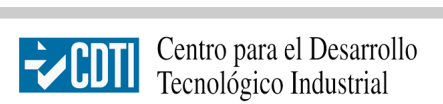




Multiscale Annotation of Still Images with GAT

Xavier Giró-i-Nieto and Manuel Martos



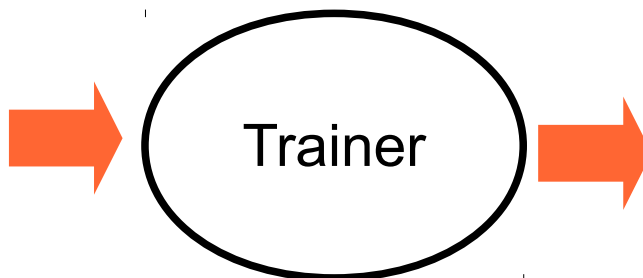


Outline

1. **Overview** ←
2. Images at global scale
3. Images at local scale
4. Sequences at local scale
5. Conclusions

- Motivation: Generic annotation for detectors of visual objects.

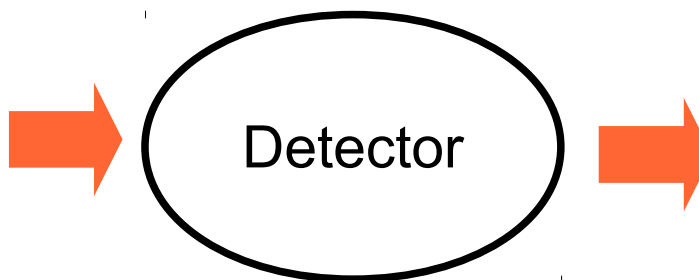
Manual annotations



Model



New image



Automatic annotation



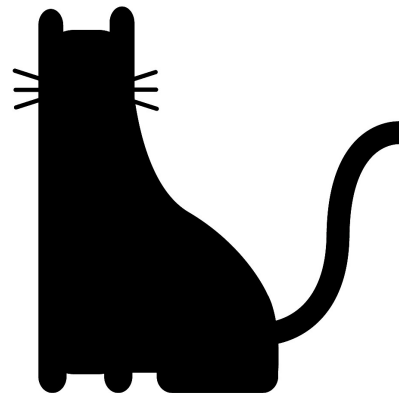
Introduction

- GAT = “*Graphical Annotation Tool*”

Input

GAT

Manual annotation



Anchor

Car

- Global scale

The Extra Sensory Perception Game [von Ahn and Davish'04]



Crowd-sourced annotation of free-text through a game

● Global scale

Efficient Video Annotation (EVA) [Volkmer'05]

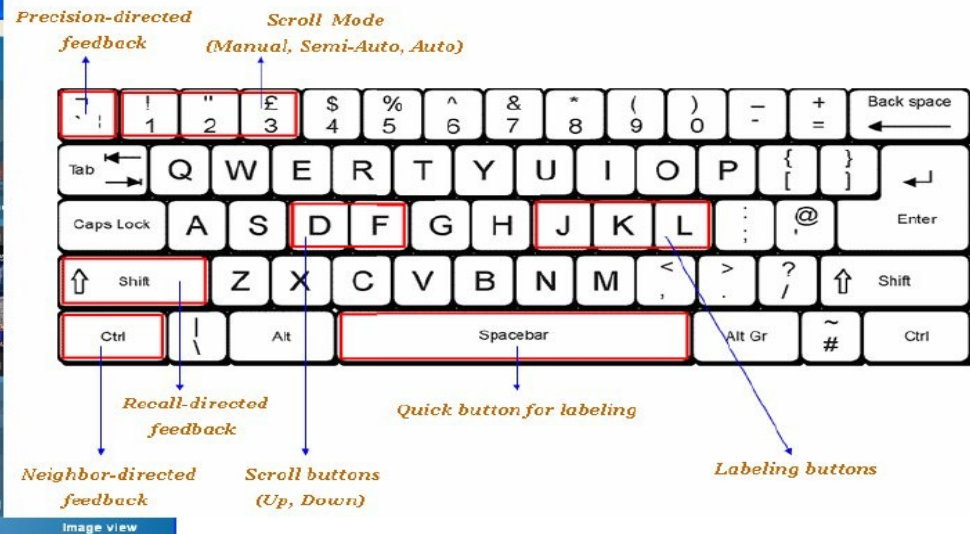


Clicks to toggle labels for pre-selected concept

Related work

Global scale

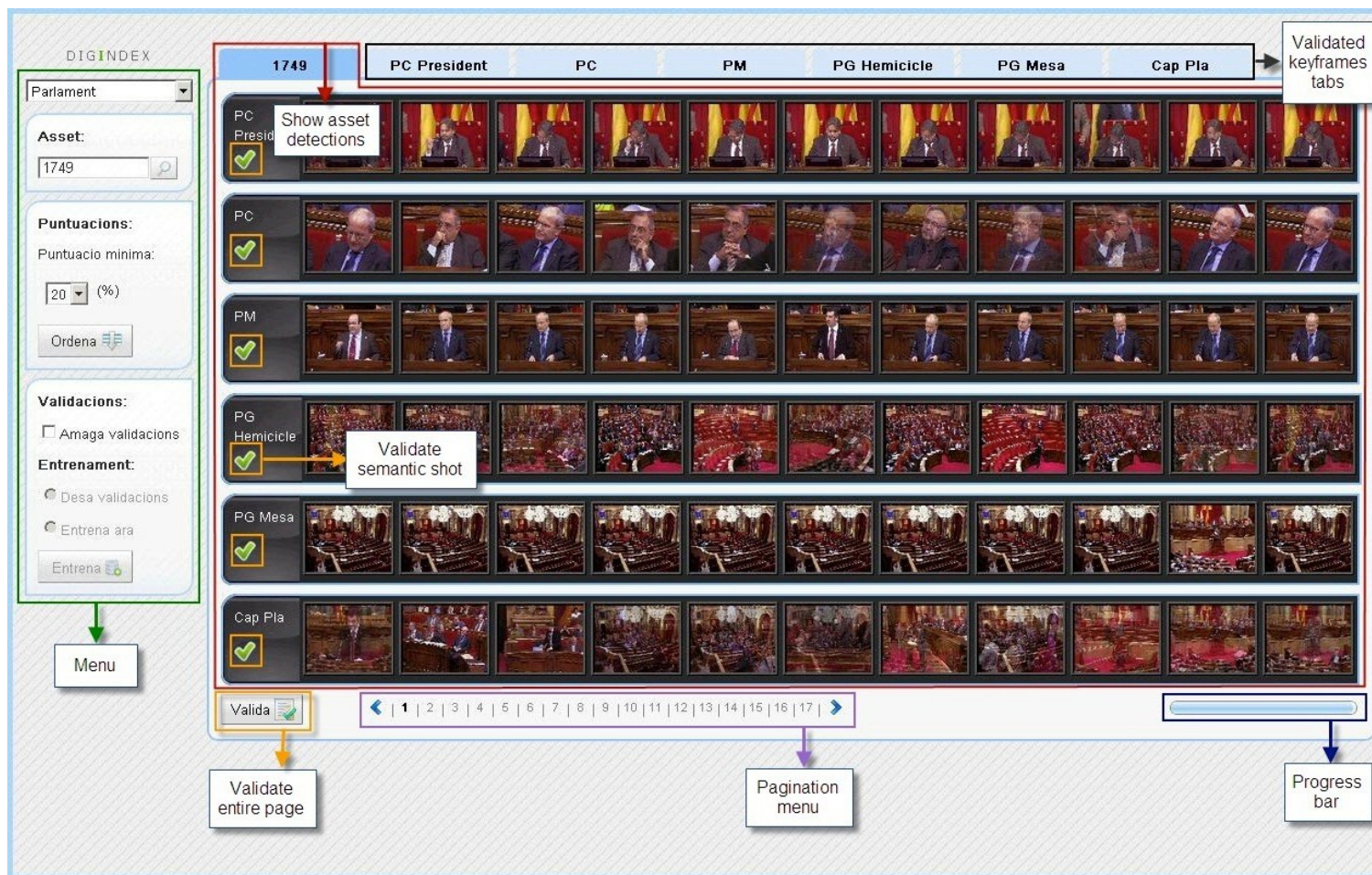
VisionGo [Zheng'09]



Scroll display controlled by keyboard (video search).

Global scale

Digindex [Carcel'11]

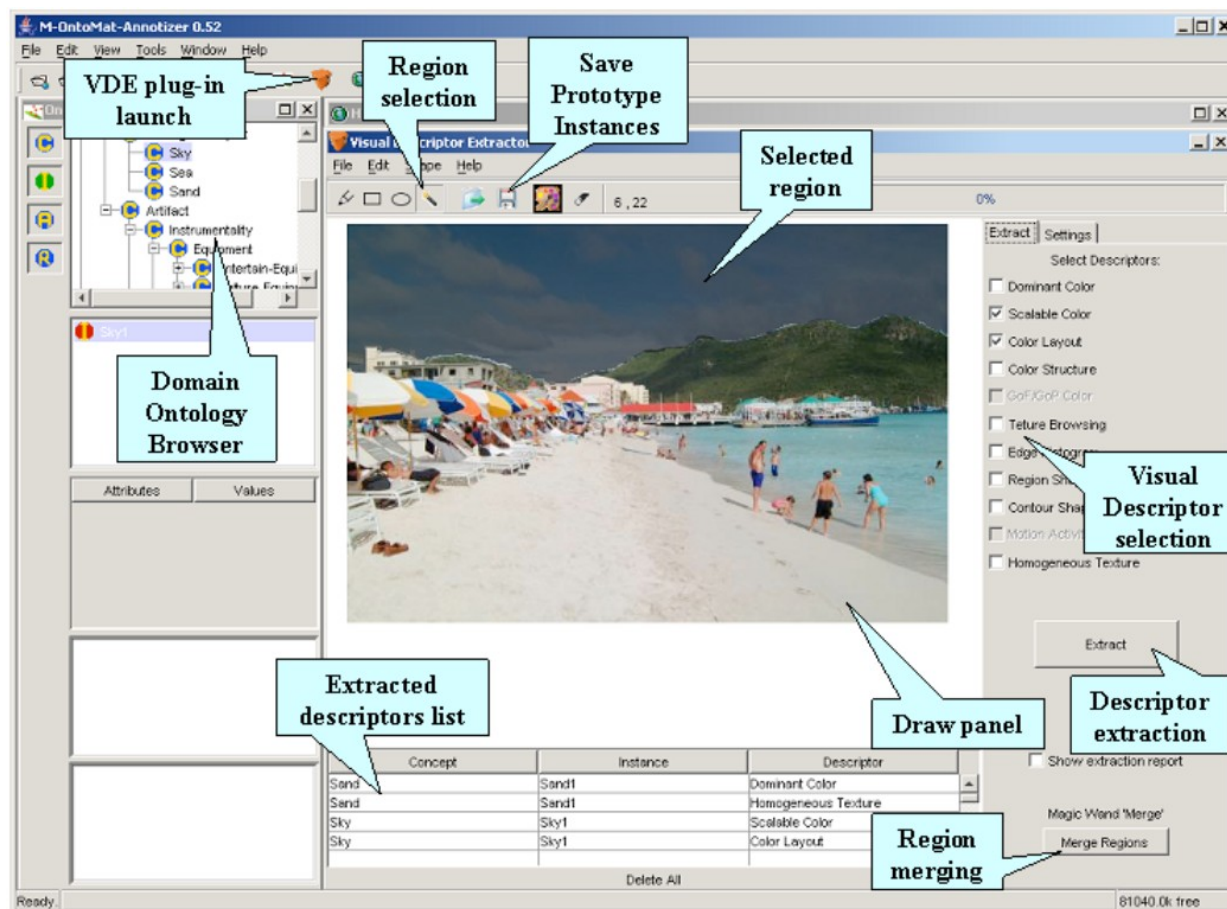


Drag & drop between rows associated to concepts.

Related work

Local scale

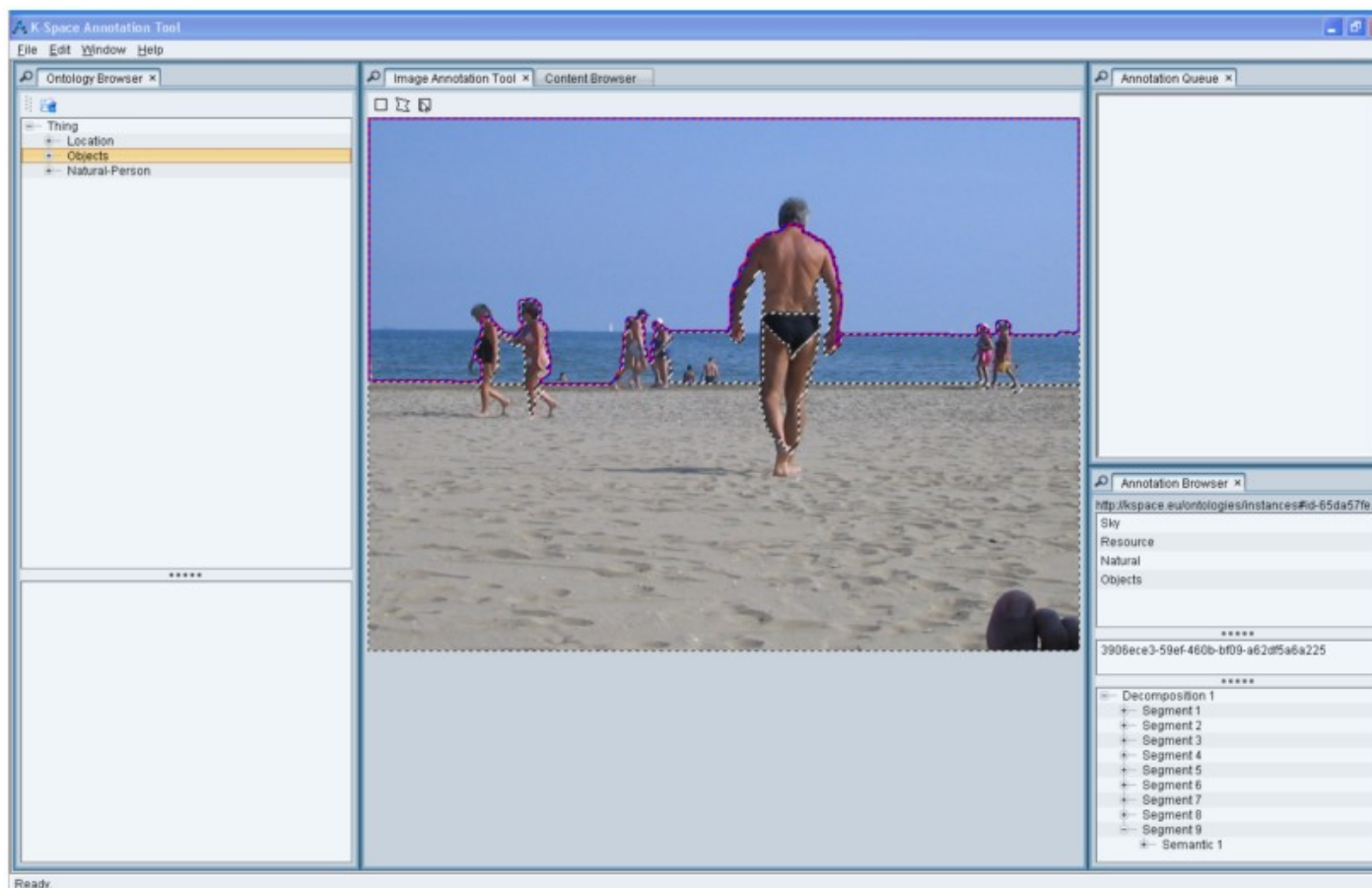
M-OntoMat-Annotizer [Petridis et al'06]



MPEG-7 compliant with segmentation engine

Local scale

K-Space Annotation Tool (KAT) [Saathoff et al'06]

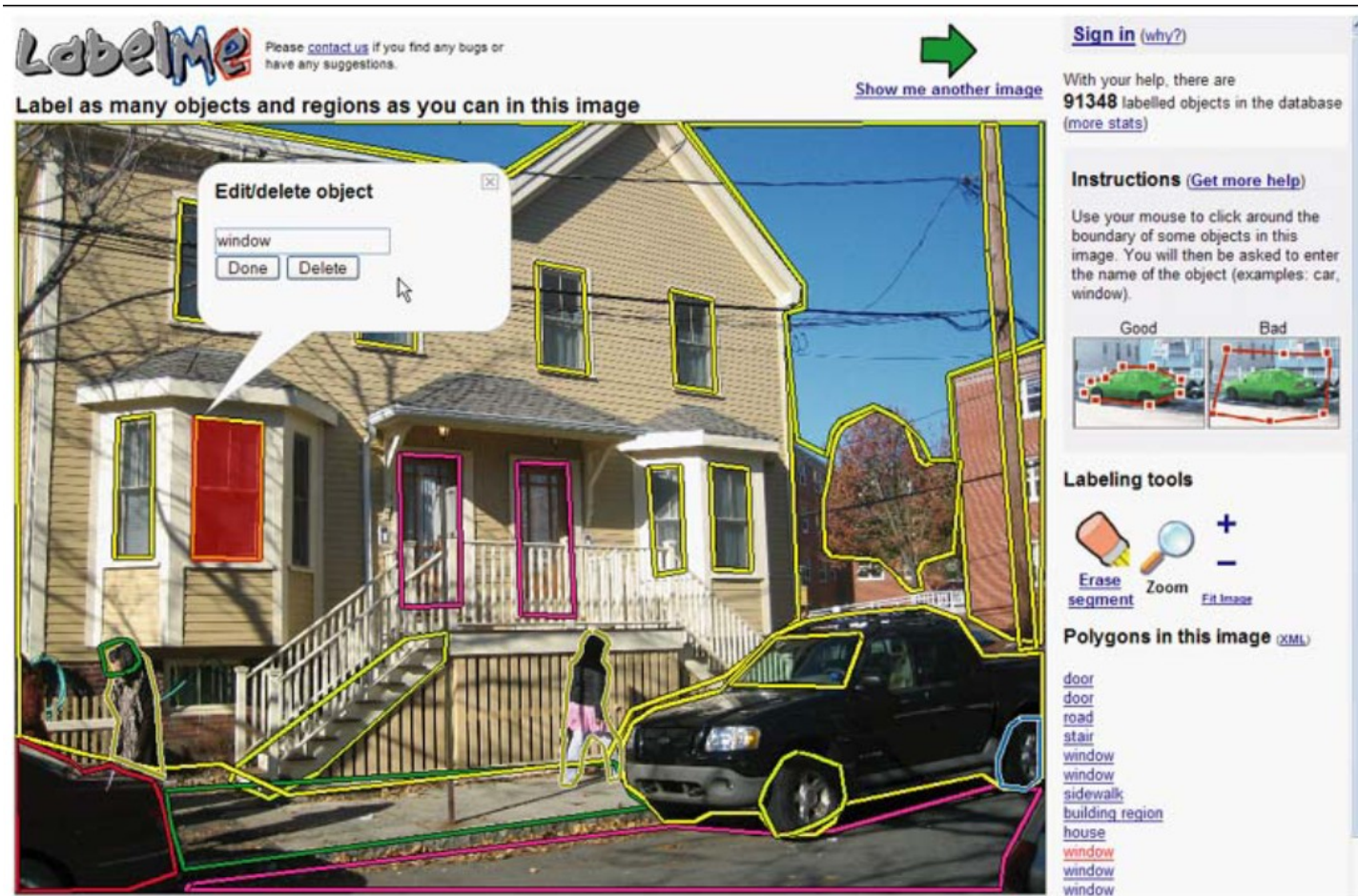


Rich Semantic Annotation coded in RDF

Related work

Local scale

LabelMe [Russel et al'08]

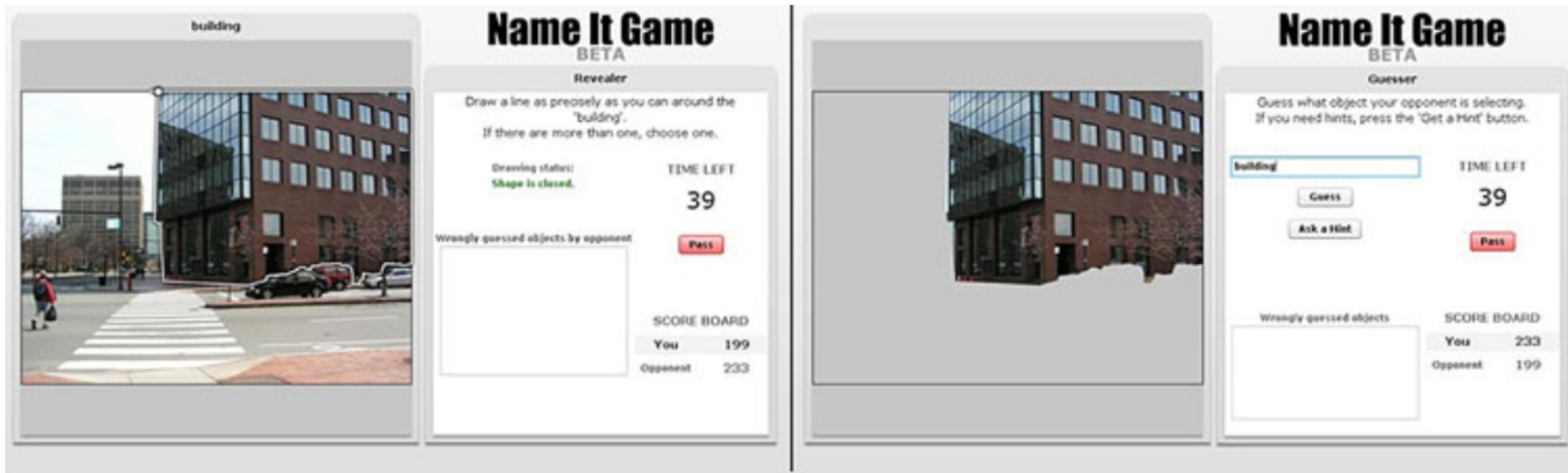


Rough polygons on a crowdsourced initiative

Related work

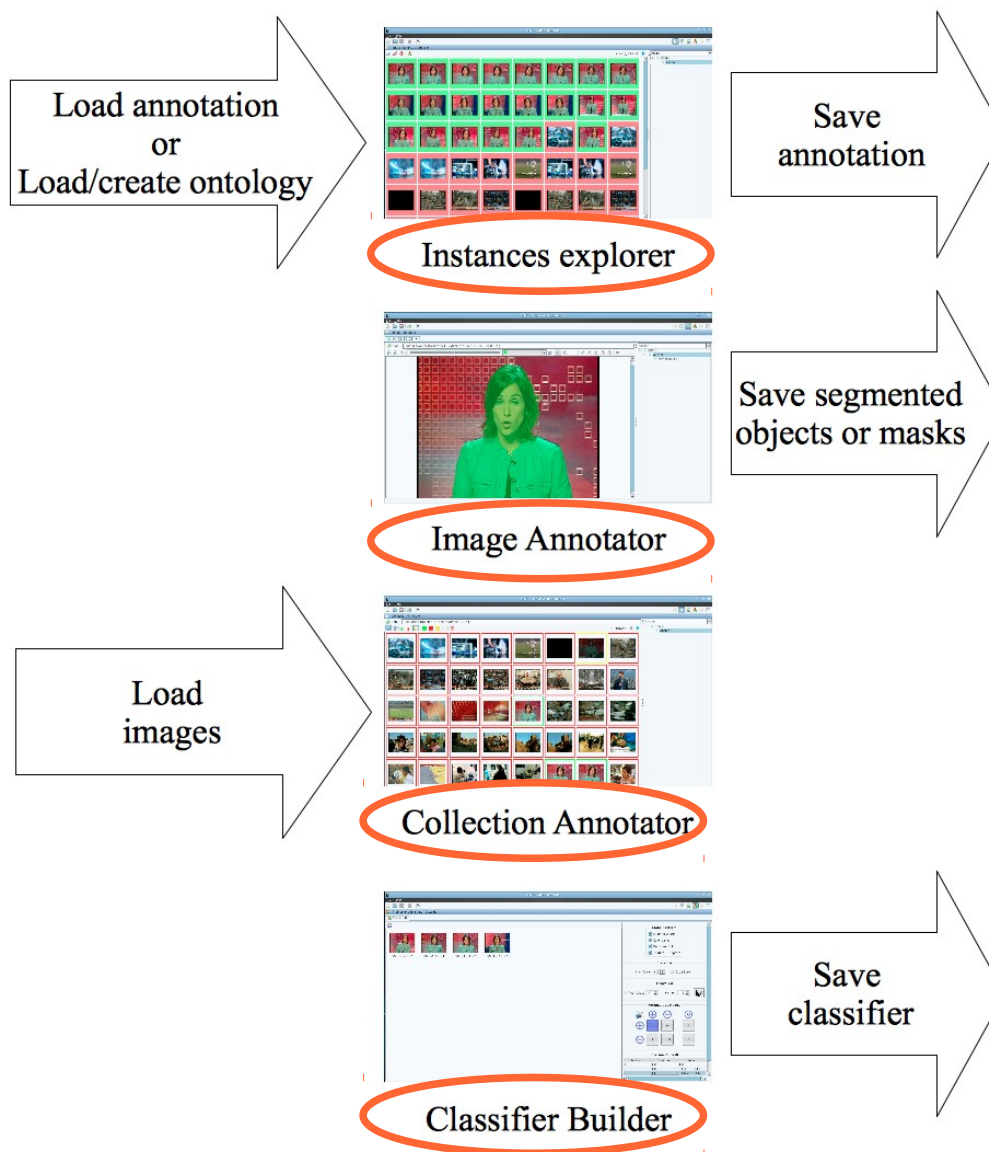
Local scale

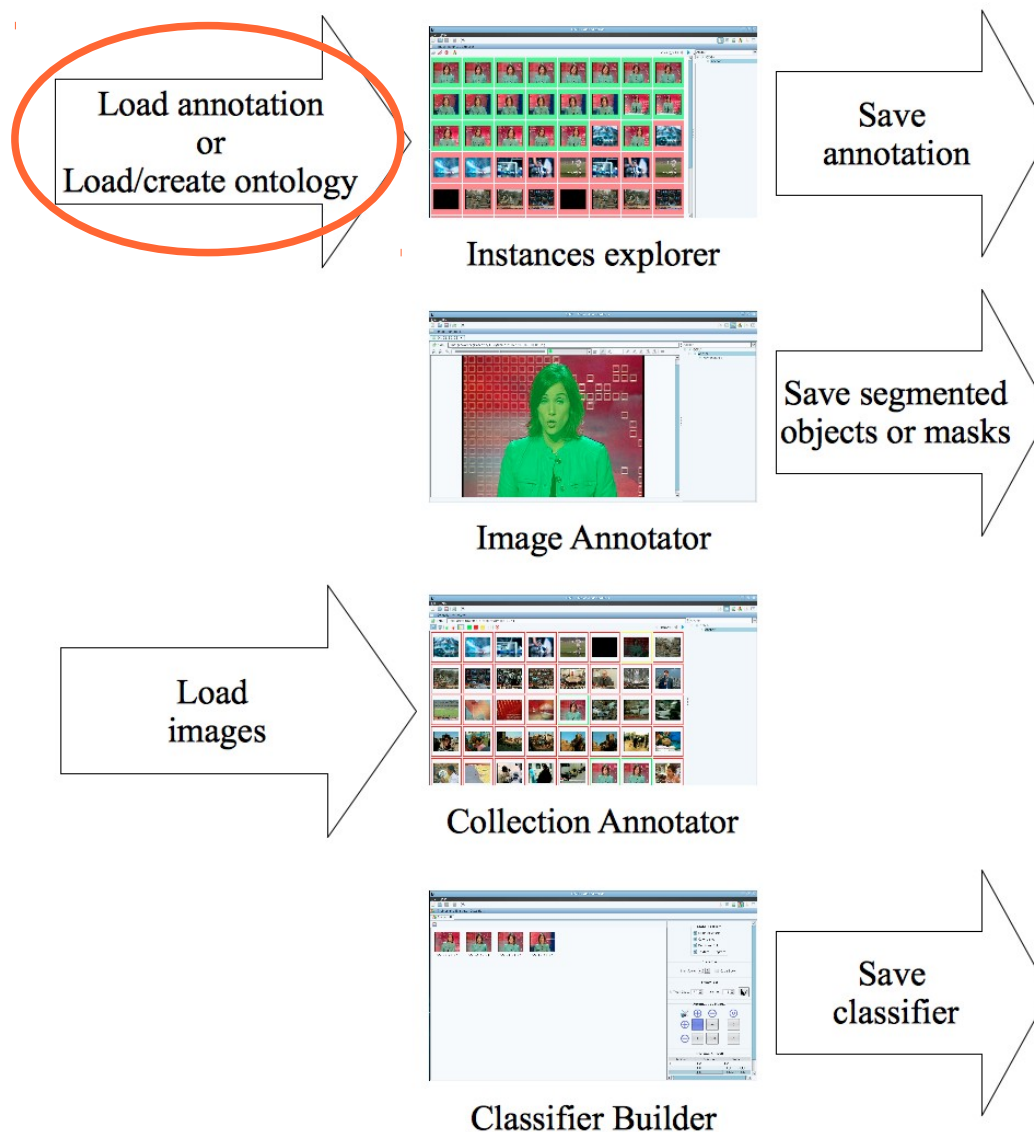
Name-it Game [Steggink and Snoek'10]



Rough polygons on the adaptation of ESP to local

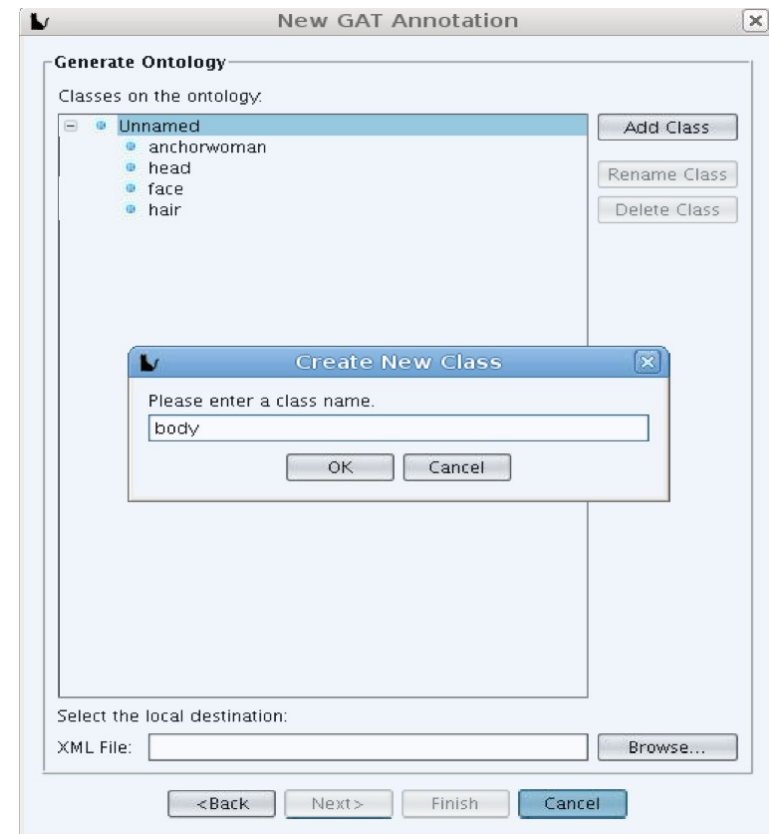
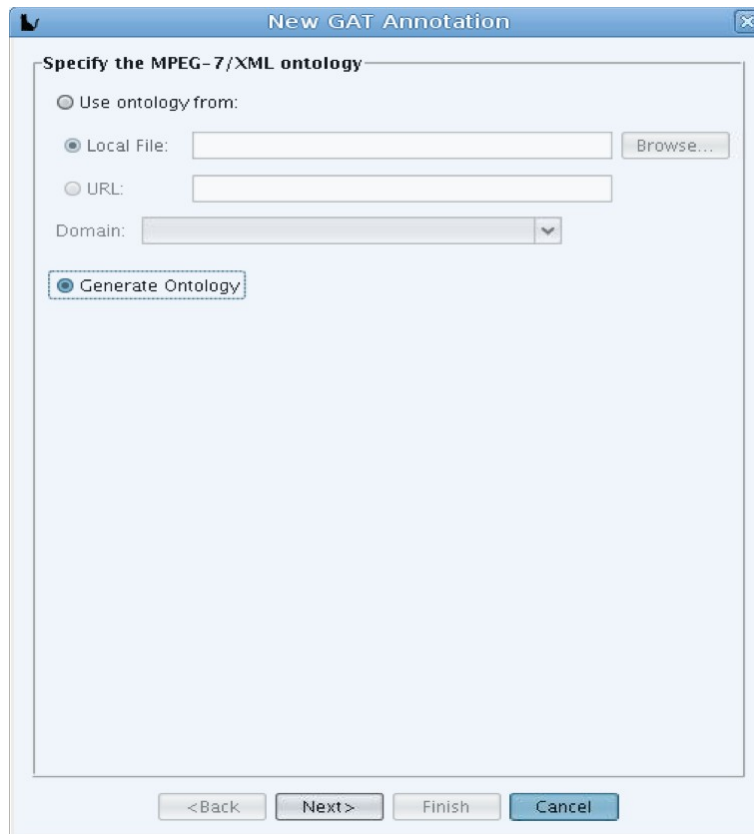
- Four perspectives for multiscale annotation.

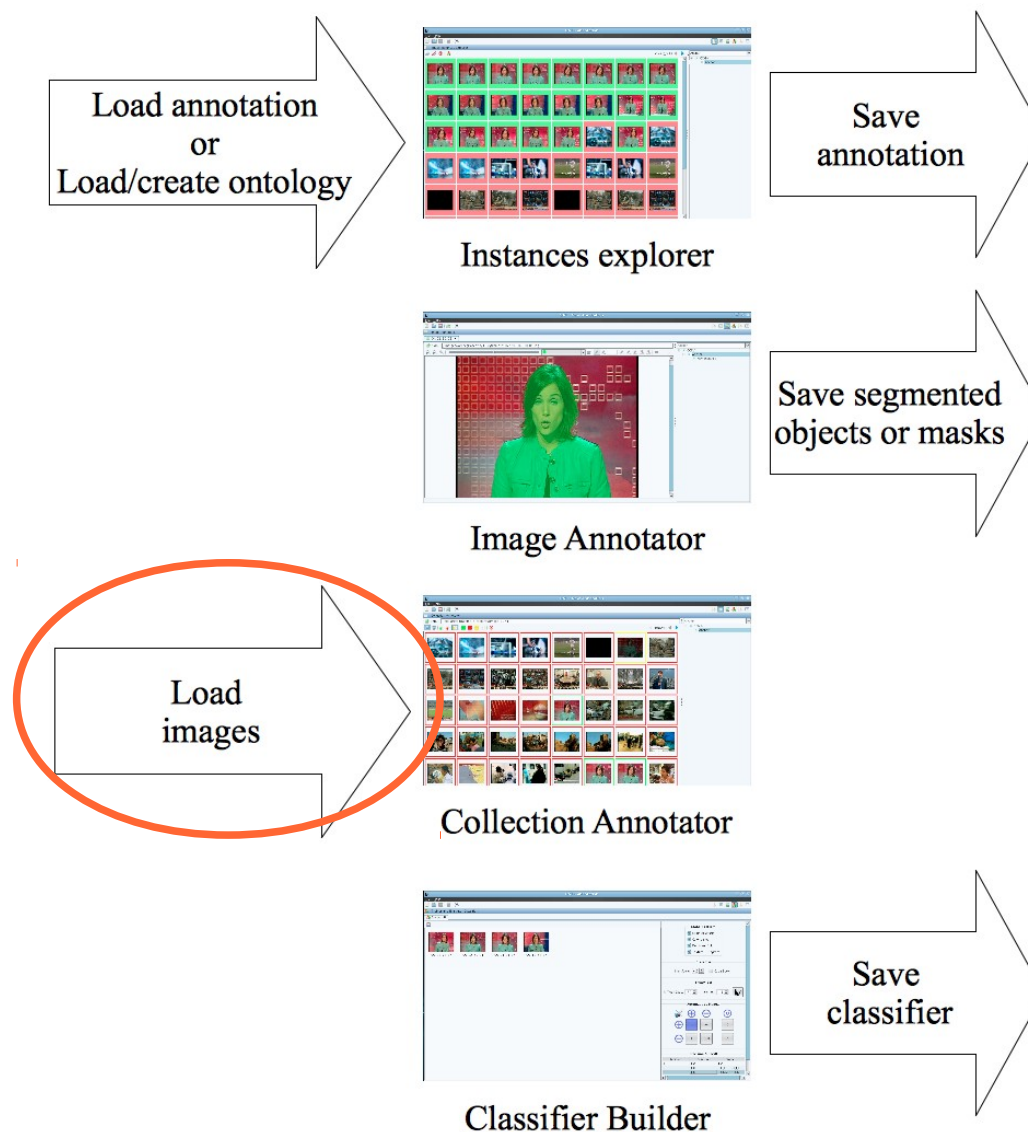




Ontology editor

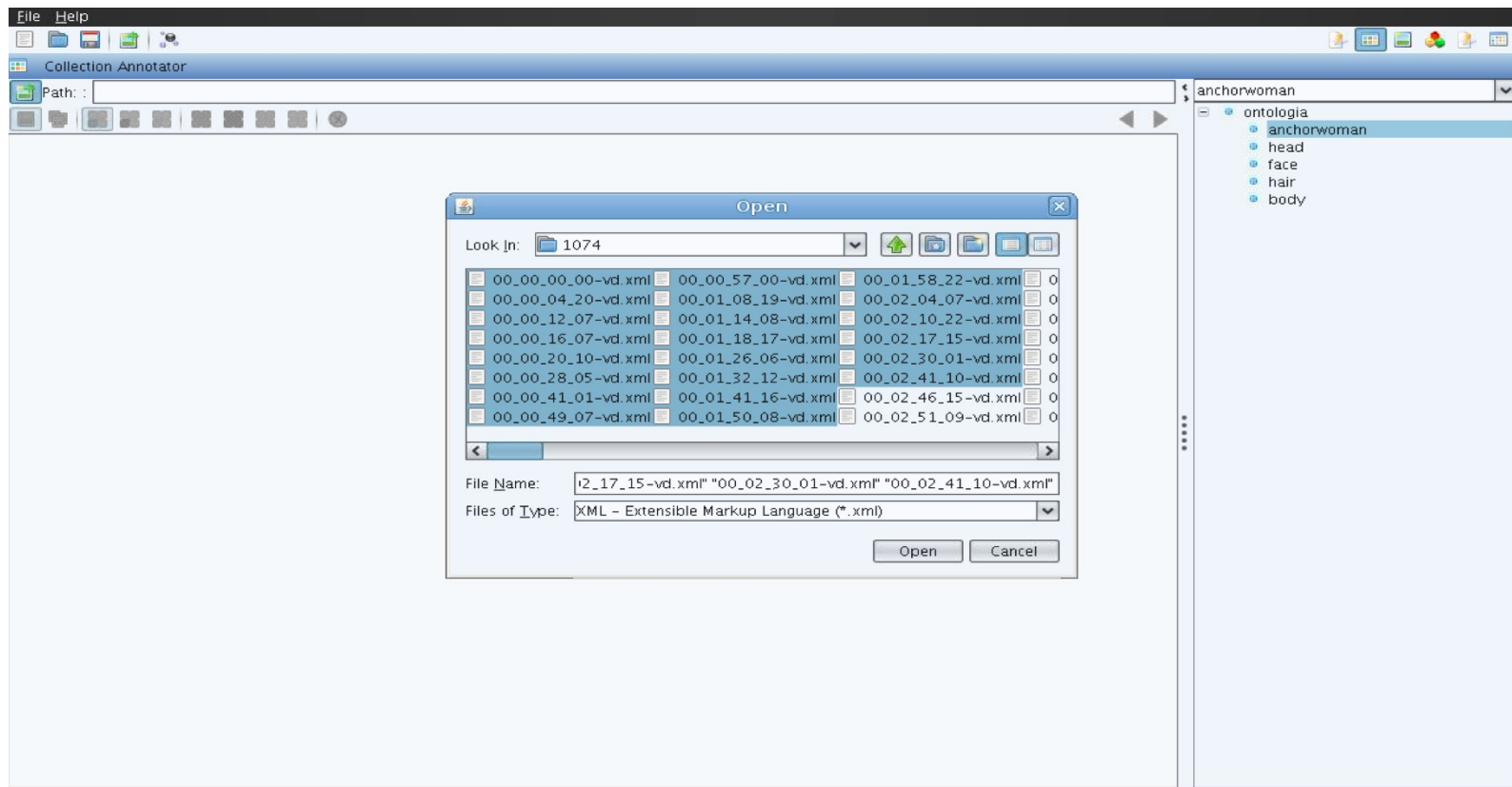
- Every annotation must be related to an existing ontology.
- Ontologies contains a collection of semantic classes saved in MPEG-7/XML.





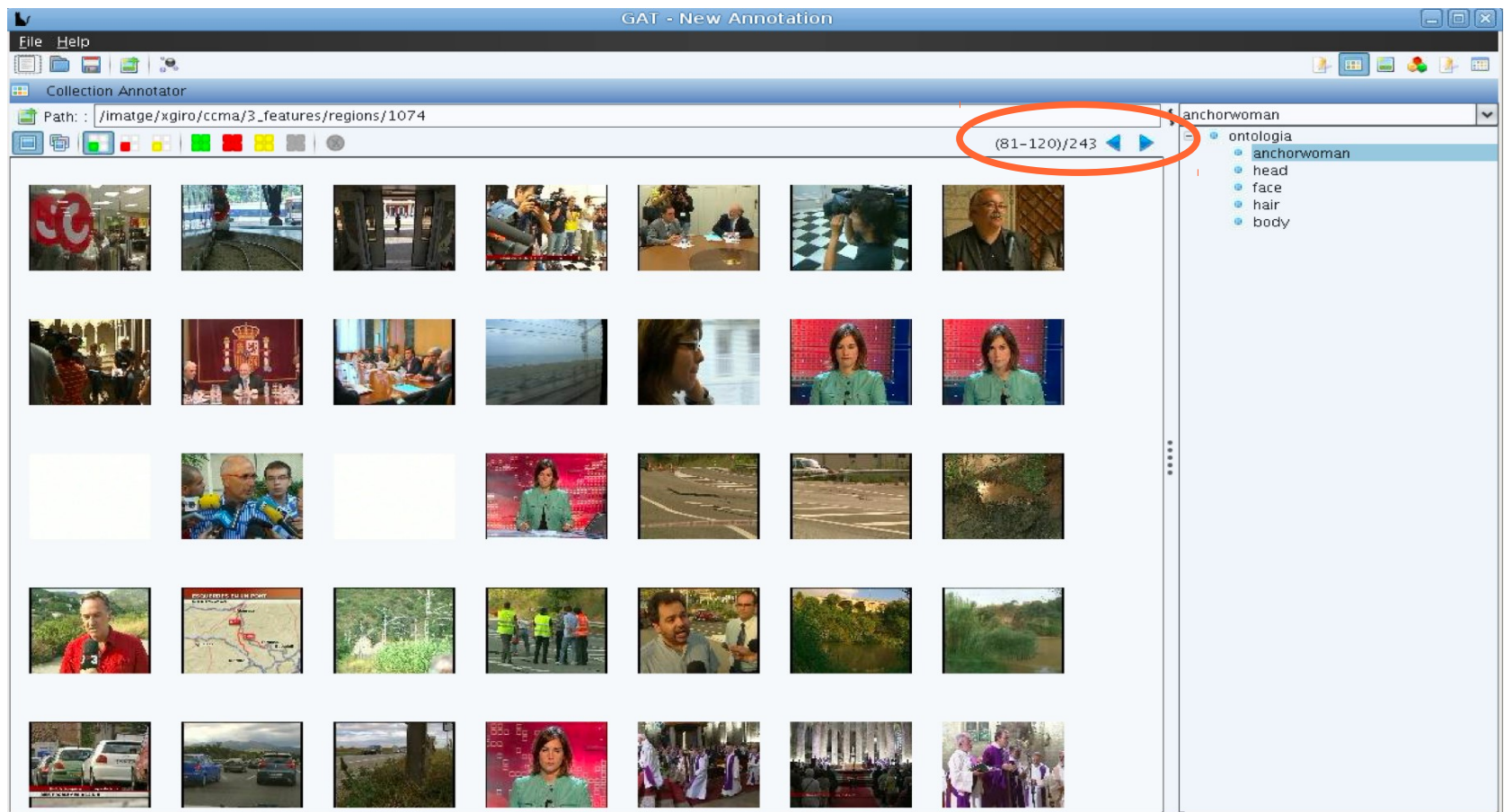
Load images

- Images are loaded from a local directory.



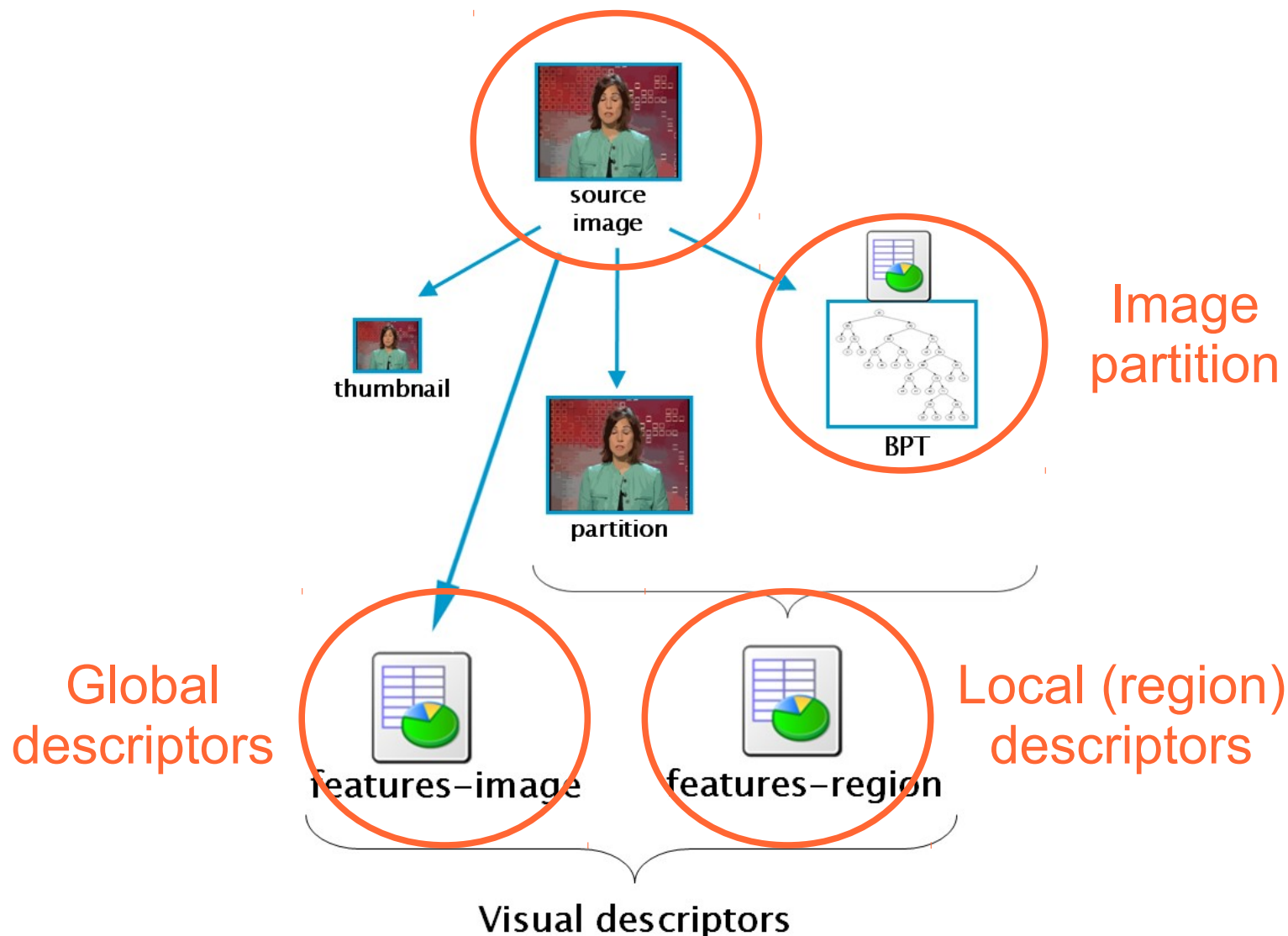
Load images

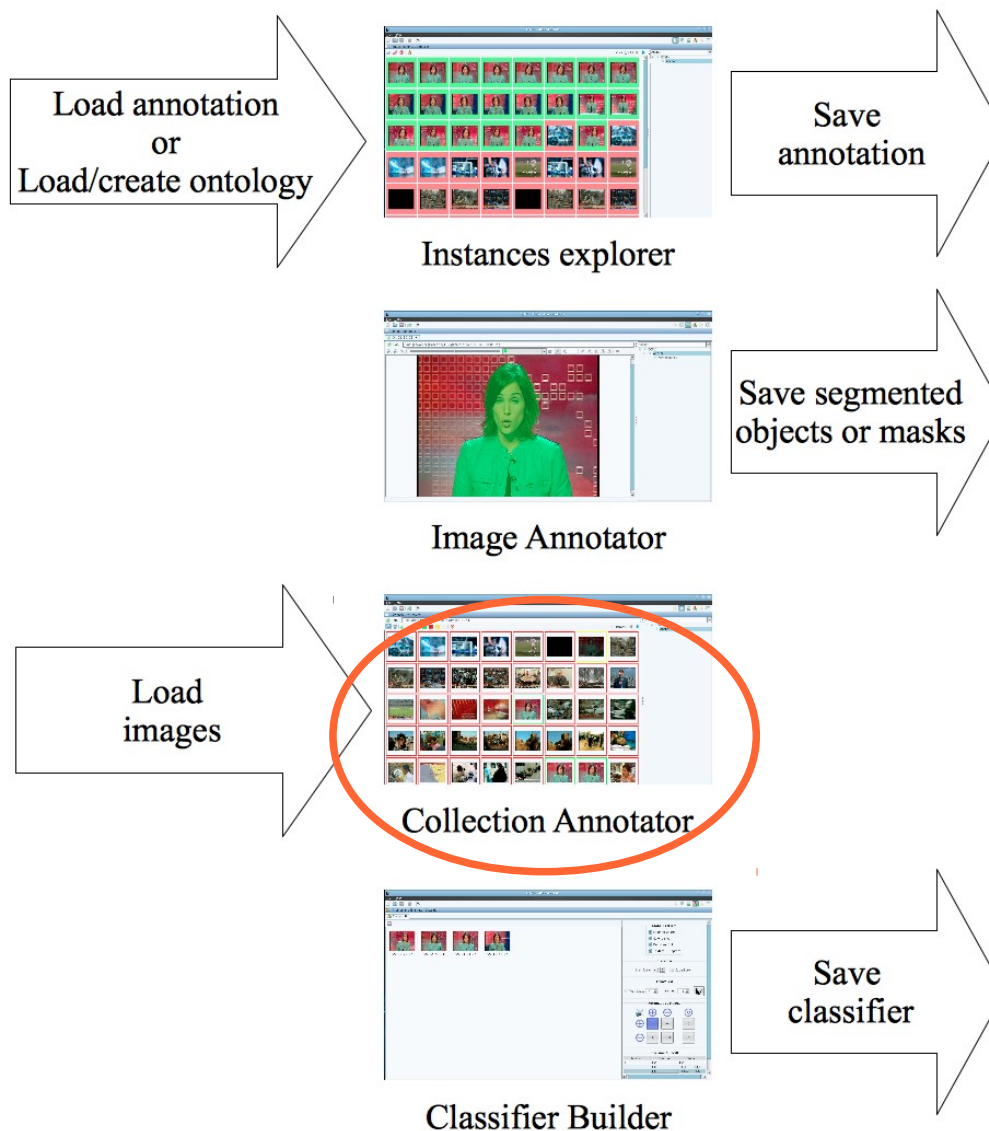
- Displayed thumbnails are organised in pages.



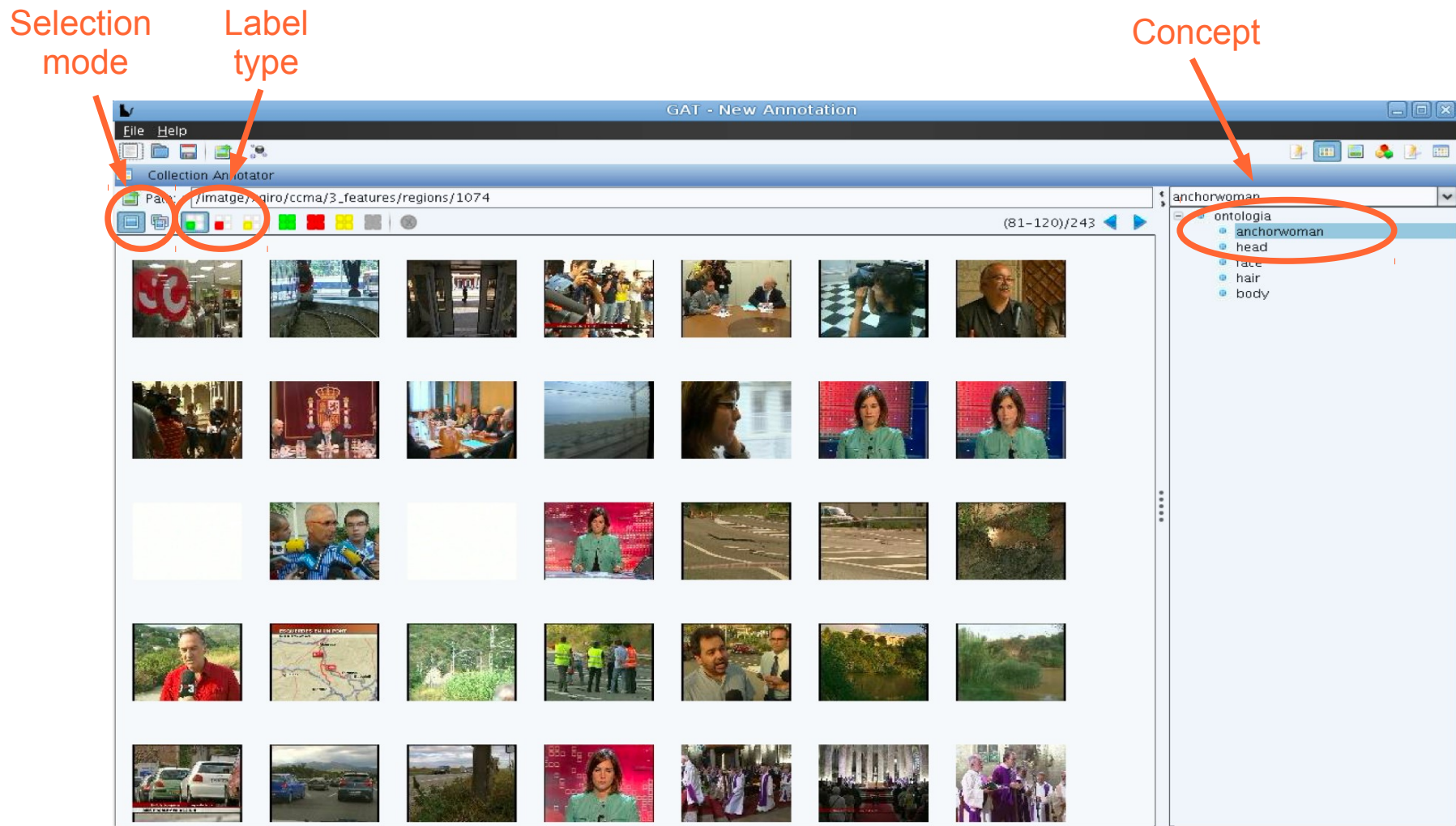
Load images

- Images can be loaded from different types of files:



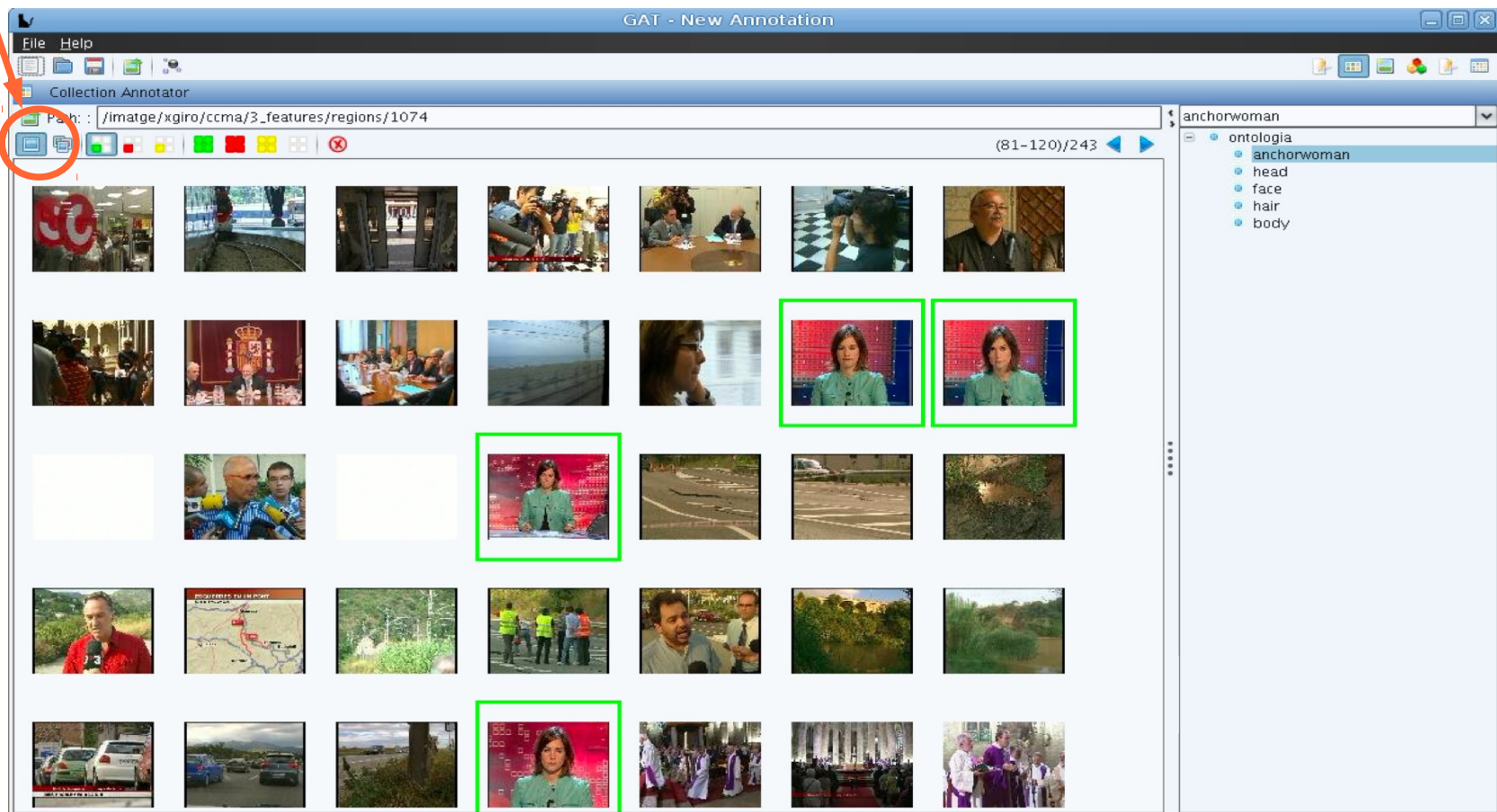


- Three basic settings to annotate at the global scale:



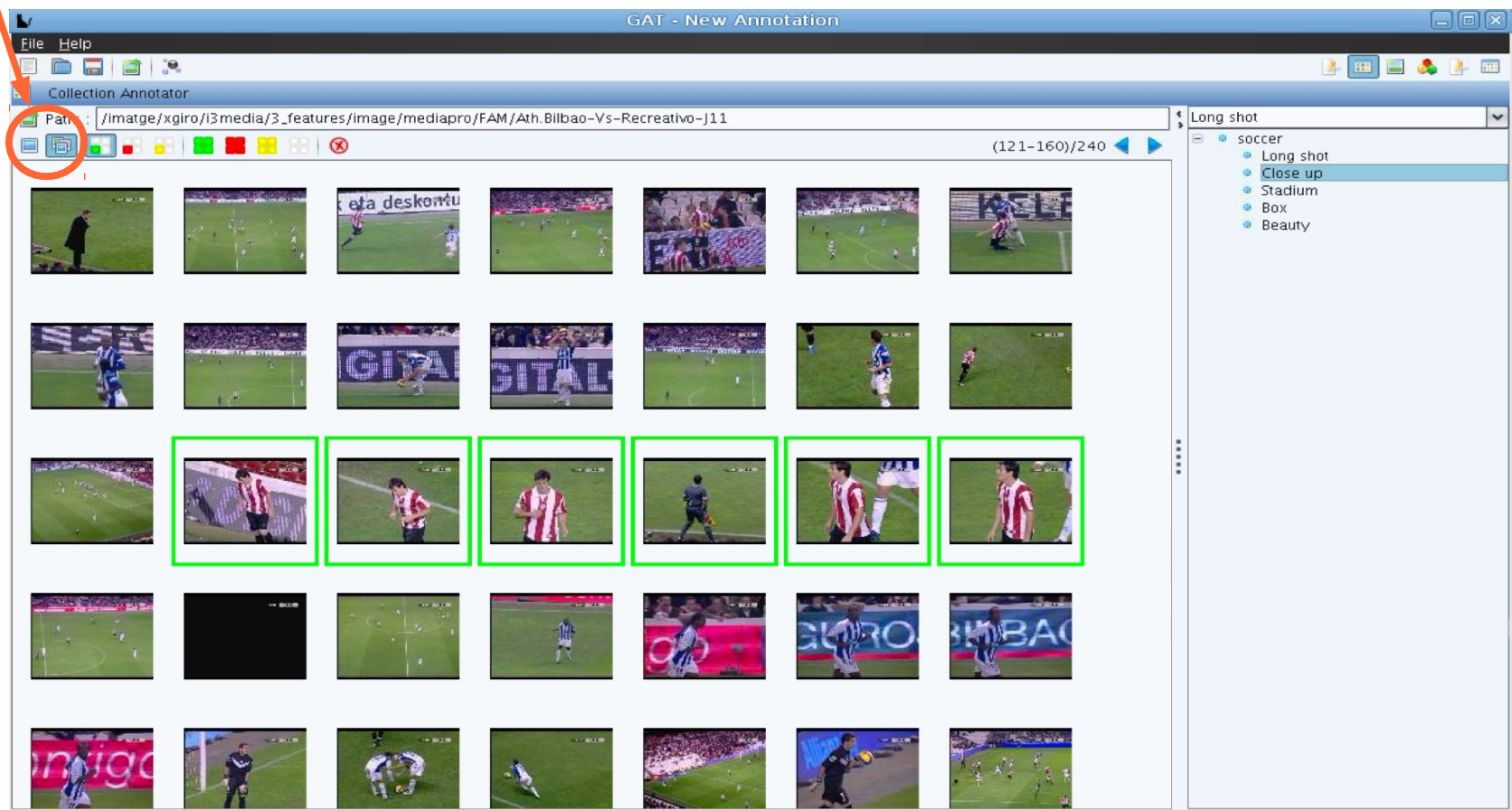
Selection mode: individual

Selection
mode

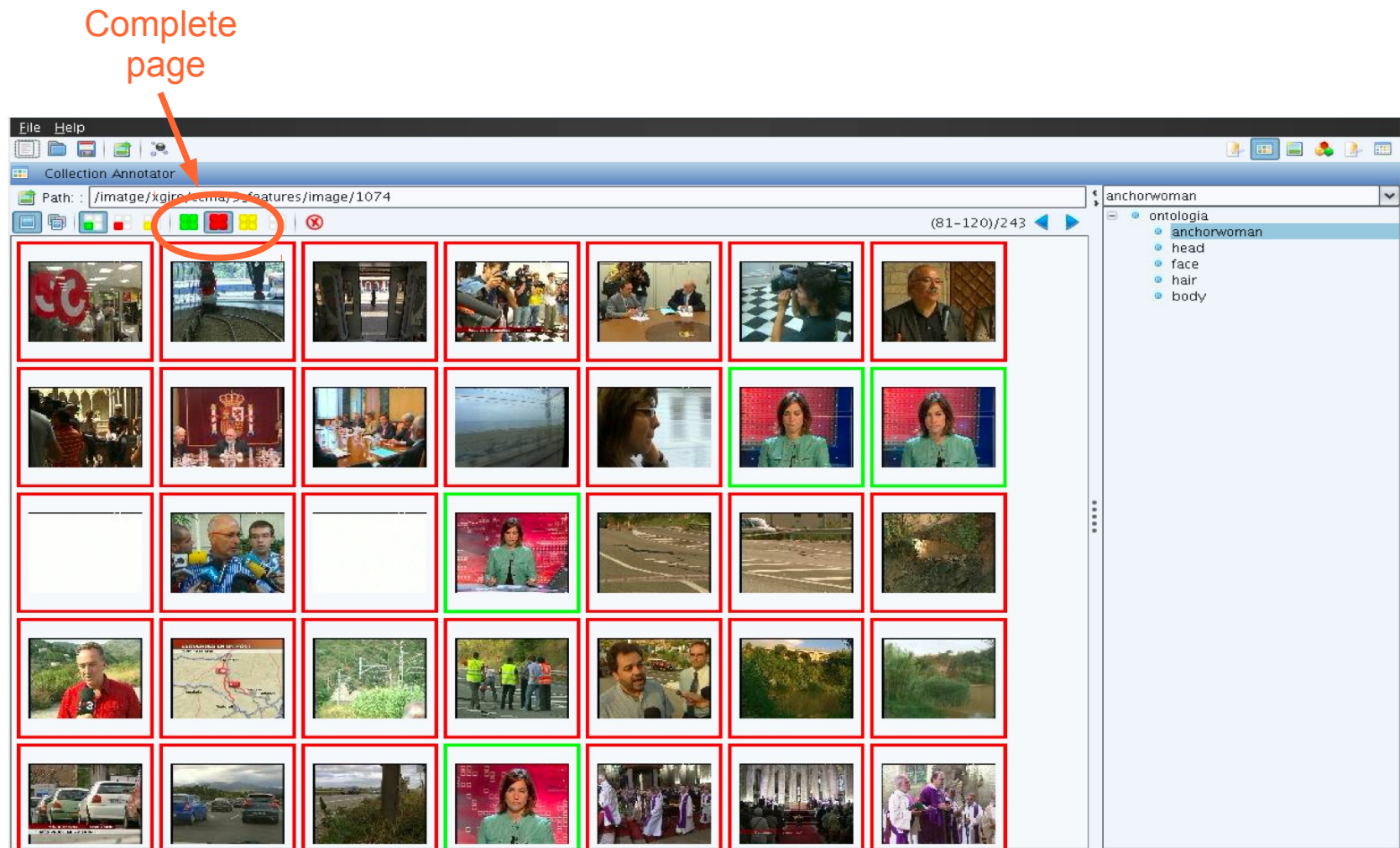


- Selection mode: sequential (click or mouse wheel)

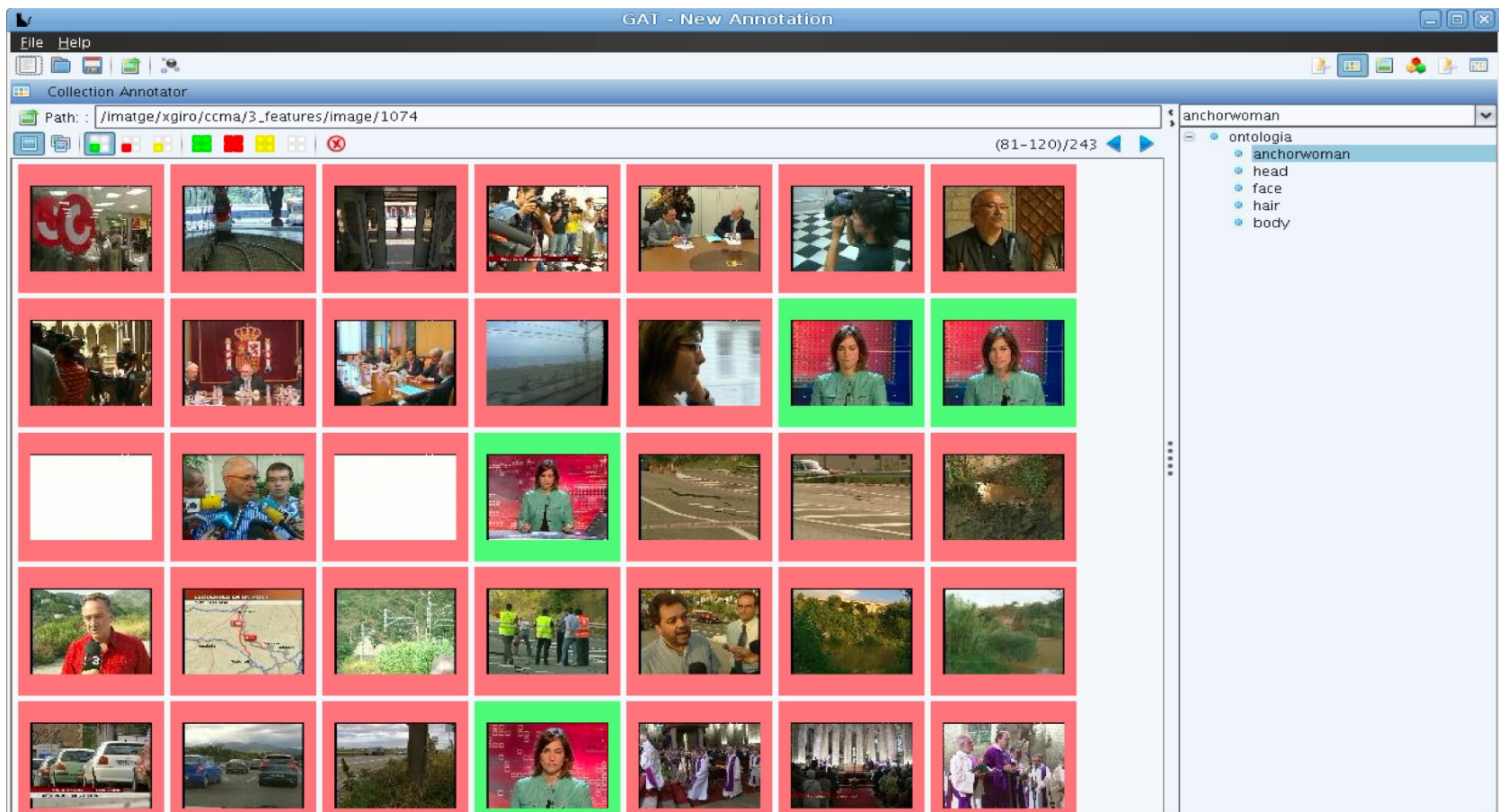
Selection
mode

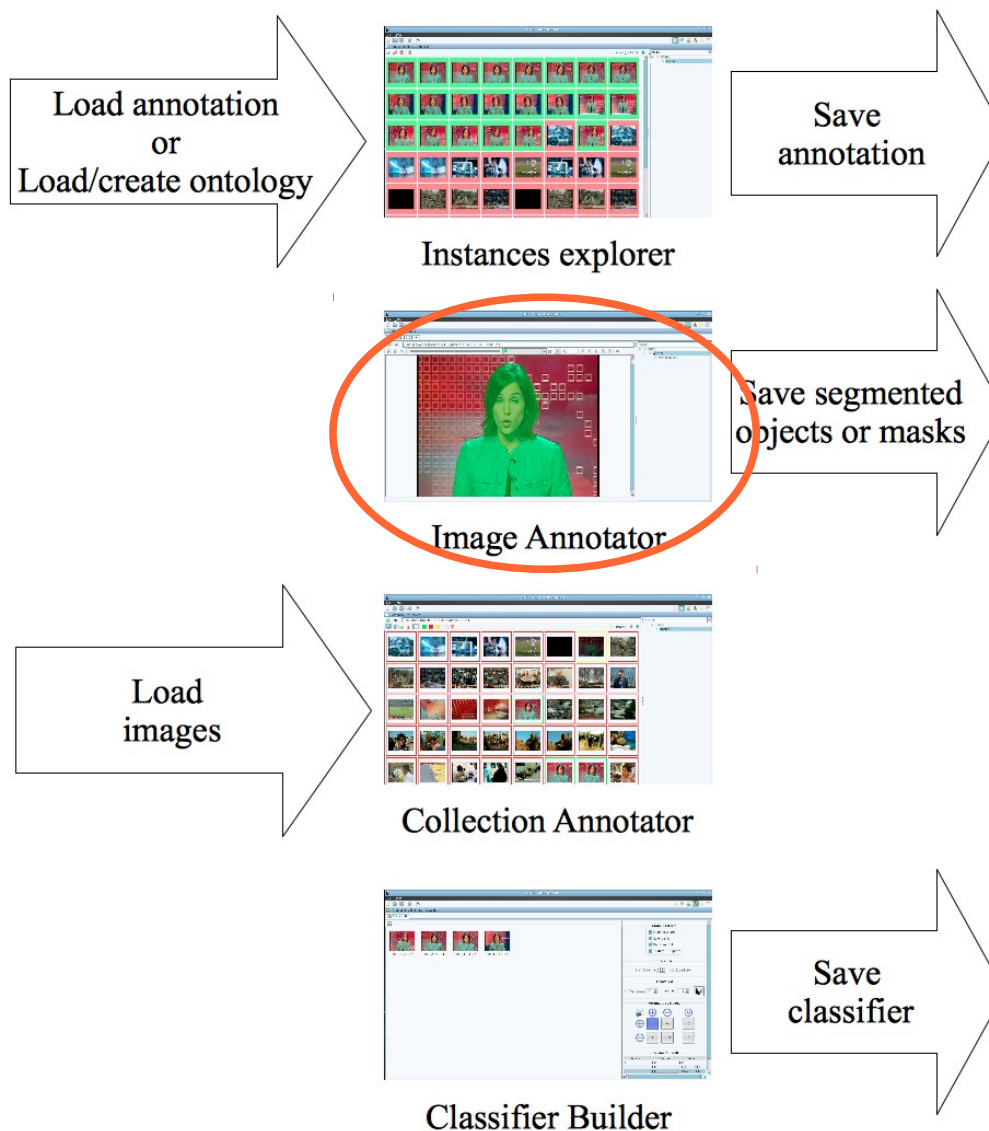


- Additional massive selectors to quickly complete the page.

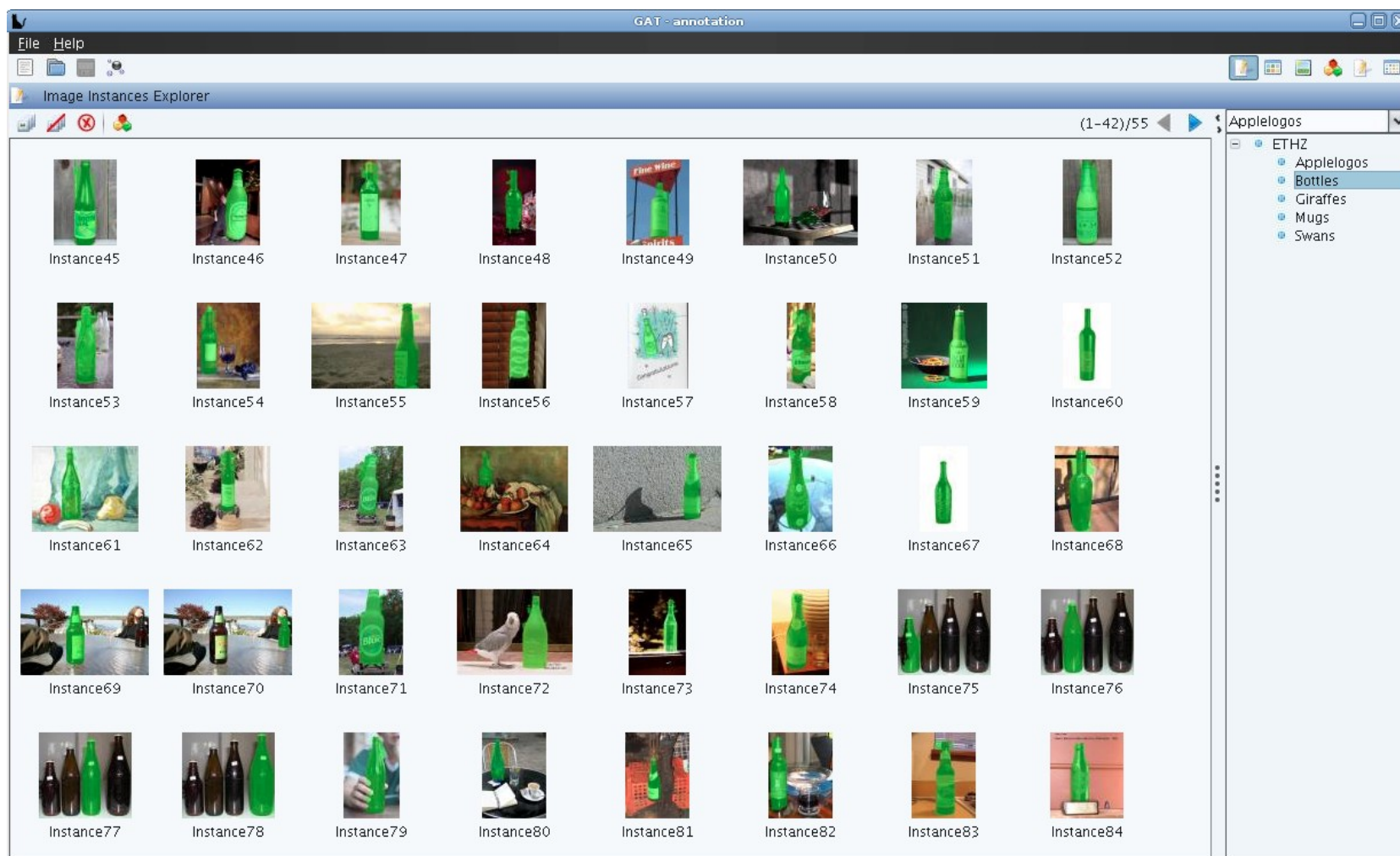


- A right click validates the selection, painting surrounding panel.



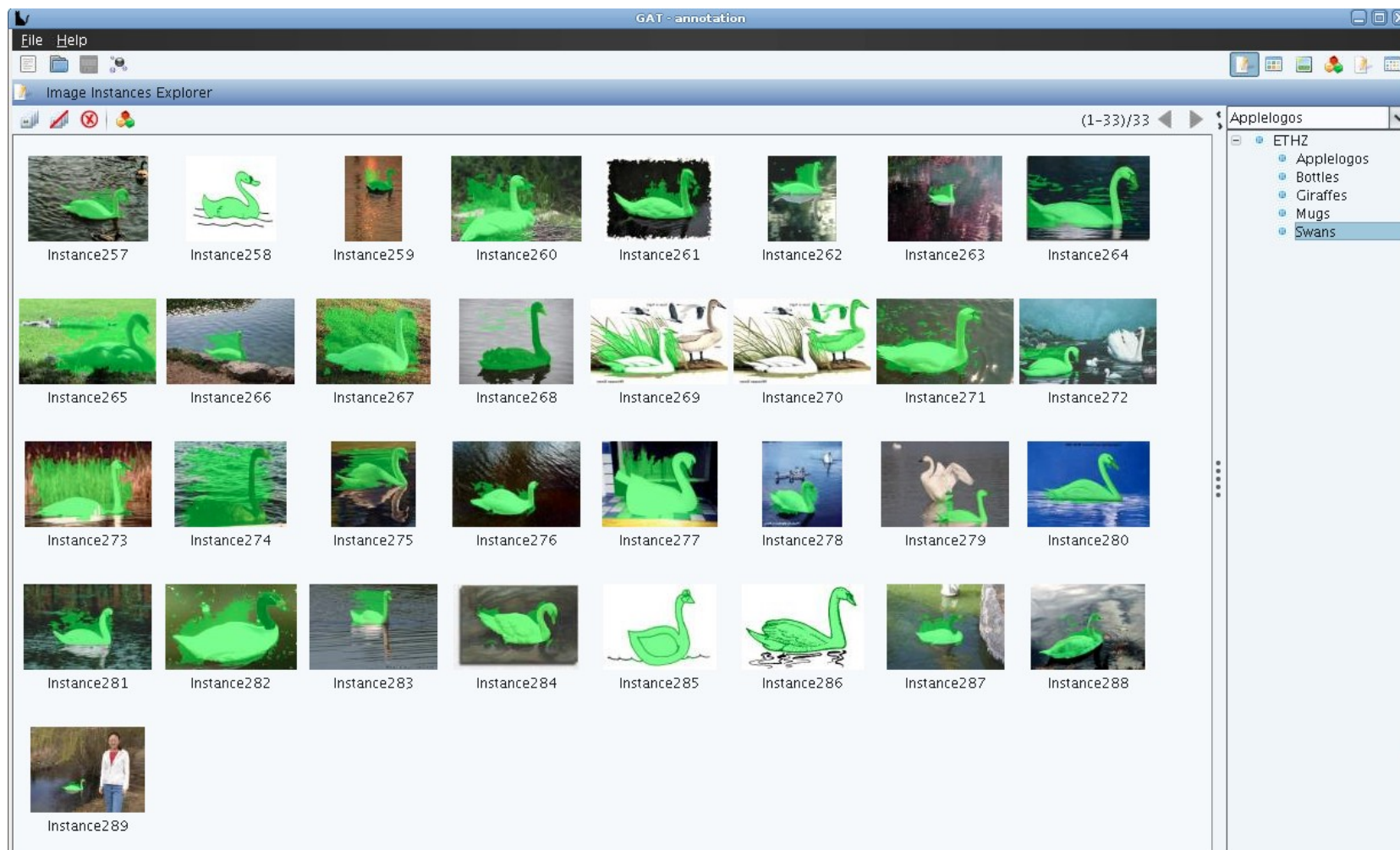


- Annotation at a local scale associated to positive labels.



“Bottles” from the ETHZ dataset [Ferrari'06]

- Annotation at a **local scale** associated to positive labels.



“Swans” from the ETHZ dataset [Ferrari'06]

- Rough annotation with points, rectangles and lines.

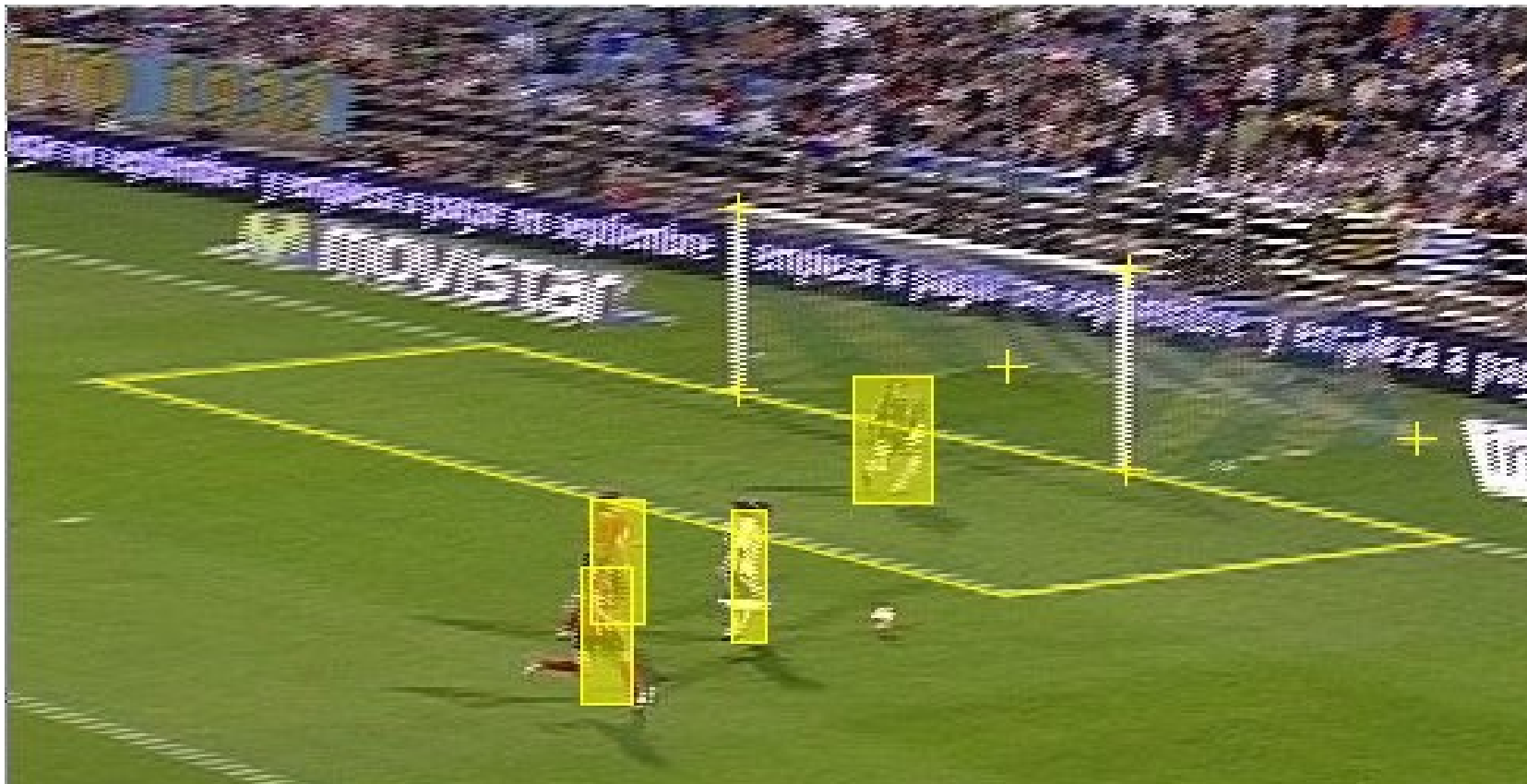
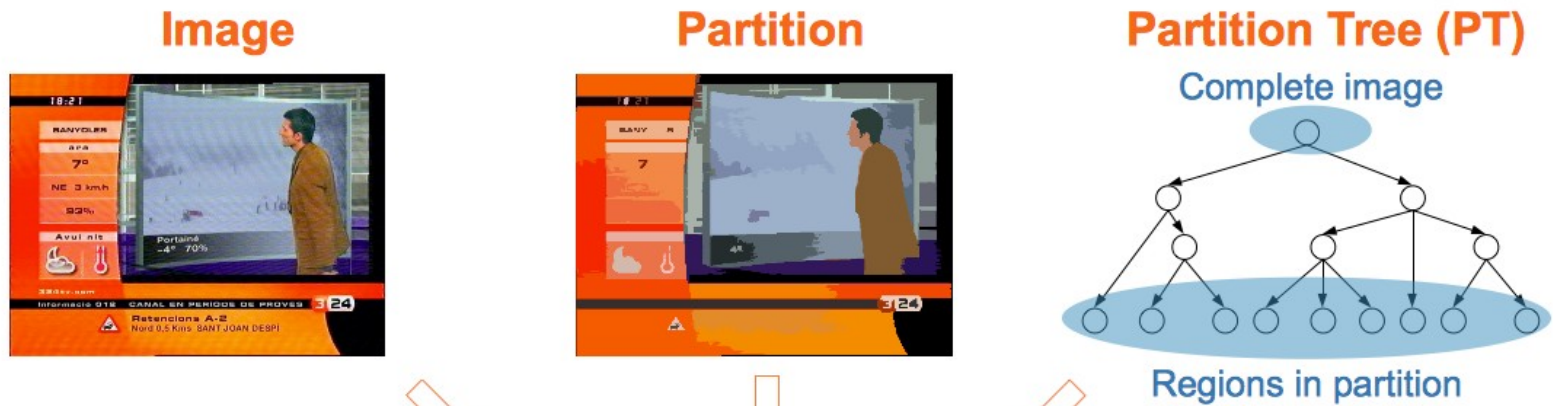


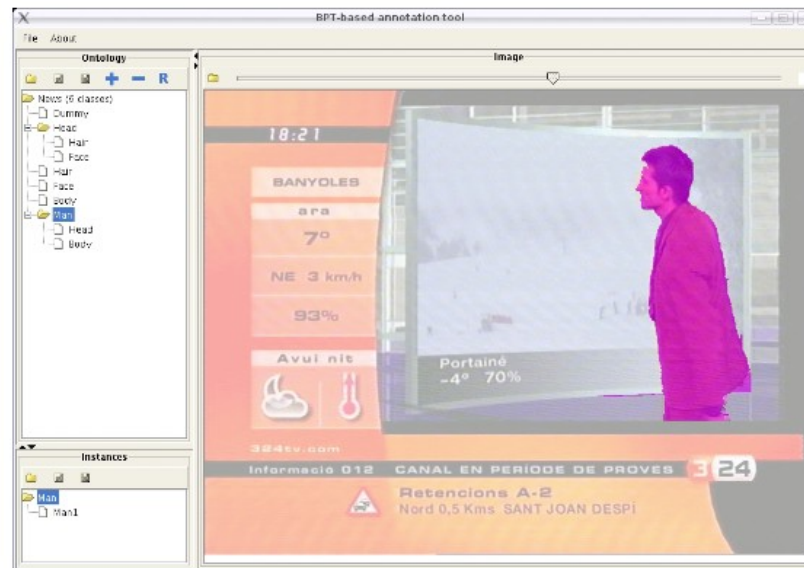
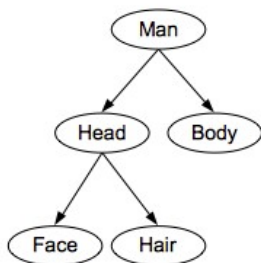
Image Annotator

- Interactive segmentation with Hierarchical Partition.



Graphical User Interface

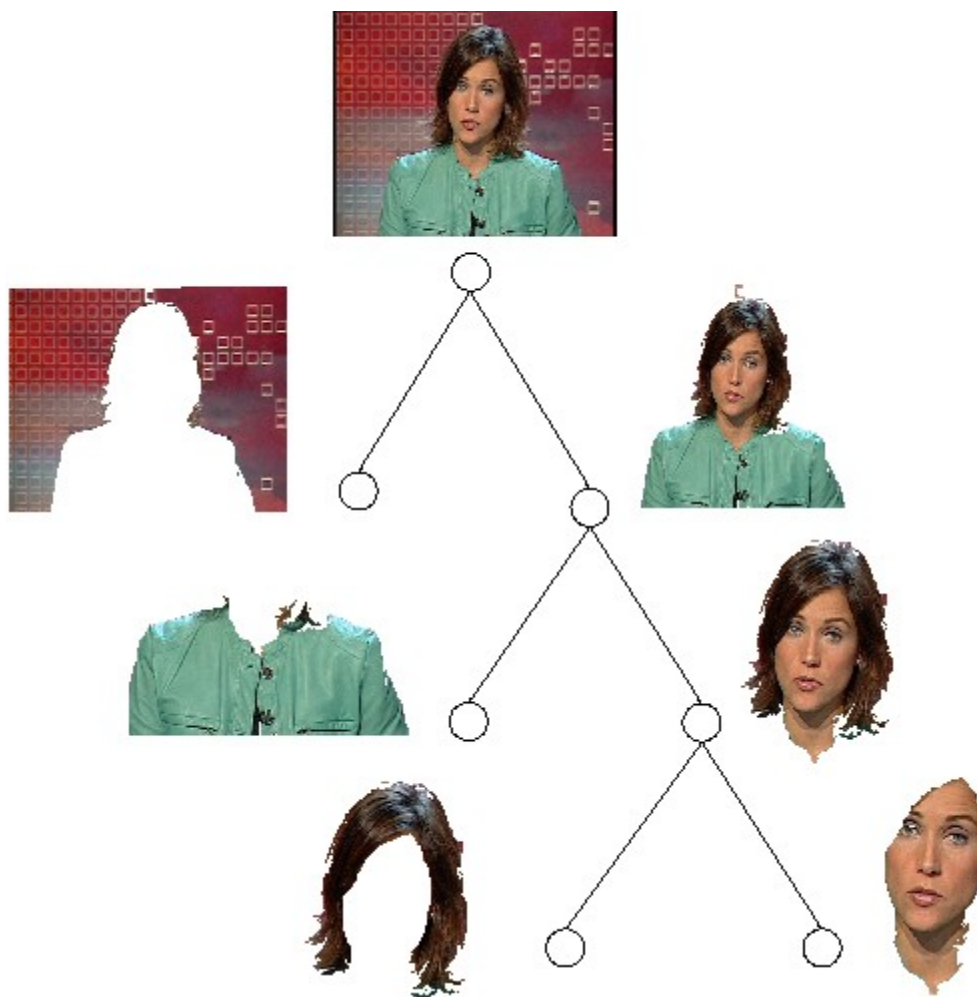
Semantic Tree (object / parts ontology)



User Interaction

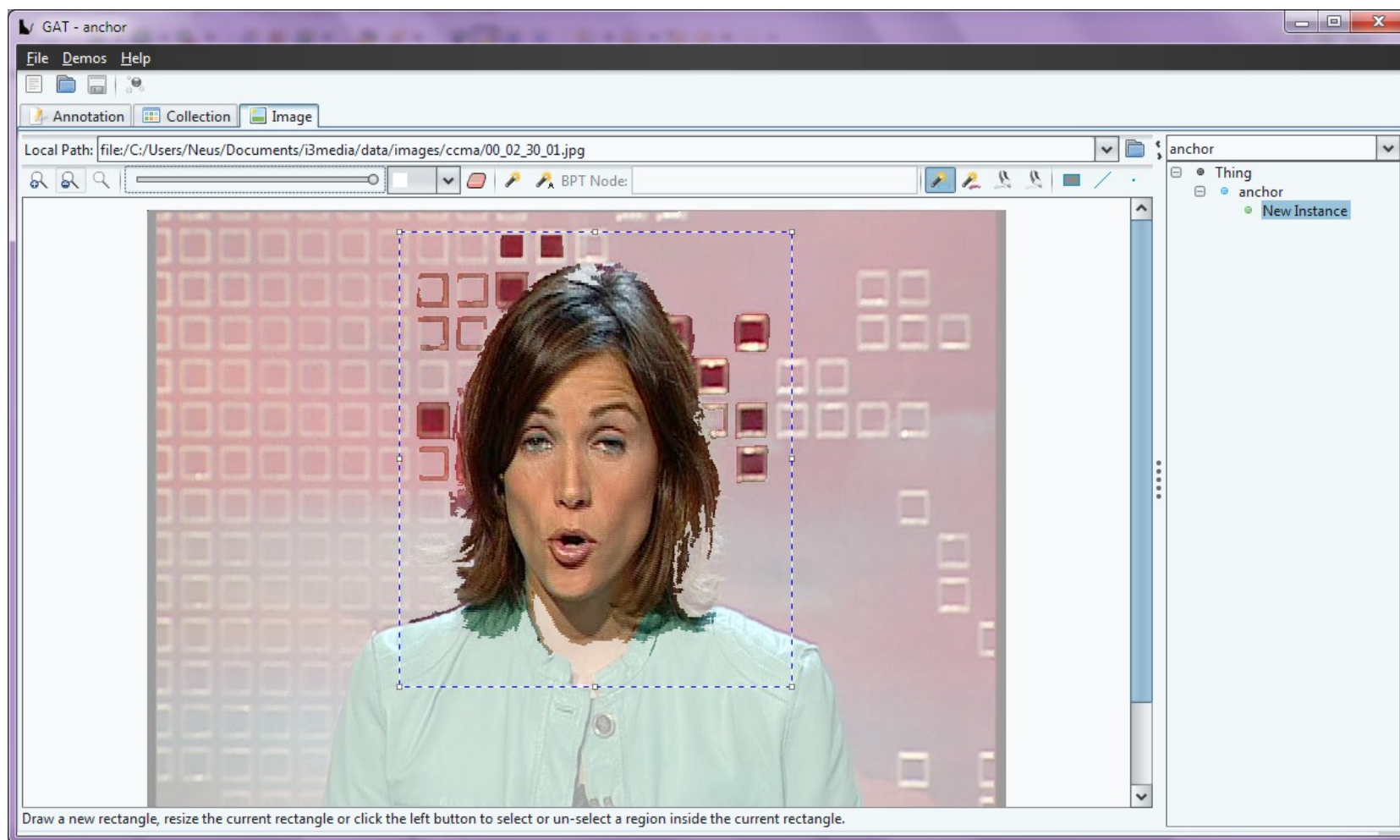


- Example: Binary Partition Trees (BPTs).



[Garrido, Salembier 2000] <http://dx.doi.org/10.1109/83.841934>

1. Rectangular marker



[Muñoz, Giró-i-Nieto 2010] <http://hdl.handle.net/2099.1/13525>

2. Foreground (and background) scribbles



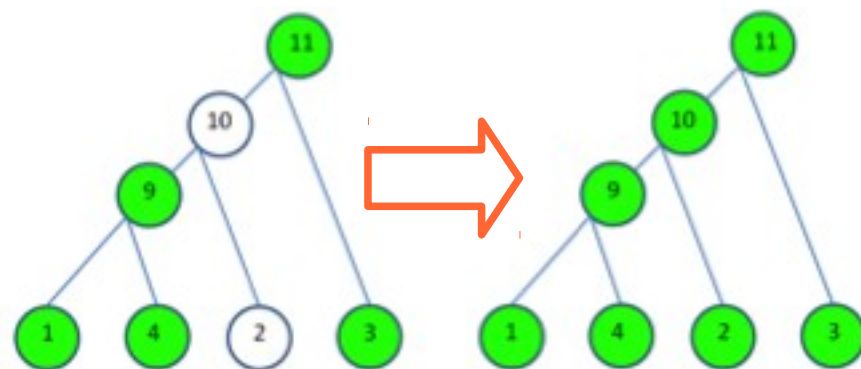
Foreground



Background



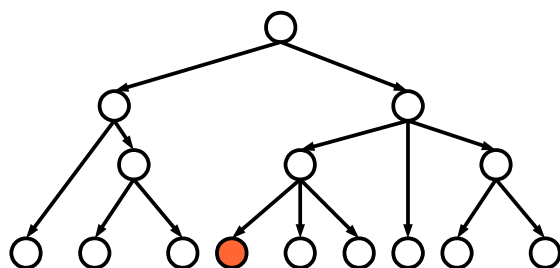
The BPT structure is used for expansion.



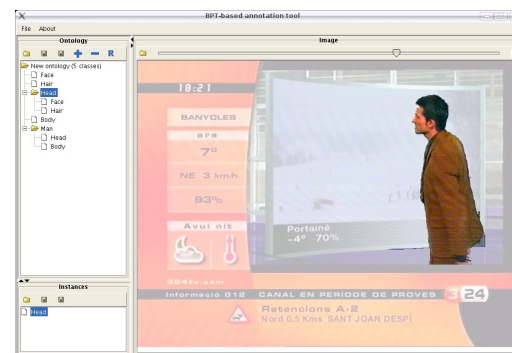
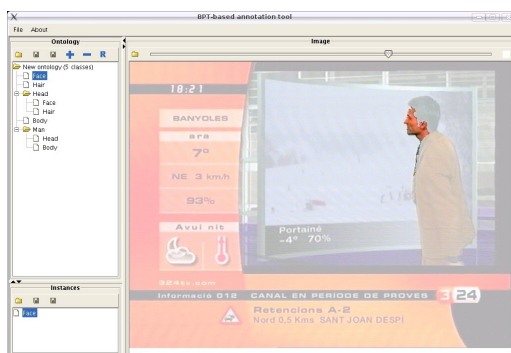
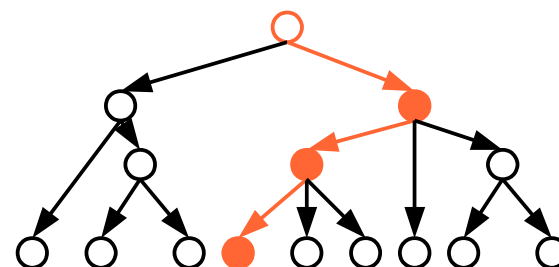
[Muñoz, Giró-i-Nieto 2010] <http://hdl.handle.net/2099.1/13525>

3. BPT navigation

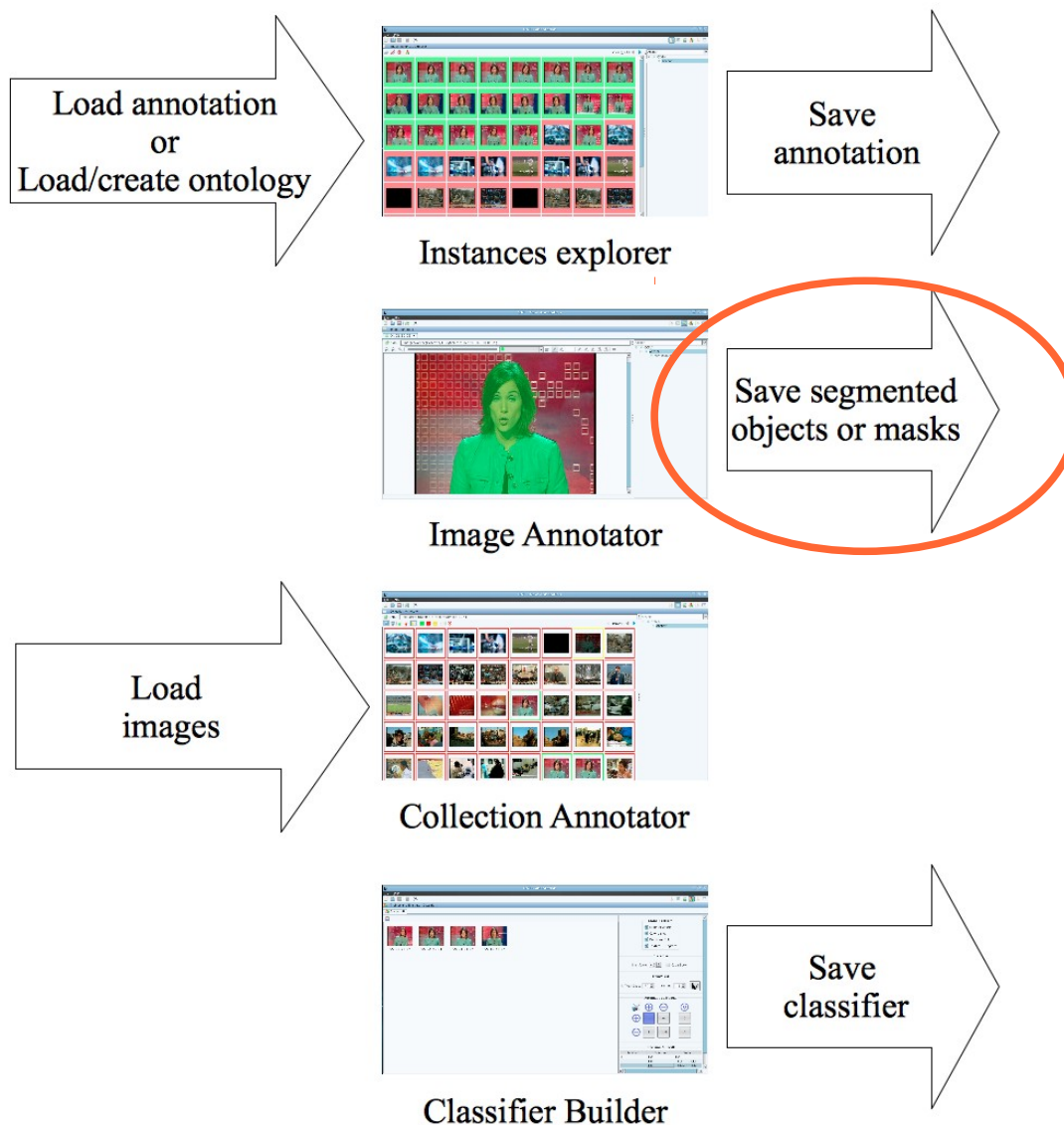
1) Select a leaf with left click or placing cursor.



2) Move through the selected branch with mouse wheel.

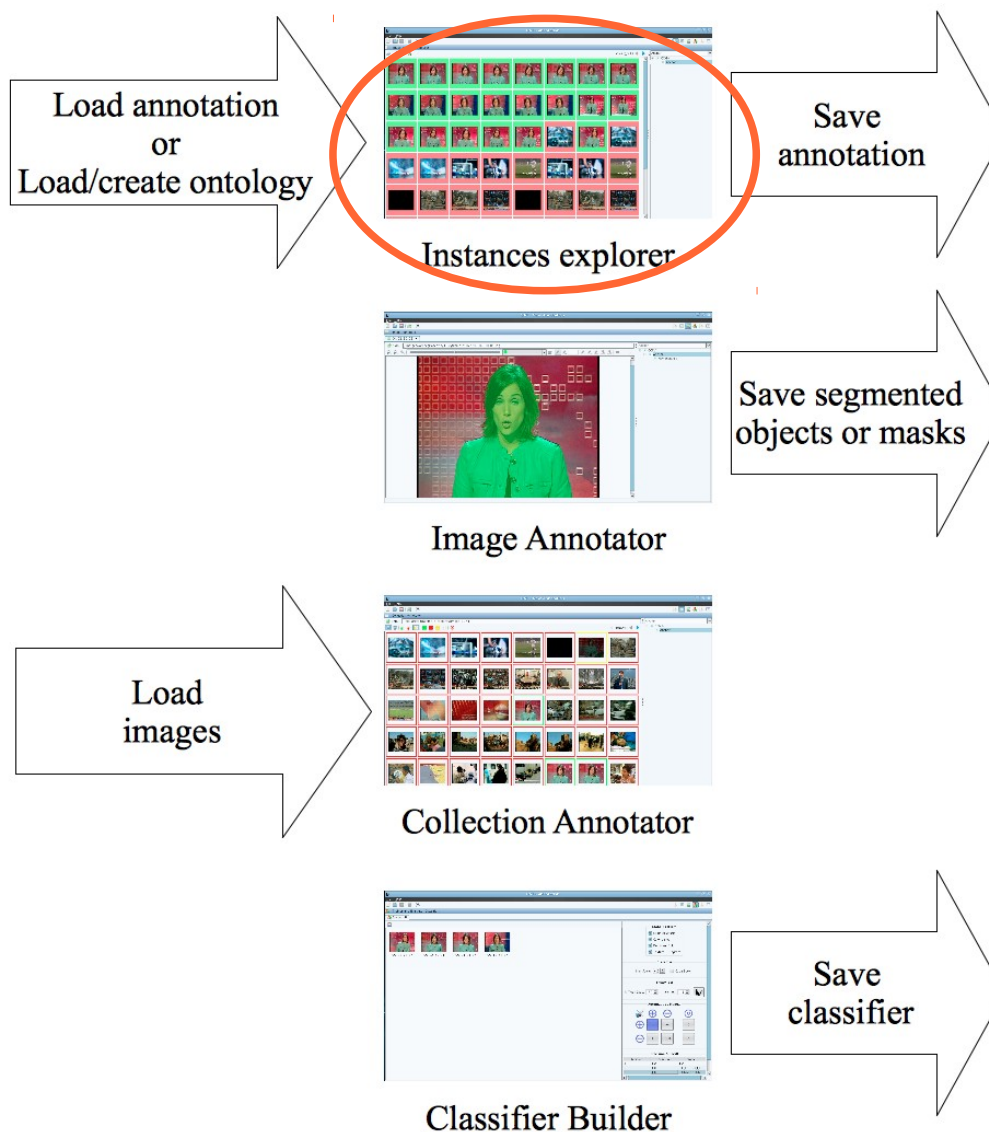


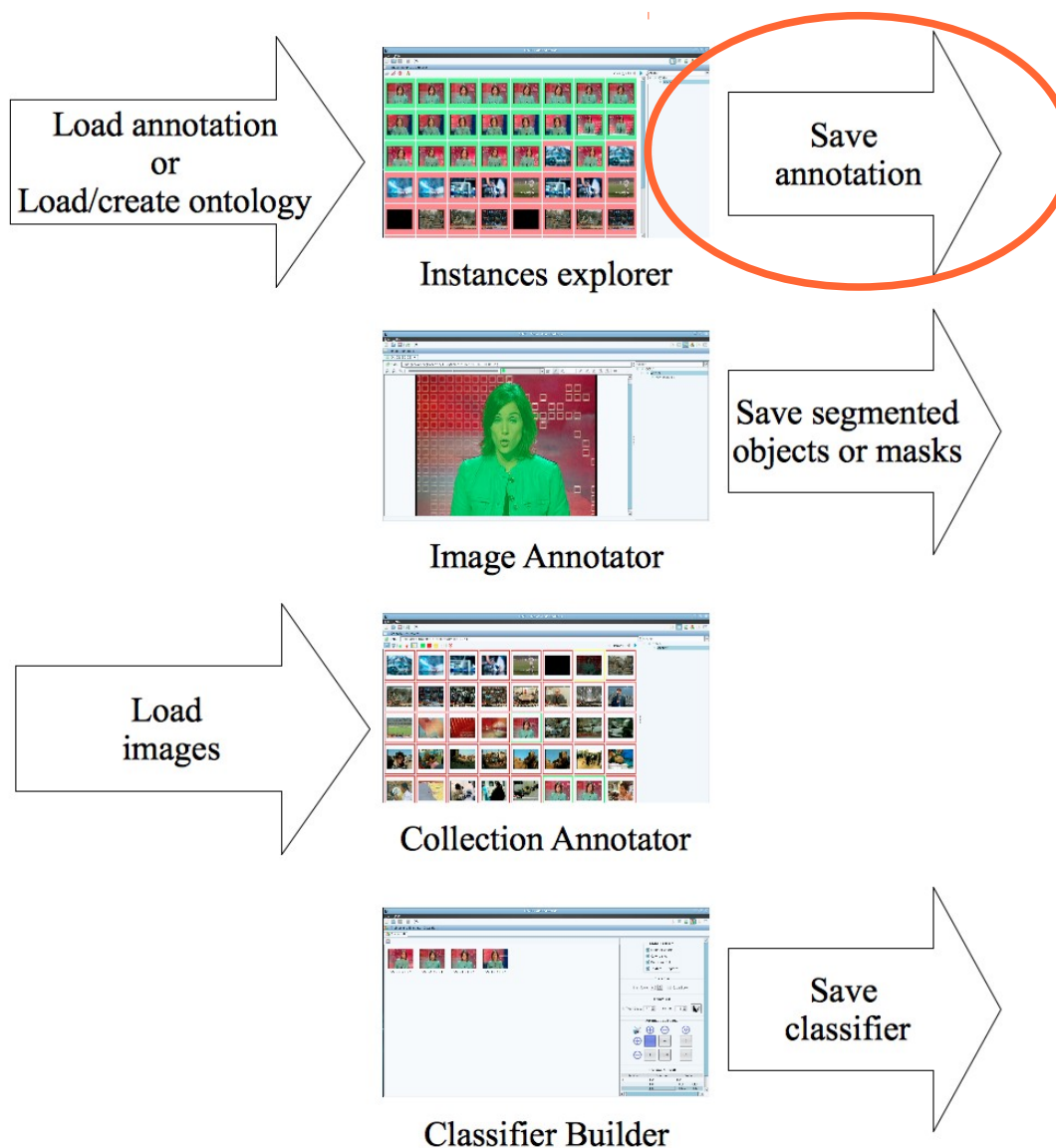
[Giró-i-Nieto, Camps, Marqués 2010] <http://dx.doi.org/10.1007/s11042-009-0389-2>



- Image files of segmentations can be saved to disk.





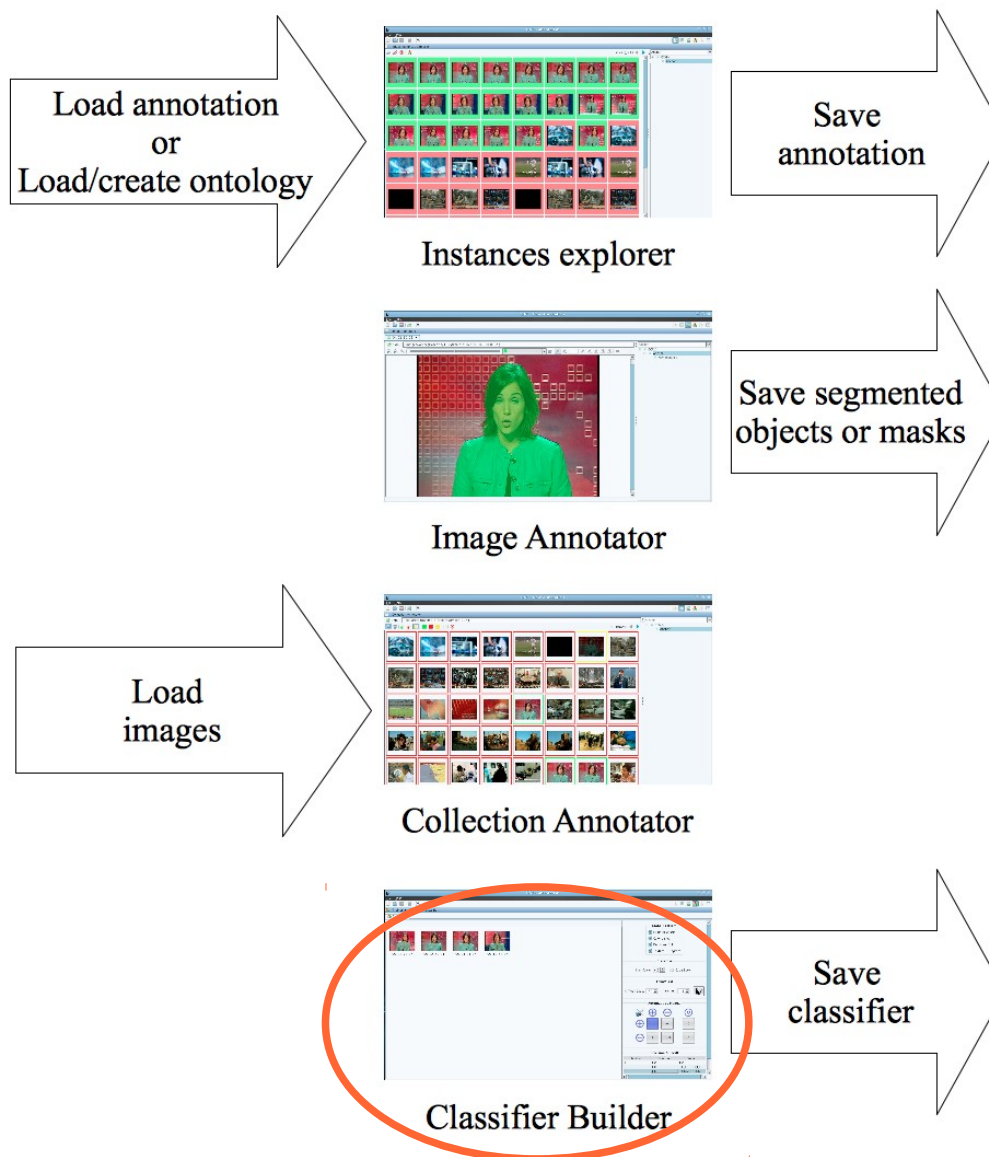




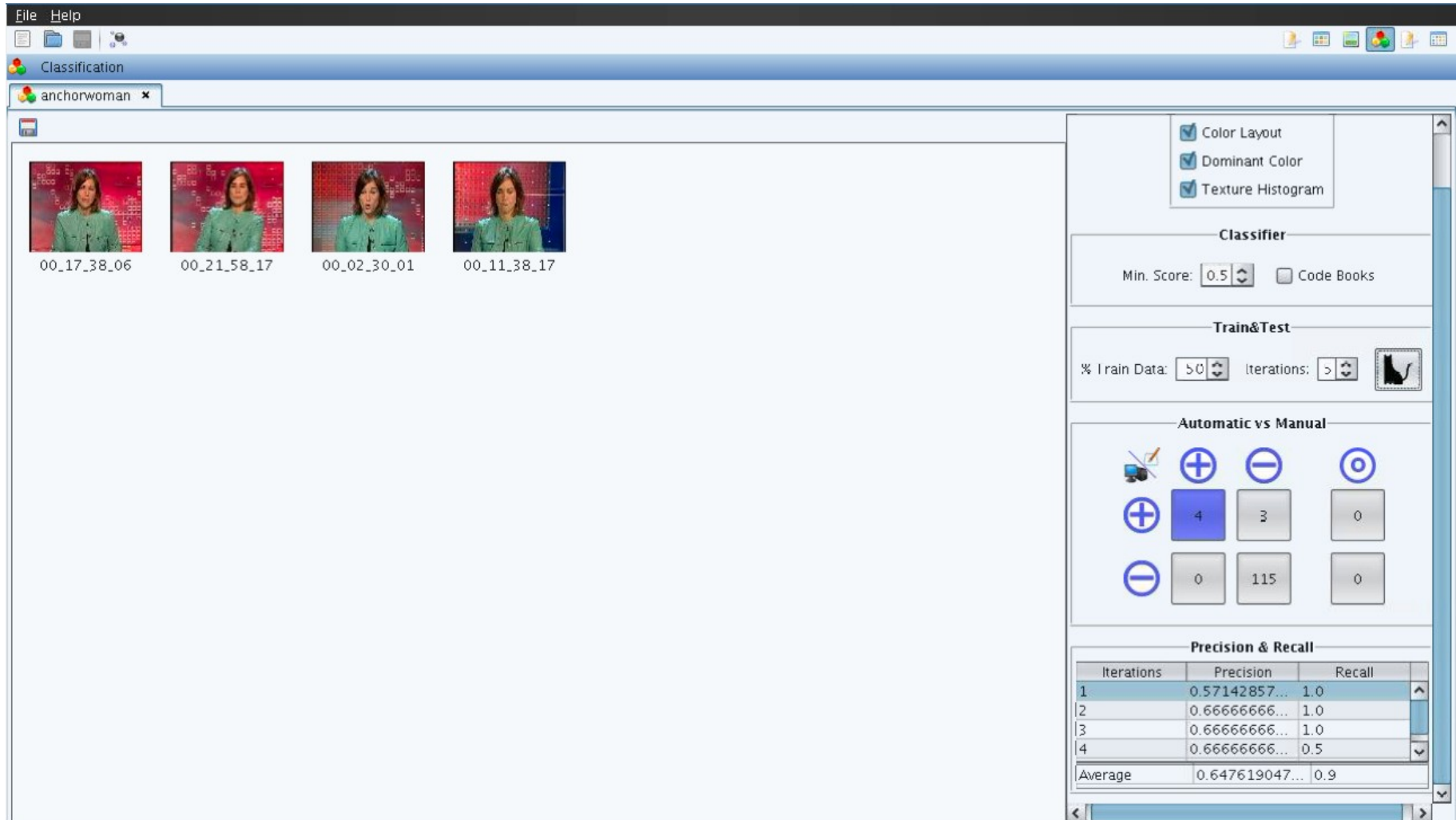
Save annotation

- Annotation is stored in MPEG-7/XML.

```
<?xml version="1.0" encoding="UTF-8"?>
<Mpeg7 xmlns="urn:mpeg:mpeg7:schema:2001" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <Description xsi:type="urn:ModelDescriptionType" xmlns:urn="urn:mpeg:mpeg7:schema:2001">
    <DescriptionMetadata>
      <Instrument>
        <Tool>
          <Name>GAT (Graphical Annotation Tool)</Name>
        </Tool>
      </Instrument>
    </DescriptionMetadata>
    <Model xsi:type="urn:CollectionModelType" id="1">
      <Semantics>
        <Label>
          <Name>anchorwoman</Name>
        </Label>
      </Semantics>
      <Collection xsi:type="urn:ContentCollectionType" id="positive">
        <Content xsi:type="urn:ImageType">
          <Image id="SegmentInstance21">
            <MediaLocator>
              <MediaUri>file:/imatge/xgiro/ccma/3_features/image/1074/00_02_30_01-vd.xml</MediaUri>
              <StreamID>7</StreamID>
            </MediaLocator>
            <Relation strength="1.0"/>
          </Image>
        </Content>
        <Content xsi:type="urn:ImageType">
          <Image id="SegmentInstance54">
            <MediaLocator>
              <MediaUri>file:/imatge/xgiro/ccma/3_features/image/1074/00_06_27_17-vd.xml</MediaUri>
              <StreamID>7</StreamID>
            </MediaLocator>
            <Relation strength="1.0"/>
          </Image>
        </Content>
      </Collection>
    </Model>
  </Description>
</Mpeg7>
```

● Precision / Recall with cross-validation



Classifier Builder

Classification

anchorwoman x

00_17_38_06 00_21_58_17 00_02_30_01 00_11_38_17

Classifier

Min. Score: 0.5 Code Books

Train&Test

% Train Data: 50 Iterations: 5

Automatic vs Manual

4 3 0

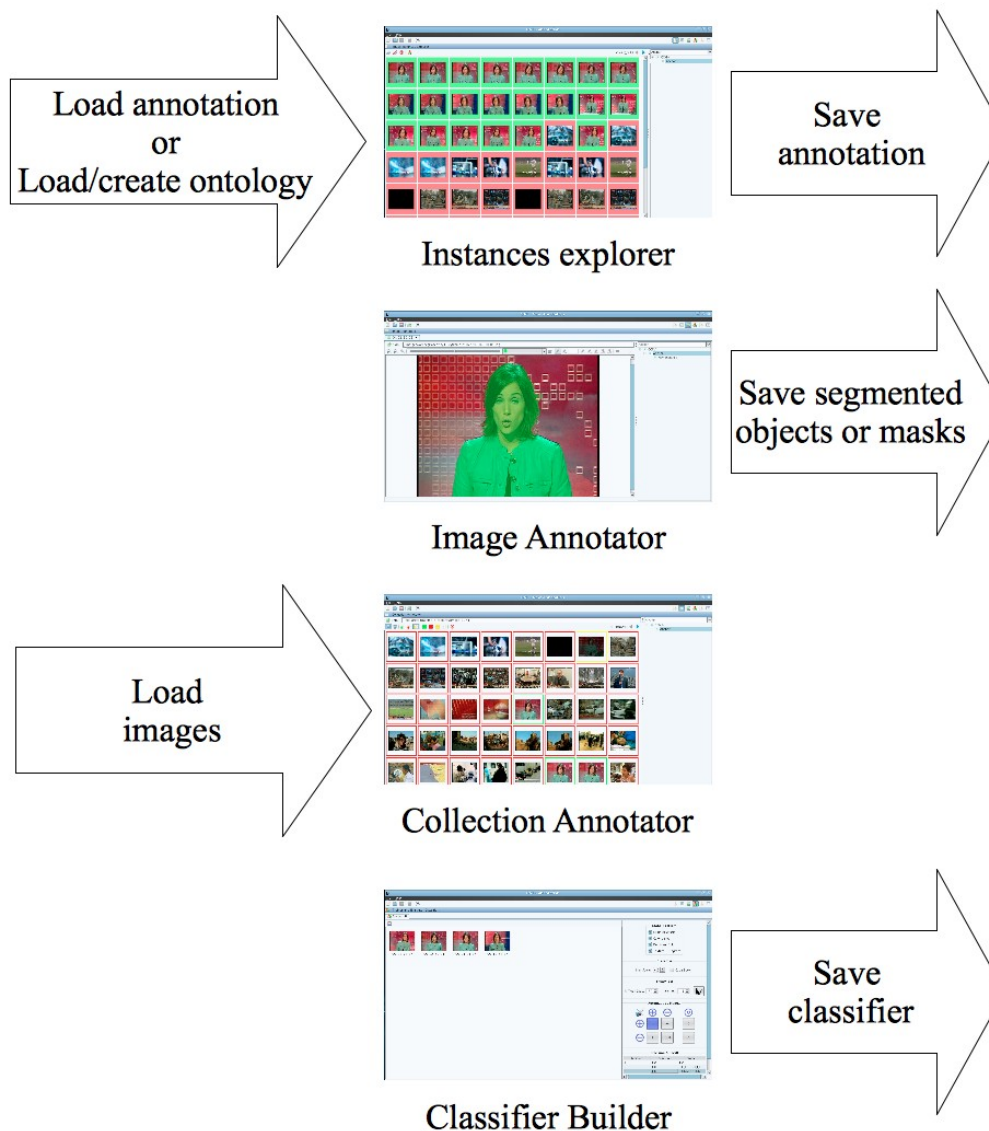
0 115 0

Precision & Recall

Iterations	Precision	Recall
1	0.57142857...	1.0
2	0.66666666...	1.0
3	0.66666666...	1.0
4	0.66666666...	0.5
Average	0.647619047...	0.9


- Random partition in every cross validation trial

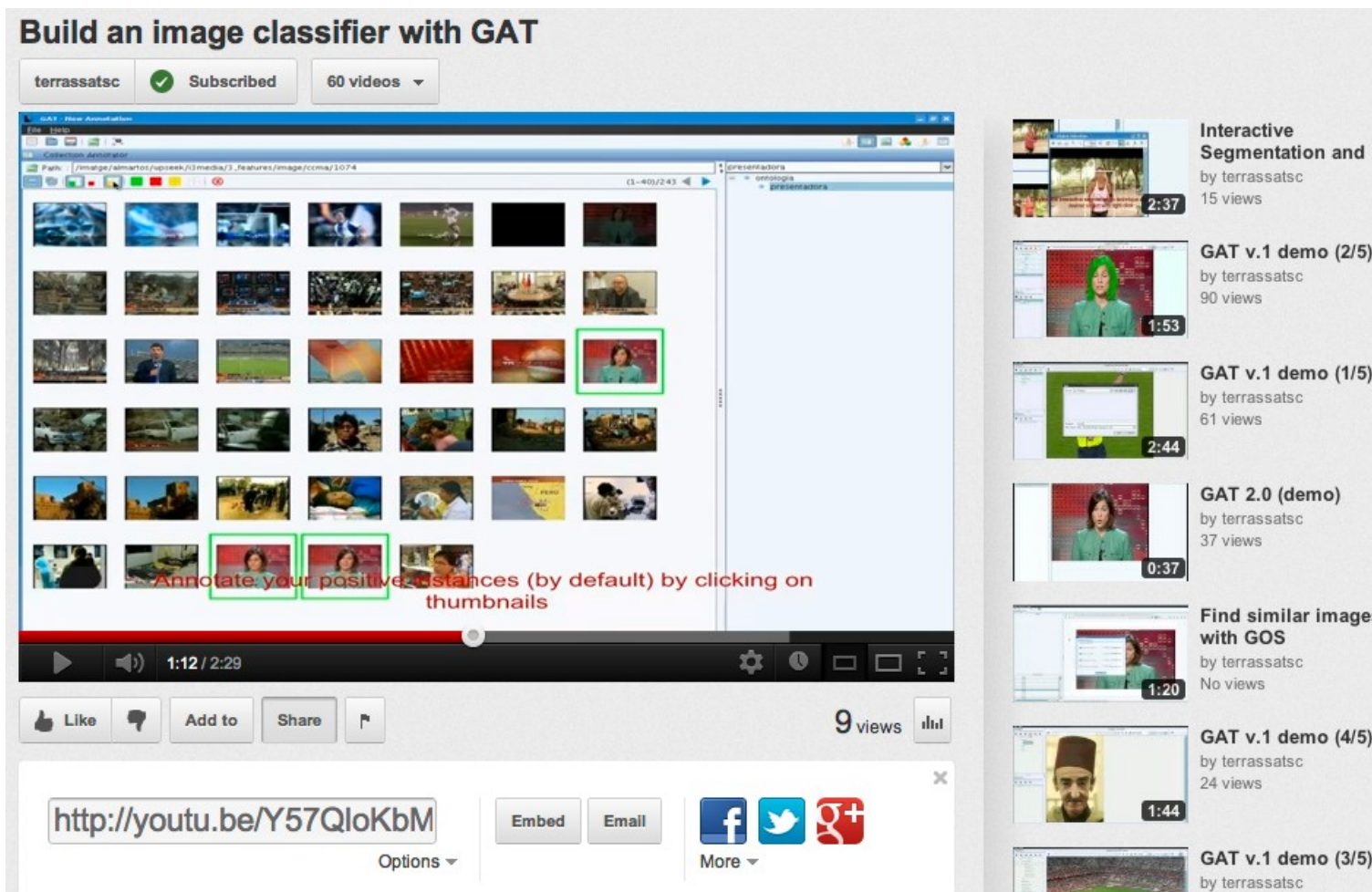




- Video-demo, available at http://youtu.be/Y57QloKbM_Q

Build an image classifier with GAT

terrassatsc  60 videos



Interactive Segmentation and
by terrassatsc
15 views

GAT v.1 demo (2/5)
by terrassatsc
90 views

GAT v.1 demo (1/5)
by terrassatsc
61 views


GAT 2.0 (demo)
by terrassatsc
37 views

Find similar images
with GOS
by terrassatsc
No views

GAT v.1 demo (4/5)
by terrassatsc
24 views

GAT v.1 demo (3/5)
by terrassatsc

- Run and download from <http://upseek.upc.edu/gat>




GAT - Graphic Annotation Tool

What is it? | Contact

What is it?

GAT is a manual annotation tool of still images at region and graphic level developed by the [Image and Video Processing Group](#) of the [Signal Theory and Communications Department](#) of the [Technical University of Catalonia](#).




Play with it

Click the Launch button to run the application using [Sun's Java Web Start](#). Alternatively, you can also download the [source code](#) to compile and execute it with [Ant](#).


[Launch](#)

Watch it work


Segment and label objects in still images
[\[Download\]](#)




Read and edit an annotation
[\[Download\]](#)




Draw points and lines on an image
[\[Download\]](#)




Annotate parts of composite objects
[\[Download\]](#)



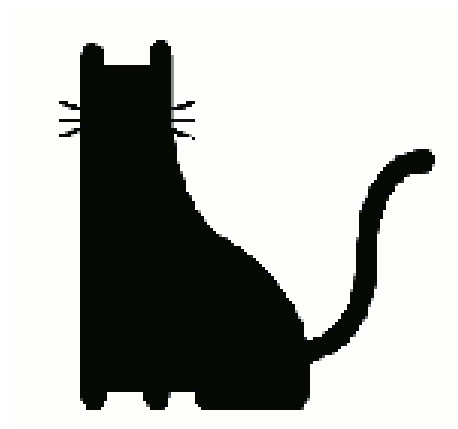
Zoom in an out for precision
[\[Download\]](#)



Track objects in video sequences
[\[Download\]](#)



- GAT is a tool for the annotation of images at the global and local scale.
- Client for the UPSeek CBIR [Giró-i-Nieto'08]
- Open source of the GUI.
- Exploited for generating ground truth data and for teaching.



[Giró-i-Nieto et al 2008] <http://dx.doi.org/10.1145/1816041.1816093>



Future work

- Evaluation of usability, especially interactive segmentation [McGuinnes'10].
- Solve license issues to distribute segmentation & classification engines, or adapt existing [Noma'12].
- Usable integration with the additional perspectives for sequences of video frames [Giró-i-Nieto'12].
- Support for OWL data format.

[McGuinnes'10] <http://dx.doi.org/10.1016/j.patcog.2009.03.008>

[Noma'12] <http://dx.doi.org/10.1016/j.patcog.2011.08.017>

[Giró-i-Nieto'12] WIAMIS 2012, on Wednesday





Thank you for your attention

 @xavigiro
#vigta2012

● Contact:

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Research blog: <http://bitsearch.blogspot.com>

E-mail: xavier.giro@upc.edu

Twitter: @xavigiro & #gatupc

● This slides are available from Xavi's website:

Google → “Xavier Giro-i-Nieto”

<http://imatge.upc.edu/~xgiro/>