

Adaptive Learning for SN photometric classification

EWASS – Prague, June/2017

Emille E. O. Ishida

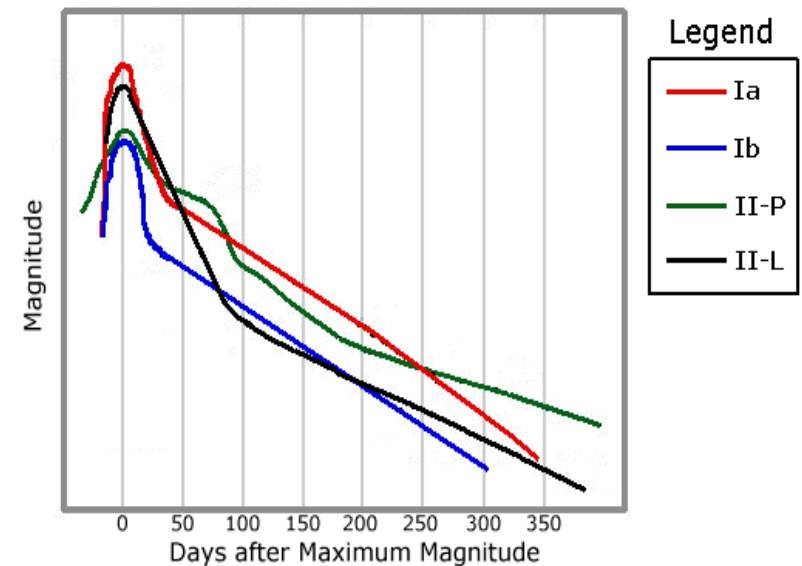
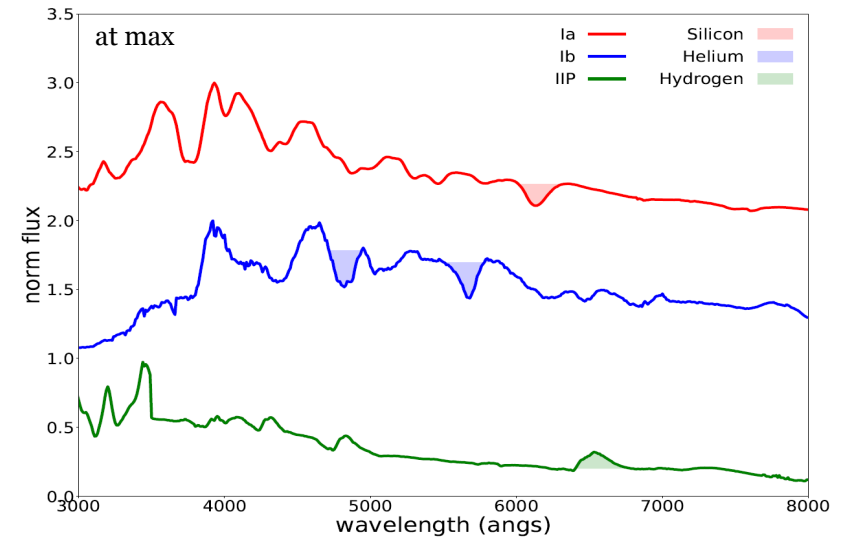
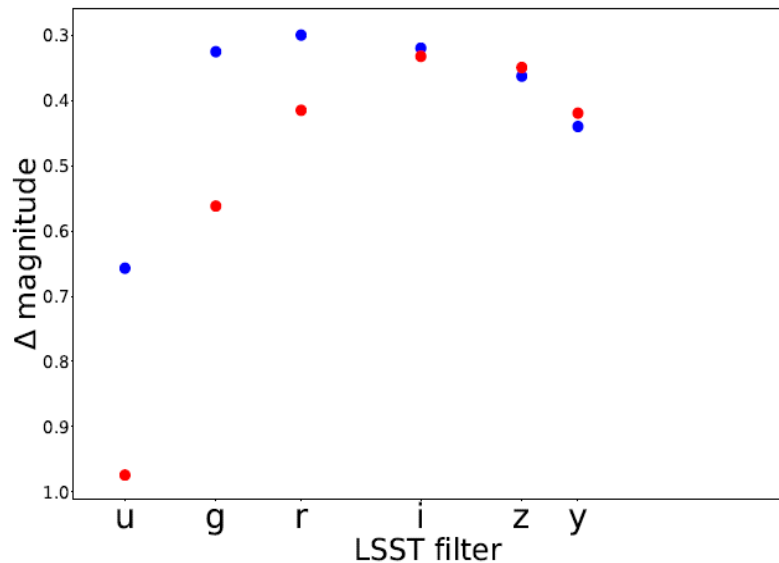
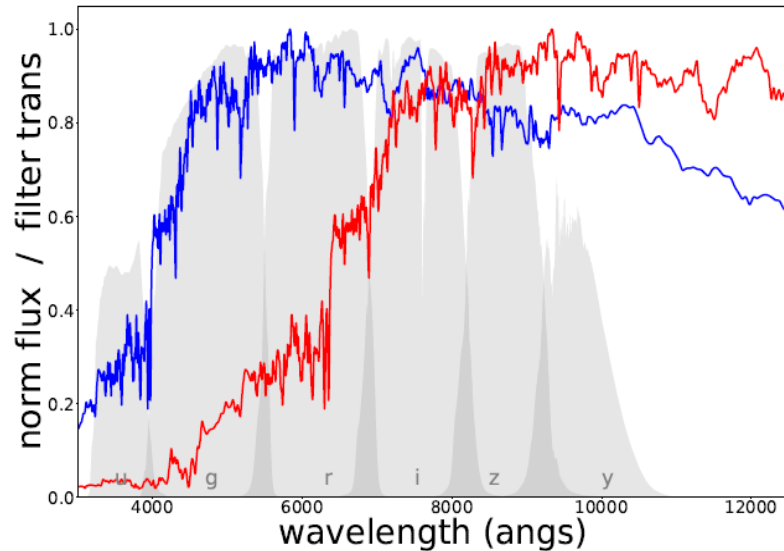
*Laboratoire de Physique de Clermont - Université Clermont-Auvergne
Clermont Ferrand, France*

Spectroscopy
X
Photometry

Spectroscopy x Photometry

Supernovae Typing

Redshift – from host galaxy

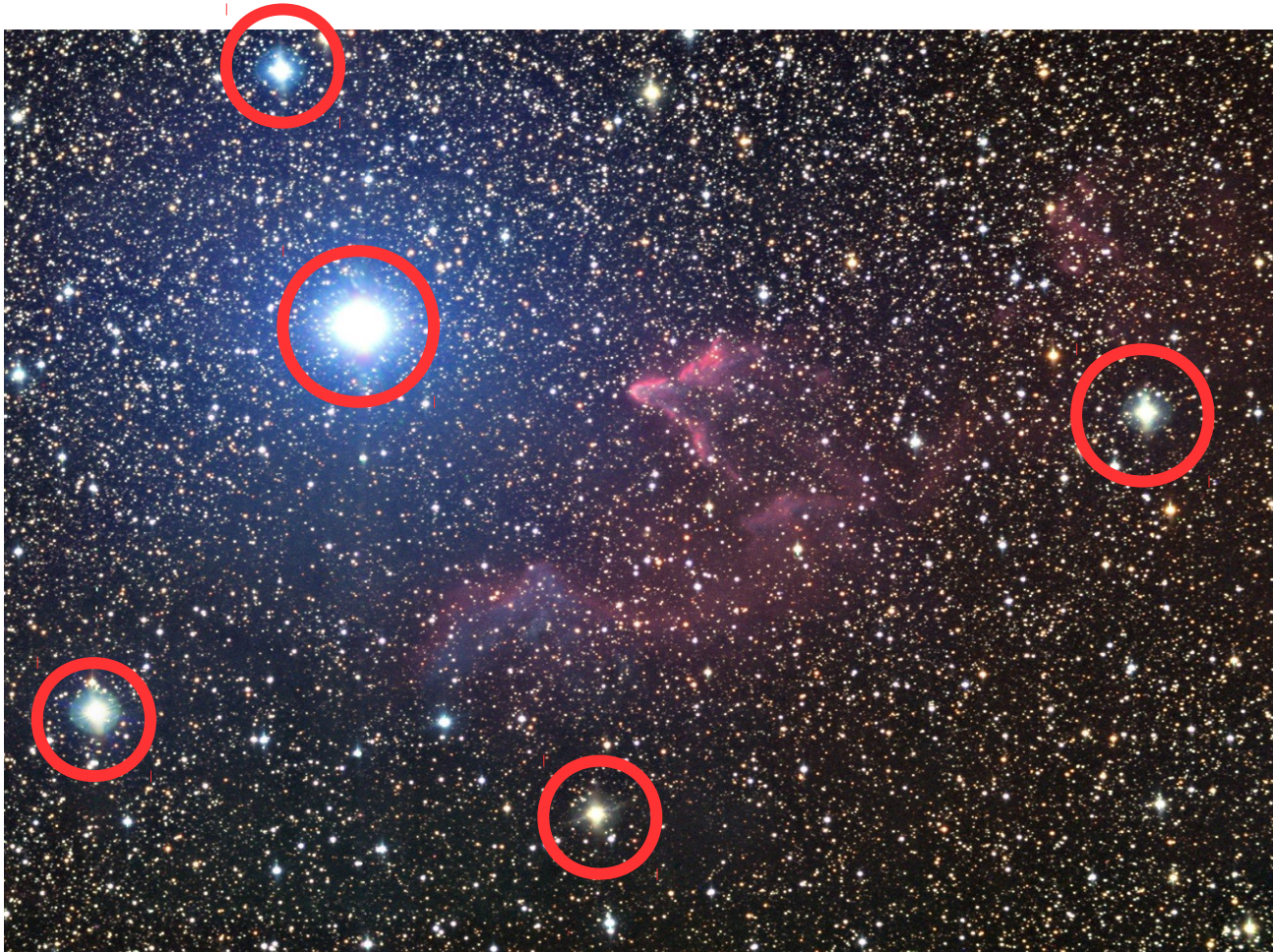


How are spectroscopic sets constructed?



How are spectroscopic sets constructed?

Take spectra for learning and determine everything else



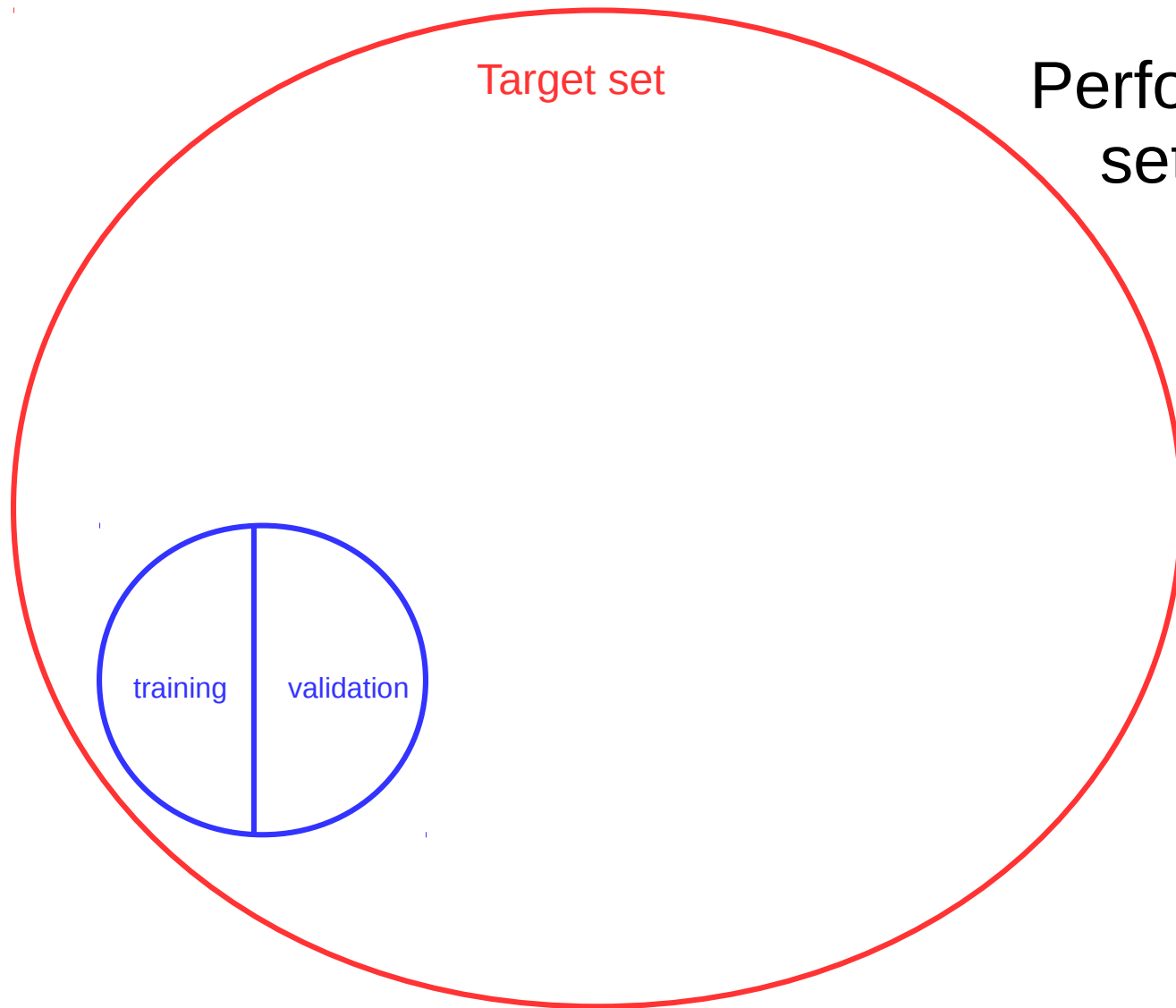
As a consequence ...



Training set is a highly biased subset of the target set

The problem with text-book ML:

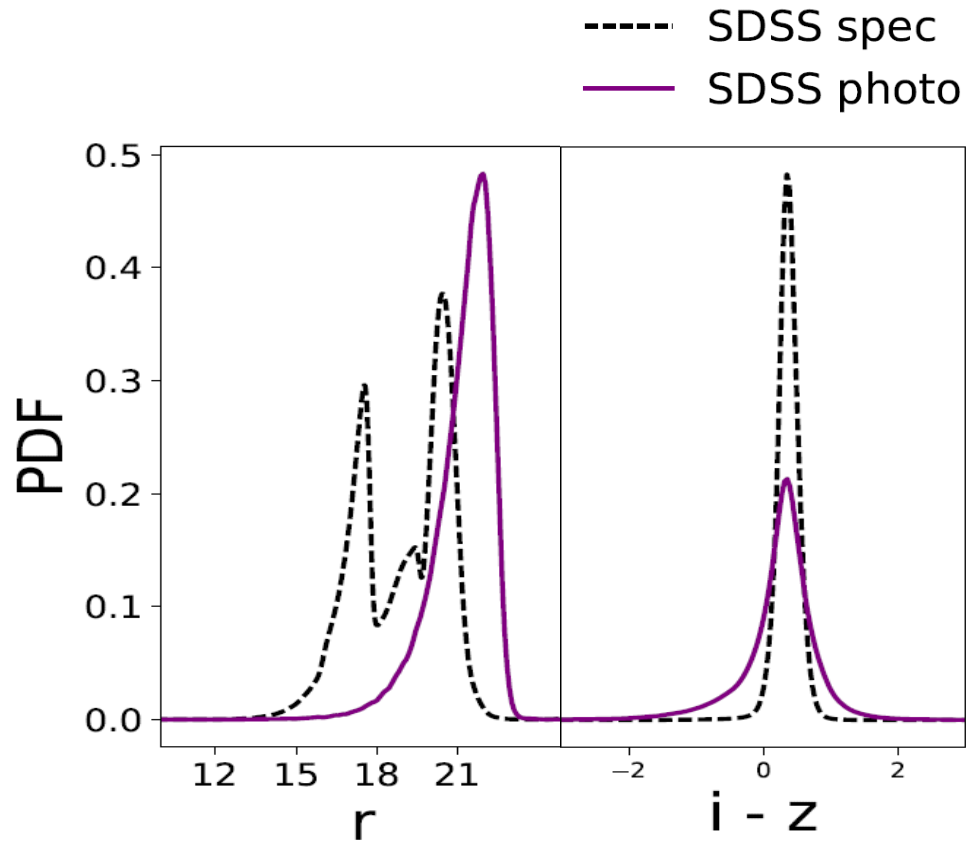
Representativeness



Performance in validation
set does not guarantee
results in target set

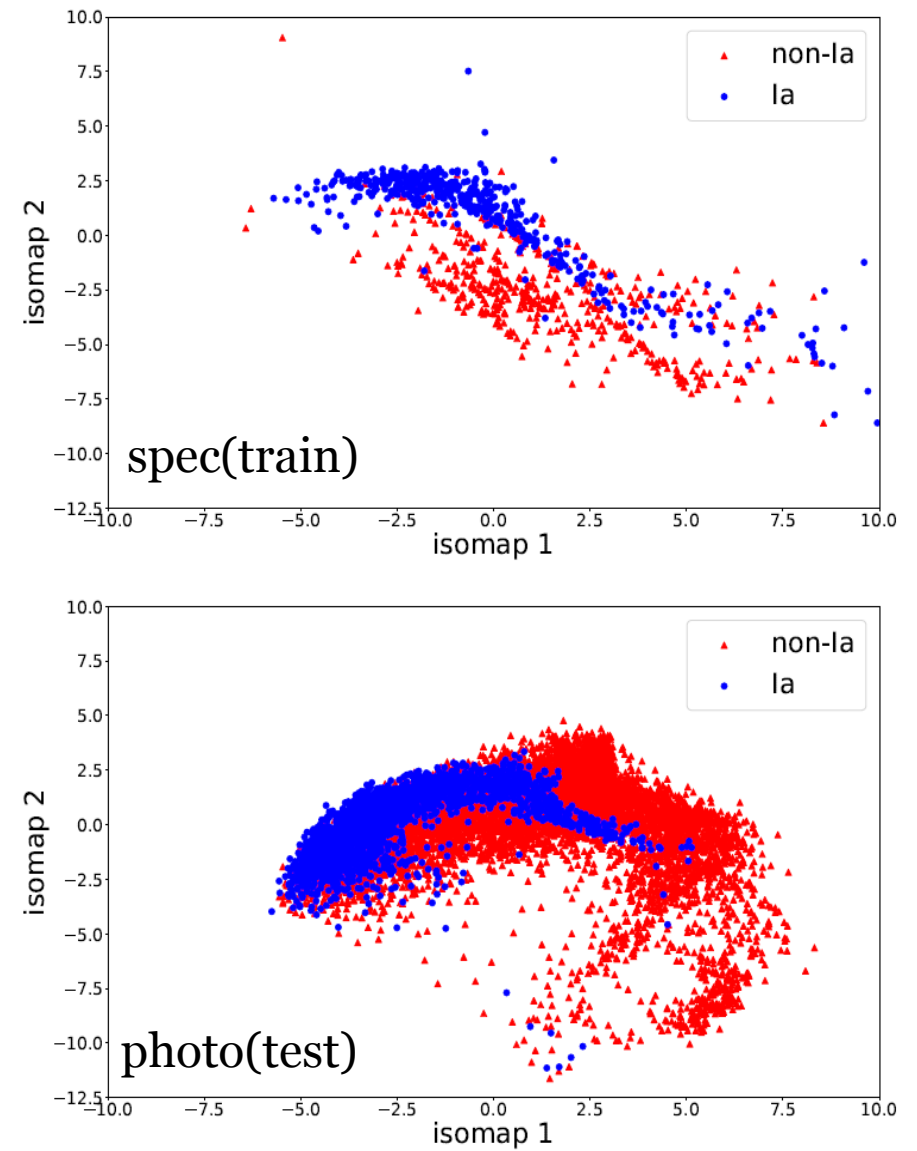
Representativeness

Redshit – from host galaxy

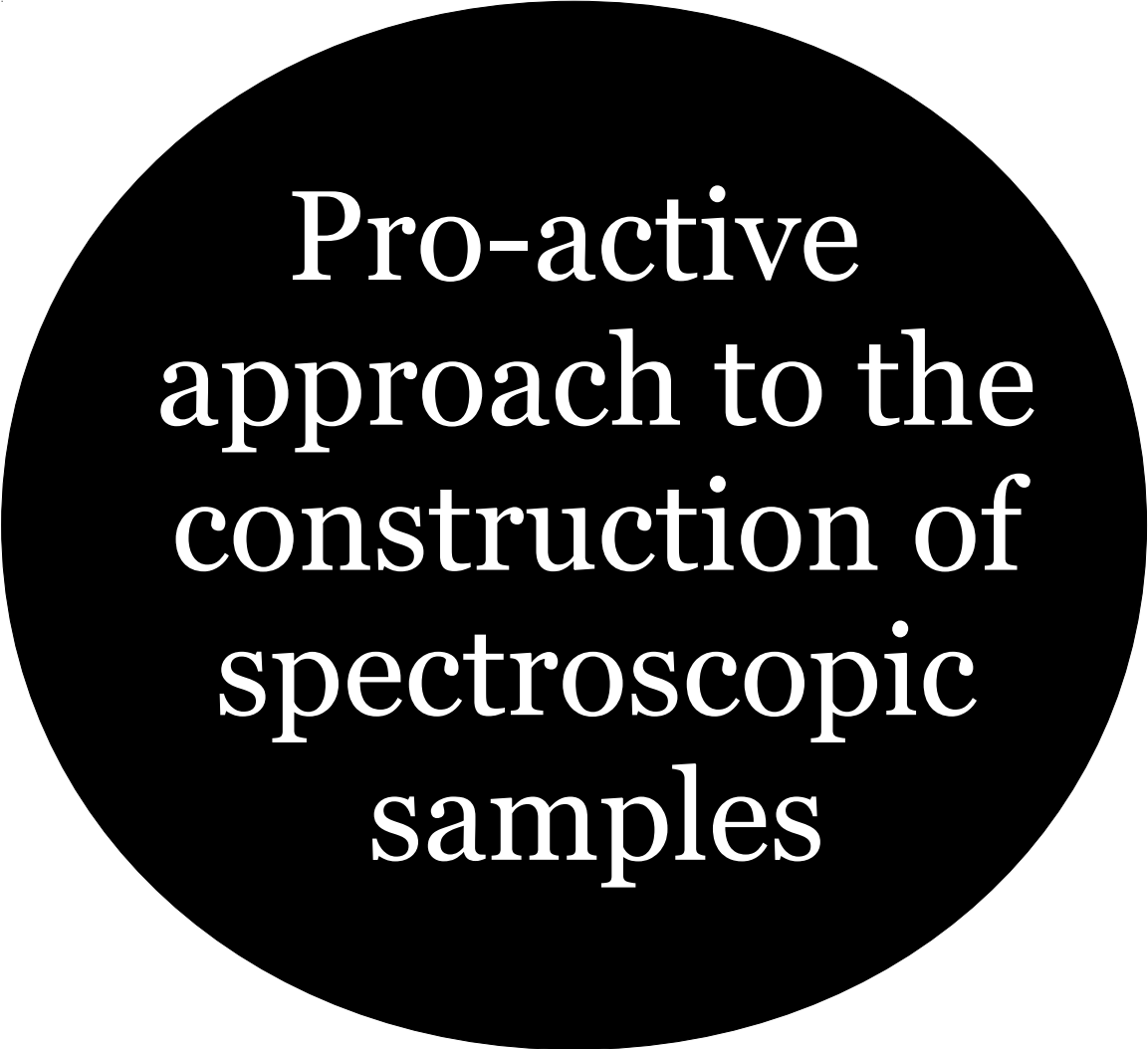


*Beck, Lin, **Ishida** et al., 2017*

Supernovae Typing

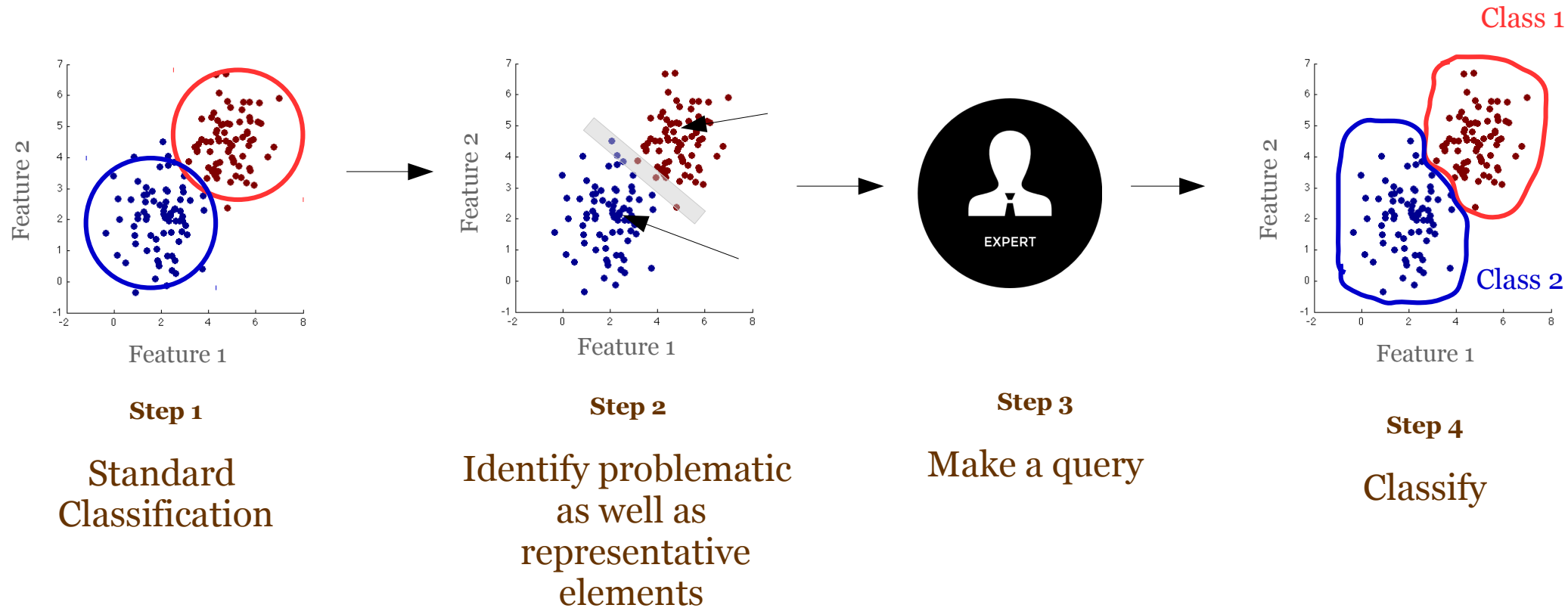


SNPCC data, Kessler et al., 2010 – plot by Ishida

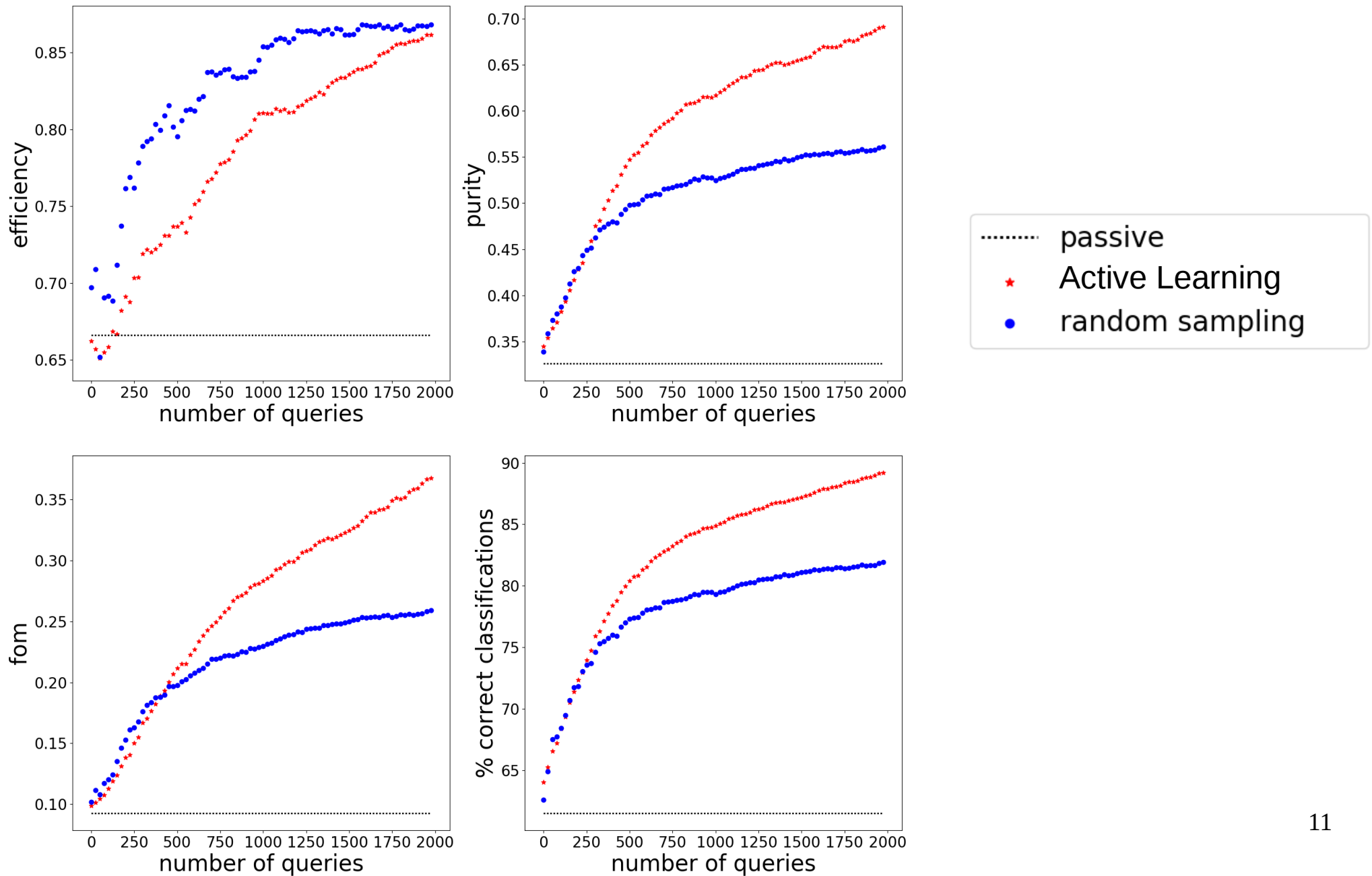


Pro-active
approach to the
construction of
spectroscopic
samples

Active Learning



Simple logistic regression + AL



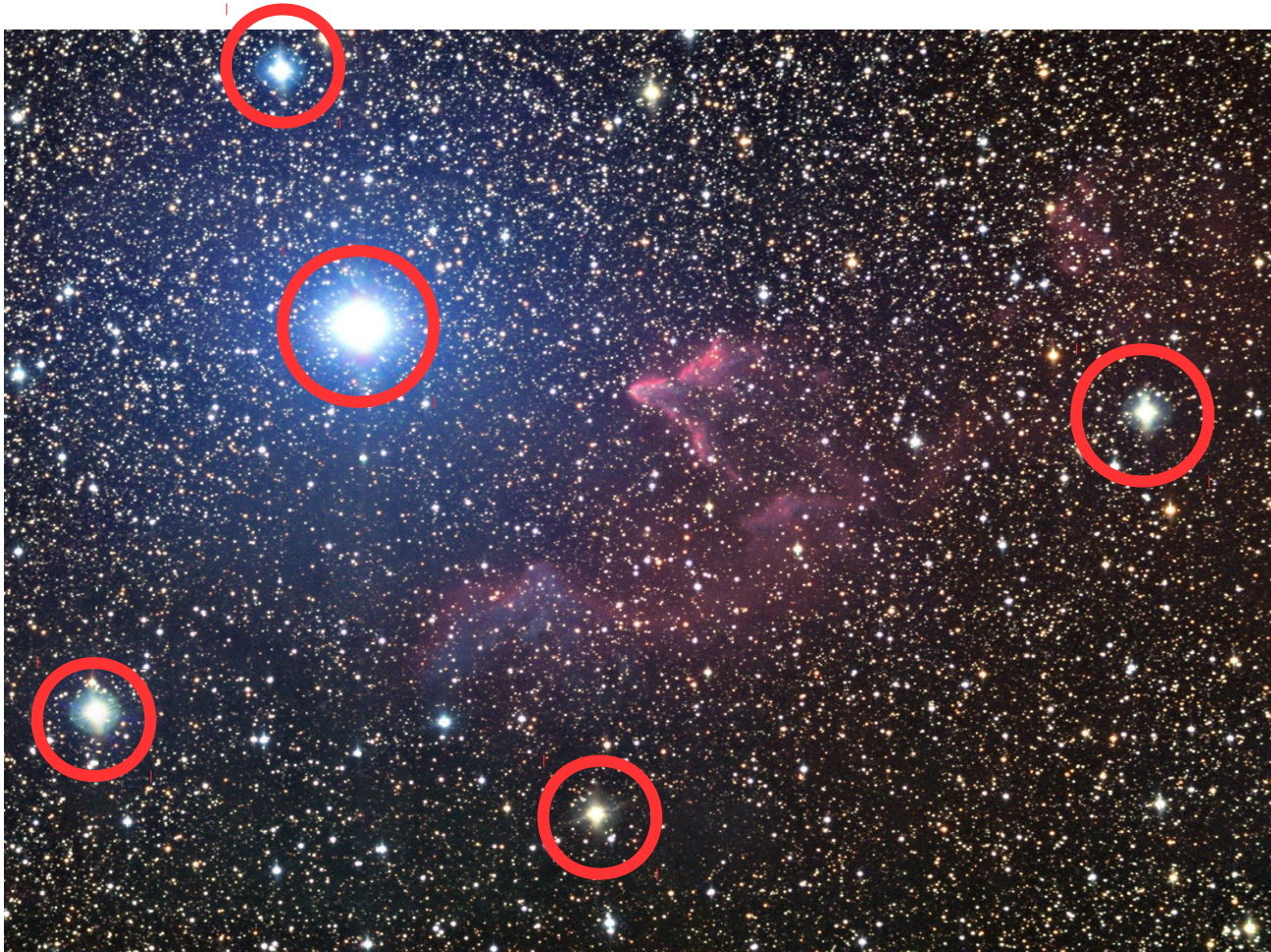
Alternative approach

Landmark selection



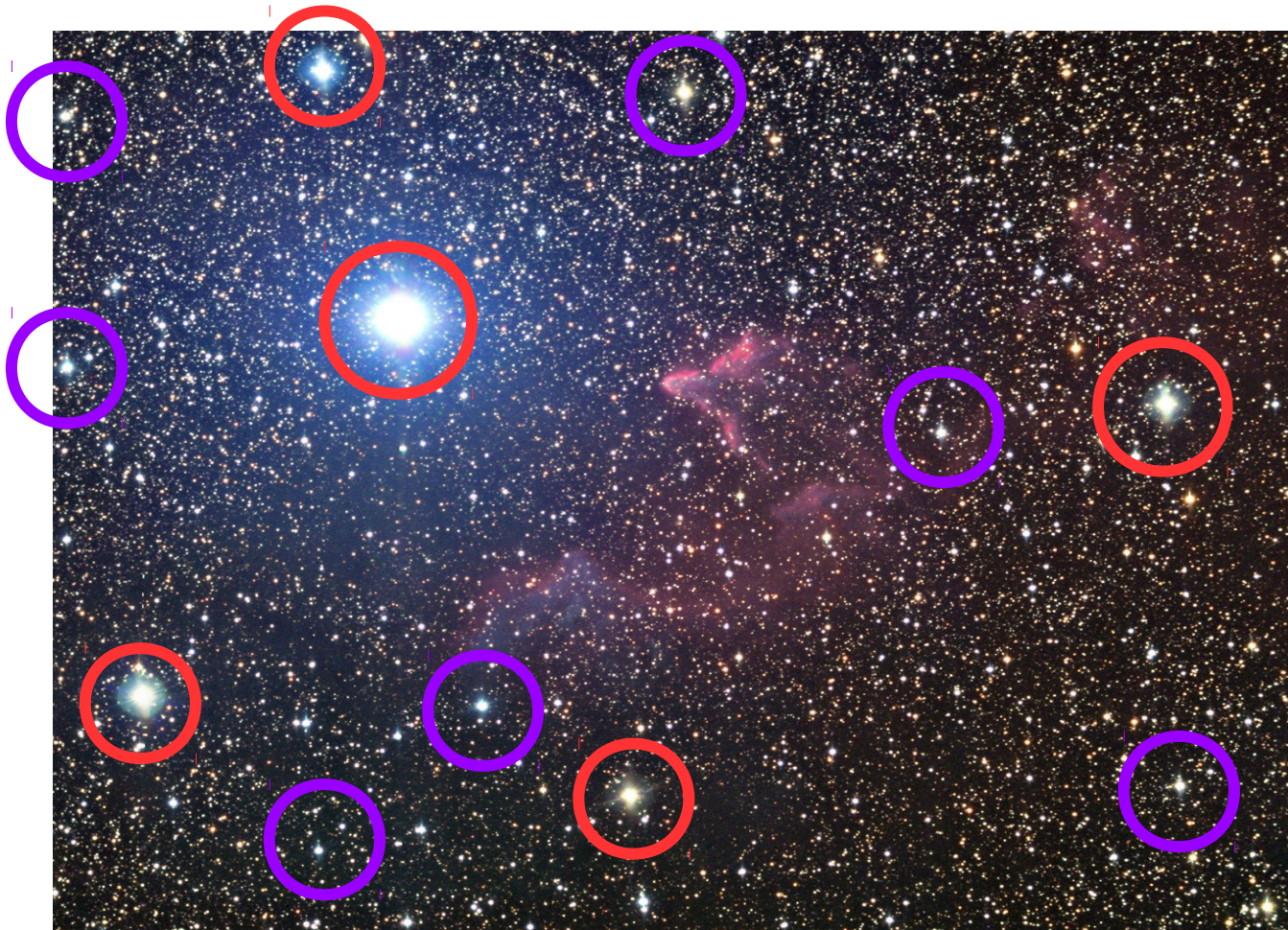
Alternative approach

Landmark selection



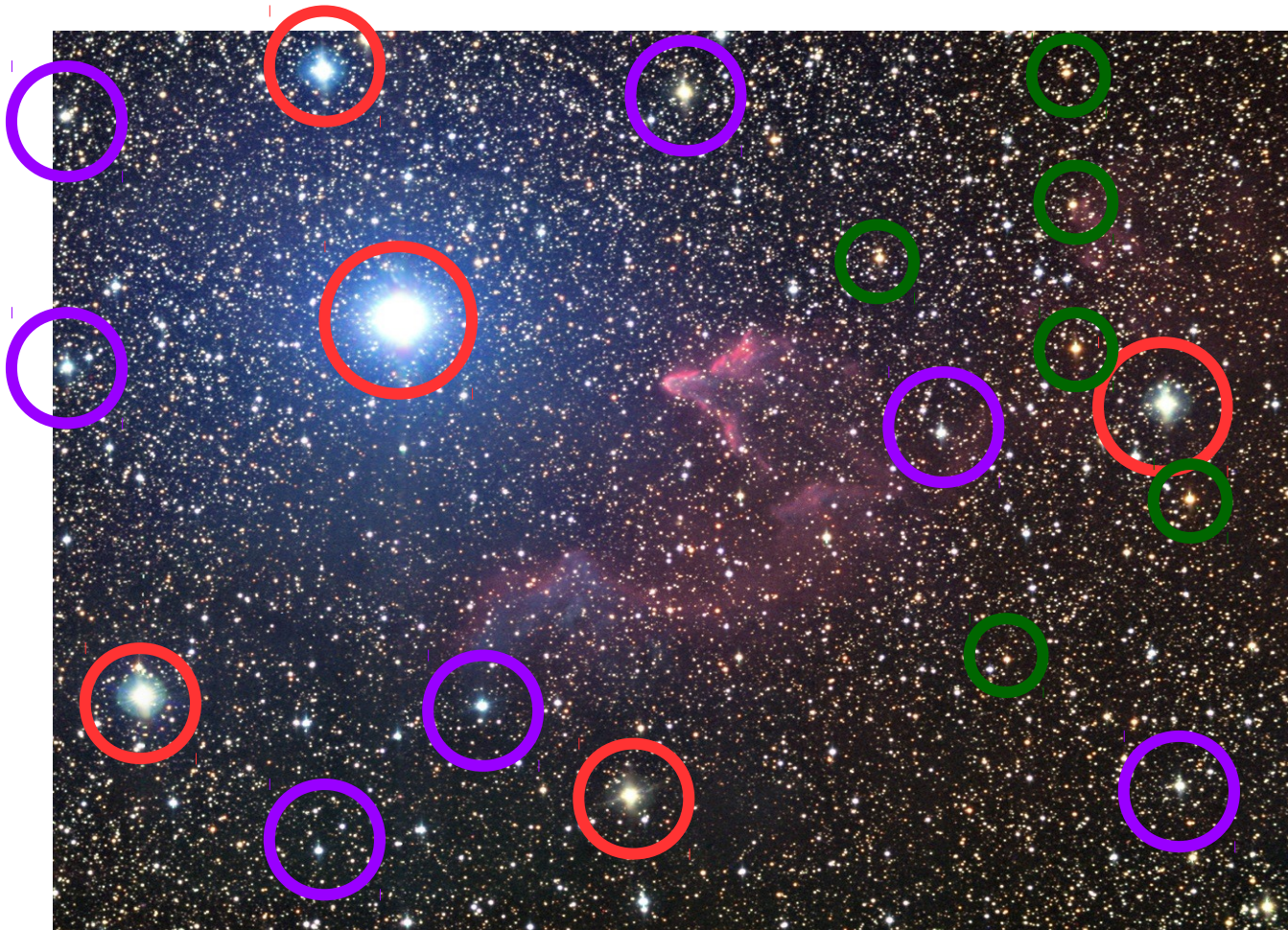
Alternative approach

Landmark selection



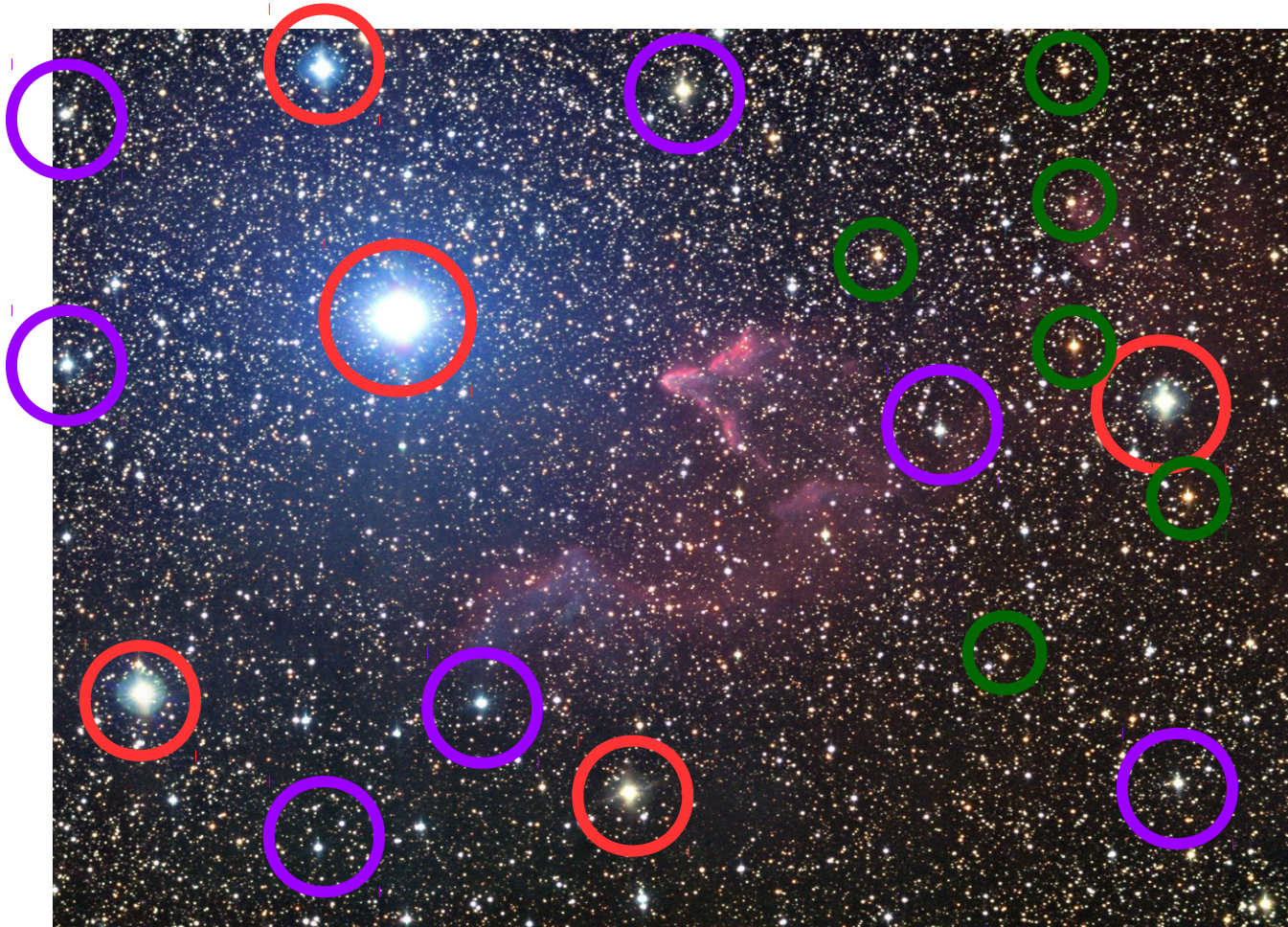
Alternative approach

Landmark selection



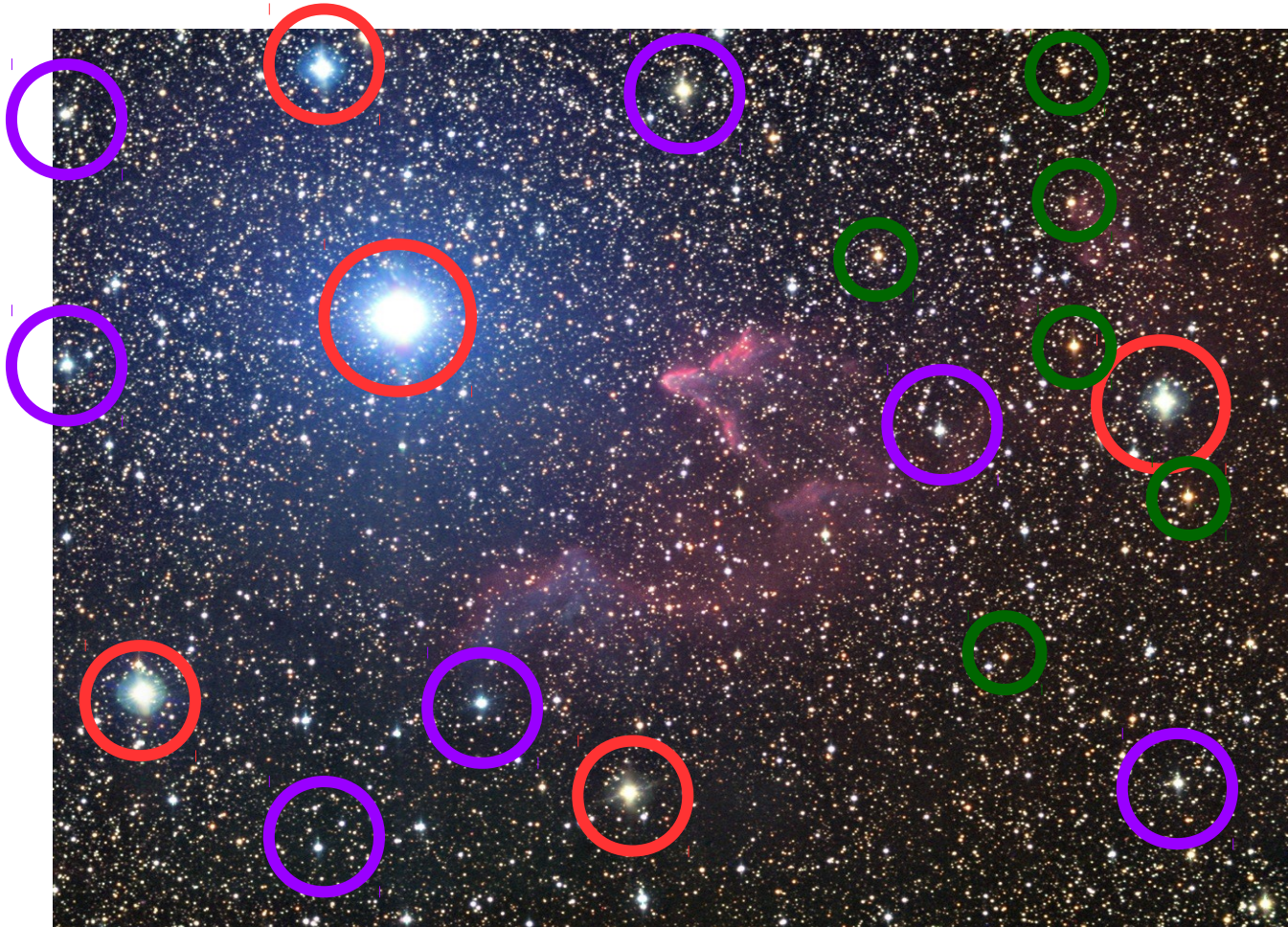
Alternative approach

Landmark selection + Active Learning



Alternative approach

Landmark selection + Active Learning



Sometimes,

There will be a group without a minimum
necessary number of labels...

Sometimes,

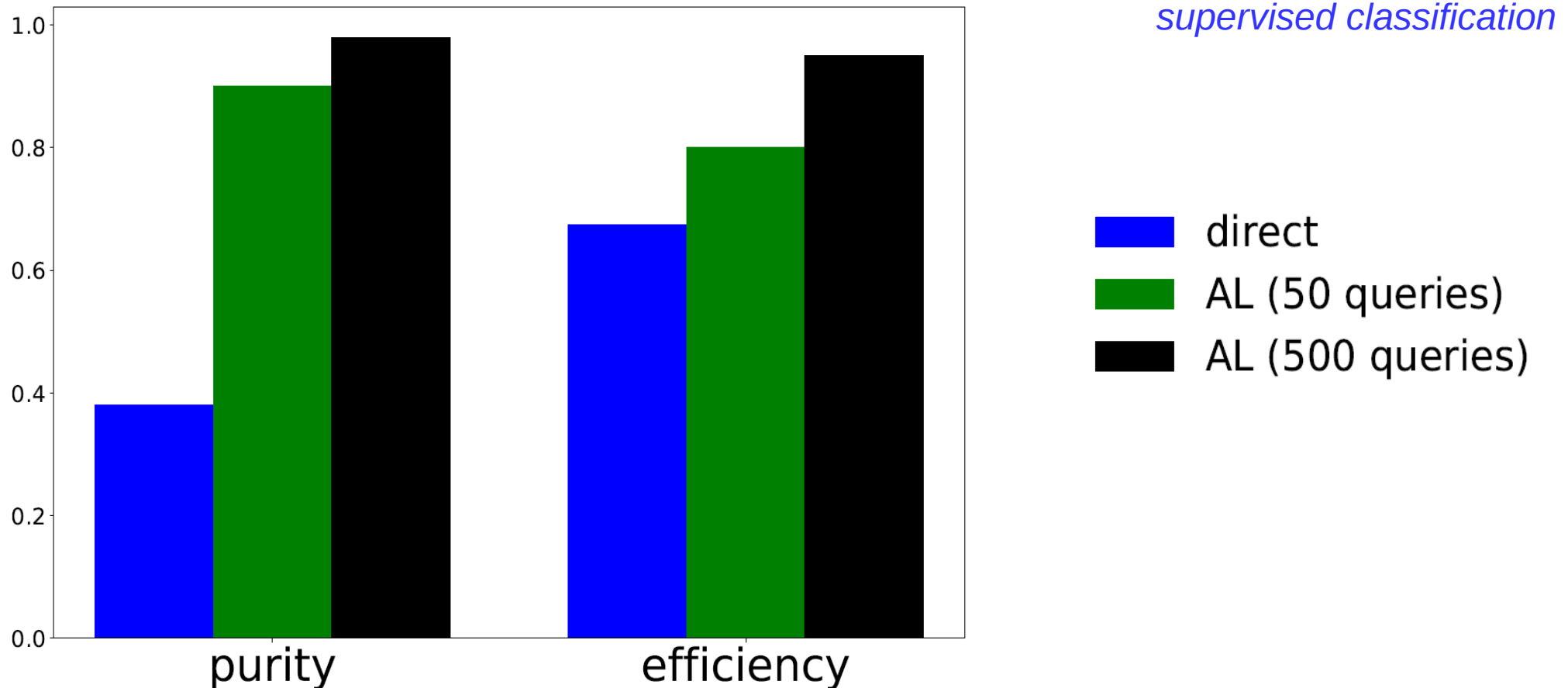
There will be a group without a minimum
necessary number of labels...



Ask!

Automated Supernova Ia Classification Using Adaptive Learning Techniques

Kinjal Dhar Gupta*, Renuka Pampana*, Ricardo Vilalta*, Emille E. O. Ishida[†], Rafael S. de Souza[‡]



But SN fade away...

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1. Use simulations to identify the ideal spectroscopic sample:
 - redshift range
 - errors
 - colors

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2. Use partial light curves (pre-max)

But SN fade away...

1. Use simulations to identify the ideal spectroscopic sample:

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2. Use partial light curves (pre-max)





<https://github.com/COINtoolbox>

The COIN Residence Program - CRP

Annual meetings

Conference

Workshop

Hackathon

The COIN Residence Program - CRP

Annual meetings

~~Conference~~

~~Workshop~~

~~Hackathon~~

The COIN Residence Program - CRP

A non-profit start-up?

Annual meetings



John Johnson/HBO



<https://www.theroadtosiliconvalley.com/moving/comparing-sydney-silicon-valley/>

The COIN Residence Program - CRP

A non-profit start-up?

Annual meetings



John Johnson/HBO



CRP #2, UK, 2015



CRP #2, UK, 2015

CRP #3, Budapest, 2016



<https://www.theroadtosiliconvalley.com/moving/comparing-sydney-silicon-valley/>



<https://iaacoin.wixsite.com/crp2017>

#coinCF2017

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COIN Residence Program #4

20-27 August 2017
Clermont Ferrand, France

IAA facebook page

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International Astrostatistics Association



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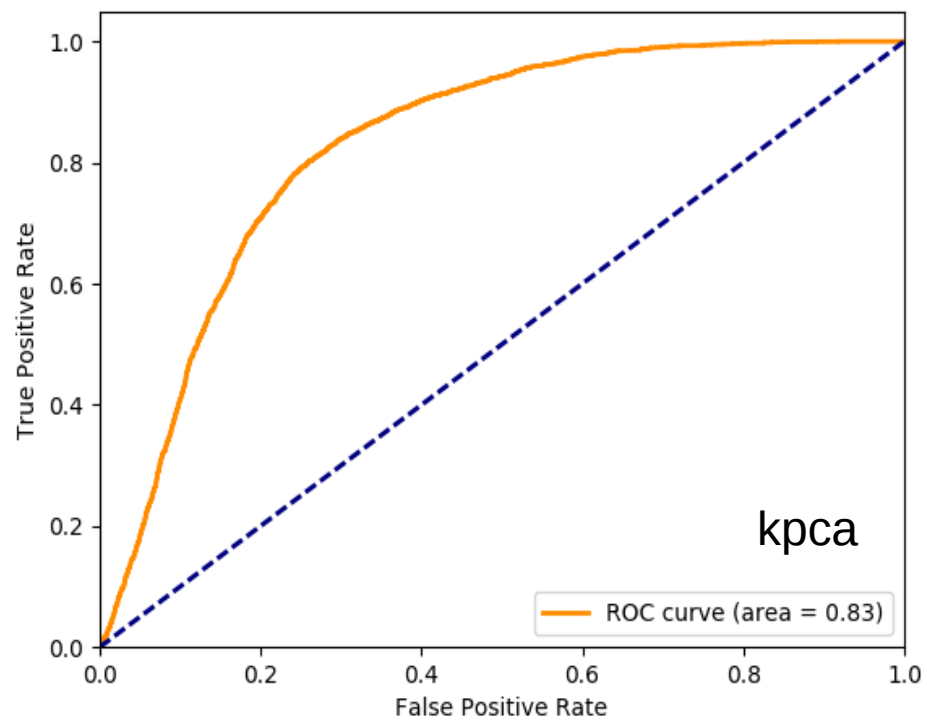
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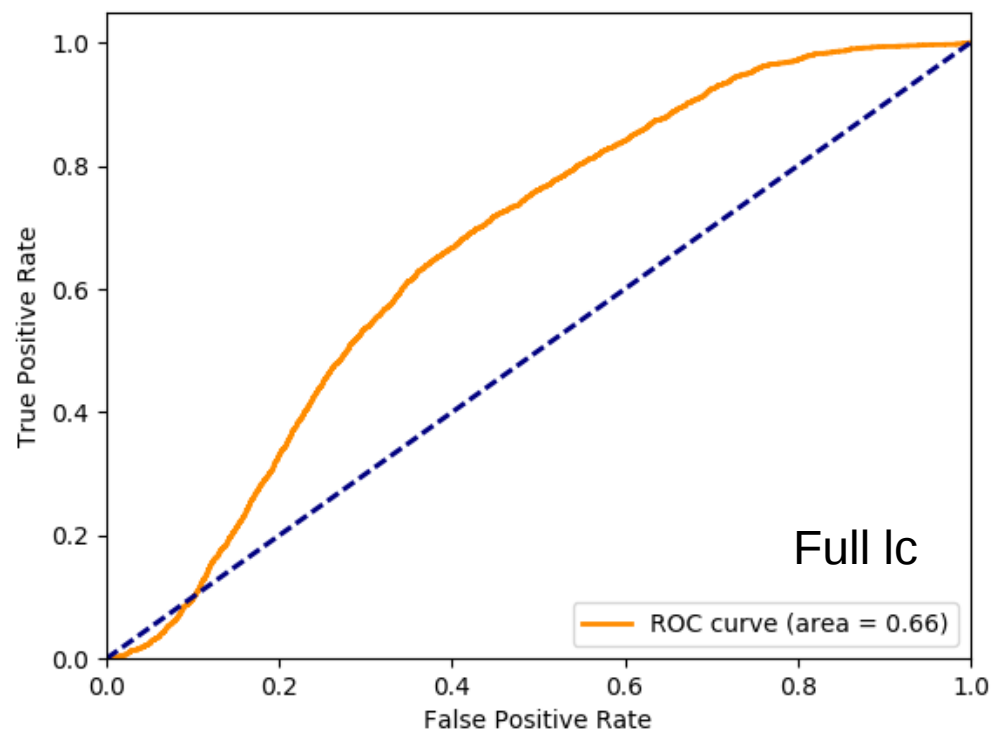
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Extra slides



Logistic regression



Background: Active Learning in Astronomy

ACTIVE LEARNING TO OVERCOME SAMPLE SELECTION BIAS: APPLICATION TO PHOTOMETRIC VARIABLE STAR CLASSIFICATION

JOSEPH W. RICHARDS^{1,2}, DAN L. STARR¹, HENRIK BRINK³, ADAM A. MILLER¹, JOSHUA S. BLOOM¹,
NATHANIEL R. BUTLER¹, J. BERIAN JAMES^{1,3}, JAMES P. LONG², AND JOHN RICE²

supervised classification

THE ASTROPHYSICAL JOURNAL, 744:192 (19pp), 2012 January 10

