Overview of ImageCLEF 2014

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(for all organizers)

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ImageCLEF history

- Started in 2003 with a photo retrieval task
  - 4 participants submitting results
- 2009 with 6 tasks and 65 participants
- Retrieval and detection (annotation) tasks in various domains (photo, medical, plants, …)
- 2014
  - 4 tasks, LifeCLEF now an independent lab
  - Almost 200 registered participants
  - 21 groups submitted results

ImageCLEF objectives

- Annotate images with concepts
  - Using visual information, text, and other sensors
- Language-independent and multilingual indexing & retrieval from image collections
- Multimodal retrieval combining text with visual features and other sensors
- Extracting semantic concepts that can be used for several languages
- Evaluating machine learning approaches

ImageCLEF registration system

Home
Subtracks
Collections
Runs

Users
Pending Signatures

ImageCLEF-Website
CLEF-Website

Register new user

All users

All Users (1 - 10 of 242)

Type	Groupname	E-mail	Country	signature OK			
admin	hesso	ivan.eggel@hevs.ch	Switzerland	✓	Update	Detail	
admin	MedGIFT	henning.mueller@hevs.ch	Switzerland	✓	Update	Detail	
admin	HES SO	alba.garcia@hevs.ch	Switzerland	✓	Update	Detail	
admin	xenocanto	bob@xeno-canto.org	Netherlands	✓	Update	Detail	
admin	TUWien ifs	rauber@ifs.tuwien.ac.at	Austria	✓	Update	Detail	
admin	TU Vienna	schindler@ifs.tuwien.ac.at	Austria	✓	Update	Detail	
admin	VALE	caputo@dis.uniroma1.it	Italy	✓	Update	Detail	
admin	Inria Zenith and Imedia teams	herve.goeau@inria.fr	France	✓	Update	Detail	
participant	XC	wp@xeno-canto.org	Netherlands	✓	Update	Detail	Delete
admin	UPV PRHLT	mauvilsa@upv.es	Spain	✓	Update	Detail	

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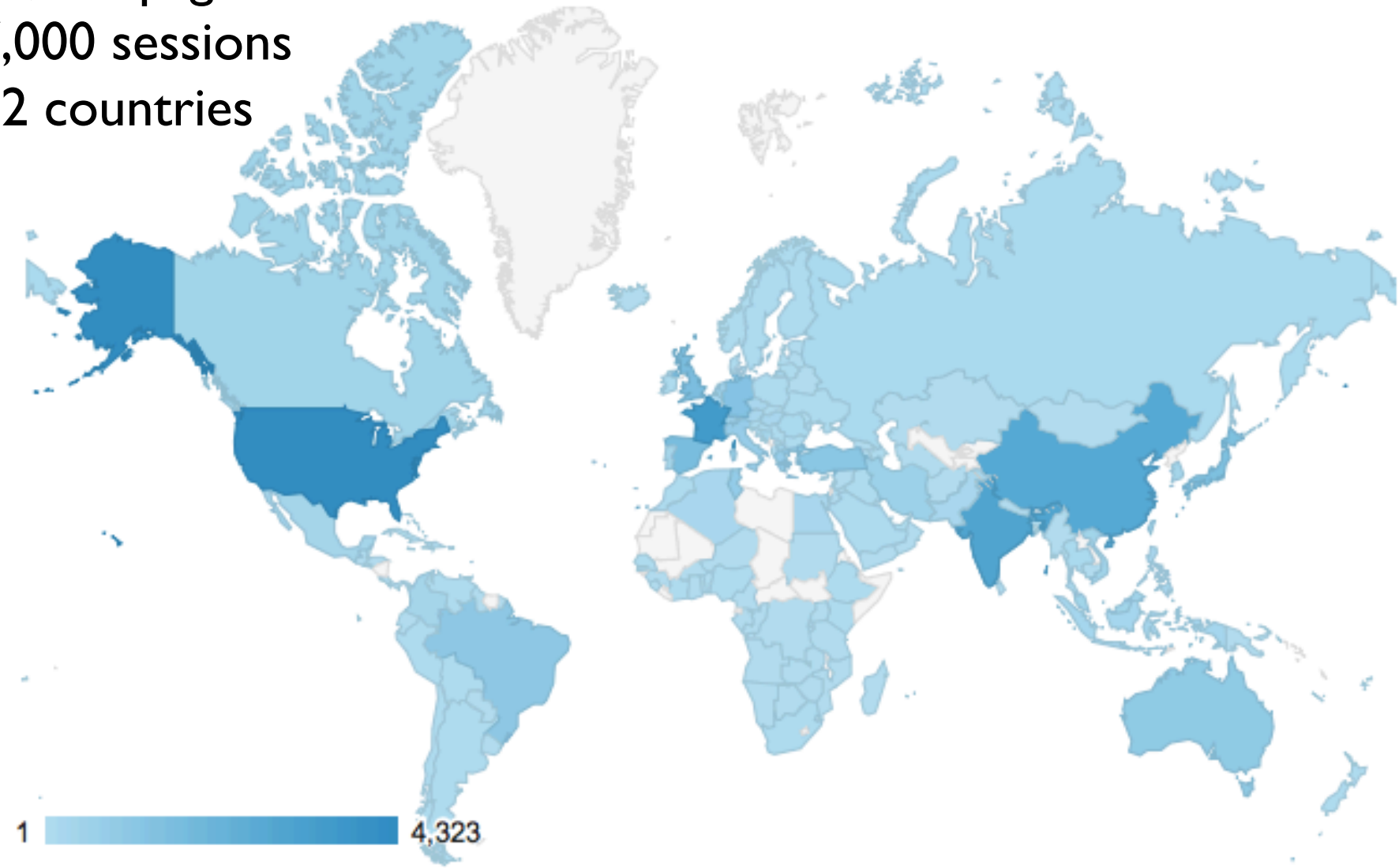
Show Data in Single Page

ImageCLEF web page

105,000 page views
37,000 sessions
162 countries



Tasks in 2014

- Scalable Concept image annotation task
  - Large-scale annotation with web data
- Robot vision task
  - Detecting places and objects in robotic images
- Domain adaptation task (new)
  - Train in one domain and evaluate in another one
- Liver annotation task (new)
  - Automatically annotate regions in the liver with semantic terms

Scalable concept image annotation task

General information

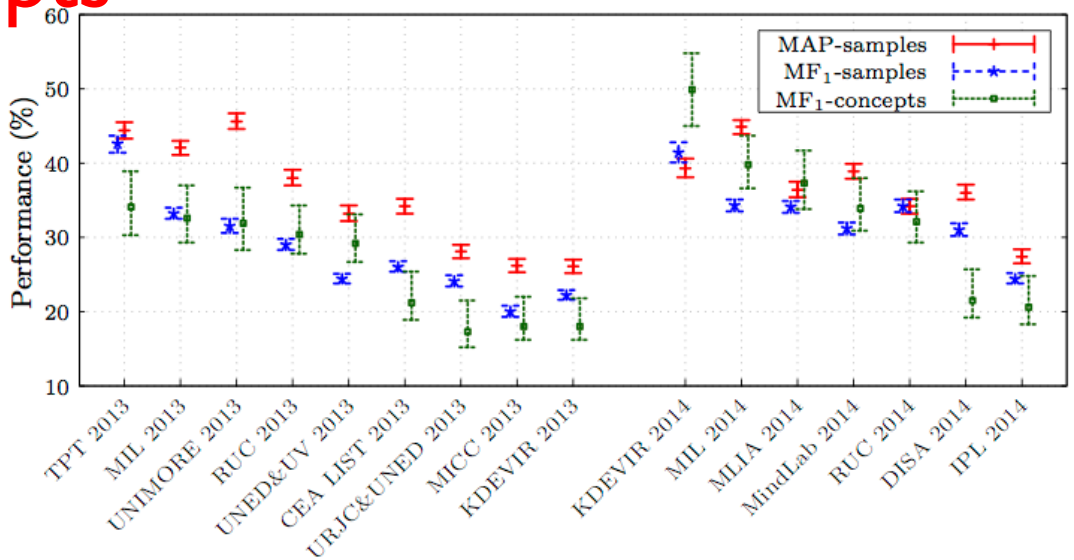
- Objective: To use automatically gathered data (web pages, language resources, etc.) to develop scalable image annotation systems
- Past editions: Track started in 2012, this was the third edition
- Organizers: Mauricio Villegas and Roberto Paredes (Universitat Politècnica de València).
- Participation: 11 groups took part, 58 runs were submitted in total

Tasks and data

- Task description:
  - Develop and train image annotation systems using the provided data and/or other data as long as not hand labeled
  - Use the developed systems to automatically annotate a set of images for a given concept list and using as input only visual features
- Provided training data (500,000 images):
  - The original images and 7 types of extracted visual features
  - The webpages in which the images appeared and preprocessed textual features

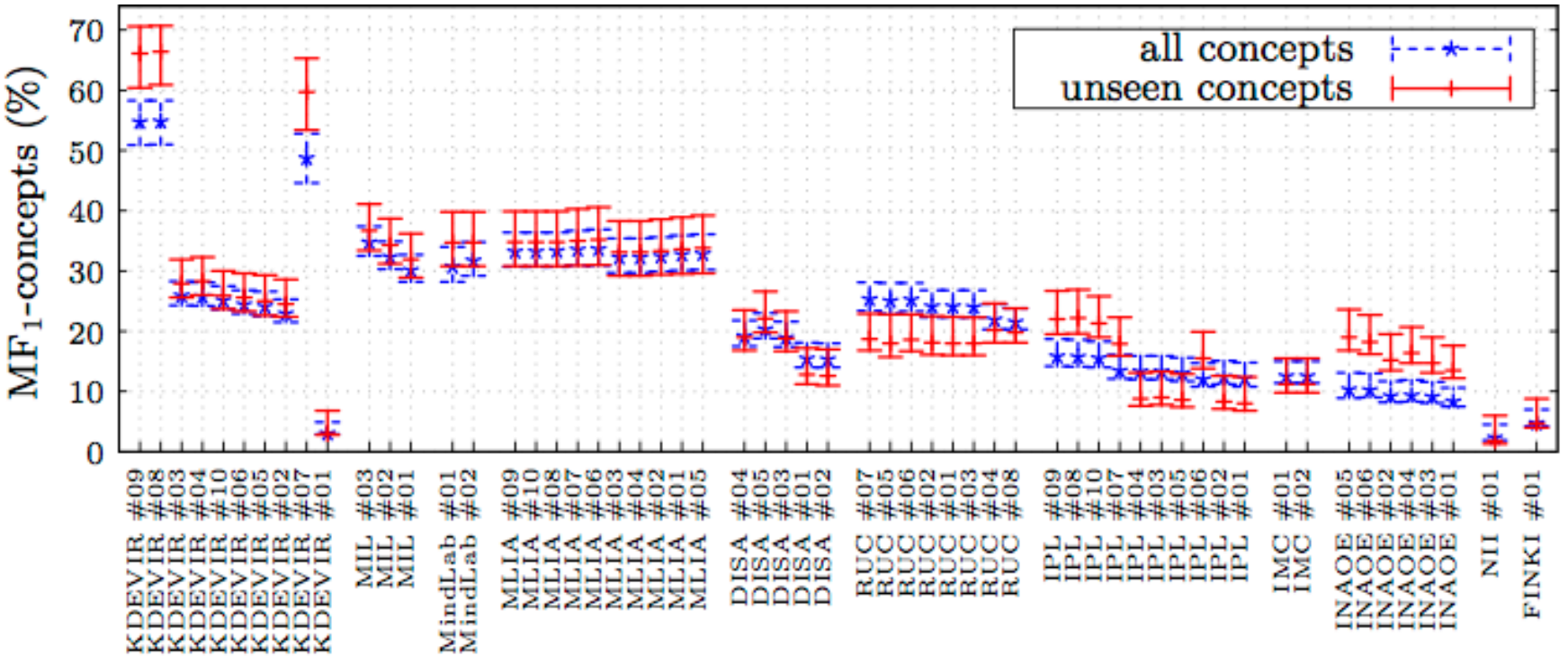
Results

- Results indicate that web data can be used for training practical and scalable annotation systems
- A performance improvement is observed with respect to last year's submissions
- Most improvement on MF measures, indicating better approaches for selecting the final annotated concepts



Lessons learned

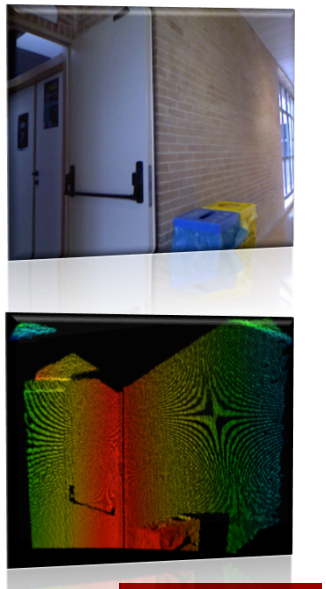
- Best system from KDEVIR group:
  - Employed provided visual features
  - Success due to classifier considering contextual info and usage of concept ontologies both in training and test



Robot vision task

General information

- Multimodal information retrieval
- Two problems: place classification and object recognition
  - 10 room categories, 8 objects
- Two info sources: visual and depth images
- Proposed since 2009 (5th edition)
  - Organizers: J. Martinez-Gomez, I. Garcia-Varea, M. Cazorla and V. Morell
- 4-9 participants over the years



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Data and setup

- Supervised classification problem
  - Participants are provided with labeled sequences
    - Training (5000 frames) and validation (1500 frames)
- Each training frame contains
  - Visual Image, Range Image (.pcd format)
  - Semantic category of scene where frame was acquired
  - List of objects appearing in the scene
- Training and test sequences
  - Different building but with similar structure and objects/rooms appearance relationships

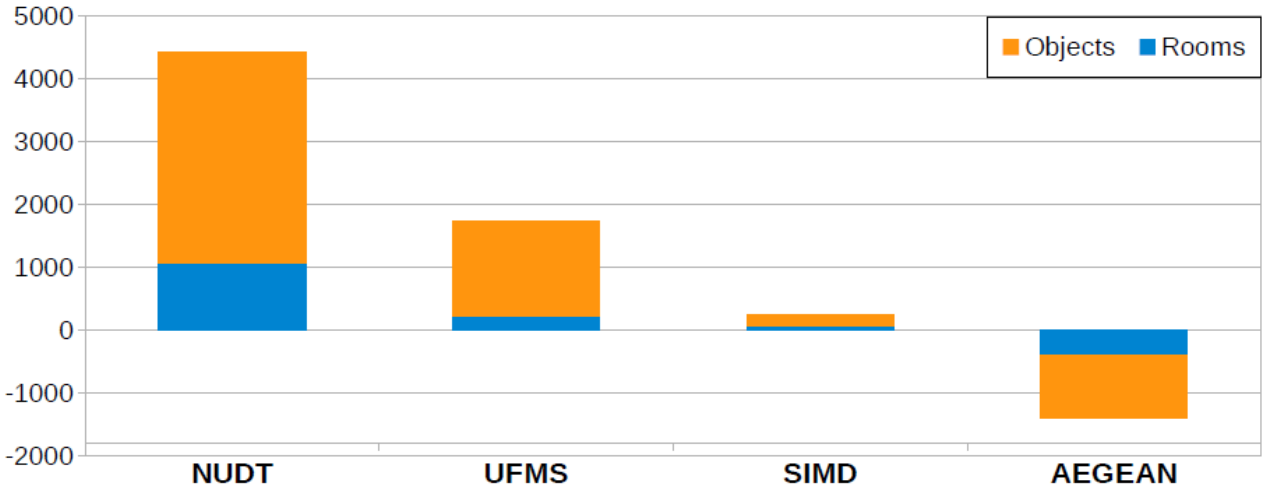
Rooms and objects

Results

- Submissions were evaluated by computing an overall score

Class/Room Category (one by frame)	
Correctly / Wrongly / Not Classified	+1.0 / -0.5 / 0.0 points
Object Recognition (8 by frame)	
True Positive (TP)/ FP/ TN / FN	+1.0 / -0.25 / 0.0 / -0.25 points

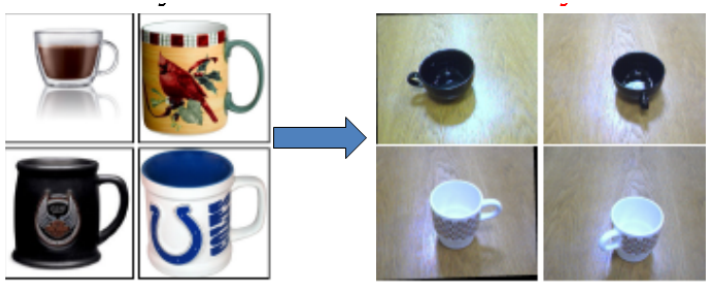
- Winner of the task: NUDT, Changsa, China



Domain adaptation task

Objectives and task

- Research challenge
  - How to learn object classifiers from few models learned in another domain



- The task
  - Learn object classifiers for 12 classes from 4 domains, use this knowledge to learn new objects in a fifth domain

Participants and runs

- Three groups submitted a total of 20 runs:
  - Xerox Research Center Europe
  - Hubert Curien Lab Group
  - Artificial Cognitive Systems Lab, Idiap Research Institute

Group Name	Score Total
XRCE	228
Hubert-Curien	158
Idiap	45

- Easiest class: airplane

Hardest classes: bike, dog

Lessons learned

- Ensemble Methods rule (see talk by B. Childlovskii)
- Choice to distribute pre-computed features vs. raw images suboptimal
- 40+ groups registered, 3 groups submitted runs, 1 group submitted working notes paper
- First edition of the task and it will not be continued

Liver retrieval task

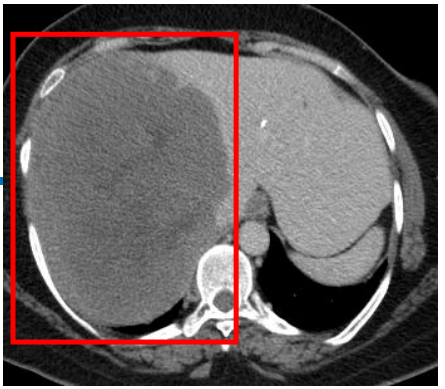
General overview

- Motivation
  - Low level visual features have a limited performance in clinical applications
  - Semantic features can work better and these can be predicted using visual features
  - This can potentially create more complete reports and ease retrieval
- Task
  - Given a cropped liver volume complete a standardized report with semantic terms in a given ontology

Data used

- 50 training and 10 test datasets
- Each training dataset is represented as:
  - A cropped 3D CT image of the liver
  - A liver mask, which defines the liver in the image
  - A ROI, which defines the lesion area in the image
  - A set of 60 CoG image descriptors of dimension 454
  - A set of 73 UsE features annotated using ONLIRA
- Test sets have the same format but UsE features are missing, goal is their prediction

Example data



Cluster size: 2
Segment: SegmentV, SegmentVI, SegmentVII, SegmentVIII
Lobe: Right lobe
Width: 175, Height: 126
Is gallbladder adjacent? True
Is peripheral localized: False
Is sub-capsular localized: False
Is central localized: True
Margin type: Lobular
Shape: Round
Is contrasted: False
Contrast uptake: NA
Contrast pattern: NA
Lesion composition: PureCystic
Is Calcified(area): False
Area calcification type: NA
Is calcified(Capsule): NA
Capsule calcification type: NA
Is calcified(polyp): NA
Polyp calcification type: NA
Is calcified(pSeudoCapsule): NA
Is calcified (Septa): NA
PSeudoCapsule calcification type: NA
Is calcified(solid component): NA
Solid component calcification type: NA
Is calcified(wall): NA
Wall calcification type: NA
Density: Hypodense
Density type: Homogeneous
Diameter type: NA
Thickness: NA
Is leveling observed: False
Leveling type: NA
Is debris observed: False
Debris location: NA
Wall type: Thin
is Contrasted(wall): False
Is Close to vein: Right portal vein, Right hepatic vein, Middle hepatic vein
Vasculature proximity: Bended

Results

- The BMET group, achieved the best results using an image retrieval technique
- A classifier-based method is used by the CASMIP group
- piLabVAVlab used a Generalized couple tensor factorization (GCTF) method

Grp	Comp.	Acc.	Score	Method	Feature
BMET	0.98	0.91	0.947	Image Retrieval	CoG
CASMIP	0.95	0.91	0.93	LDA + KNN	CoG+
piLabVaVlab	0.51	0.89	0.677	GCTF	CoG

Conclusions

- 2014 was a transition year for ImageCLEF with two totally new tasks
  - Split with LifeCLEF that has grown well
- Many groups get access to data but then do not submit runs for the competition
  - Maybe do not release the test data to all?
- Increase in performance can be seen

Contact and more information

- More information can be found at
  - http://www.imageclef.org/

- Contact:
  - Henning.mueller@hevs.ch