Exploring the spectroscopic diversity of type Ia supernovae with DRACULA: a machine learning approach

M. Sasdelli (Liverpool John Moores U., UK), <u>E. E. O. Ishida (U. Clermont-Auvergne, France)</u>, R. Vilalta (U. Houston, USA), M. Aguena (U. Sao Paulo, Brazil), V. C. Busti (U. Sao Paulo, Brazil), H. Camacho (U. Sao Paulo, Brazil), A. M. M. Trindade (U. Porto, Portugal), F. Gieseke (U. Copenhagen, Denmark), R. S. de Souza (ELTE, Hungary), Y. T. Fantaye (U. Rome Tor Vergata, Italy) and P. A. Mazzali (Liverpool John Moores U., UK) for the COIN collaboration

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Goal:

Automatically identify sub-types of type Ia supernovae

Challenges:

1. Not enough spectra at maximum 2. Highly non-linear problem 3. Validation of unsupervised

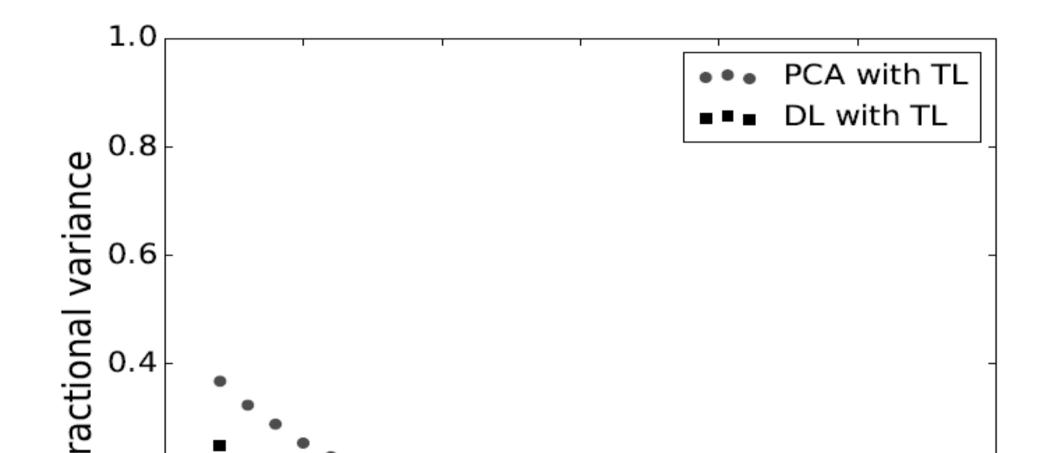
Laboratoire de Physique de Clermont		UNIVERSITÉ Clermont Auvergne	COIN
1. Transfer Learning			
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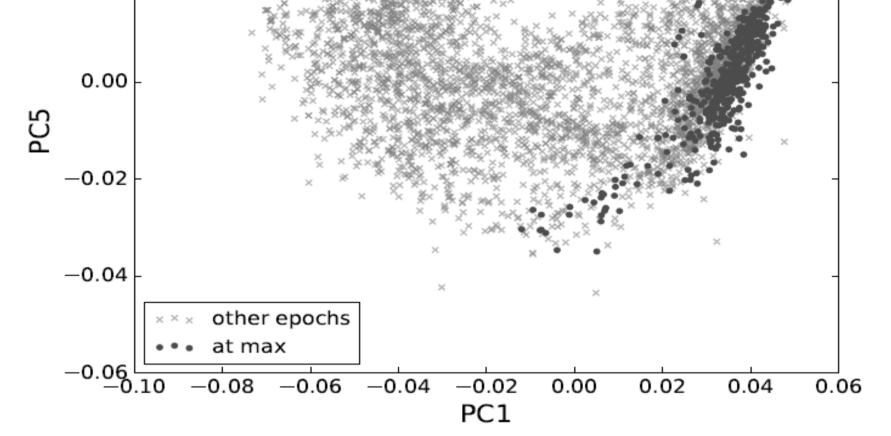
clustering

Strategies: 1. Transfer Learning 2. Deep Learning 3. Compare with human classification

2. Deep Learning for dimensionality reduction

Layers= (120,100,90,50,30,20,4,20,30,50,90,100,120)

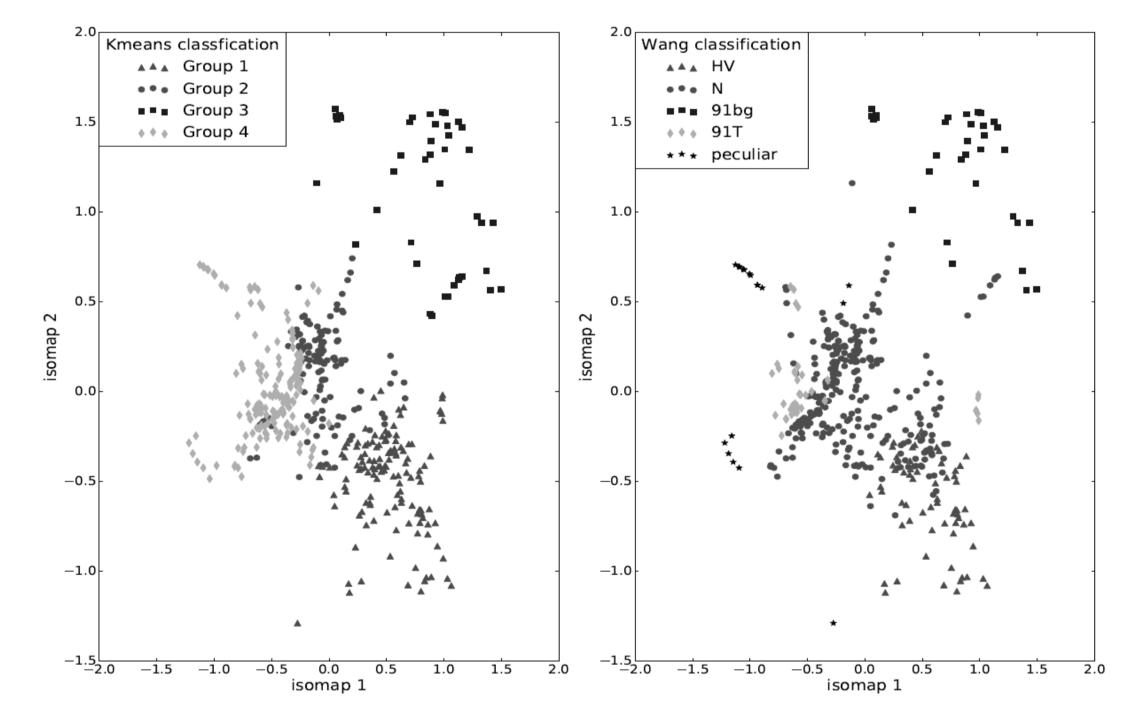




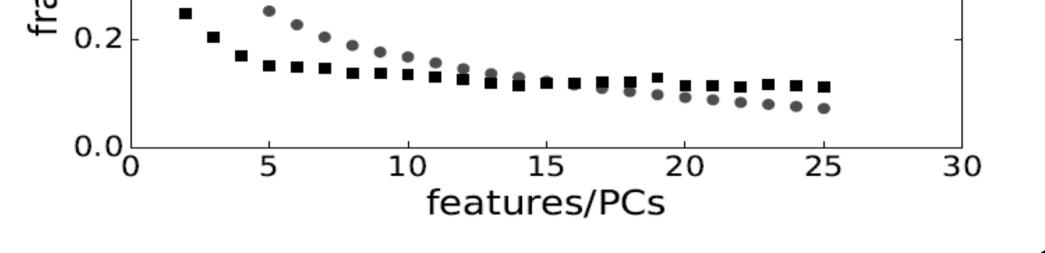
- Use spectra in *all epochs* to perform the dimensionality reduction.

- Afterwards, separate spectra at maximum for subsequent analysis







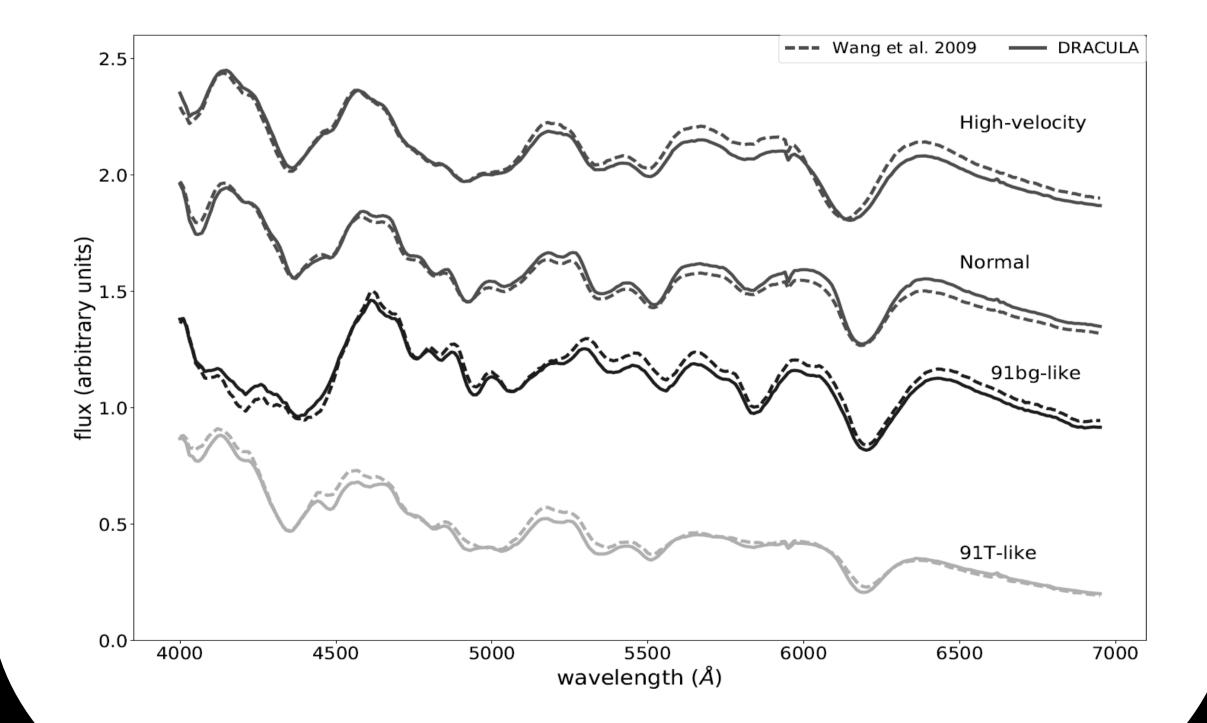


Final remarks

We were able to automatically identify groups which are very similar to the ones found in the literature.

This type of algorithm can be used in future studies to guide theoretical modeling with insights taken from the data, but this will require a large, high quality data set.

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All tools used in this work are publicly available on github – QR code bellow

> C O I N ' S Dimensionality Reduction And Clustering for Unsupervised Learning in Astronomy