Identification/characterization of objects of unknown nature (OUTLIERS) observed by Gaia.

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Reunión RIA "La contribución de las ICTS al proyecto Gaia de la ESA".
Madrid 21-23 marzo 2012

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1.- Gaia sample

- ~ 10^9 stars (1% of the Galaxy)
- ~ 10^5 WDs
- ~ 10^6 unresolved galaxies
- ~ 500.000 quasars
- Many solar system objects

→DPAC-CU8 "Astrophysical parameters" main objective: sort objects by astronomical classes.

→It will manage a standardized set of labels to classify the observed sources.

2.- Available information

- position, magnitude
- BP-RP low resolution espectra
- astrometry (π,pm)
- variability
- Hi-res spectrum RVS (V:6-17)

3.- CU8 Classifiers

i) Supervised Classification

- **DSC** --> stars, binaries, galaxies, qsos, object pairs, outliers
- Dedicated : UGC, QSOC, MSC, ESP

"Templates" (semi-empirical or synthetic)
+
pattern recognition algorithms
supervised training
metrics and minimum distances
→ labelling (classification) and parameterization

Processing algorithms are mainly based on BP/RP spectrophotometry

3.- CU8 Classifiers

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ii) Unsupervised classification

Observed "natural" classes

- OCA --> class 1, class 2, class 3,.. HMAC
- OA--> oclass1, oclass2, oclass3,.. HSC

4.- Outliers

- Objects with membership probabilities to any Gaia class below a threshold (67%)

- Objects outlying from the clusters centroids obtained by the classification algorithms

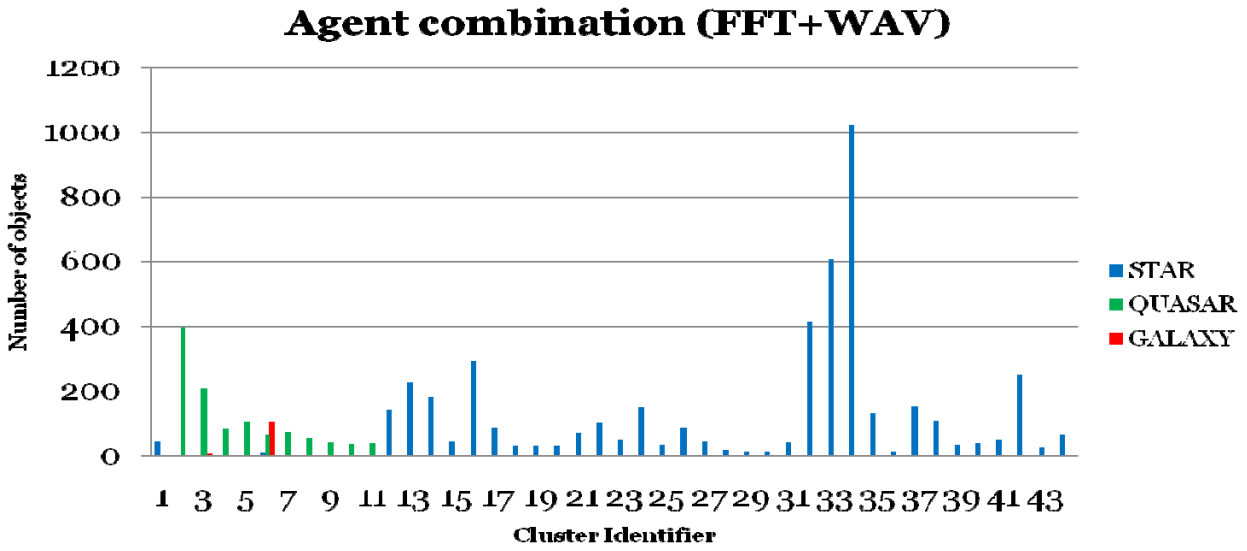
DPAC estimation: ~5% of sources

- new classes of variable stars
- rare stars (brief phases of stellar evolution)
- abnormal abundance patterns
- atypical or very faint extragalactic objects
- multiple systems
- ¿?

5.- Outlier Analysis

1- Segmentation:

- Gather objects in homogeneous clusters, in order to better identify their physical nature and study them in detail
- Clustering techniques based on unsupervised ANNs



5.- Outlier Analysis

2- Labelling

- Distribution of probabilities assigned by DSC inside outliers´ homogeneous clusters

- Statistical description of clusters by "mean" observed properties.

- Cross-correlation with external databases
  UKIDSS SDSS 2MASS

5.- Outlier Analysis

3- Analysis

Clusters with identified physical nature :
→ Feeded back to DSC (and improve it)

Remaining clusters:
→ Study "by hand"
→ Complementary observations

6.- Conclusions

- Forseen number of outliers: ~5 million from which ~30% could be identified and feeded back to DSC

- We expect to group most of the remaining and reduce the number of cases of study

- Telescope time will be needed to confirm and characterize their physical nature
  → high-medium resolution espectroscopy