

Lesson 4.6: Application: Image Classification

Class 1 Time series forecasting

Class 2 Data stream mining
in Weka and MOA

Class 3 Interfacing to R and other data
mining packages

Class 4 Distributed processing with
Apache Spark

Class 5 Scripting Weka in Python

Lesson 4.1 What is distributed Weka?

Lesson 4.2 Installing with Apache Spark

Lesson 4.3 Knowledge Flow templates I

Lesson 4.4 Knowledge Flow templates II

Lesson 4.5 Moving to a cluster

Lesson 4.6 Application: Image
Classification

Lesson 4.6: Application: Image Classification

- ❖ **Image features** are a way of describing an image using numbers
- ❖ For example:
 - *How bright is the image (f_1)?*
 - *How much yellow is in the image (f_2)?*
 - *How much green is in the image (f_3)?*
 - *How symmetrical is the image (f_4)?*



f_1	50%
f_2	50%
f_3	10%
f_4	100%



f_1	50%
f_2	2%
f_3	65%
f_4	50%

Lesson 4.6: Application: Image Classification

- ❖ **Image filters** extract the same features for a set of images

```
@relation butterfly_vs_owl
@attribute filename string
@attribute class {BUTTERFLY,OWL}
@data
mno001.jpg,BUTTERFLY
mno002.jpg,BUTTERFLY
mno003.jpg,BUTTERFLY
mno004.jpg,BUTTERFLY
owl1001.jpg,OWL
owl1002.jpg,OWL
owl1003.jpg,OWL
owl1004.jpg,OWL
```

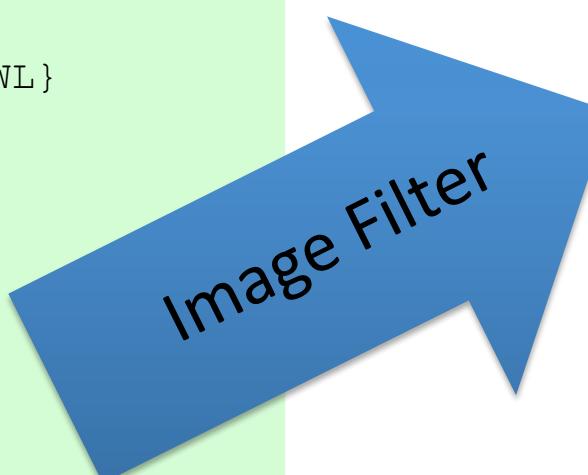


Image Filter

```
@relation butterfly_vs_owl
@attribute filename string
@attribute f1 numeric
@attribute f2 numeric
@attribute f3 numeric
@attribute class {BUTTERFLY,OWL}
```

```
@data
mno001.jpg,3,7,0,BUTTERFLY
mno002.jpg,1,2,0,BUTTERFLY
mno003.jpg,3,4,0,BUTTERFLY
mno004.jpg,6,3,0,BUTTERFLY
owl1001.jpg,3,5,0,OWL
owl1002.jpg,7,3,0,OWL
owl1003.jpg,3,5,0,OWL
owl1004.jpg,7,5,1,OWL
```

Lesson 4.6: Application: Image Classification

1. Install **imageFilters** package using the Package Manager
2. Create your own ARFF file or use the example at **%HOMEPATH%/
wekafiles/packages/imageFilter/data**
3. Open the ARFF file in the WEKA Explorer
4. Select an image filter from **filters/unsupervised/
instance/imagefilters**
5. Set the filter's **imageDirectory** option to the correct directory
6. Click the Apply button
7. Repeat 5-7 if you wish to apply more than one filter
8. (Optional) Remove the first filename attribute
9. Select a classifier and perform some experiments

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❖ Summary

- *Image features are mathematical properties of images*
- *Image filters can be applied to calculate image features for an entire dataset of images*
- *Different features measure different properties of the image*
- *Experimenting with WEKA can help you identify the best combination of image feature and classifier for your data*

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❖ References

- **LIRE:** *Mathias L., Chatzichristofis S.* A. Lire: Lucene Image Retrieval – An Extensible Java CBIR Library. *In Proc. of the 16th ACM International Conference on Multimedia*, pp. 1085-1088, Vancouver, Canada, 2008
- **MPEG7 Features:** *Manjunath B., Ohm J.R., Vasudevan V.V., Yamada A.* Color and texture descriptors. *IEEE trans. on Circuits and Systems for Video Technology* 11,703–715, 2001
- **Bird images:** *Lazebnik S., Schmid C., and Ponce J.* A Maximum Entropy Framework for Part-Based Texture and Object Recognition. *Proceedings of the IEEE International Conference on Computer Vision, Beijing, China, October 2005*, vol. 1, pp. 832-838
- **Butterfly images:** *Lazebnik S., Schmid C, and Ponce J.* Semi-Local Affine Parts for Object Recognition. *Proceedings of the British Machine Vision Conference, September 2004*, vol. 2, pp. 959-968.