Optimizing Roman Photometric Redshifts

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On behalf of: **Finian Ashmead** **Yoki Salcedo** **Ashod Khederlarian**

University of Pittsburgh

Roman HLIS Cosmology PIT
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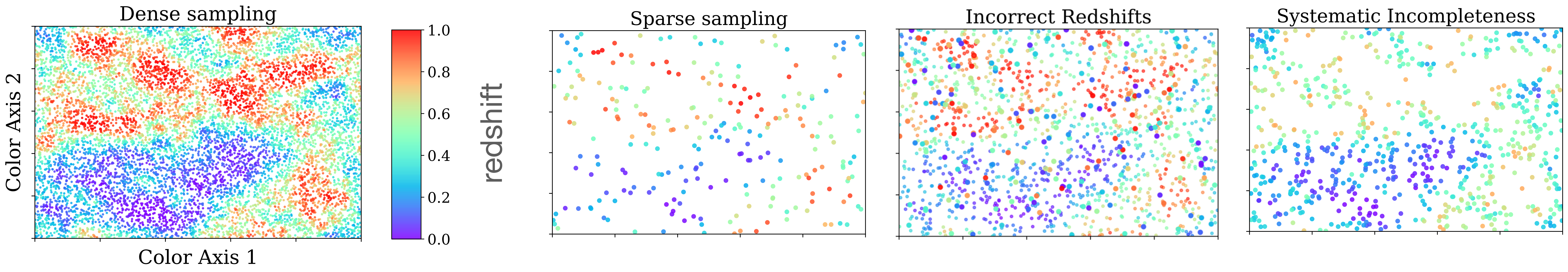
NASA

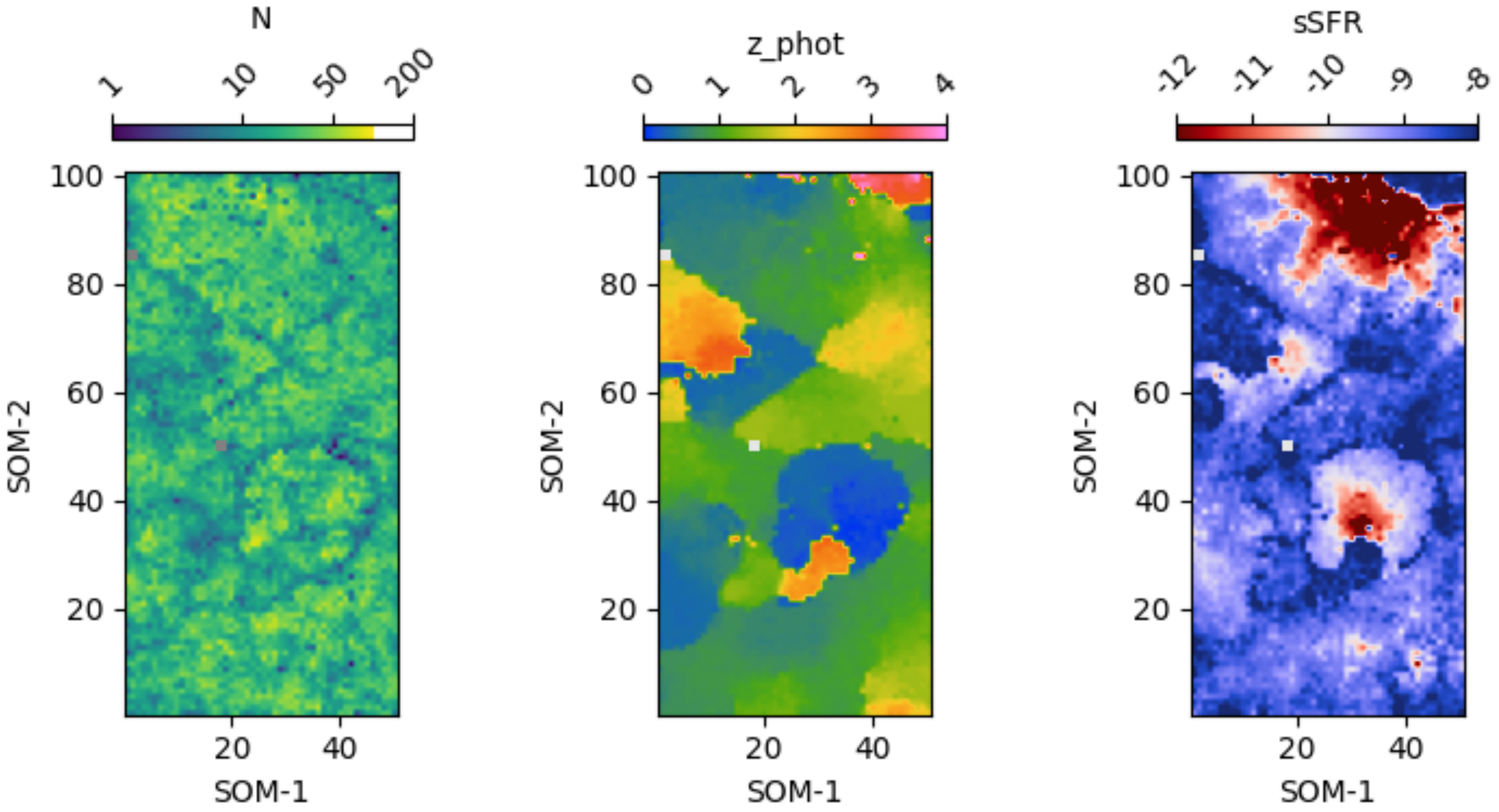
Photo-z Calibration Challenges



Newman & Gruen (2022)

- Compared to photometric objects in color-redshift space, existing spec-z training sets suffer from
  - **sparse sampling**
  - **incorrect redshifts**
  - **systematic incompleteness**

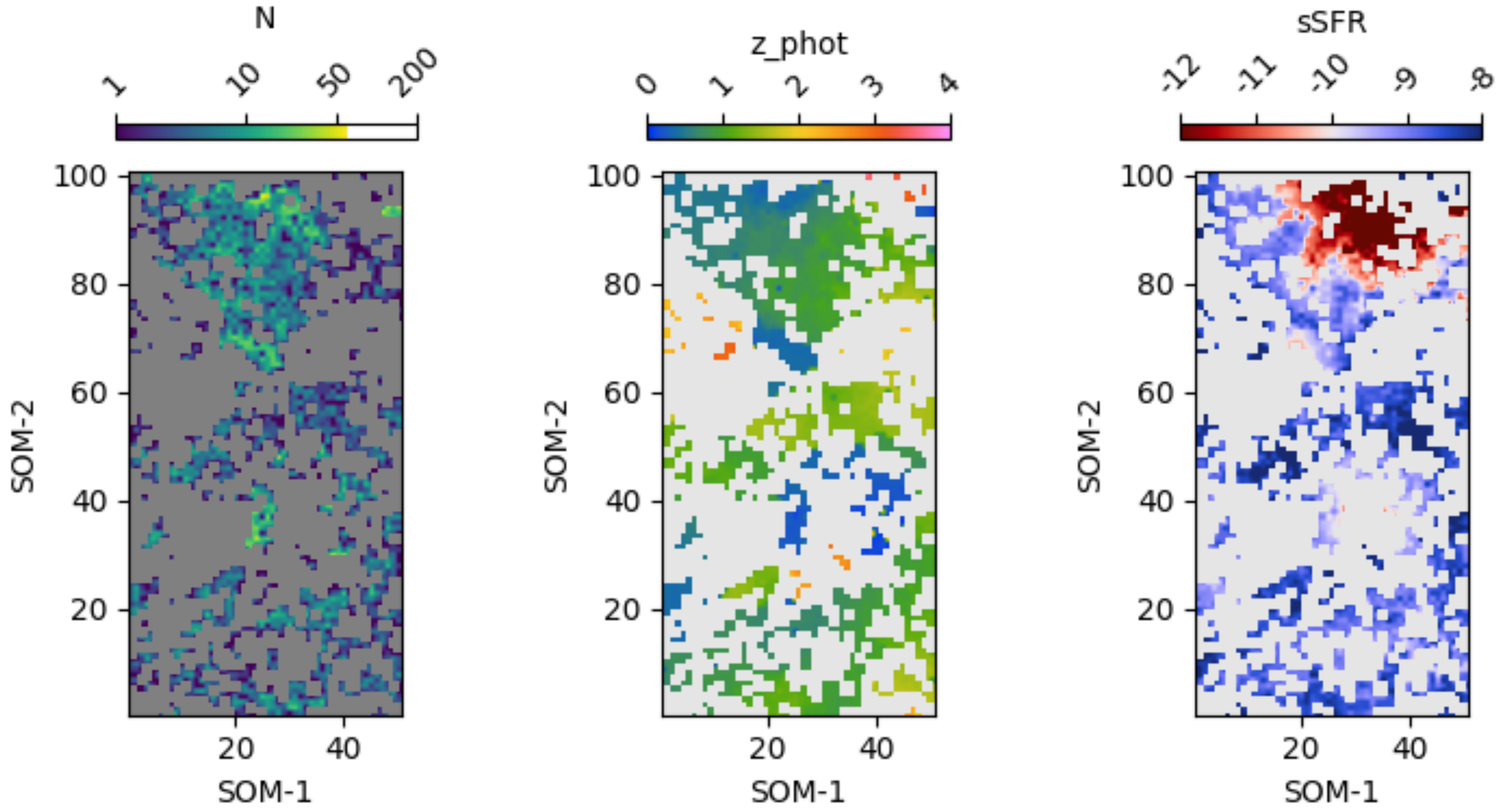
SOM: sharp boundaries and discrete binning hinder interpolation



credit: **Finian Ashmead**

*u*grizyJHKs* data from Weaver et al. (2022)

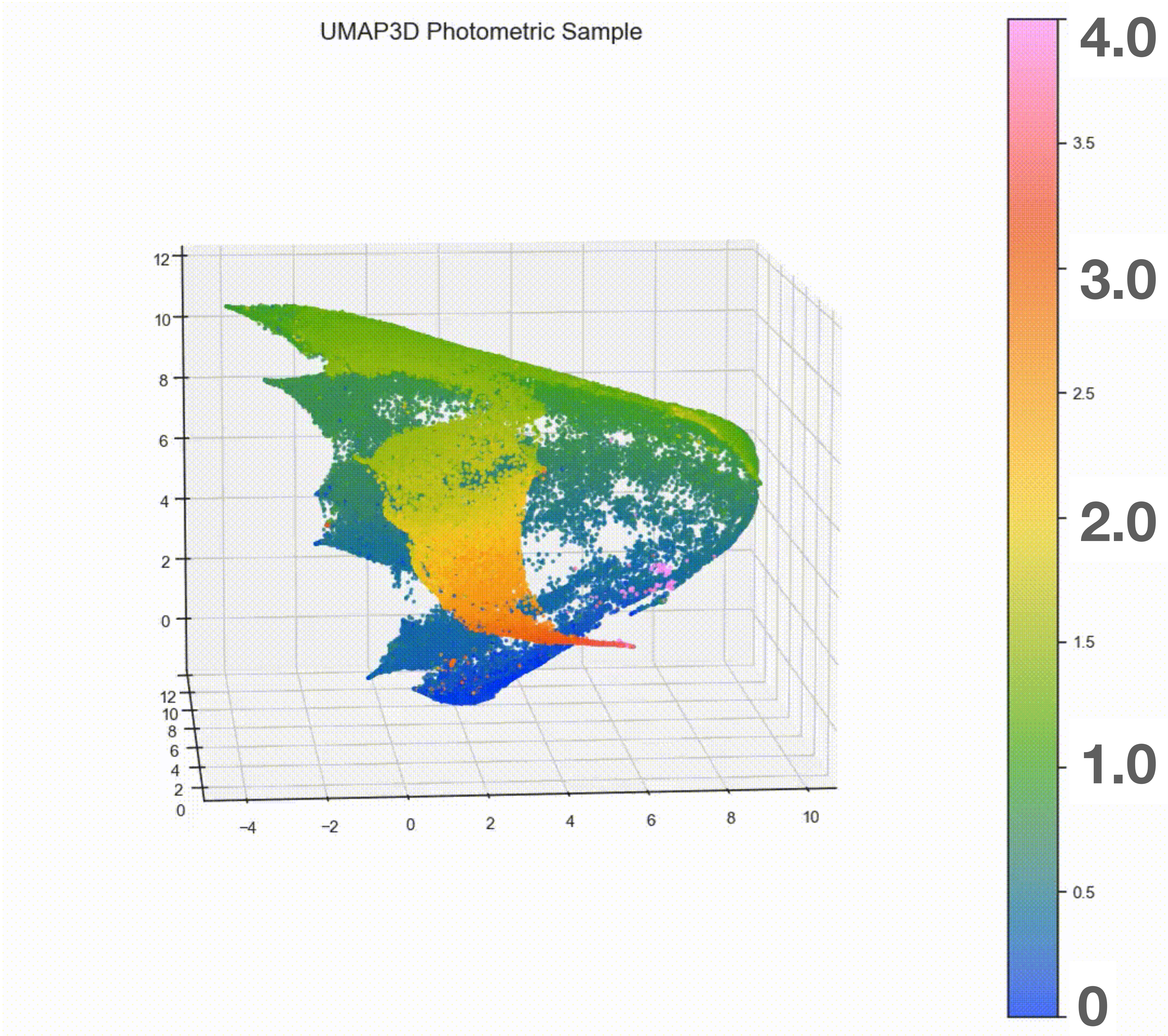
Spec-z's sparsely populate color-space and are systematically incomplete.



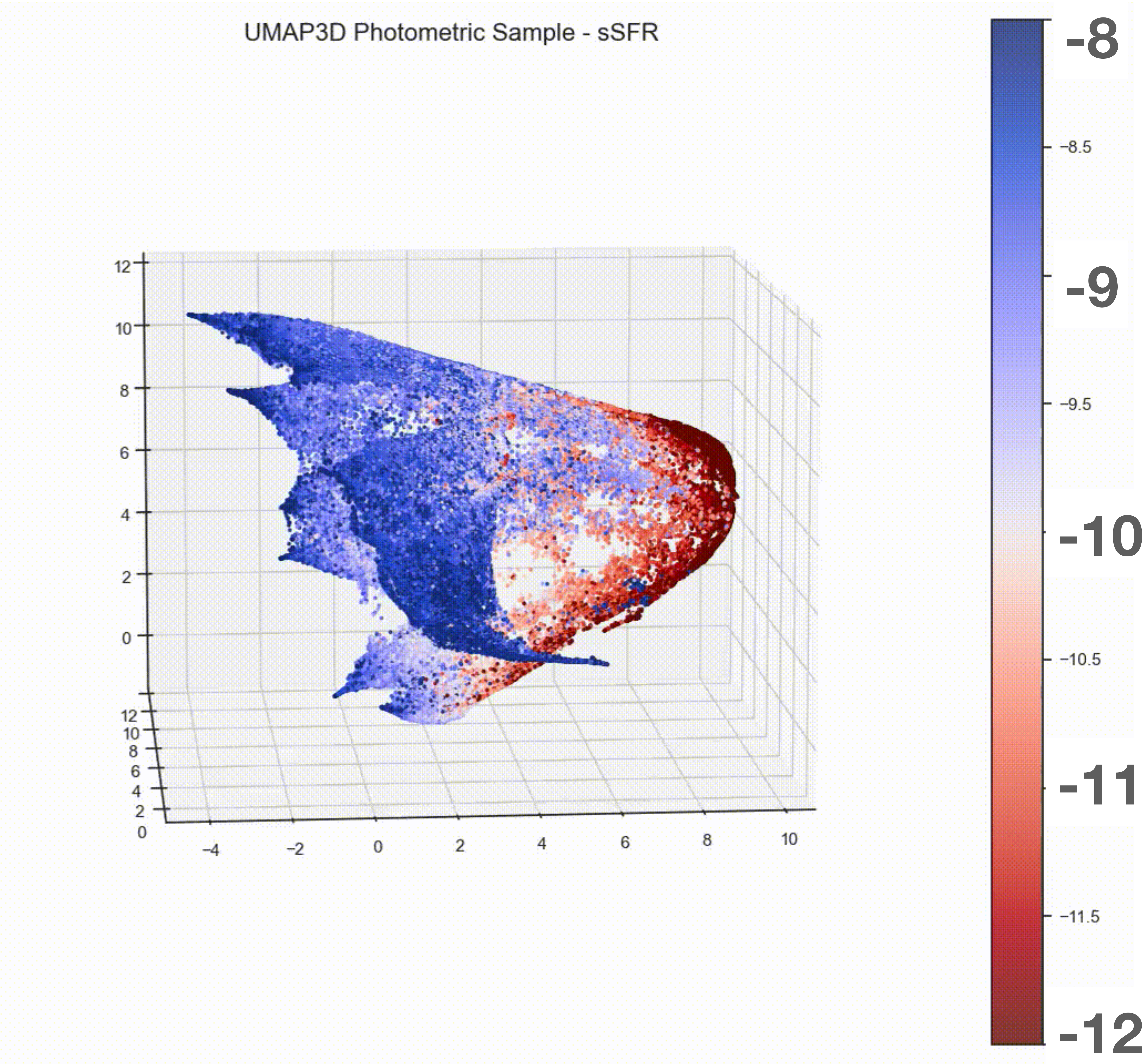
credit: **Finian Ashmead**
*u*grizyJHKs* data from Weaver et al. (2022)
spec-z's (confidence > 95%) from Khostovan et al. (in prep.)

Roman WFS (PI: Newman): Optimizing Spec-z Training Sets w/ UMAP

Photo-z



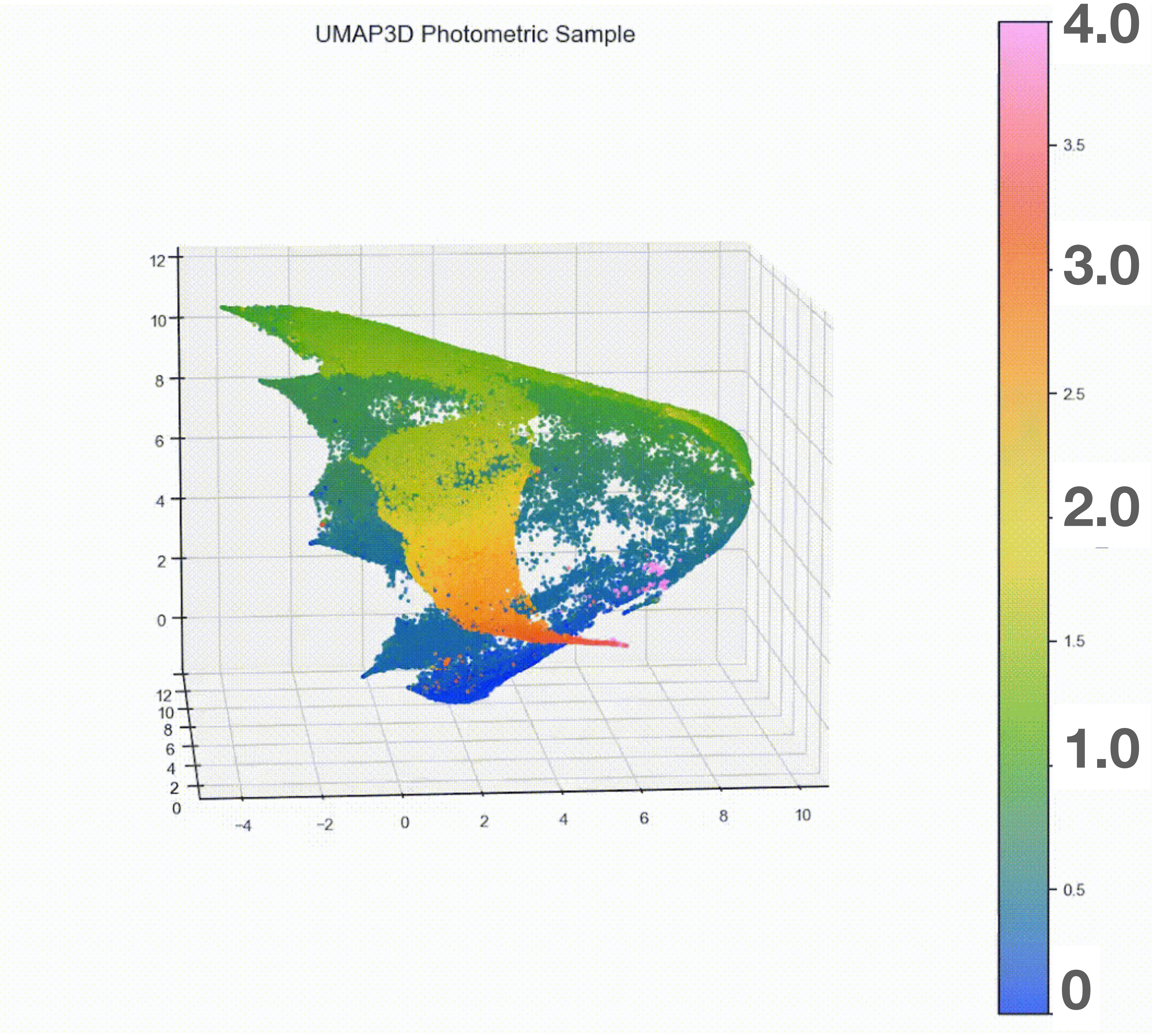
log(sSFR)



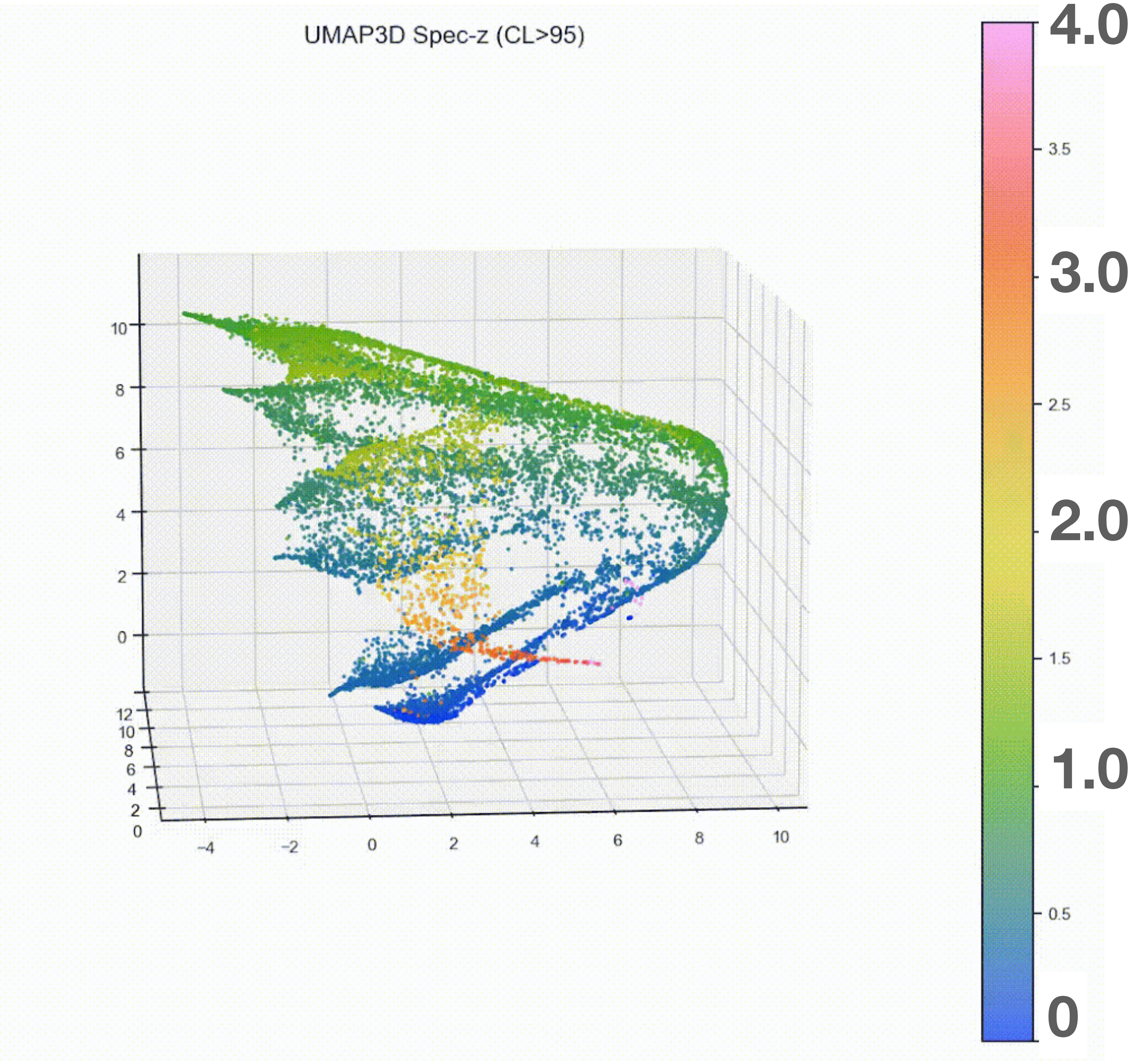
credit: **Finian Ashmead**

UMAP Color Manifold Enables Interpolation

Photo-z

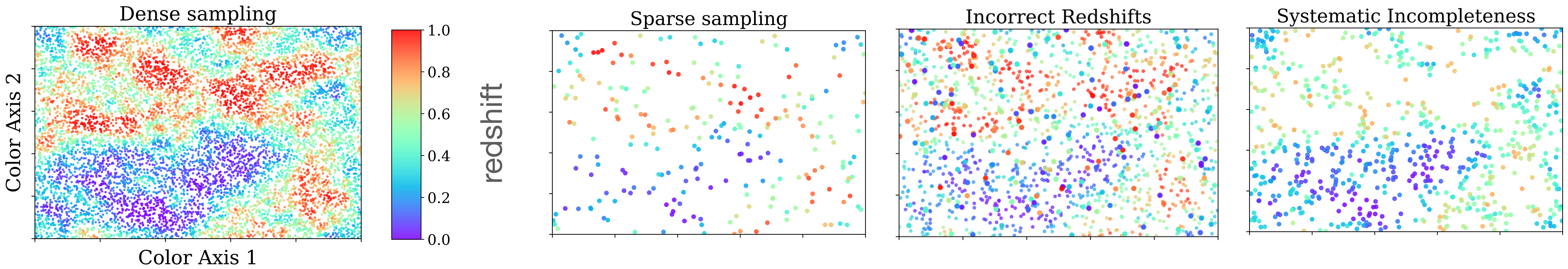


Spec-z

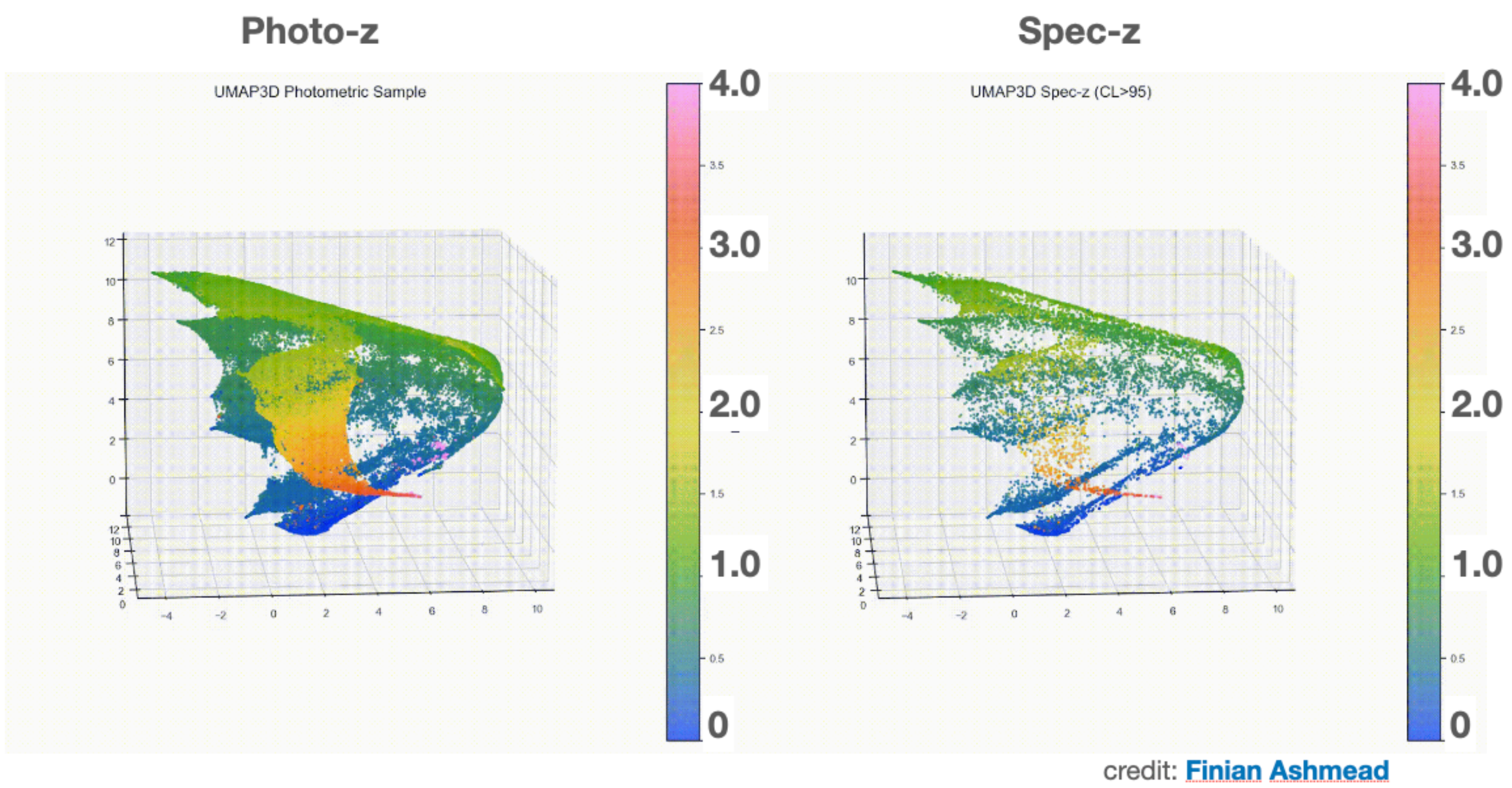


credit: **Finian Ashmead**

Photo-z Calibration Challenges



Newman & Gruen (2022)

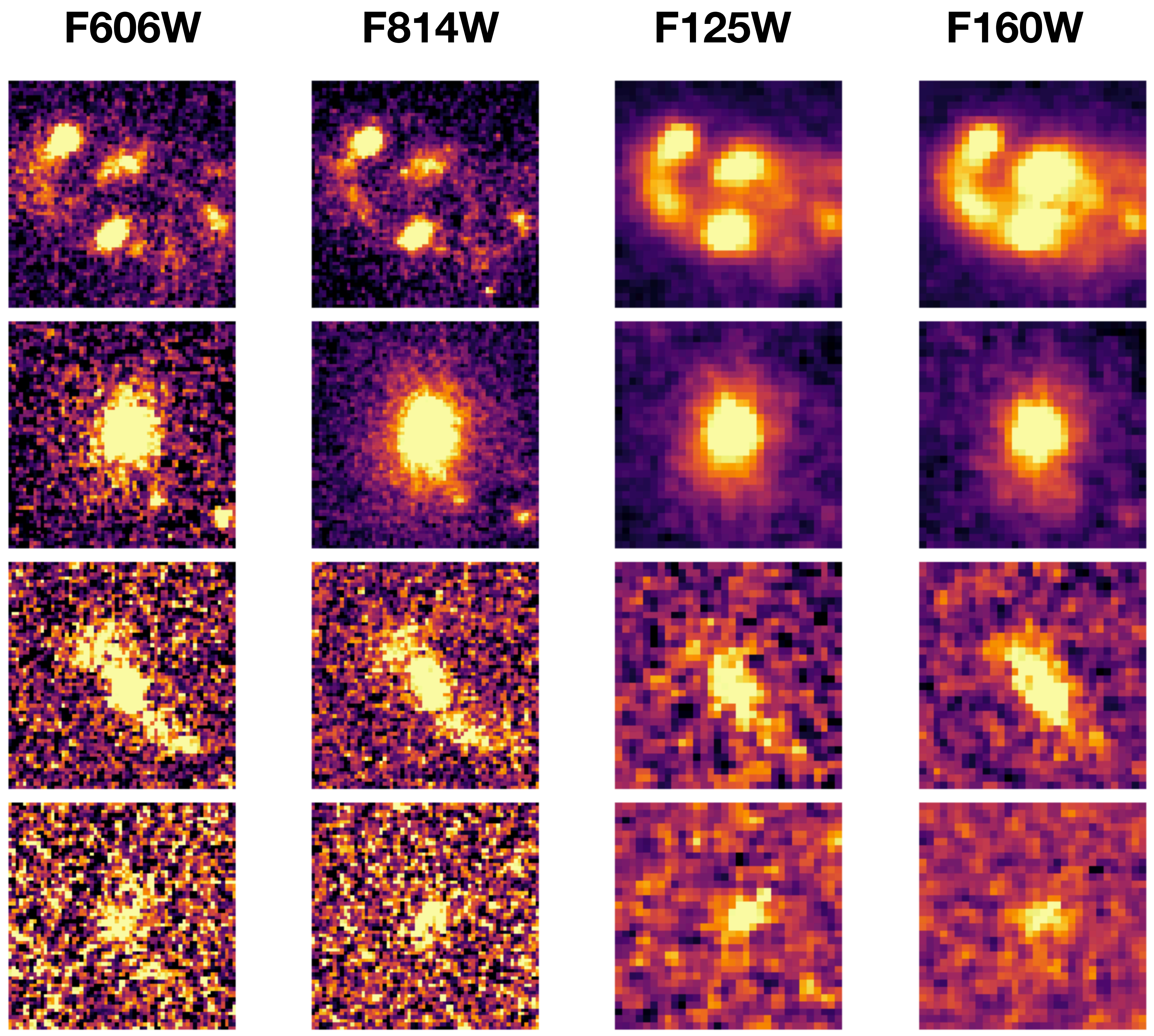


credit: Finian Ashmead

- Compared to photometric objects in color-redshift space, existing spec-z training sets suffer from
  - **sparse sampling → interpolation**
  - **incorrect spec-z's → robust methods**
  - **systematic incompleteness → rebalance training set to match photometric objects**

Roman WFS (PI: Andrews): Image-based Deep Learning Photo-z's

- **Goal: leverage Roman's spatially-resolved color information for better photo-z's.**
- Prototyping on *O*(100k) 4 band HST CANDELS imaging out to H-band with *O*(20k) training redshifts.
- Currently achieving similar performance to classical ML methods and still room for algorithmic improvement.
- **We expect our approach to scale much better than other methods given the massive size of the Roman dataset.**



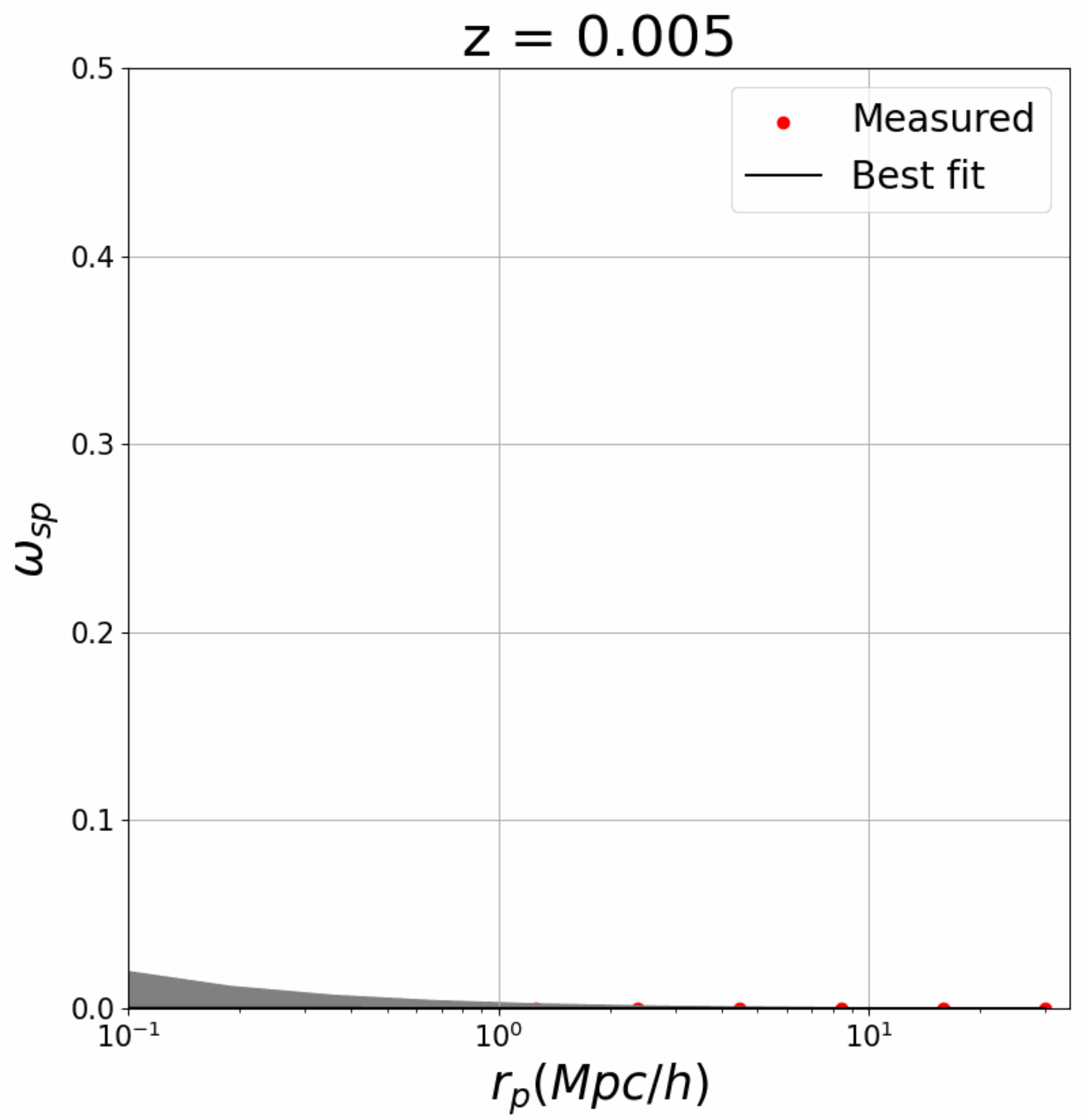
credit: **Ashod Khederlarian**

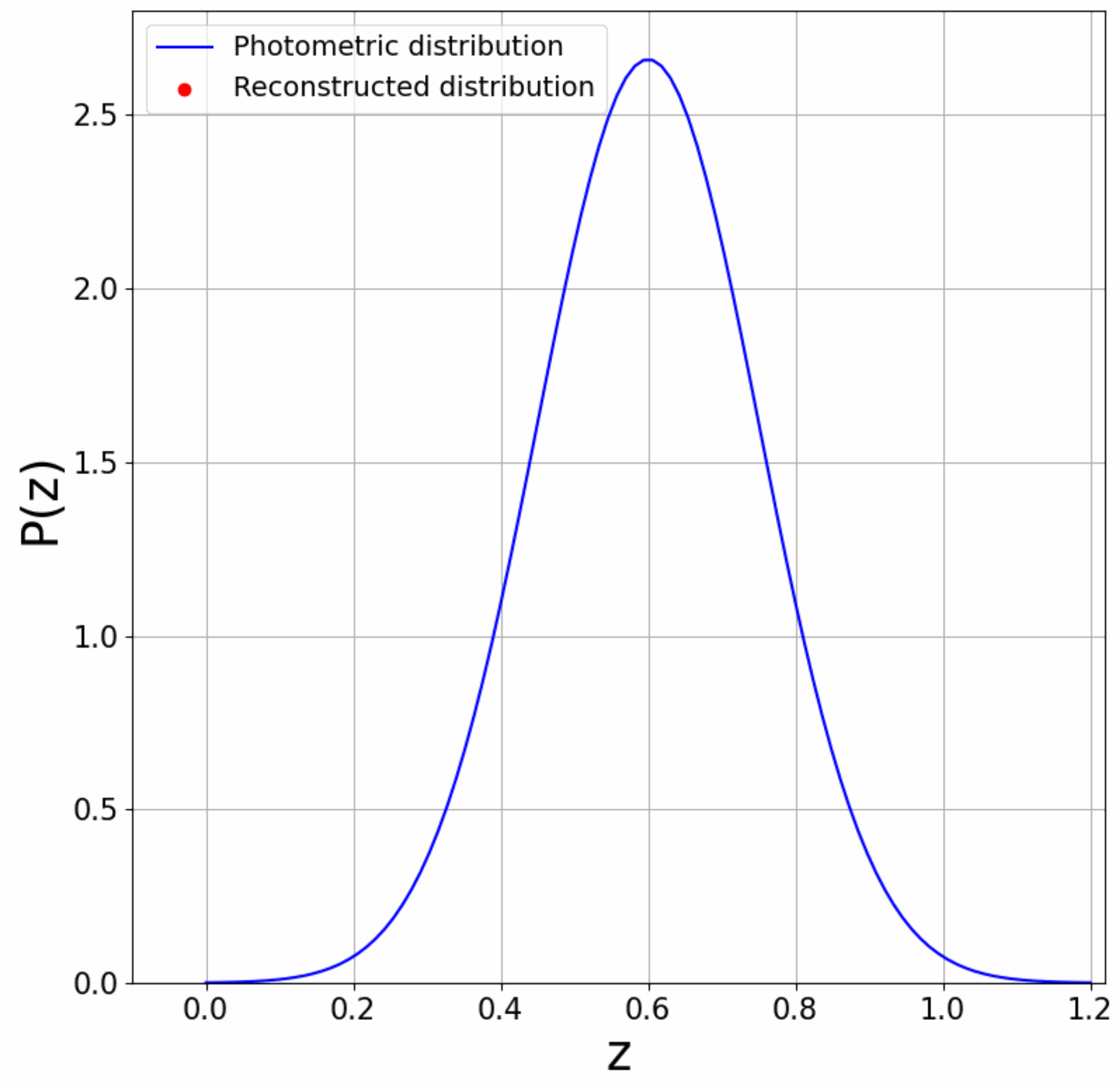
Clustering between photometric and spectroscopic samples can calibrate redshift distributions.

- **Yoki Salcedo** (Pitt) will work on adapting and testing RAIL framework for clustering redshifts (RAIL version of yet-another-wizz) for Roman.

- Clustering redshifts can test or improve calibration of redshift distributions.

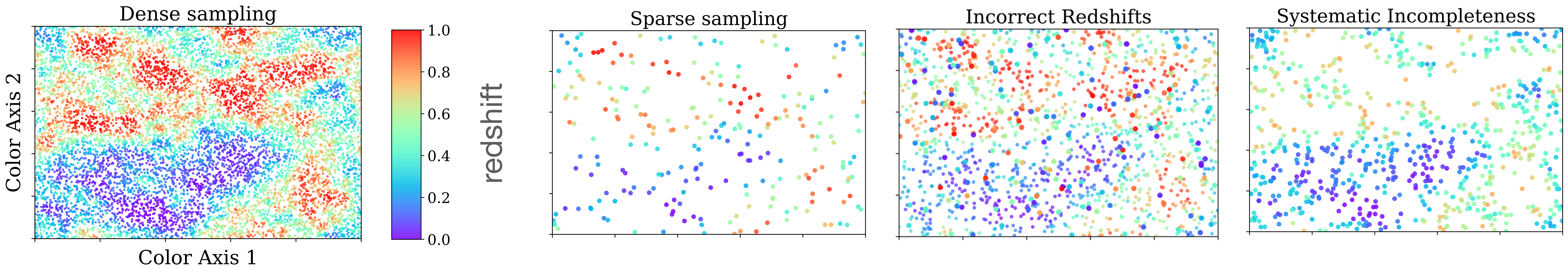
- Also worked on DESI-2 target selection; DESI and DESI-2 will provide key samples for cross-correlation





credit: **Yoki Salcedo**

Photo-z Calibration Challenges



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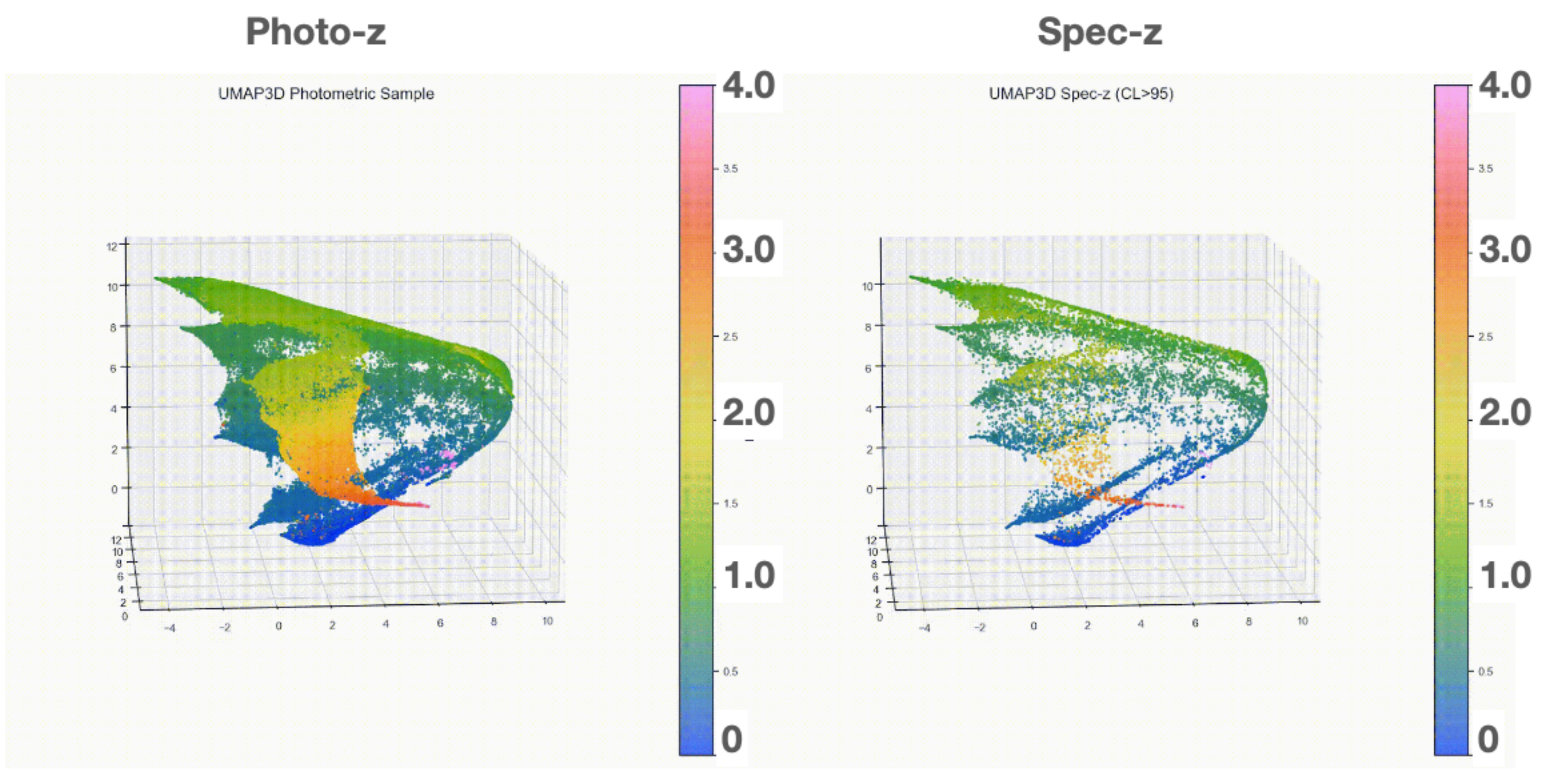

credit: Finian Ashmead

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