The hidden population of AM CVn binaries in the SDSS

Philip Carter[1]

T. R. Marsh[1], D. Steeghs[1], P. J. Groot[2], G. Nelemans[2], A. Rau[3], C. M. Copperwheat[1], G. Roelofs[4]

[1]University of Warwick, [2]Radboud University Nijmegen, [3]MPE Garching, [4]Harvard-Smithsonian CfA

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Introduction

2003: 10 known members.

The Sloan Digital Sky Survey

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- Imaging of $>$11000 deg^2 of sky.
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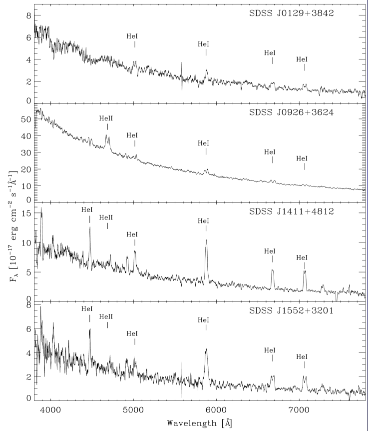
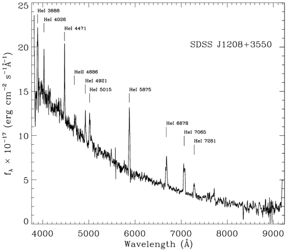
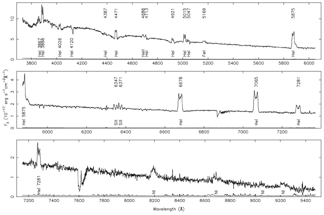


Anderson et al. 2005



Anderson et al. 2008



Roelofs et al. 2005

The serendipitous SDSS AM CVns

The Sloan Digital Sky Survey

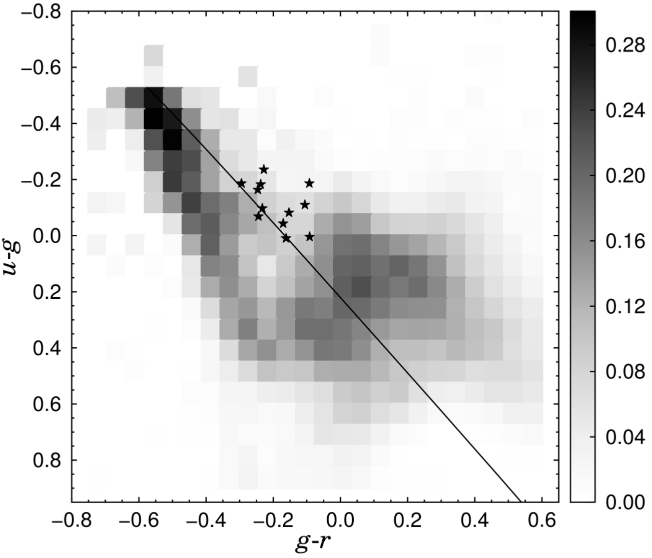
Population synthesis space density: 6.1×10^{-6} - 2.7×10^{-5} pc^{-3}
(Nelemans et al. 2001)

Observed space density:
1 - 3 $\times 10^{-6}$ pc^{-3}

Expect $>$ 50 AM CVns total in SDSS.

Roelofs et al. 2007

The Sloan Digital Sky Survey



SDSS spectroscopic completeness

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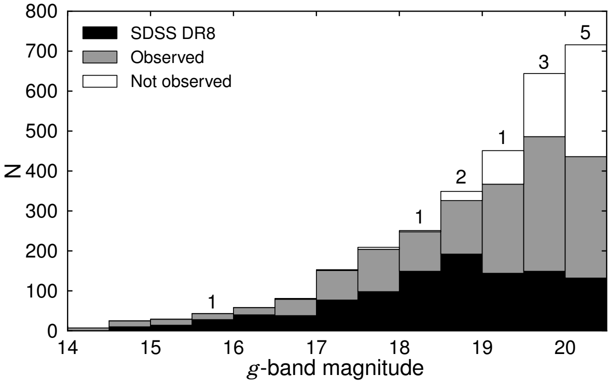

The search for the hidden population

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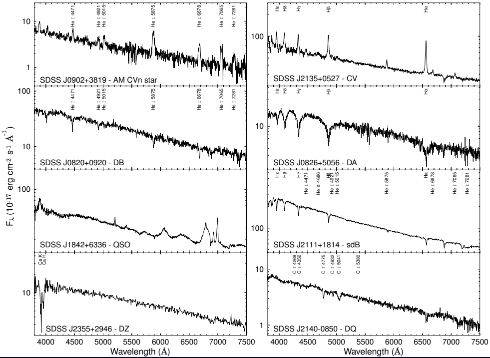
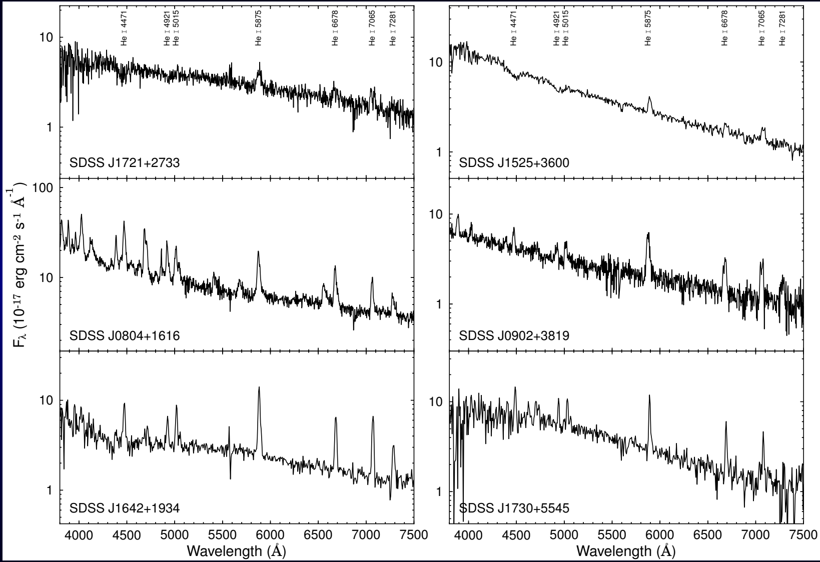


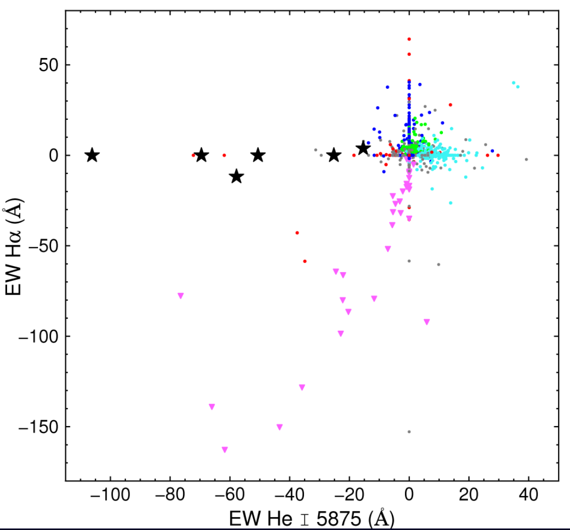
- 624 white dwarfs
- 108 quasars
- 29 CVs
- 6 new AM CVns.

The search for the hidden population



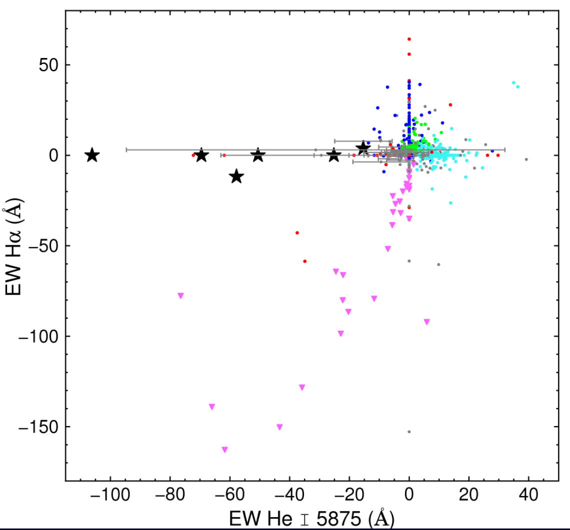
The 6 new AM CVns

The search for the hidden population



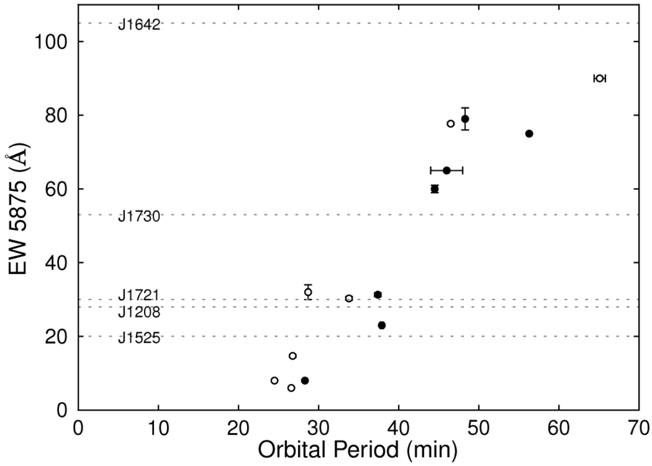
EW distribution

The search for the hidden population



EW distribution

Equivalent width – period relation



The sample

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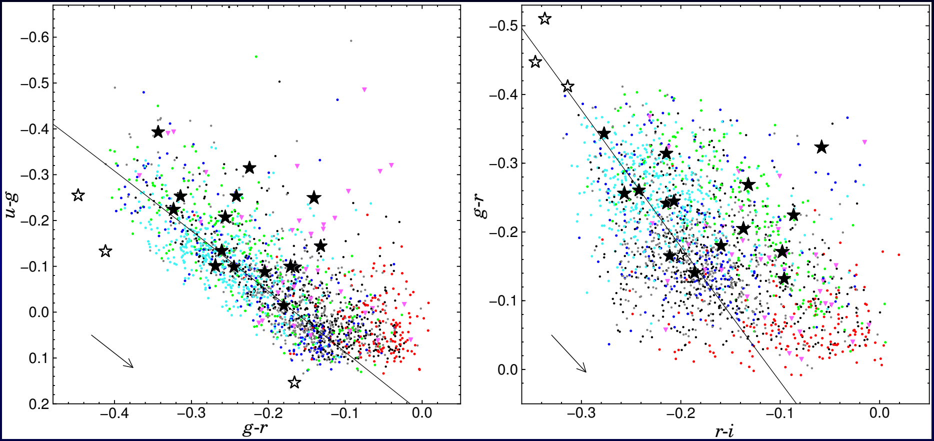

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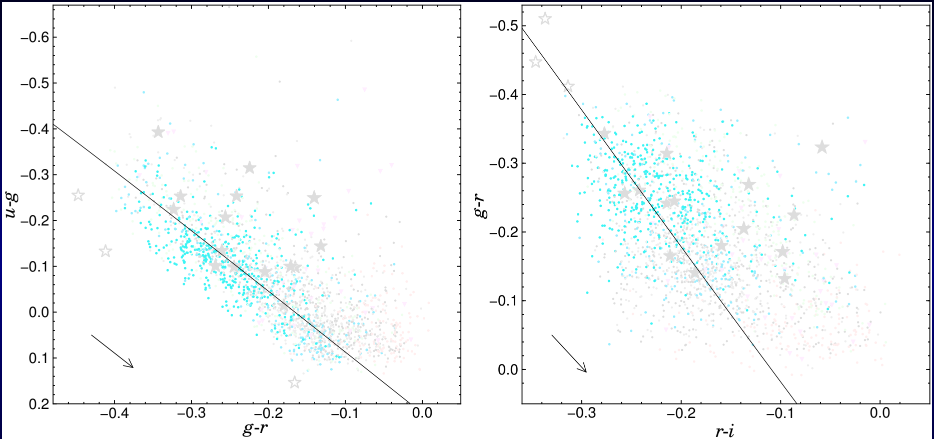
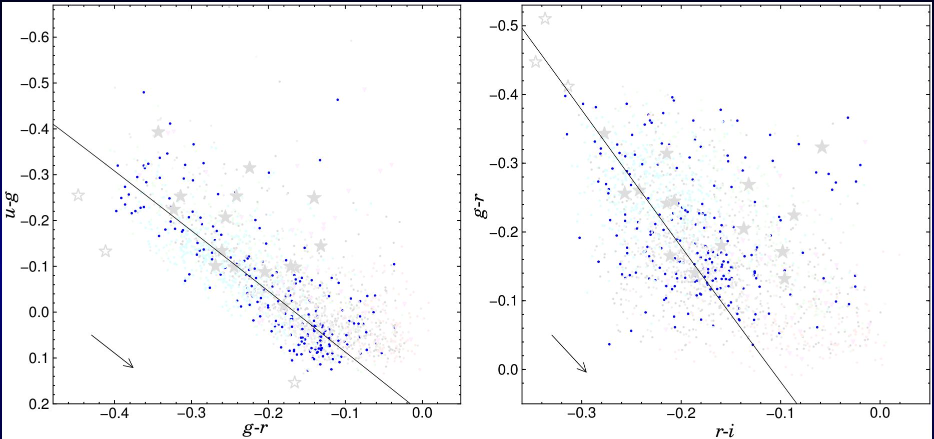


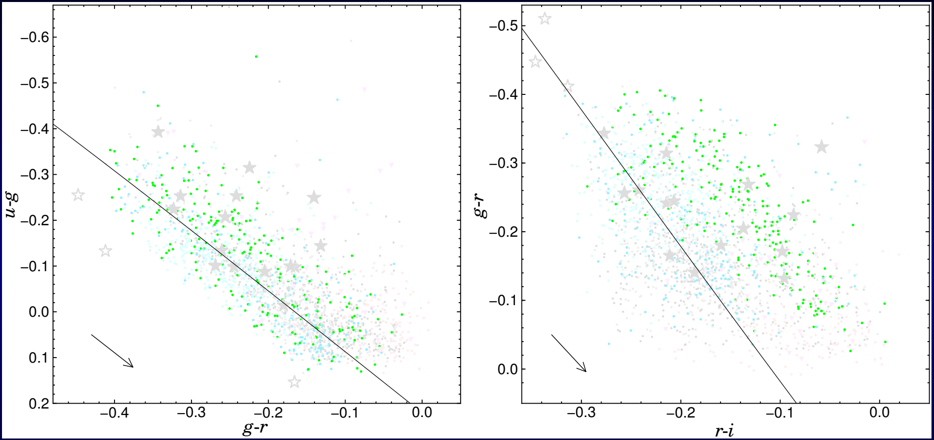
DB white dwarfs

The sample



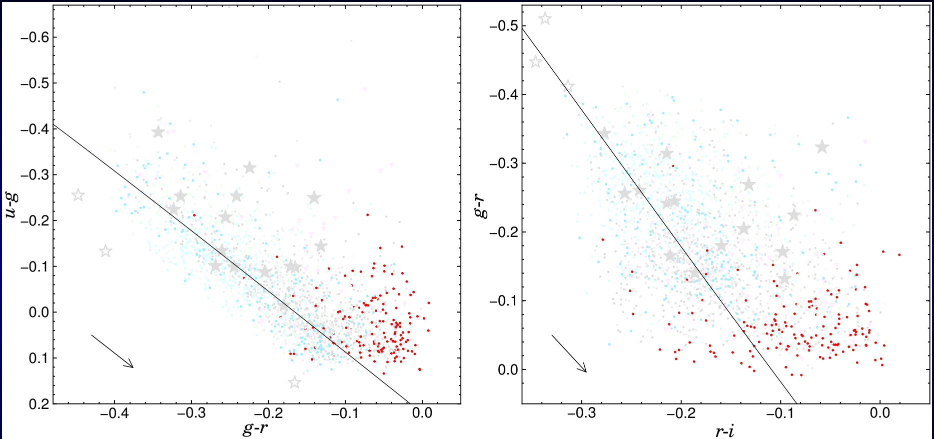
other classes of white dwarf

The sample



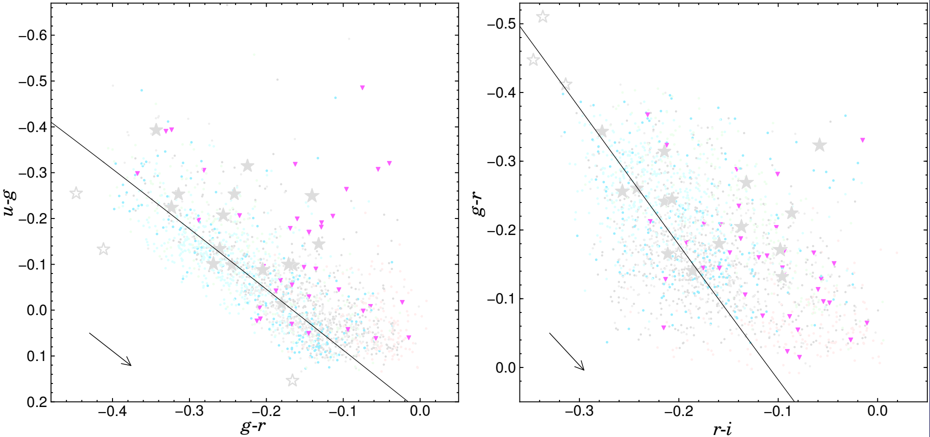
subdwarfs

The sample



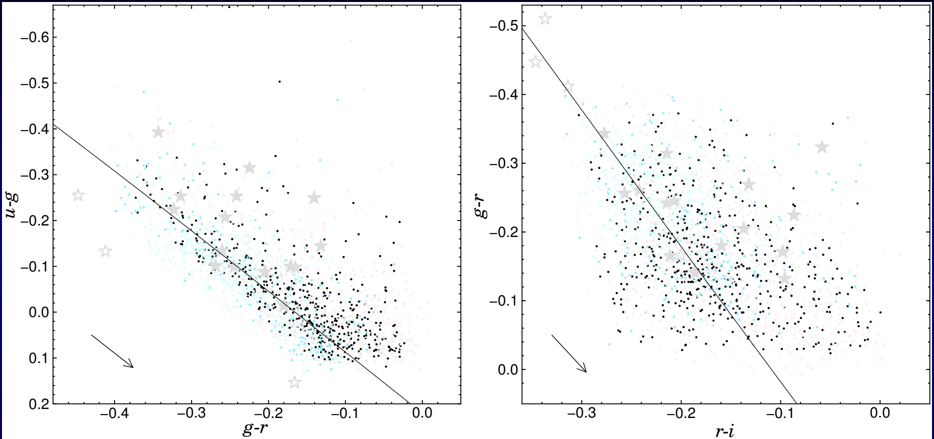
quasars

The sample



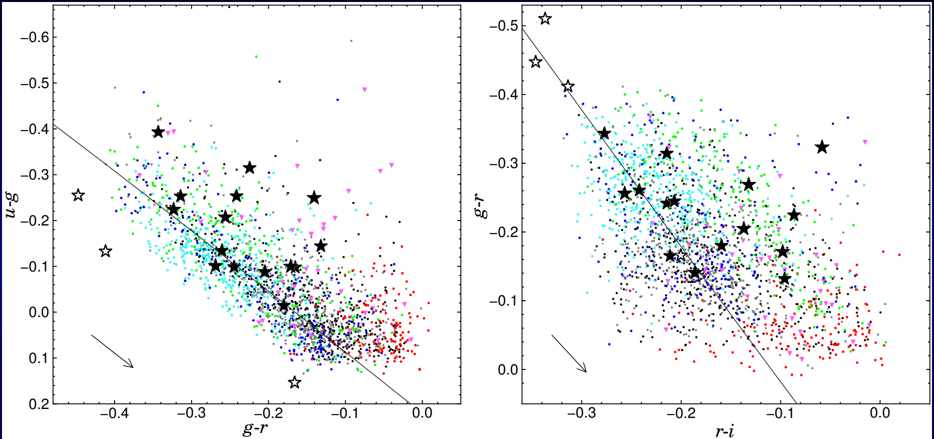
cataclysmic variables

The sample



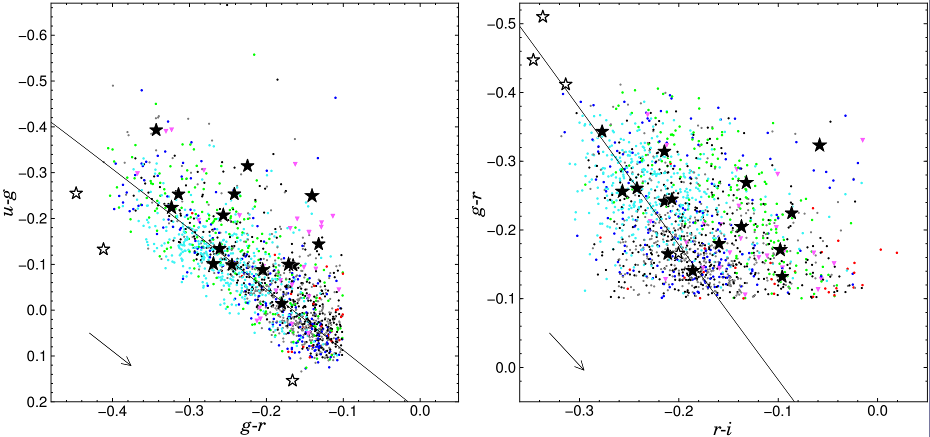
Remaining targets

The sample



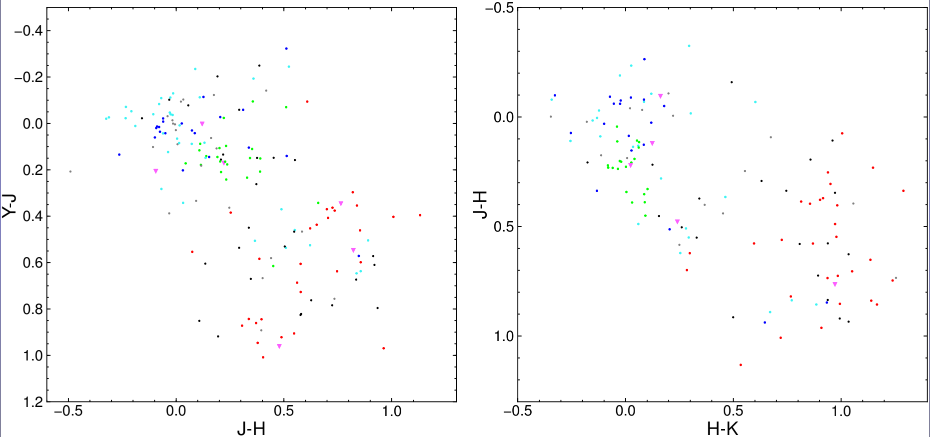
u-g
g-r
−0.6
−0.5
−0.4
−0.3
−0.2
−0.1
0.0
0.1
0.2
−0.4
−0.3
−0.2
−0.1
0.0
g-r
r-i
−0.5
−0.4
−0.3
−0.2
−0.1
0.0
−0.3
−0.2
−0.1
0.0

The sample



$g - r < -0.1;$

UKIDSS



Y-J
J-H
J-H
H-K
−0.4
−0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
−0.5
0.0
0.5
1.0
−0.5
0.0
0.5
1.0
−0.5
0.0
0.5
1.0

Reducing the sample

- *GALEX* UV all sky survey.
- FUV, NUV imaging of $\sim$26,000 deg^2

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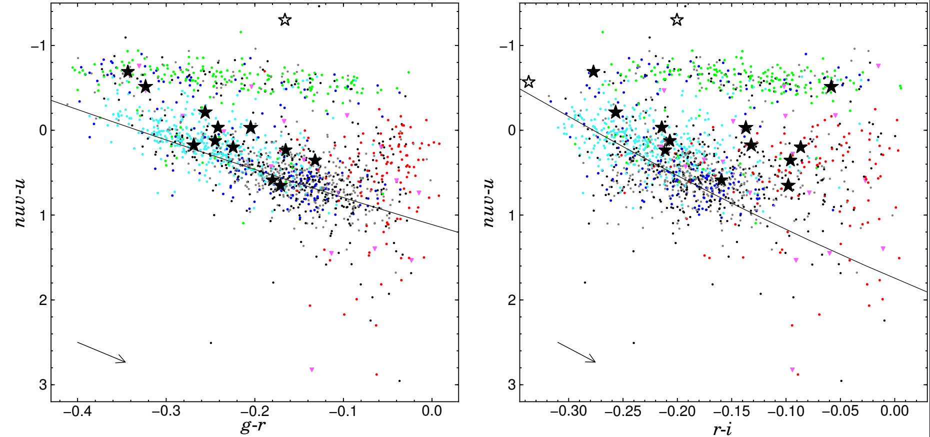
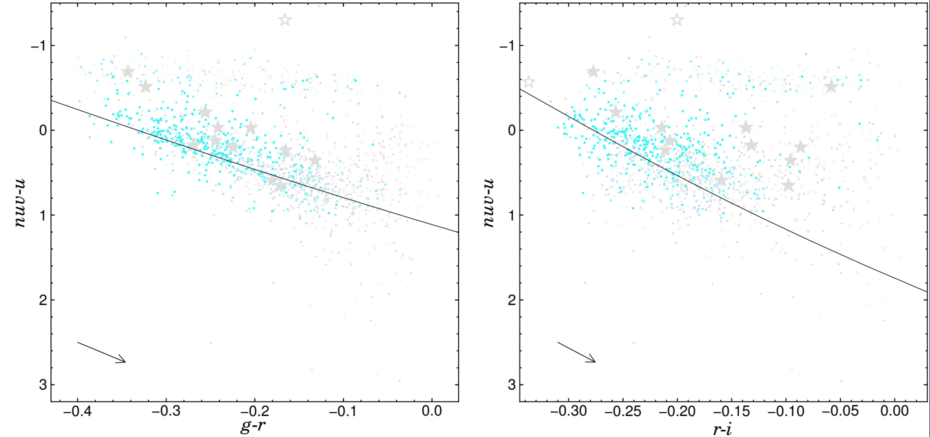
- *GALEX* UV all sky survey.
- FUV, NUV imaging of $\sim$26,000 deg^2
- 80% of SDSS targets detected.

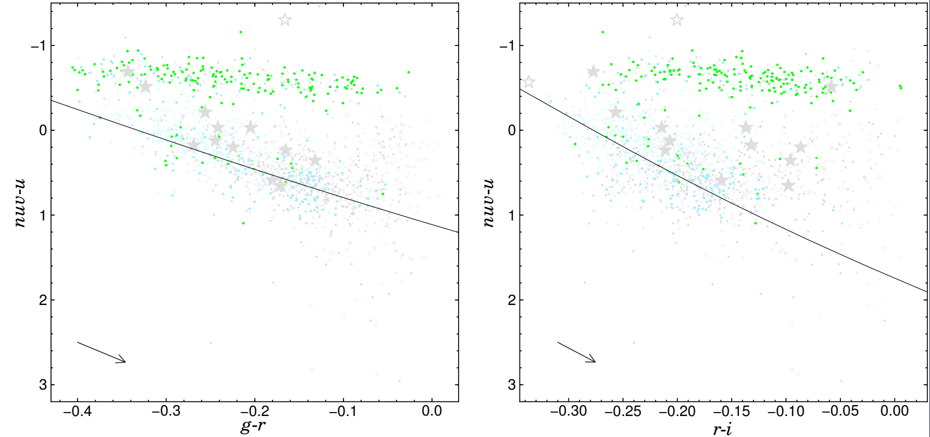
Reducing the sample



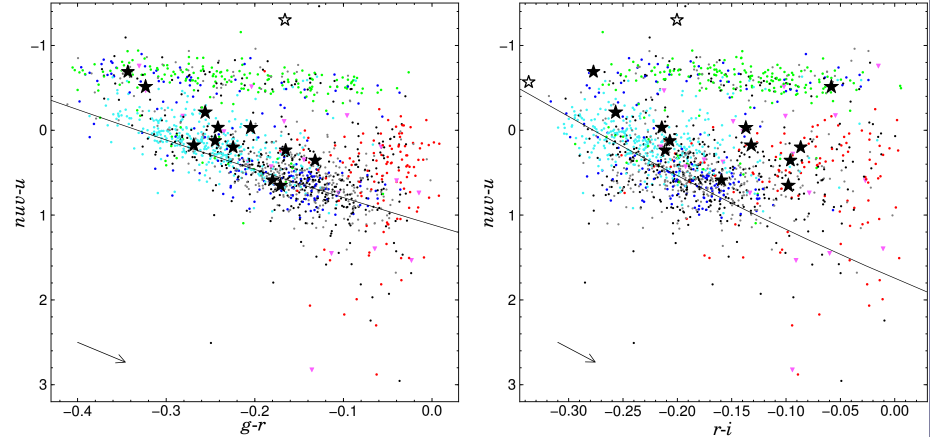
Reducing the sample



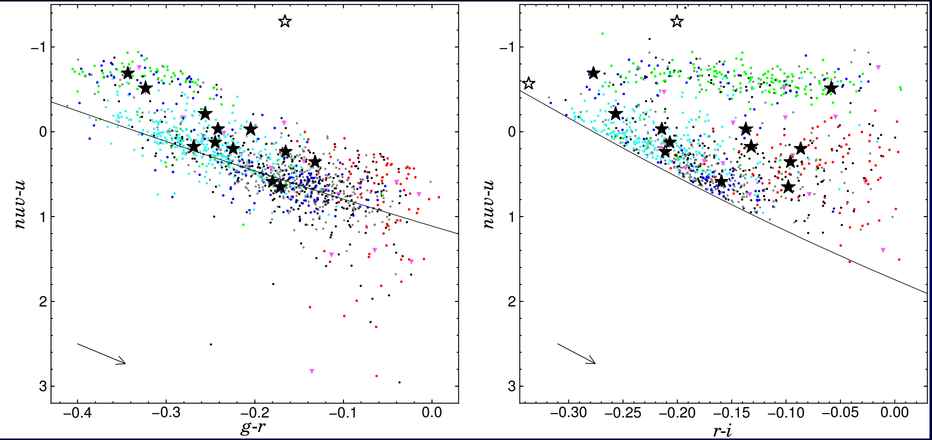
Reducing the sample



Reducing the sample



Reducing the sample



$nuv - u > 4.34(g - r) + 0.5,$ $nuv - u < 6.76(r - i) + 1.85,$

Summary

- The SDSS increased the number of known AM CVn binaries, and provided the first homogeneous sample allowing study of the population.
- Our spectroscopic survey of objects from the SDSS photometric database has so far uncovered a further 6 AM CVns.
- This indicates a lower space density than previously predicted; in order to understand how much lower we still need a larger, more complete sample.
- Using the knowledge we have already gained, and with the addition of *GALEX* fluxes, we can reduce the sample size by more than 40%.
- This should allow us to uncover the remaining AM CVns hiding in the SDSS photometric database.