

Classifications of Emission-Line Galaxies with SDSS & WISE

Final Project

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Task 1: BPT and WHAN on a Complete Sample

1. BPT Diagrams

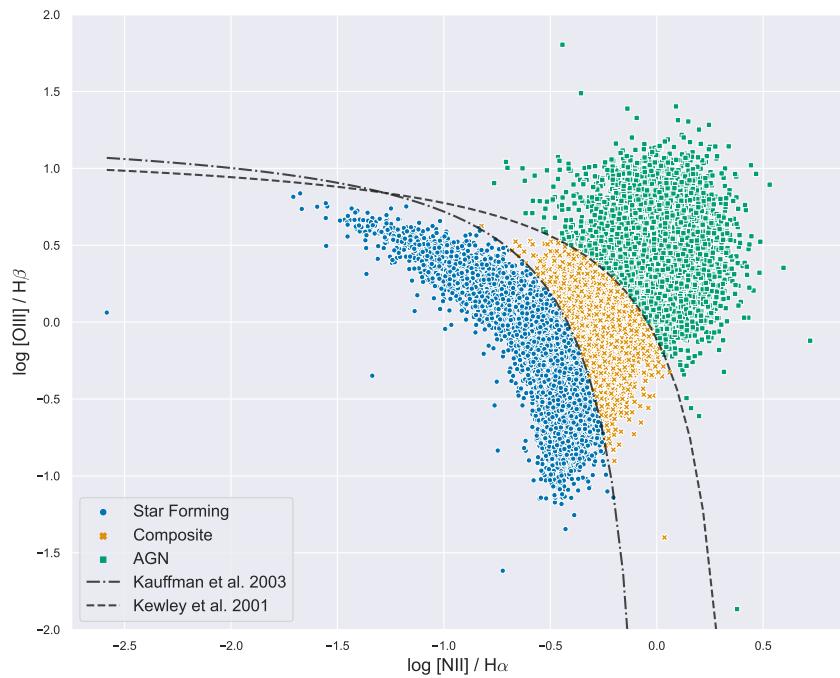


Figure 1: BPT Diagram: $[\text{NII}]/\text{H}\alpha$ vs $[\text{OIII}]/\text{H}\beta$.

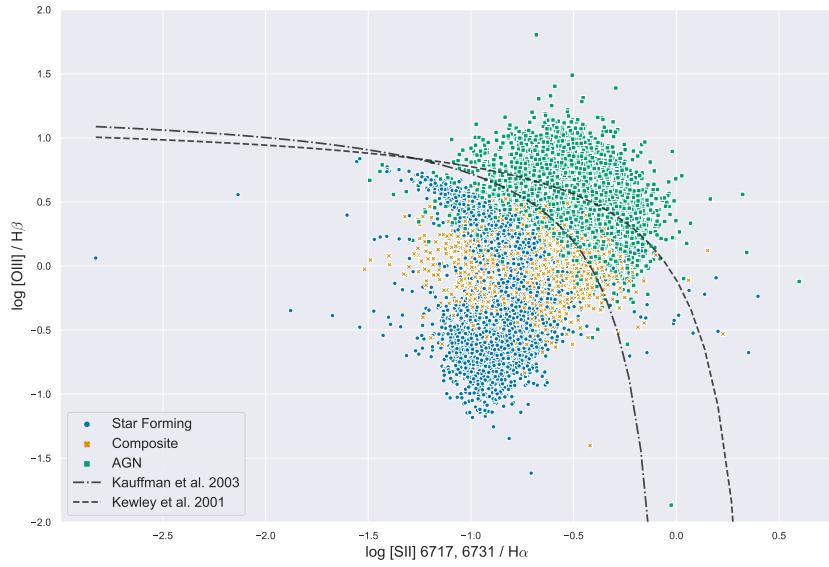


Figure 2: BPT Diagram: $[\text{SII}]/\text{H}\alpha$ vs $[\text{OIII}]/\text{H}\beta$.

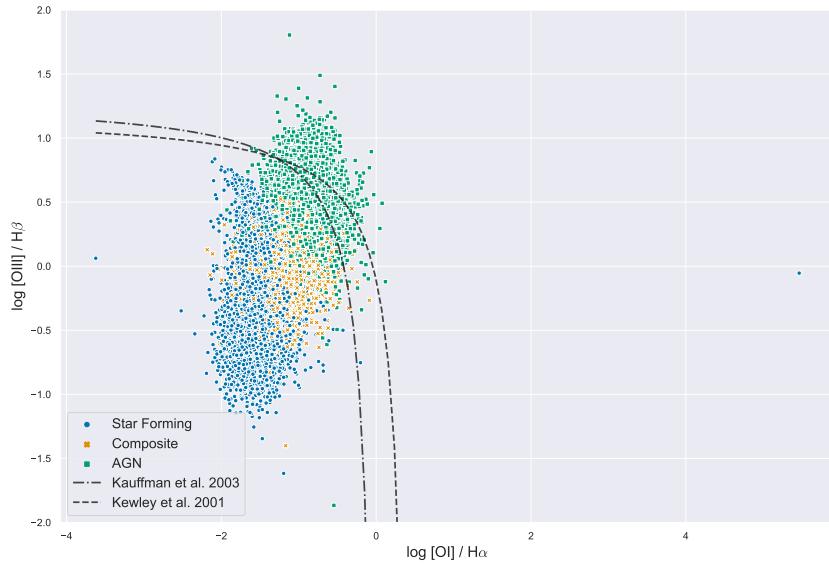


Figure 3: BPT Diagram: $[\text{OI}]/\text{H}\alpha$ vs $[\text{OIII}]/\text{H}\beta$.

2. WHAN Diagram

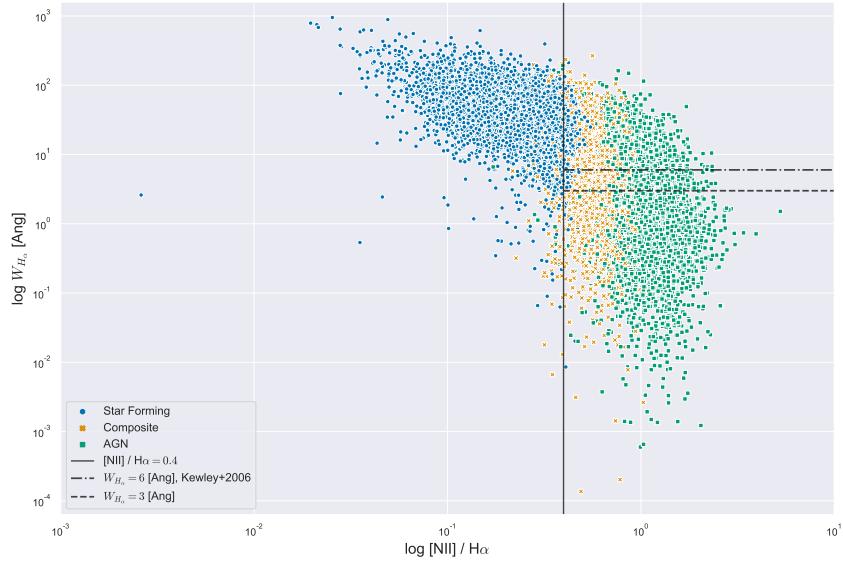


Figure 4: Whan Diagram: $[\text{NII}] / \text{H}\alpha$ vs $W_{\text{H}\alpha}$ [Ang].

Task 2: BPT and TBT on a Subsample

3. BPT Diagram

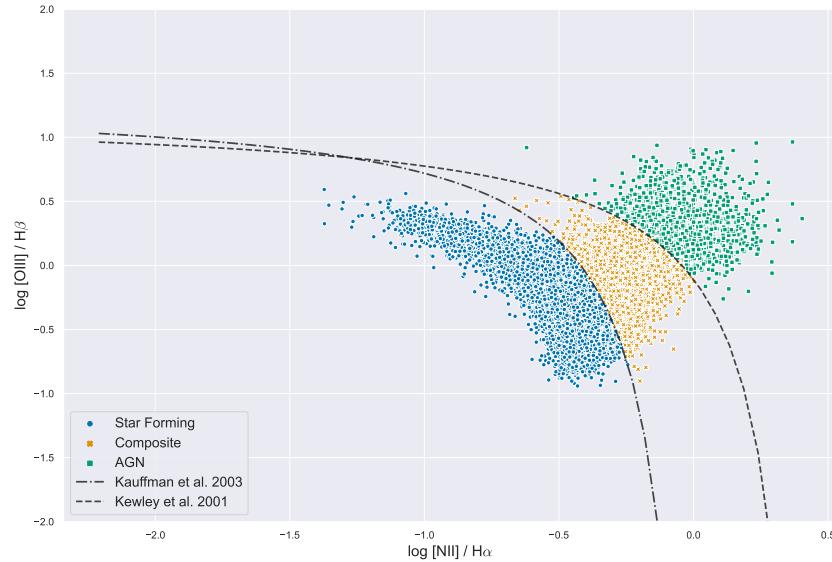


Figure 5: BPT Diagram: $[\text{NII}]/\text{H}\alpha$ vs $[\text{OIII}]/\text{H}\beta$ for the defined subsample.

4. TBT Diagram

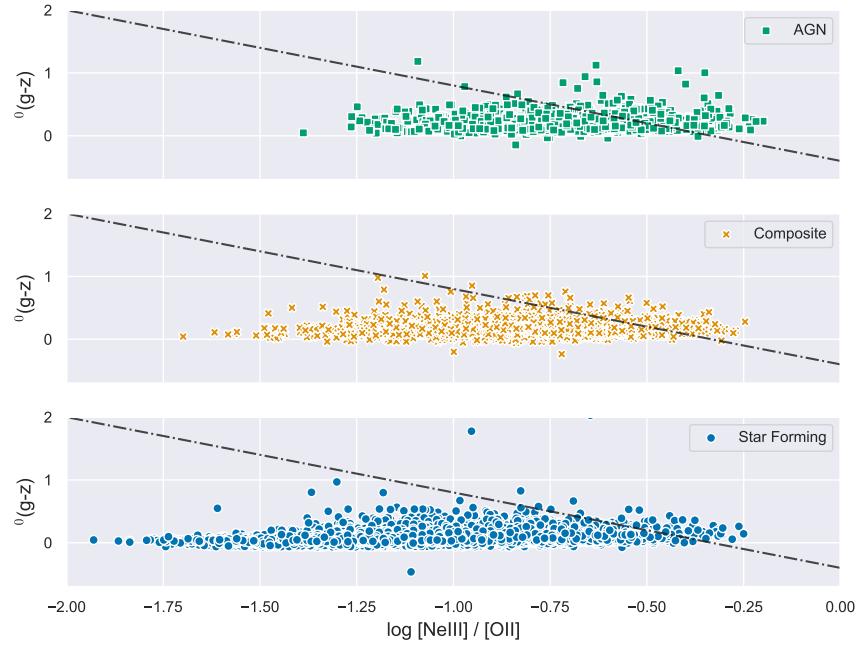


Figure 6: TBT Diagram: $[\text{NeIII}]/[\text{OII}]$ vs $^0(\text{g-z})$ for the defined subsample.

Task 3: WISE color-color diagram on an AGN Subsample

Appendix A: Computer Codes

Code 1: SQL Query: Defines Sample of 30,000 Objects

```

1  SELECT TOP 30000 s.specobjid, s.plate, s.mjd, s.fiberID,
2  s.ra, s.dec, s.subclass, s.z,
3  g.oiii_5007_flux, g.oiii_5007_flux_err,
4  g.h_alpha_flux, g.h_alpha_flux_err,
5  g.h_beta_flux, g.h_beta_flux_err,
6  g.nii_6584_flux, g.nii_6584_flux_err,
7  g.sii_6717_flux, g.sii_6717_flux_err,
8  g.sii_6731_flux, g.sii_6731_flux_err,
9  g.oi_6300_flux, g.oi_6300_flux_err,
10 g.h_alpha_reqw, g.h_alpha_reqw_err,
11 g.neiii_3869_flux, g.neiii_3869_flux_err,
12 g.oi_3726_flux, g.oi_3726_flux_err,
13 g.oi_3729_flux, g.oi_3729_flux_err,
14 p.psfMag_g, p.psfMagErr_g,
15 p.psfMag_z, p.psfMagErr_z
16
17 FROM GalSpecLine AS g
18 JOIN SpecObjAll AS s ON g.specobjid = s.specobjid
19 JOIN PhotoObjAll AS p ON s.bestobjid = p.objID
20
21 WHERE
22 (s.class = 'QSO' or s.class = 'GALAXY')
23 AND s.z <= 0.3
24 AND 2.355 * g.sigma_balmer <= 700
25 AND 2.355 * g.sigma_forbidden <= 700
26 AND g.oiii_5007_flux >> 0
27 AND (g.oiii_5007_flux / g.oiii_5007_flux_err) > 1
28 AND g.h_alpha_flux >> 0
29 AND (g.h_alpha_flux / g.h_alpha_flux_err) > 1
30 AND g.h_beta_flux >> 0
31 AND (g.h_beta_flux / g.h_beta_flux_err) > 1
32 AND g.nii_6584_flux >> 0
33 AND (g.nii_6584_flux / g.nii_6584_flux_err) > 1
34 AND g.sii_6717_flux >> 0
35 AND (g.sii_6717_flux / g.sii_6717_flux_err) > 1
36 AND g.sii_6731_flux >> 0
37 AND (g.sii_6731_flux / g.sii_6731_flux_err) > 1
38 AND g.oi_6300_flux >> 0
39 AND (g.oi_6300_flux / g.oi_6300_flux_err) > 1
40 AND g.neiii_3869_flux >> 0
41 AND (g.neiii_3869_flux / g.neiii_3869_flux_err) > 1
42 AND g.oi_3726_flux >> 0
43 AND (g.oi_3726_flux / g.oi_3726_flux_err) > 1
44 AND g.oi_3729_flux >> 0
45 AND (g.oi_3729_flux / g.oi_3729_flux_err) > 1
46 AND (p.psfMag_g / p.psfMagErr_g) > 1
47 AND (p.psfMag_z / p.psfMagErr_z) > 1

```

Code 2: SQL Query: Cross-ID to find WISE Colors

```

1  SELECT --count(*)
2  s.specobjid, s.plate, s.mjd, s.fiberID,
3  s.ra, s.dec, s.subclass, s.z,
4  W.w1mpo as w1, W.w2mpo as w2, W.w3mpo as w3,
5  W.w1sigmpo as w1, W.w2sigmpo as w2, W.w3sigmpo as w3,
6  W.w1flux, W.w2flux, W.w3flux,
7  W.w1sigflux, W.w2sigflux, W.w3sigflux
8
9  FROM GalSpecLine AS g
10 JOIN SpecObjAll AS s ON g.specobjid = s.specobjid
11 JOIN PhotoObjAll AS p ON s.bestobjid = p.objID
12 JOIN wise_xmatch AS x ON s.bestobjid = x.sdss_objid JOIN wise_allsky AS w ON w.cntr =
    ↪ x.wise_cntr
13
14 WHERE
15 (s.class = 'QSO' or s.class = 'GALAXY')
16 AND (W.w1flux / W.w1sigflux) > 1
17 AND (W.w2flux / W.w2sigflux) > 1
18 AND (W.w3flux / W.w3sigflux) > 1
19 AND (W.w1mpo / W.w1sigmpo) > 1
20 AND (W.w2mpo / W.w2sigmpo) > 1
21 AND (W.w3mpo / W.w3sigmpo) > 1
22 AND s.z <= 0.3
23 AND 2.355 * g.sigma_balmer <= 700
24 AND 2.355 * g.sigma_forbidden <= 700
25 AND g.oiii_5007_flux <> 0
26 AND (g.oiii_5007_flux / g.oiii_5007_flux_err) > 1
27 AND g.h_alpha_flux <> 0
28 AND (g.h_alpha_flux / g.h_alpha_flux_err) > 1
29 AND g.h_beta_flux <> 0
30 AND (g.h_beta_flux / g.h_beta_flux_err) > 1
31 AND g.nii_6584_flux <> 0
32 AND (g.nii_6584_flux / g.nii_6584_flux_err) > 1
33 AND g.sii_6717_flux <> 0
34 AND (g.sii_6717_flux / g.sii_6717_flux_err) > 1
35 AND g.sii_6731_flux <> 0
36 AND (g.sii_6731_flux / g.sii_6731_flux_err) > 1
37 AND g.oi_6300_flux <> 0
38 AND (g.oi_6300_flux / g.oi_6300_flux_err) > 1
39 AND g.neiii_3869_flux <> 0
40 AND (g.neiii_3869_flux / g.neiii_3869_flux_err) > 1
41 AND g.oii_3726_flux <> 0
42 AND (g.oii_3726_flux / g.oii_3726_flux_err) > 1
43 AND g.oii_3729_flux <> 0
44 AND (g.oii_3729_flux / g.oii_3729_flux_err) > 1
45 AND (p.psfMag_g / p.psfMagErr_g) > 1
46 AND (p.psfMag_z / p.psfMagErr_z) > 1

```

Appendix B: Tables