Active Learning in the VO-Cloud Science Platform

P. Škoda[1, 2], T.Mazel[1], O. Podsztavek[1]

[1]Faculty of Information Technology, Czech Technical University in Prague
[2]Astronomical Institute of the Czech Academy of Sciences, Ondřejov

KDIG Session of the Virtual IVOA Meeting, Worldwide, 12th May 2020

Czech Technical University in Prague
Faculty of Information Technology
Department of Software Engineering

Bachelor's thesis

Design and implementation of a distributed platform for data mining of big astronomical spectra archives

Jakub Koza

Supervisor: RNDr. Petr Škoda, CSc.

12th May 2015

Czech Technical University in Prague
Faculty of Information Technology
Department of Software Engineering

Master's thesis

Interactive Cloud-Based Platform for Parallelized Machine Learning of Astronomical Big Data

Bc. Jakub Koza

Supervisor: RNDr. Petr Škoda, CSc.

9th May 2017

Sources of Spectra

Getting spectra + store

(restricted access – big files)

Files

UPLOAD from given local directory (recursive)

DOWNLOAD by http + index, FTP (recursive)

VOTable

UPLOAD VOTable (e.g. prepared in TOPCAT - meta)

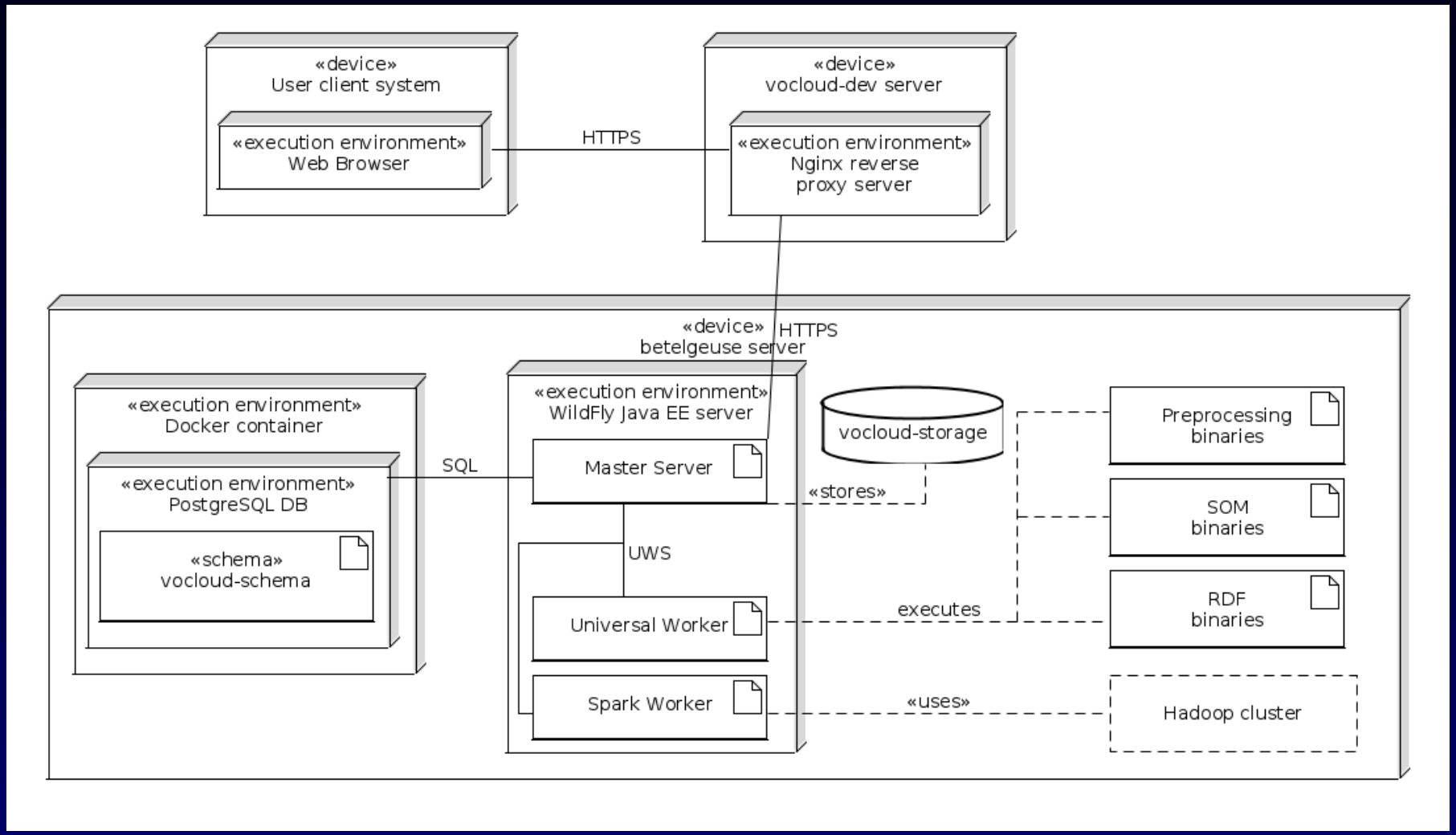
REMOTE VOTable

SSAP query + Accref

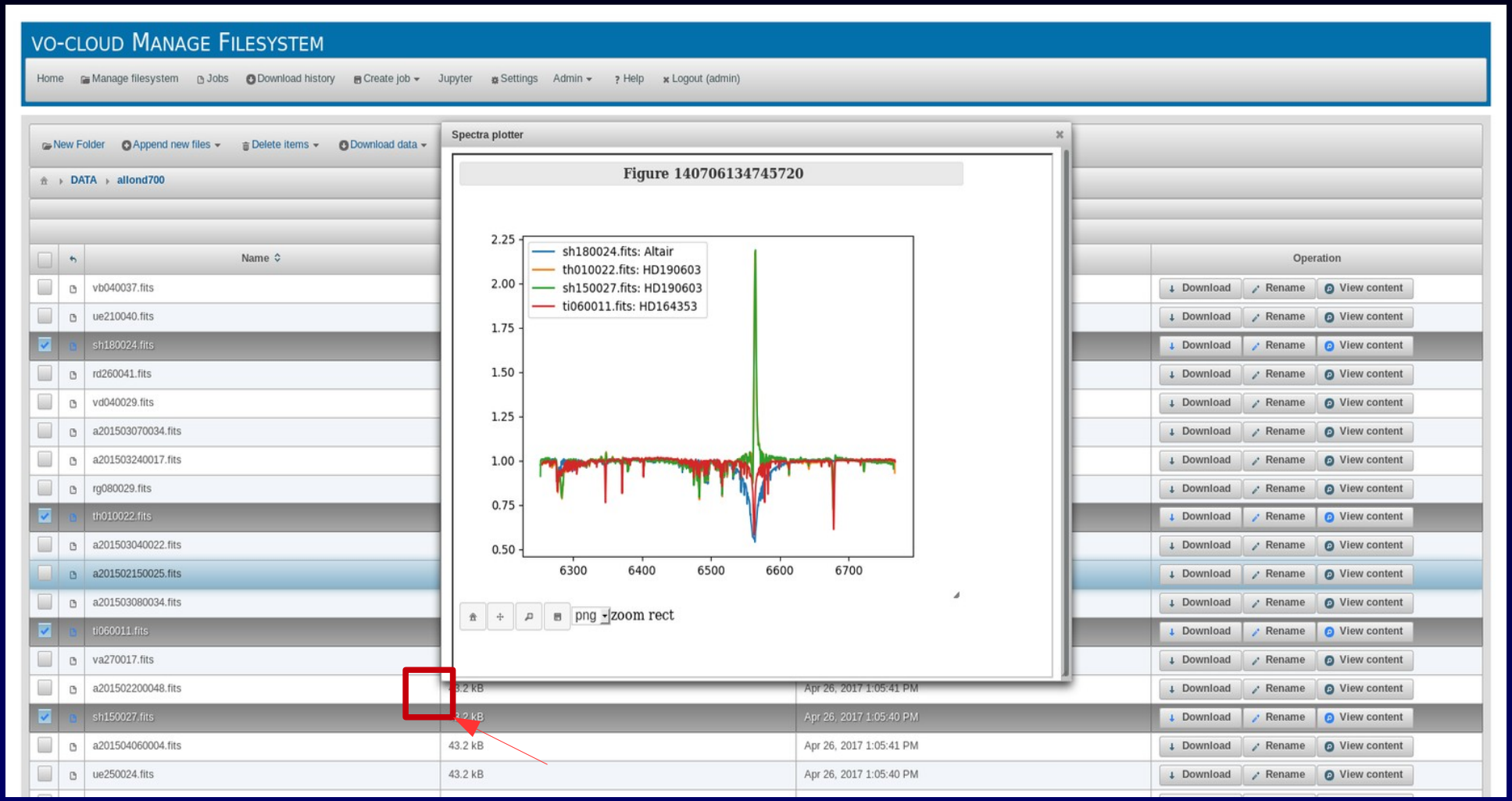
+ DataLink + SODA

~~SAMP control - send to SPLAT???~~

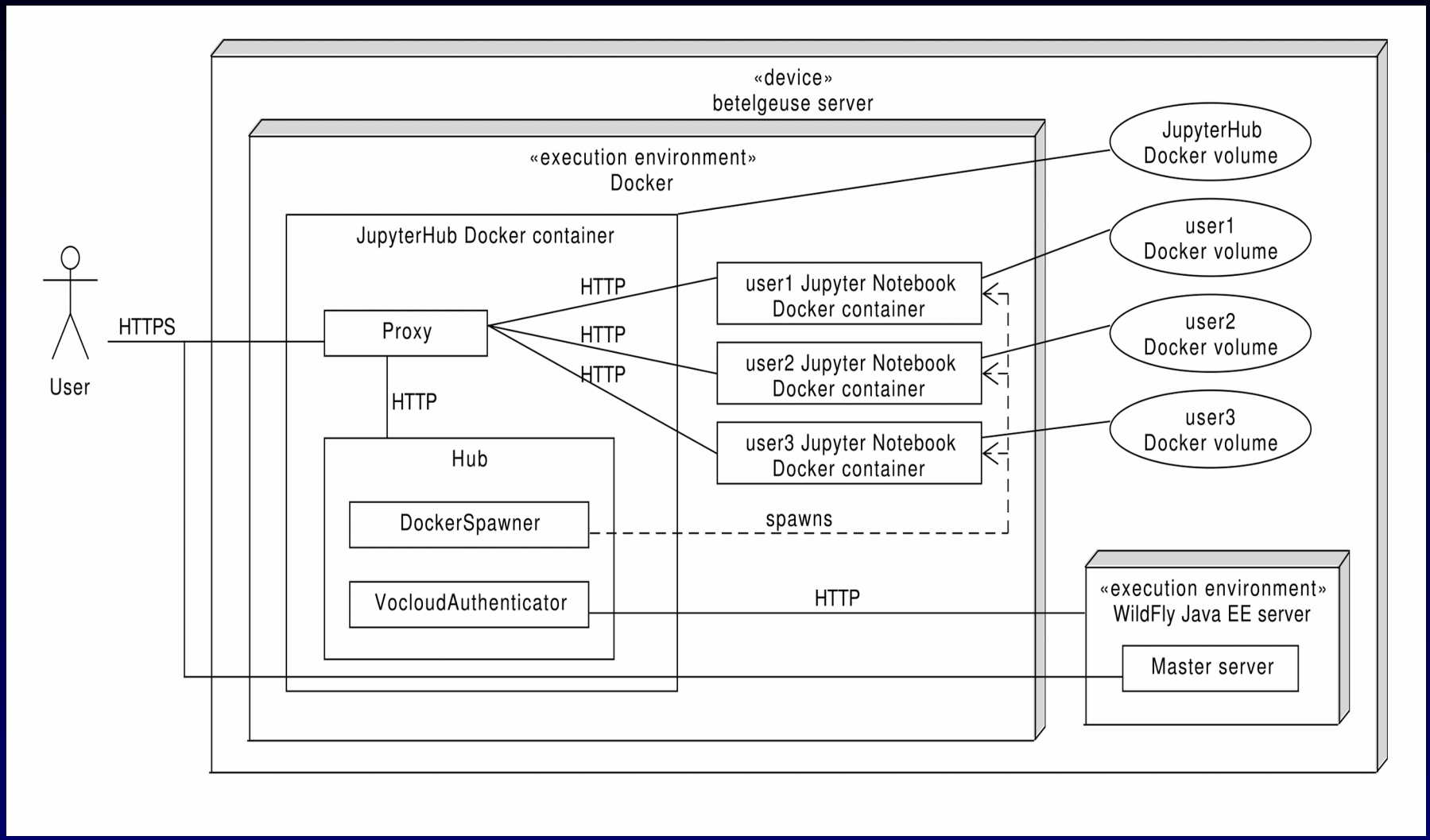
VO-CLOUD - UWS driven



VO-CLOUD spectra visualisation



JupyterHub deployment



JupyterHub example

jupyter example_plotter Last Checkpoint: 05/06/2017 (unsaved changes)

Control Panel | Logout

File Edit View Insert Cell Kernel Widgets Help | Python 3

Code | CellToolbar

In [7]:
```
path='filesystem/DATA/allond700/'
spectra=['sh180024.fits','th010022.fits','ti060011.fits','sh150027.fits']
files=[path + i for i in spectra]
files
```

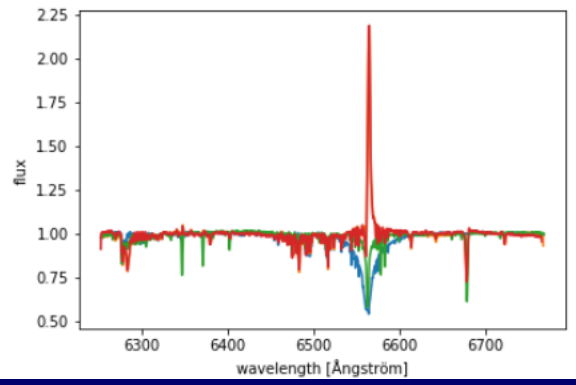
Out[7]:
```
['filesystem/DATA/allond700/sh180024.fits',
 'filesystem/DATA/allond700/th010022.fits',
 'filesystem/DATA/allond700/ti060011.fits',
 'filesystem/DATA/allond700/sh150027.fits']
```

In [13]:
```
parsed = [parse_spectrum_file(i) for i in files]
parsed[0]
```

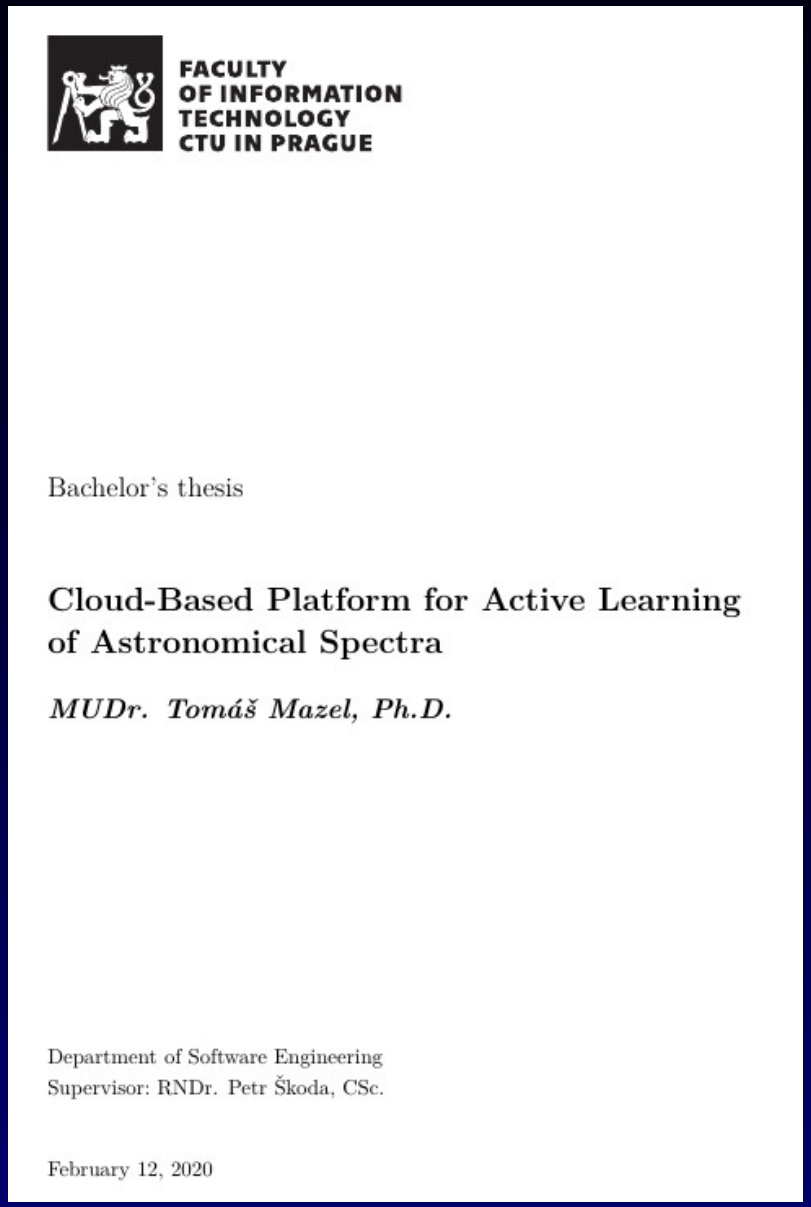
Out[13]:
```
{'flux': array([ 0.97623893,  0.97816423,  0.98200884, ...,  0.99071508,
         0.99049042,  0.98766227]),
 'name': 'Altair',
 'wave': array([ 6252.48405443,  6252.74072204,  6252.99738965, ...,  6764.27926559,
         6764.53593319,  6764.7926008 ])}
```

In [12]:
```
for i in parsed:
    plt.plot(i['wave'], i['flux'])
plt.xlabel('wavelength [Ångström]')
plt.ylabel('flux')
```

Out[12]:
```
<matplotlib.text.Text at 0x7f7f108b8550>
```



Active Learning



FACULTY
OF INFORMATION
TECHNOLOGY
CTU IN PRAGUE

Bachelor's thesis

Cloud-Based Platform for Active Learning of Astronomical Spectra

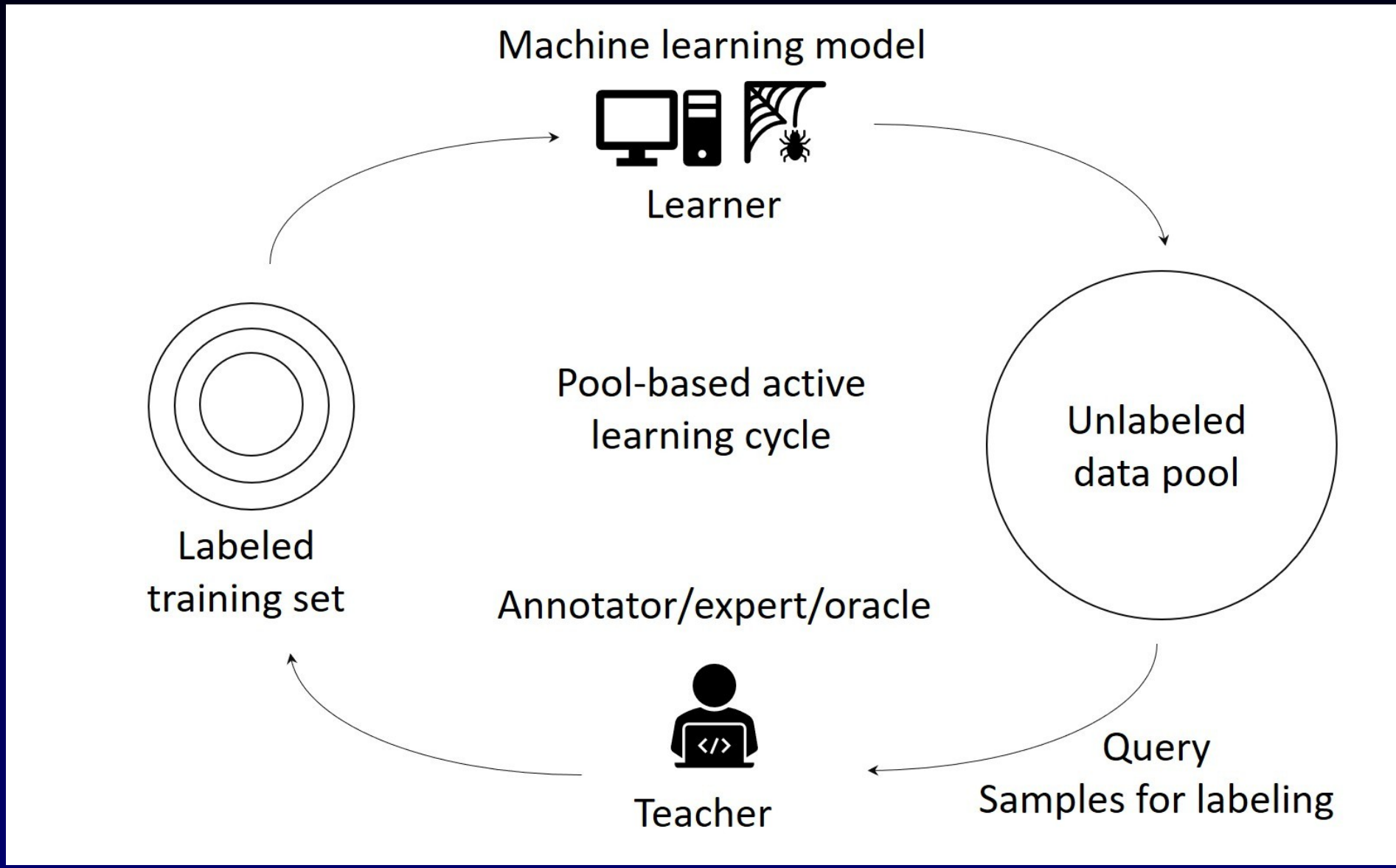
MUDr. Tomáš Mazel, Ph.D.

Department of Software Engineering
Supervisor: RNDr. Petr Škoda, CSc.

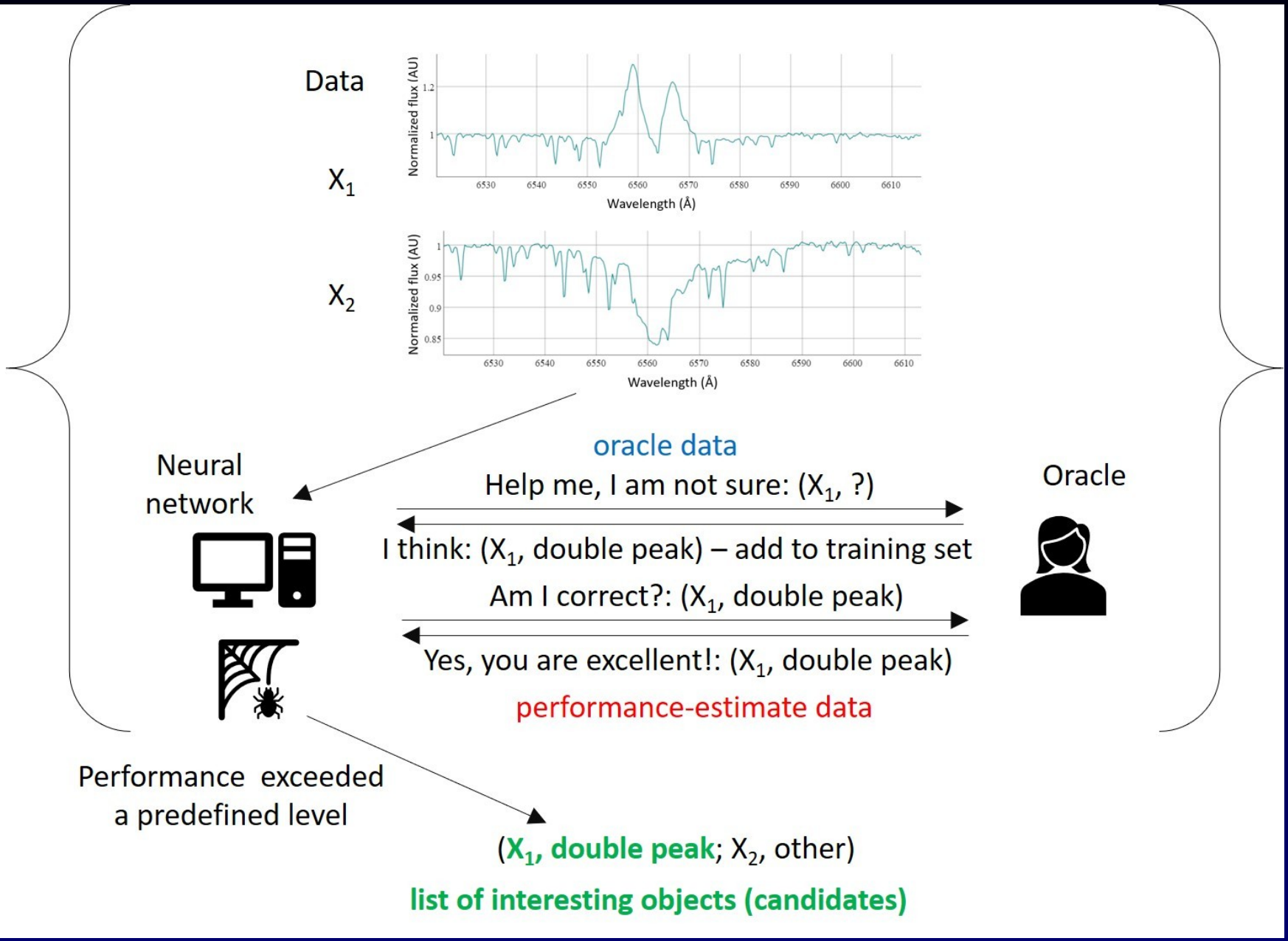
February 12, 2020

- ElasticSearch
- CSV (HDF5)
- Python scripts/nb
- CUDA/TF/KERAS

Active Learning

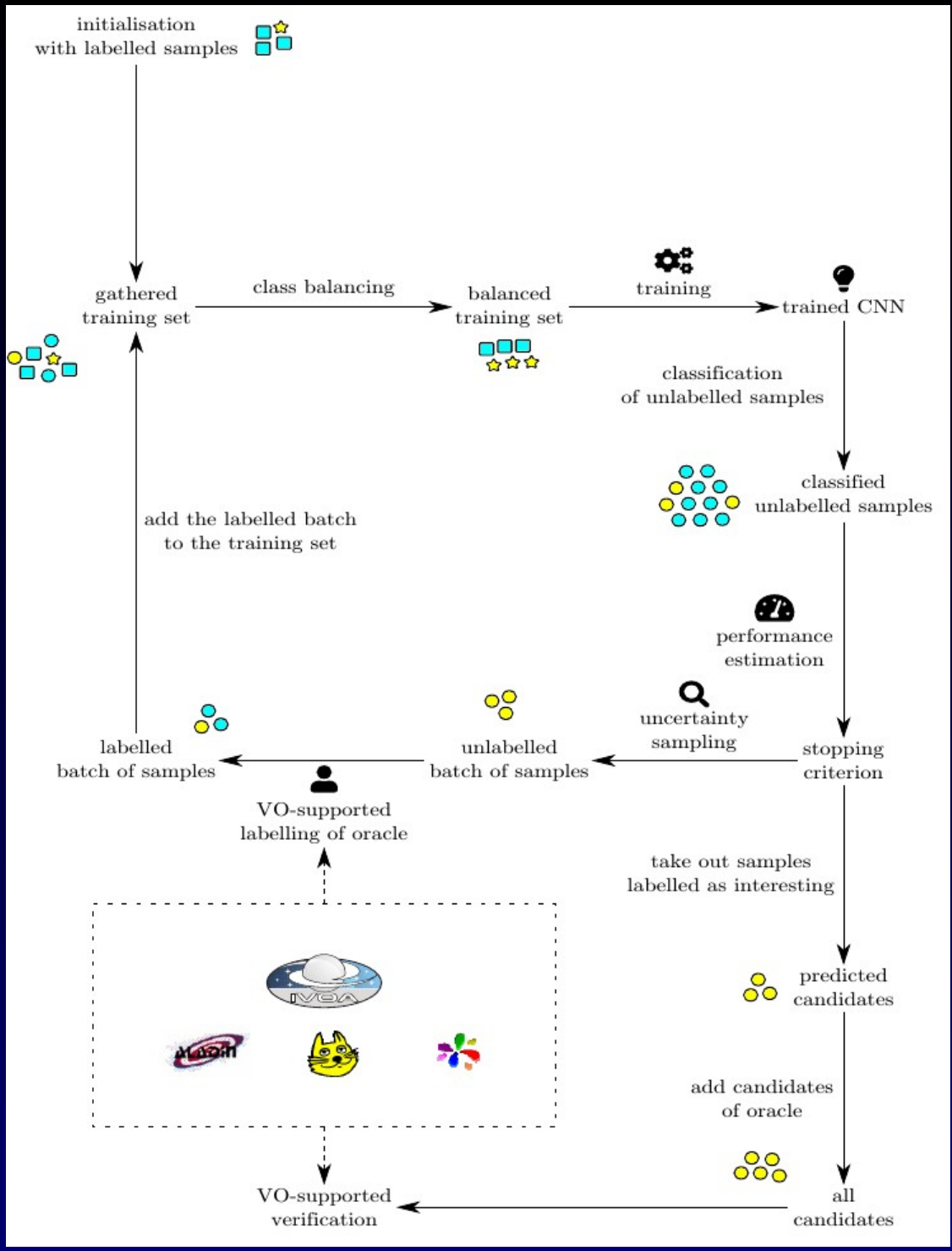


Active Learning

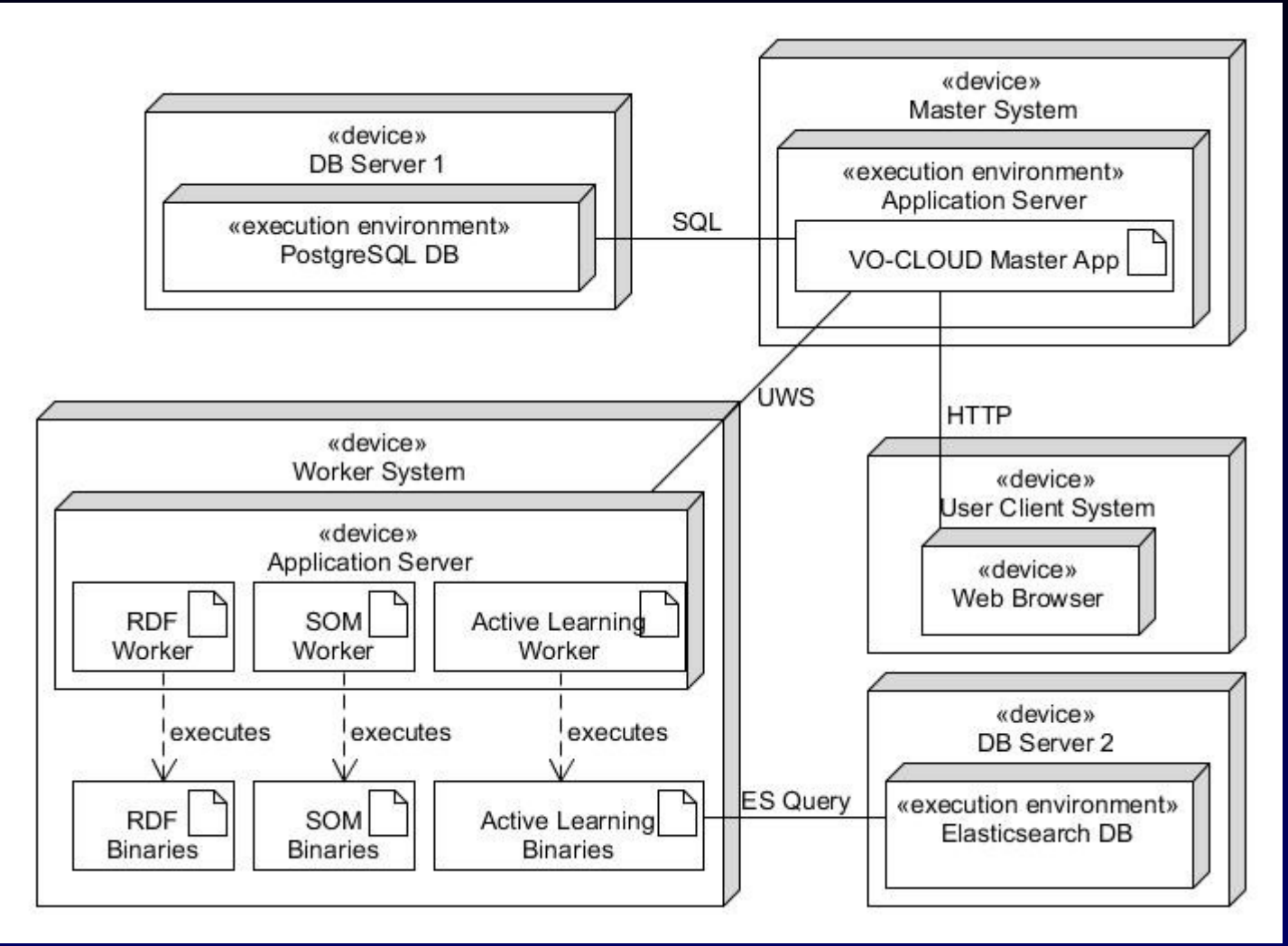


Active Deep Learning: CNN Chooses Data for Its Training

- Oracle classification (domain expert knowledge)
- Uncertainty sampling (entropy)
- From predicted target classes selected batch of 100
- Batch added to training set
- True positive rate estimation



VO-CLOUD Integration



Future KDD Science platforms

Include human in loop

Expert needs VO to check the nature of suggested candidates

to decide - RE-LABEL OR CONFIRM

Get information OUT of DOMAIN

(e.g. part of spectrum, image not preprocessed)

Thank You

LINKS

https://zenodo.org/record/573727

https://zenodo.org/record/44641

Source on GitHub

https://github.com/vodev (10 repositories)