Visualizing
Unsupervised Learning Techniques

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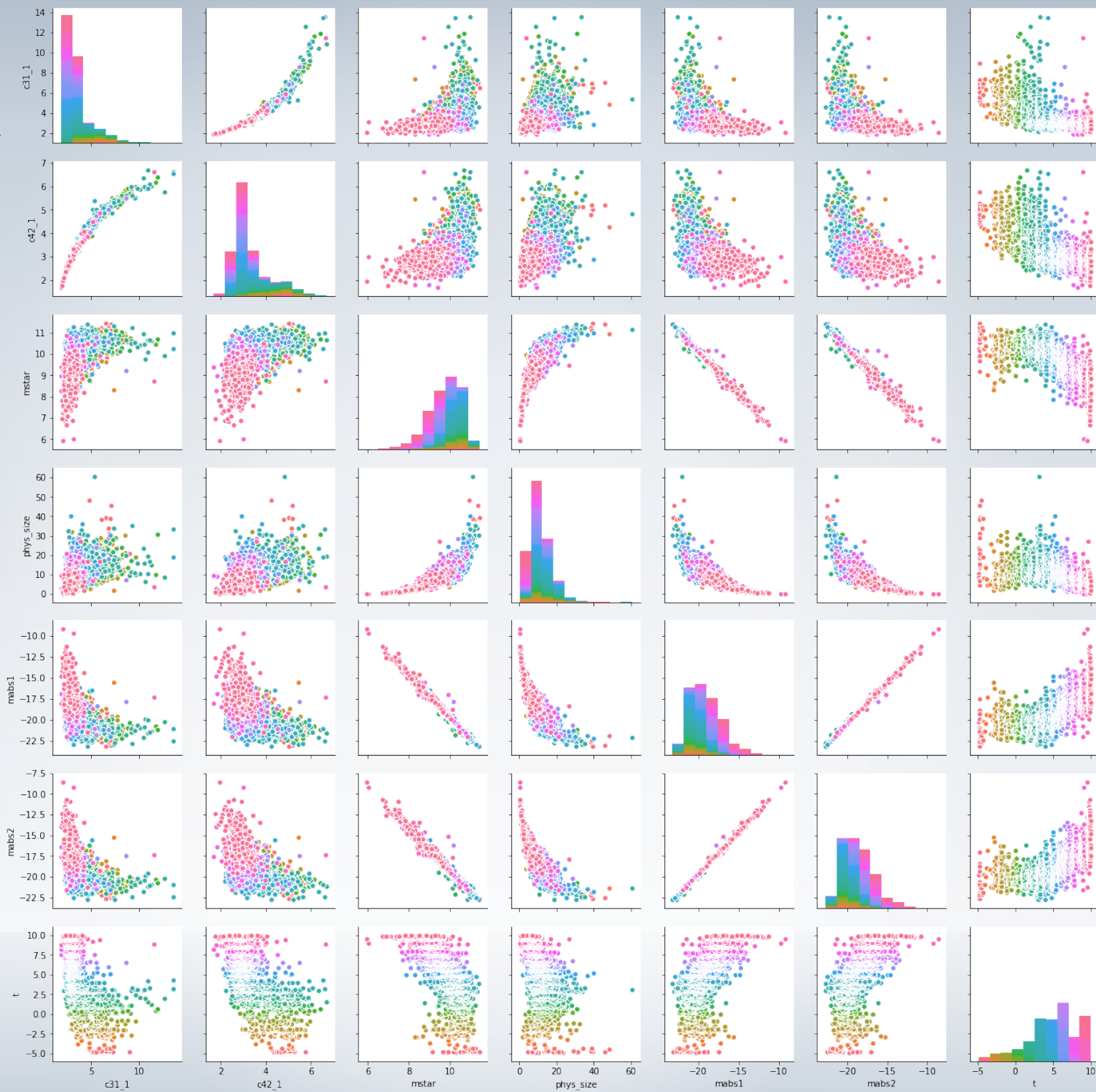
Groningen, 26.01.2018

Motivation

Working sample:

- Spitzer Survey of Stellar Structure in Galaxies (S4G)

- Near-IR data, 3.6 and 4.5 μm

- Sample size: ~2350 galaxies

- **Selected features**: 6
    - Absolute magnitude (2 bands)
    - Concentration (2 measures)
    - Stellar mass
    - Physical size (from apparent size and distance)

- **Label**: morphological type [-5 : 10]
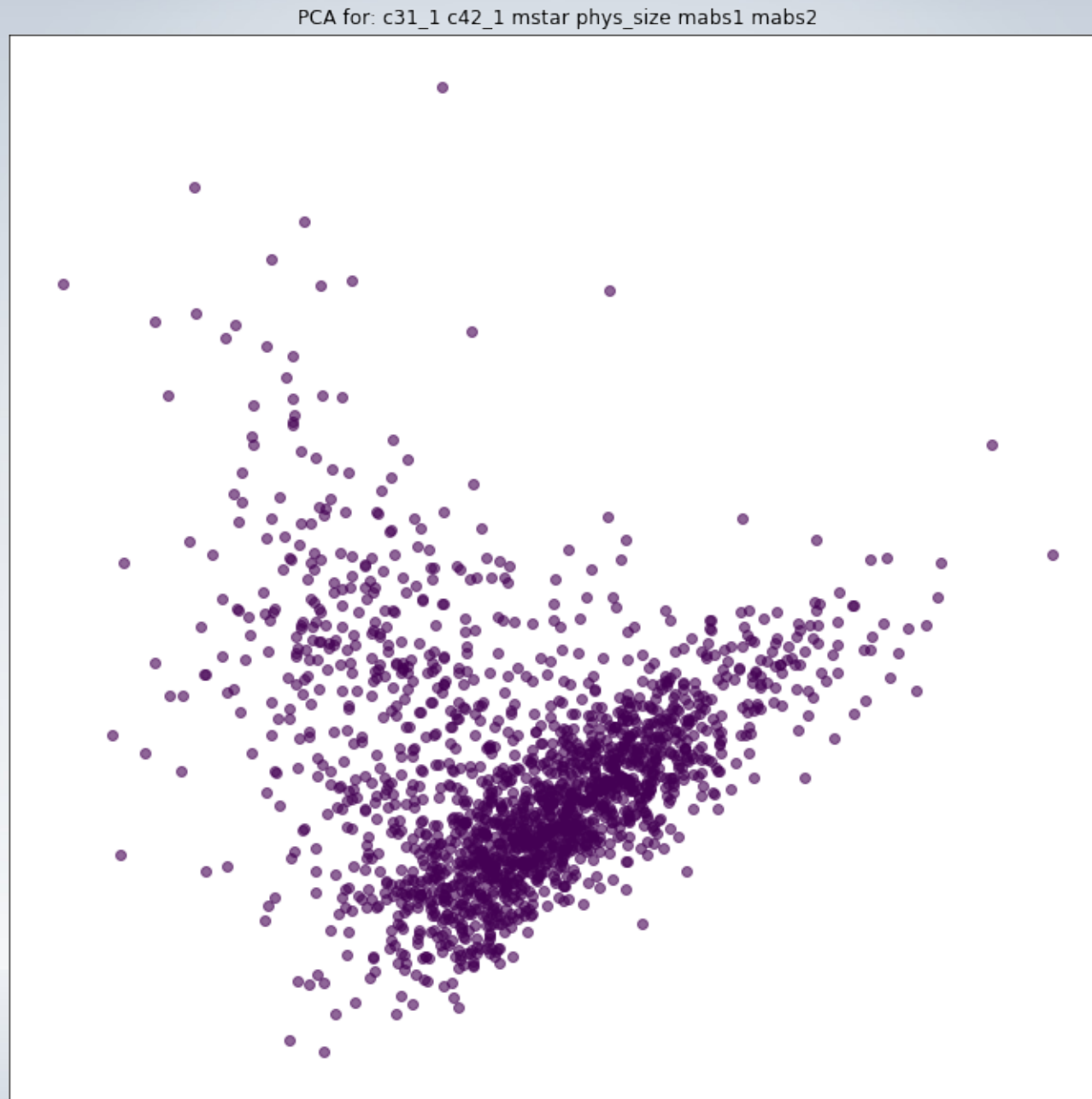 (from early-types to late-types)

Unsupervised Learning techniques:

- Principal Component Analysis (**PCA**)
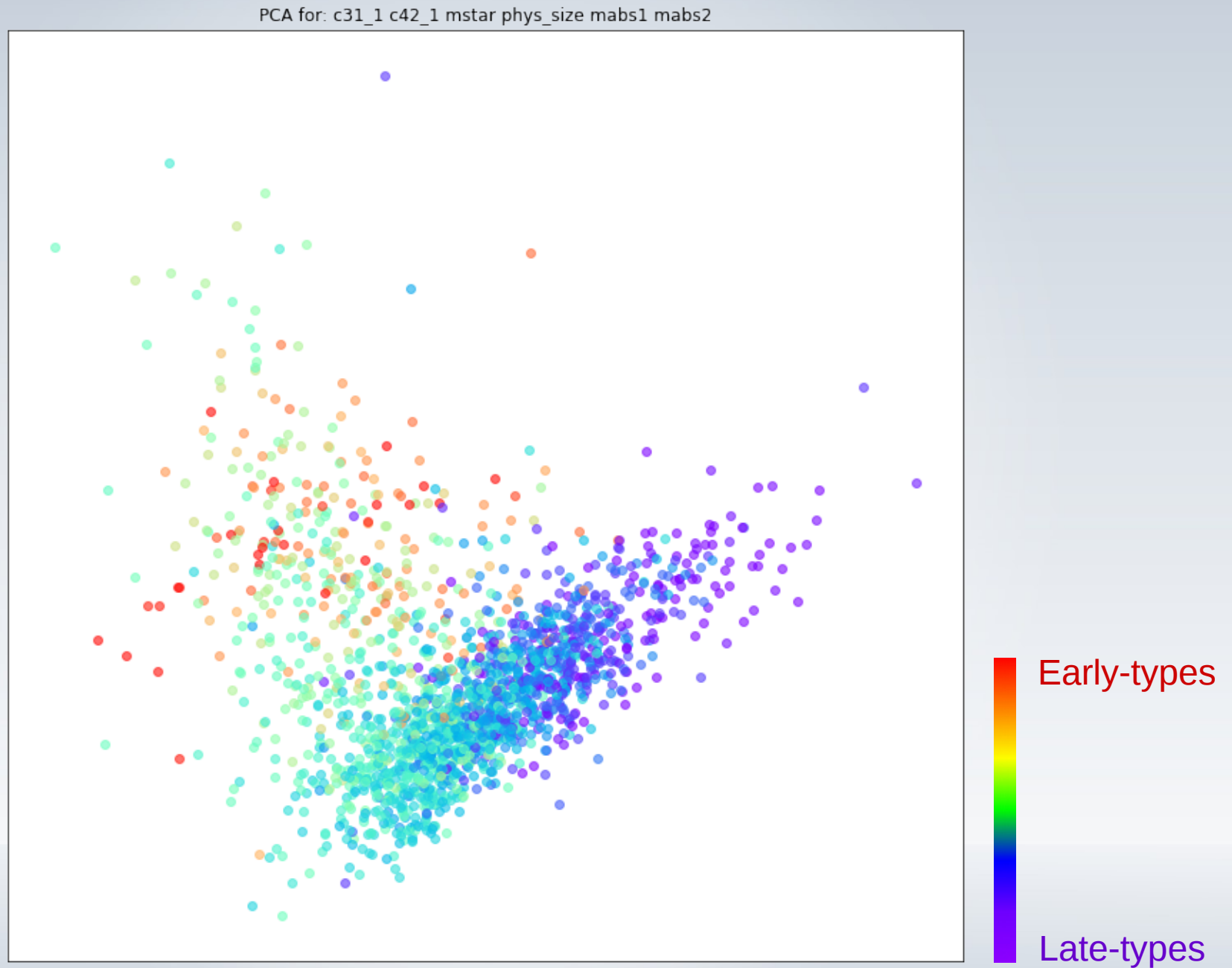
- T-distributed Stochastic Neighbor Embedding (**tSNE**)

Correlation between galaxy features
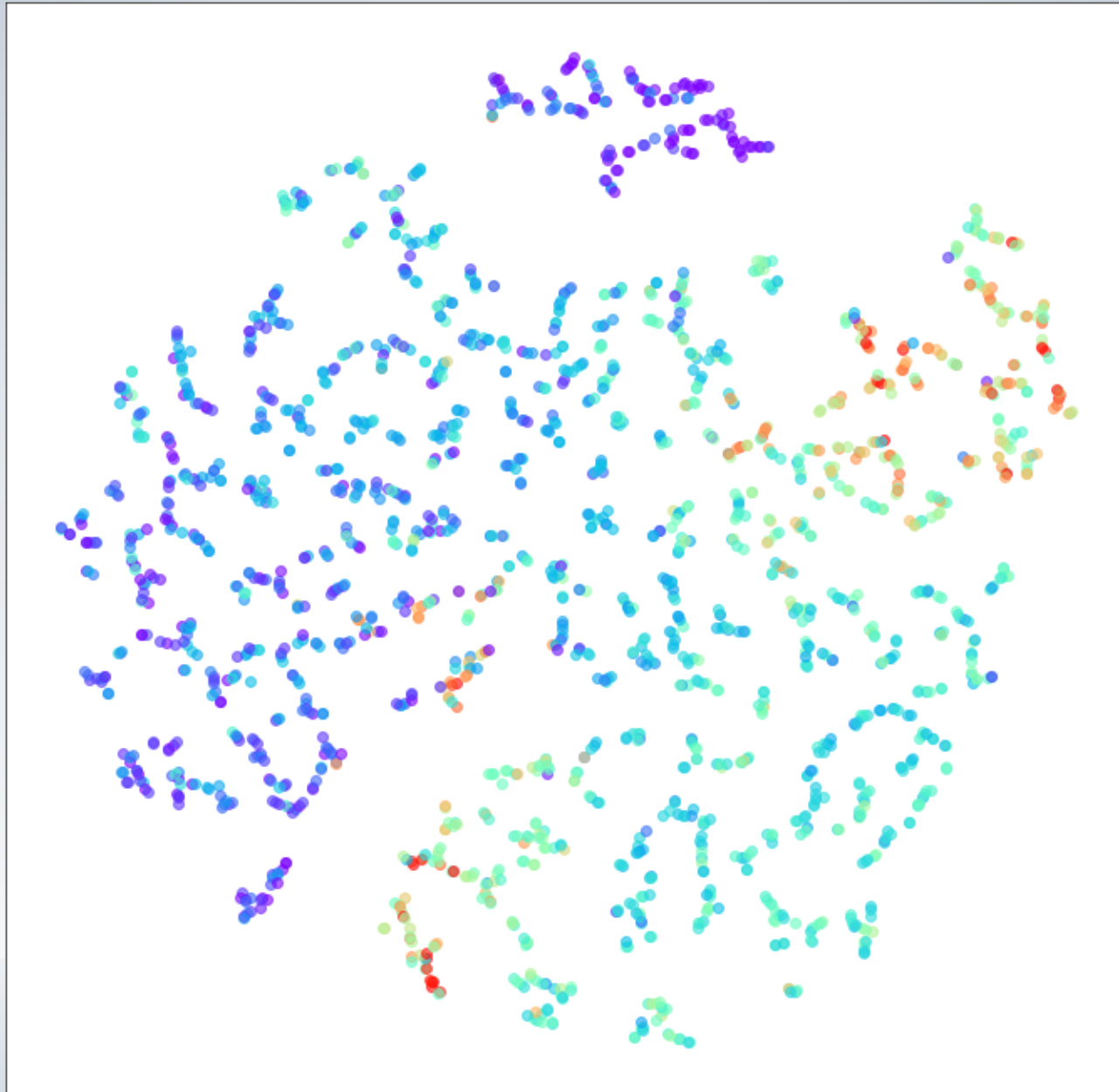
PCA: 6 features as input

PCA for: c31_1 c42_1 mstar phys_size mabs1 mabs2

PCA: 6 features as input, labelled output

PCA for: c31_1 c42_1 mstar phys_size mabs1 mabs2
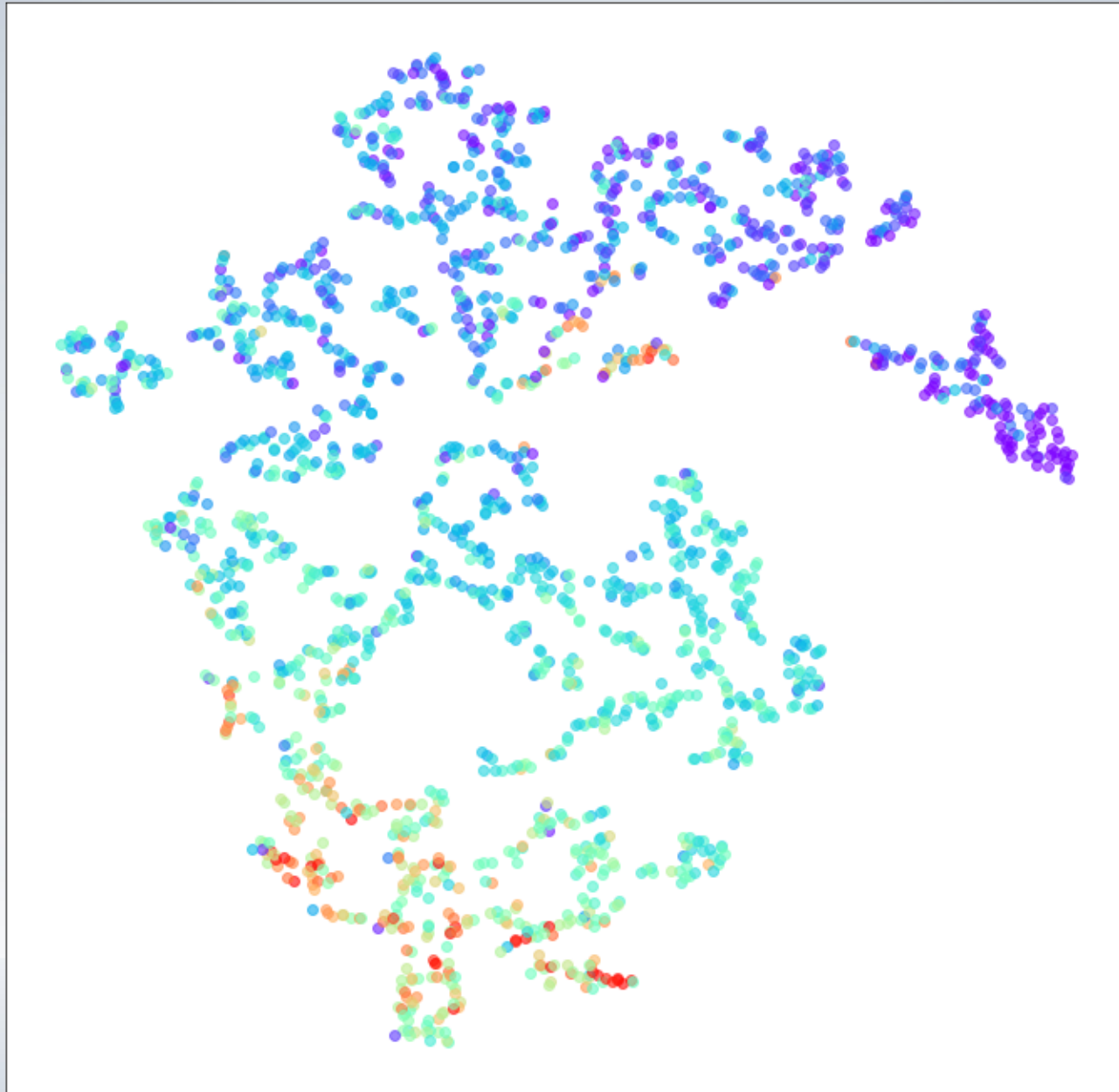
Early-types

Late-types

tSNE: 6 features as input, perplexity=5

tSNE for: c31_1 c42_1 mstar phys_size mabs1 mabs2 p5
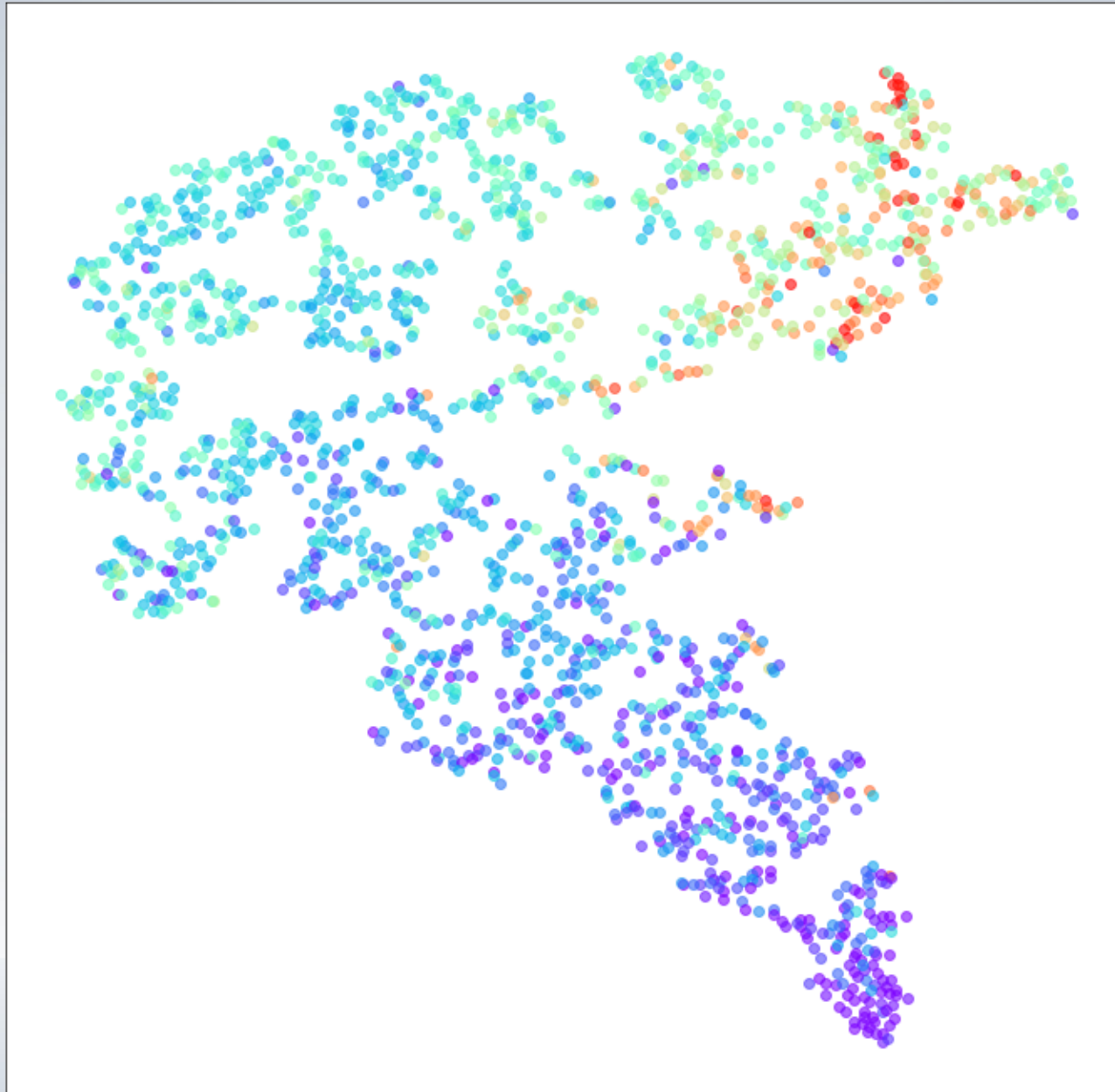
tSNE: 6 features as input, perplexity=15
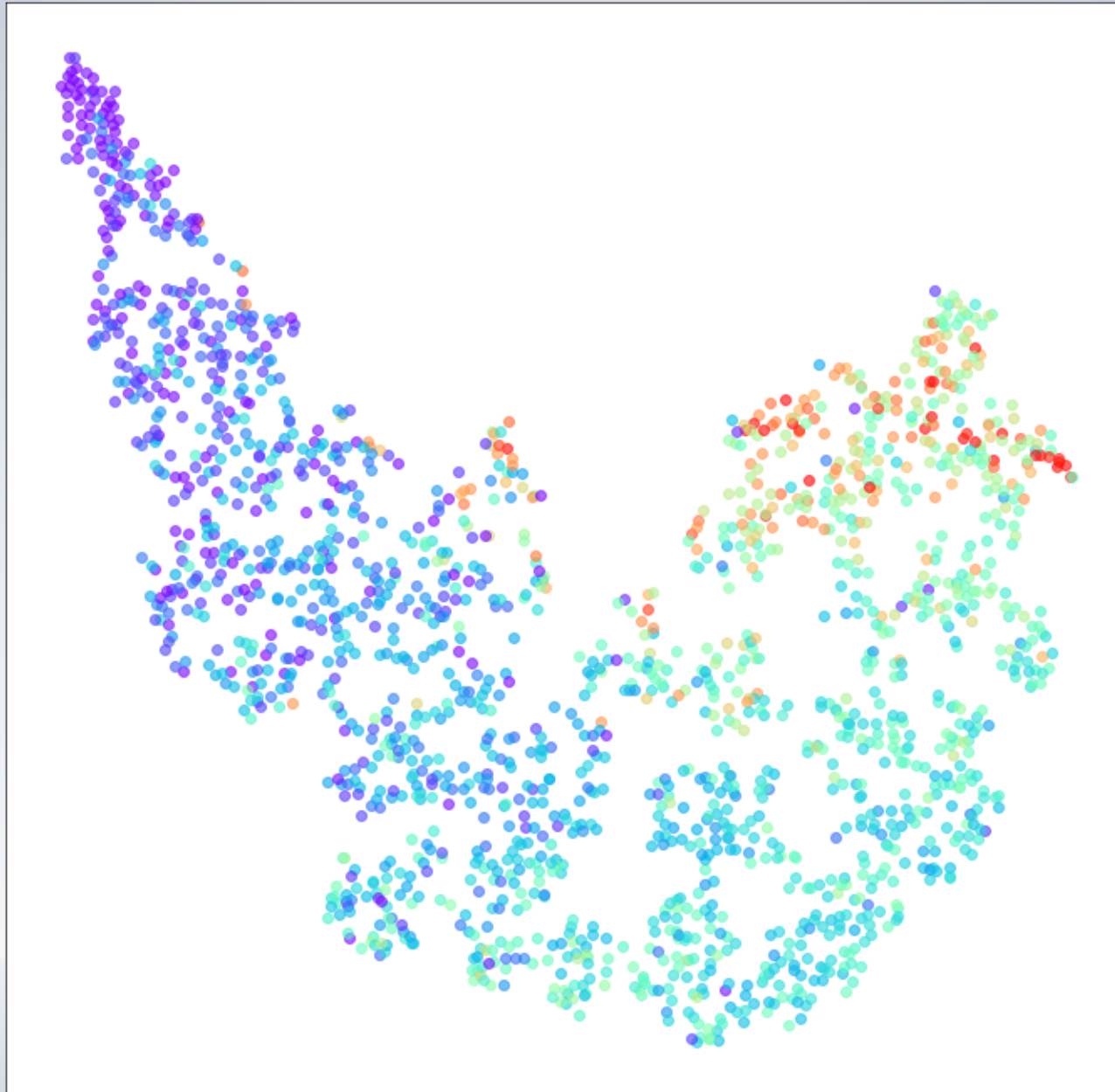

tSNE for: c31_1 c42_1 mstar phys_size mabs1 mabs2 p15

tSNE: 6 features as input, perplexity=30

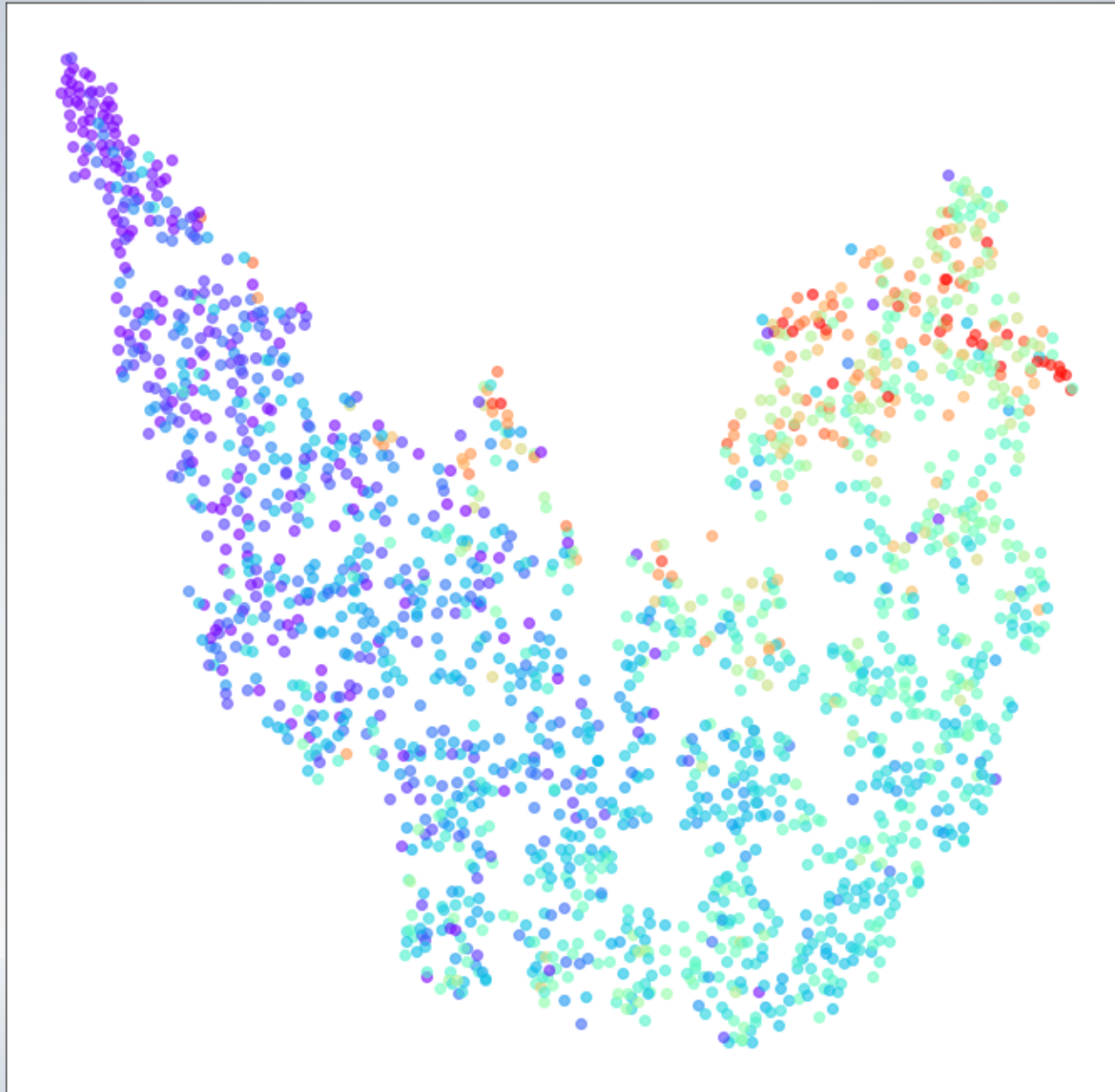tSNE for: c31_1 c42_1 mstar phys_size mabs1 mabs2 p30

tSNE: 6 features as input, perplexity=40
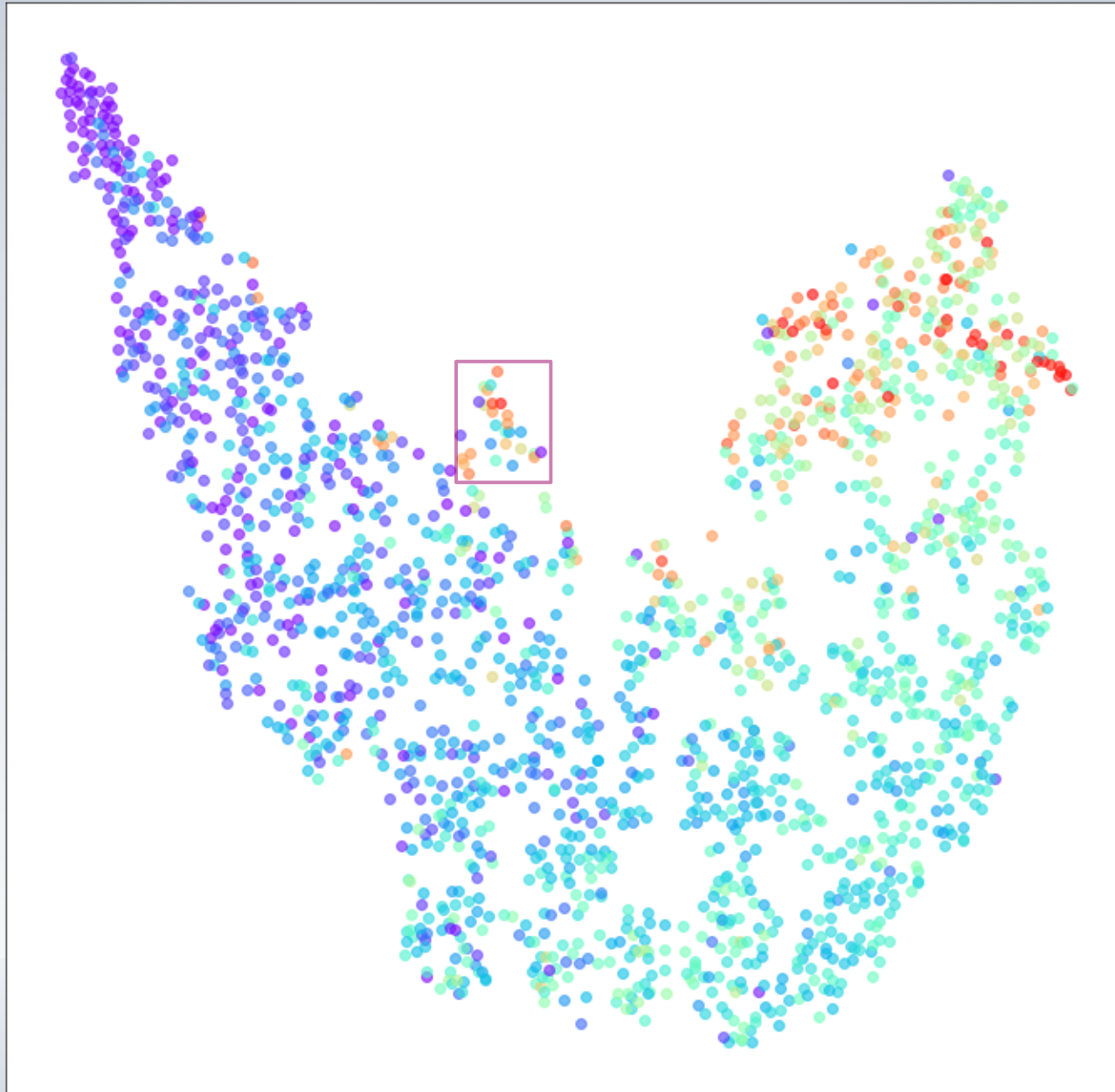

tSNE for: c31_1 c42_1 mstar phys_size mabs1 mabs2 p40

tSNE: 6 features as input, perplexity=50
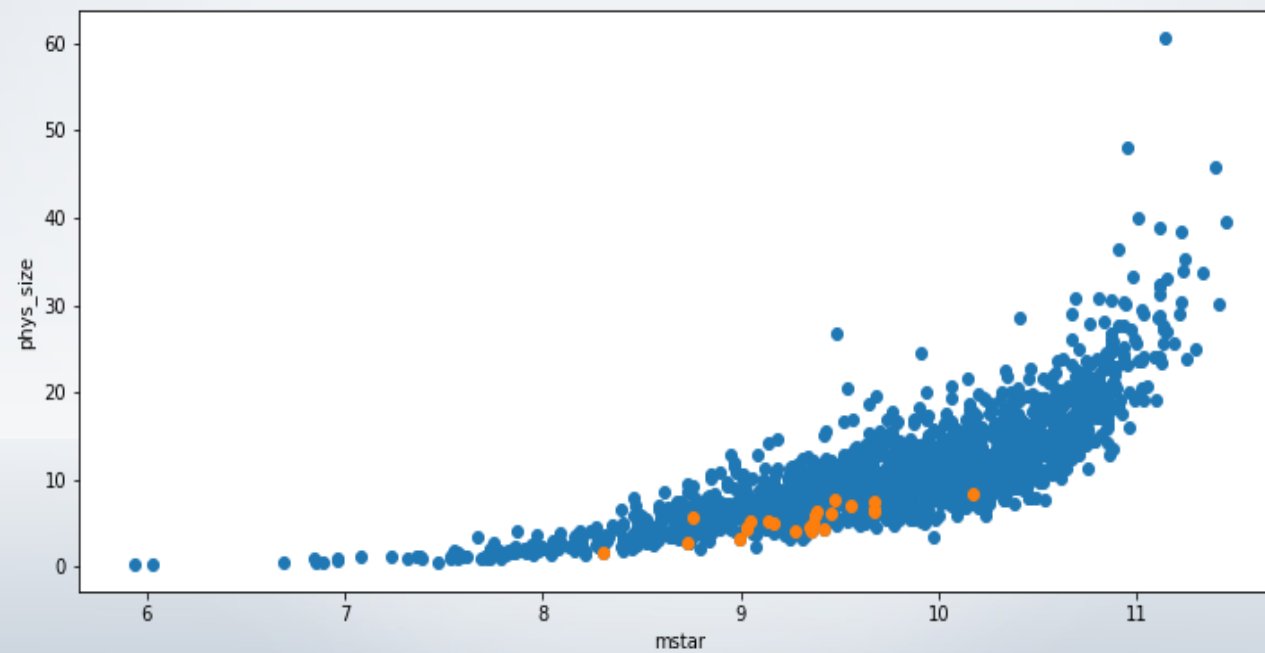

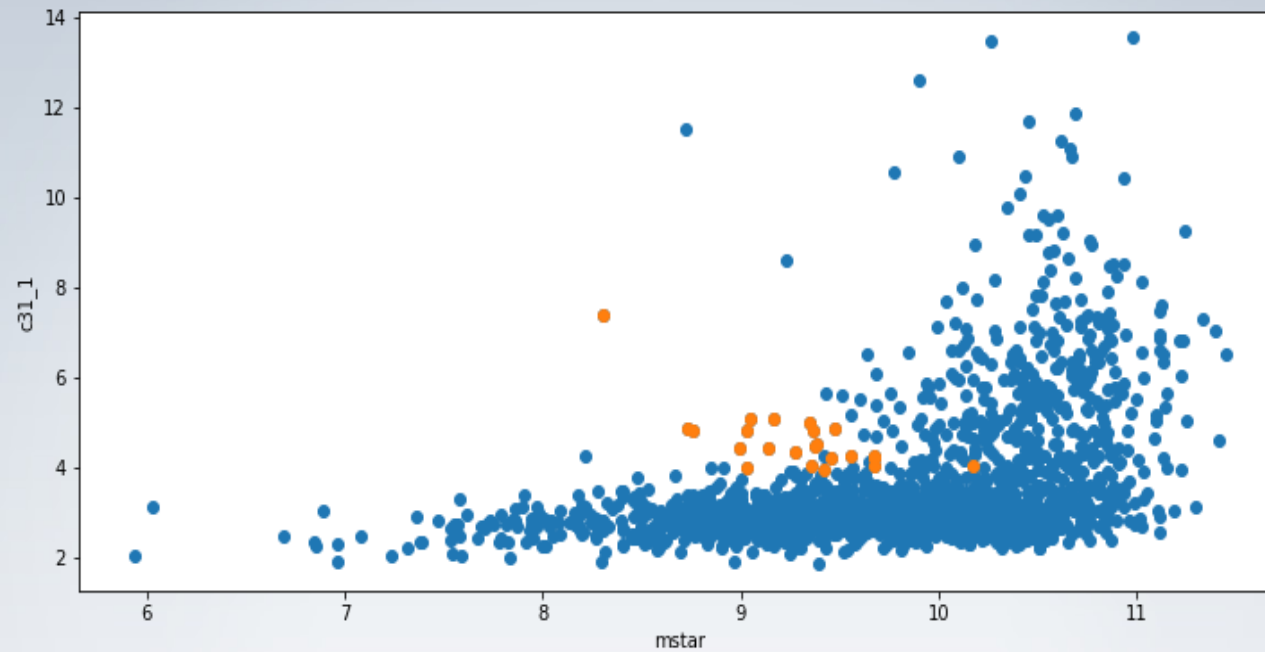tSNE for: c31_1 c42_1 mstar phys_size mabs1 mabs2 p50
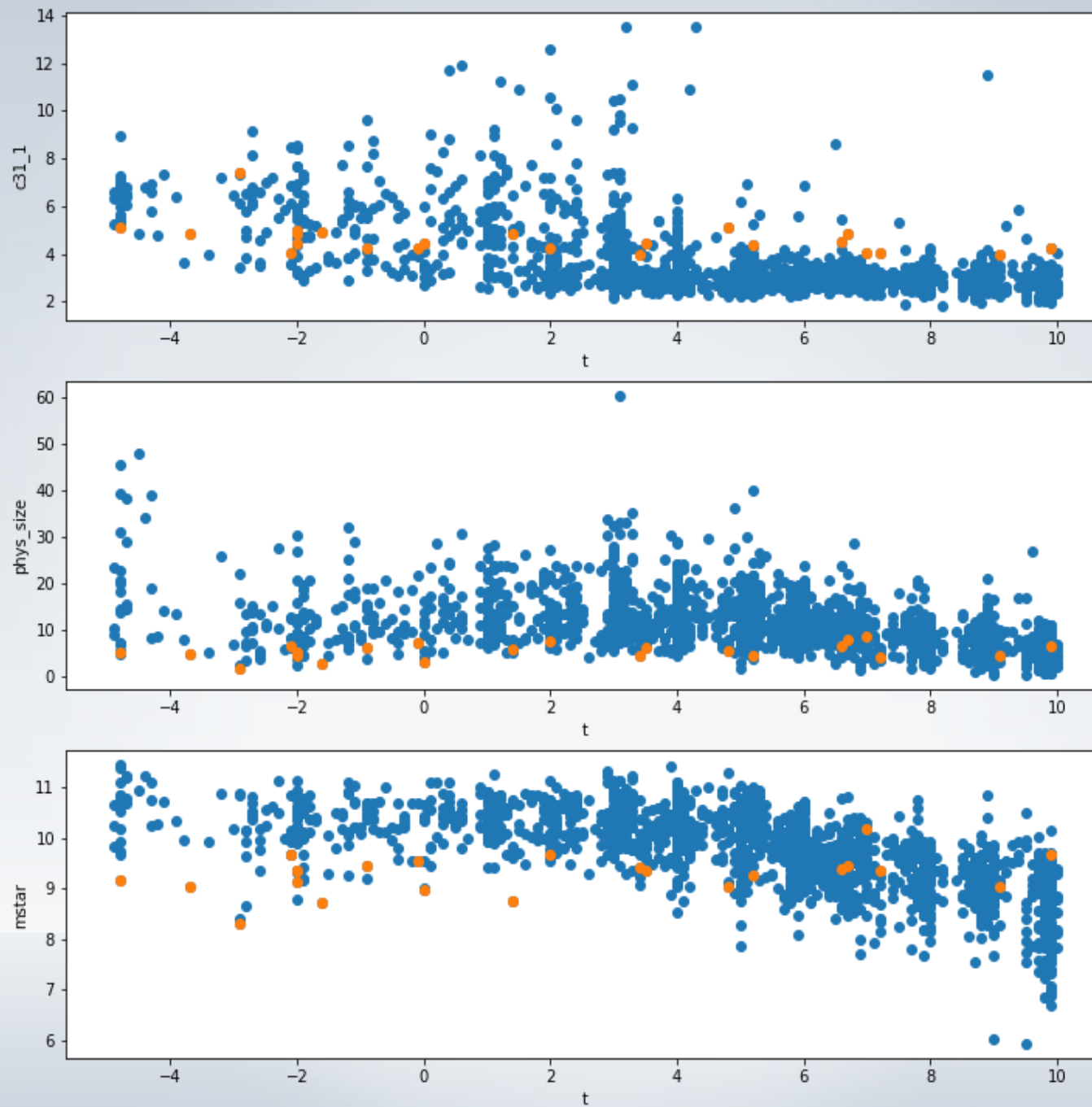
tSNE: 6 features as input, perplexity=50

tSNE for: c31_1 c42_1 mstar phys_size mabs1 mabs2 p50

Zooming in the 'pocket': stellar mass

Zooming in the 'pocket': morphological type

Zooming in the 'pocket': example galaxy images