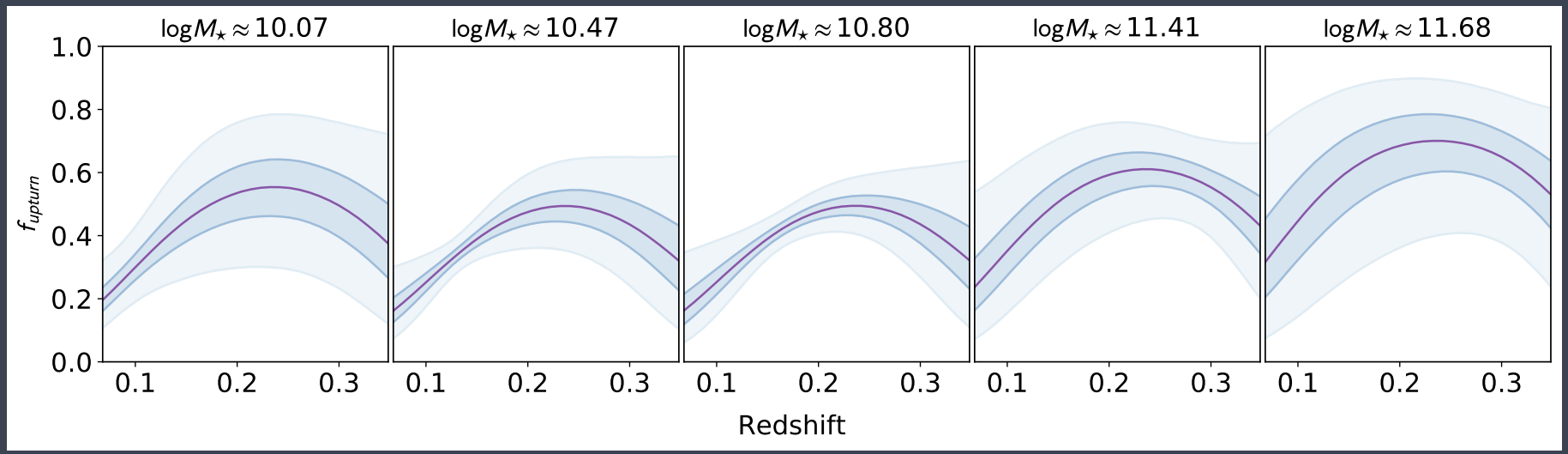
f_{upturn} *vs.* log $M_\star$



Results for log$M_\star$.

» Evolution of the UV upturn: results

f_{upturn} *vs.* z



Results for z.

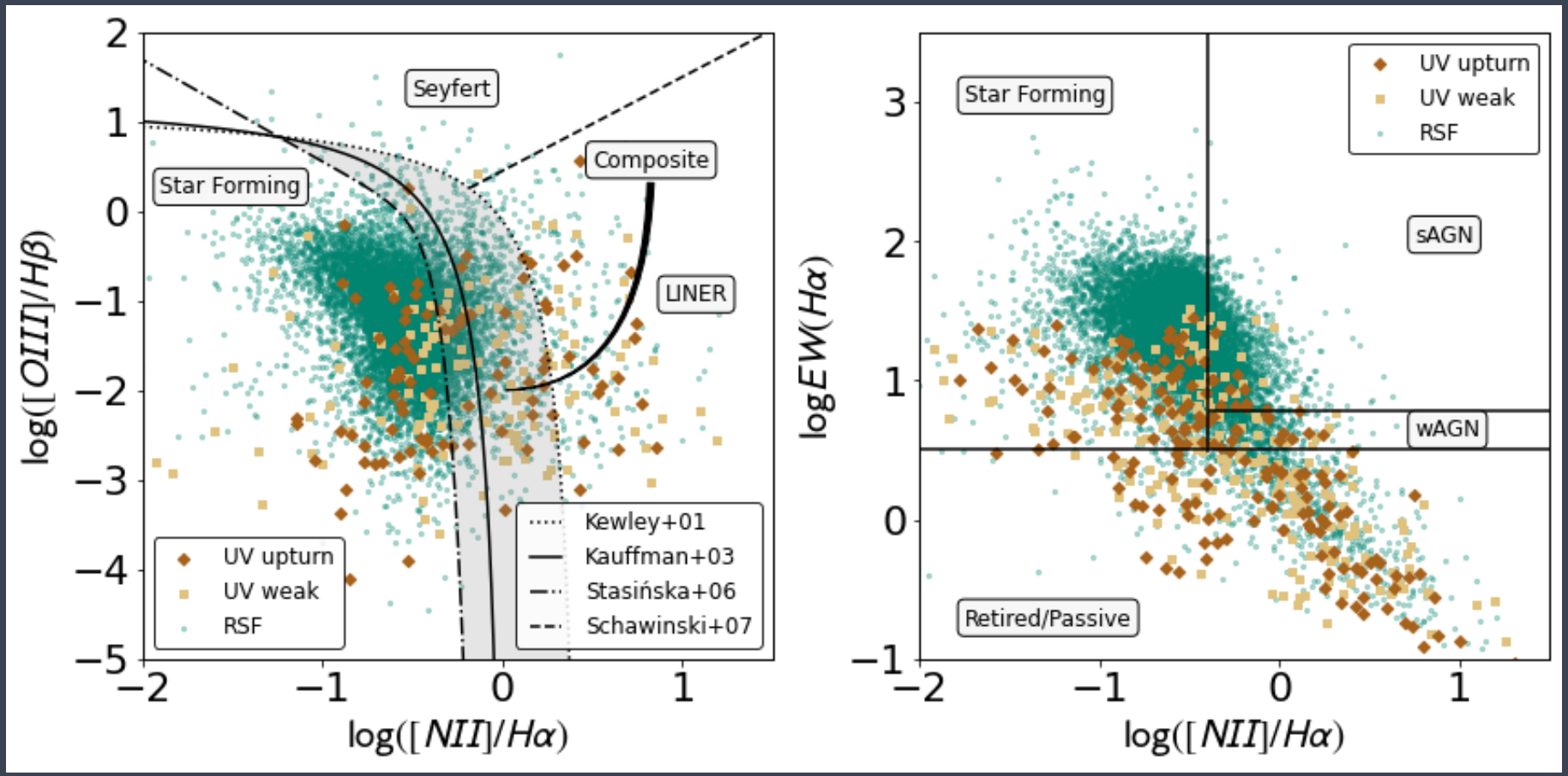
» Hypotheses

What is the census of emission line classes in our sample?

What is the impact of these emission lines on the sample?

» Evolution of the UV upturn: diagnostic diagrams

Dantas et al. (2020)

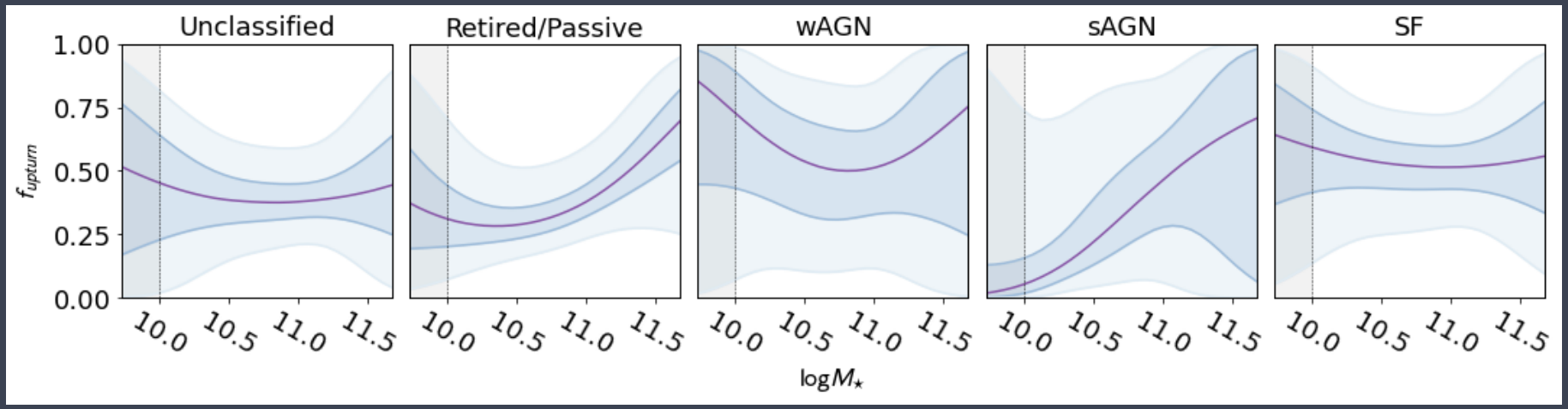


BPT and WHAN diagrams for the sample

» Evolution of the UV upturn: regression stratified by emission lines

Dantas et al. (2020)

f_{upturn} *vs.* log $M_\star$

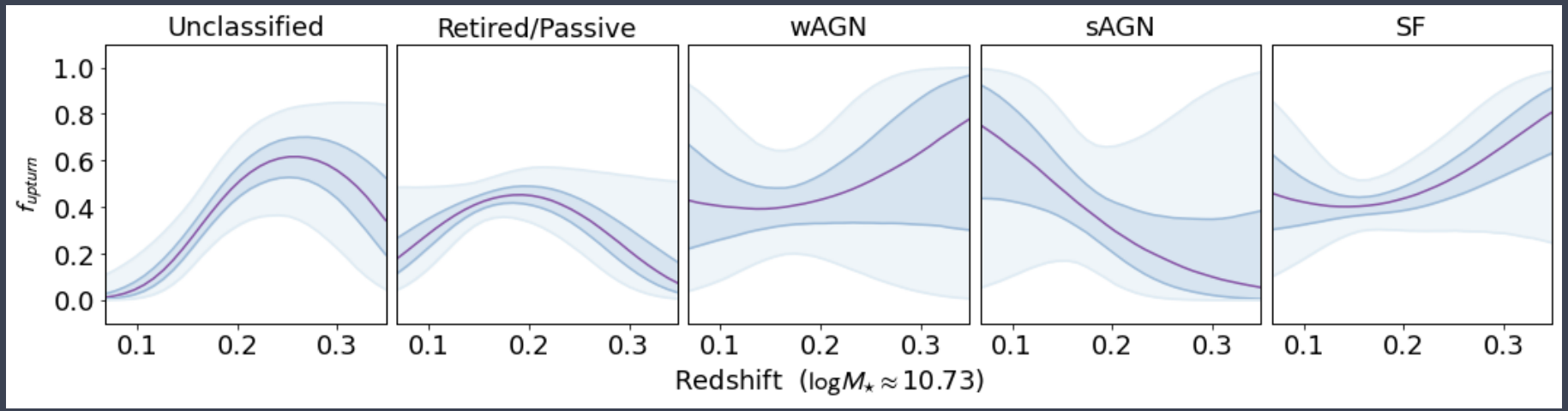


Results for log $M_\star$ for different emission-line classes.

» Evolution of the UV upturn: regression stratified by emission lines

Dantas et al. (2020)

f_{upturn} *vs.* z



Results for z for different emission-line classes.

» Conclusions

The main results for the evolution of the UV upturn are:

* the fraction of galaxies hosting UV upturn peaks at $z \sim 0.25$ followed by a seemingly decline;

» Conclusions

The main results for the evolution of the UV upturn are:

- the fraction of galaxies hosting UV upturn peaks at $z \sim 0.25$ followed by a seemingly decline;
- it is dependent on stellar mass: UV upturn frequency increases with mass!

» Conclusions

The main results for the evolution of the UV upturn are:

- the fraction of galaxies hosting UV upturn peaks at $z \sim 0.25$ followed by a seemingly decline;
- it is dependent on stellar mass: UV upturn frequency increases with mass!
- additional contamination by star-formation was found;

» Conclusions

The main results for the evolution of the UV upturn are:

- the fraction of galaxies hosting UV upturn peaks at $z \sim 0.25$ followed by a seemingly decline;
- it is dependent on stellar mass: UV upturn frequency increases with mass!
- additional contamination by star-formation was found;
- retired/passive ('liny' and lineless) systems are the main contributors for the main trend;

» Finally: more advertisement!

ArXiv: 2009.03915 !

UV upturn *versus* UV weak galaxies: differences and similarities of their stellar populations unveiled by a de-biased sample

M. L. L. Dantas[1★], P. R. T. Coelho[1], P. Sánchez-Blázquez[2,3]
[1] *Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, R. do Matão 1226, 05508-090, São Paulo, Brazil*
[2] *Departamento de Física de la Tierra y Astrofísica, Universidad Complutense de Madrid, 28040, Madrid, Spain*
[3] *IPARCOS, Facultad de CC Físicas, Universidad Complutense de Madrid, 28040, Madrid, Spain*

Thank you!