1. Master’s Thesis proposal

2. General Information

Master’s Thesis Title:	Learning Image Representations for Content-based Image Retrieval using Ranking Constraints.
Orientation:	research
M.Sc. Th. Advisor’s Dept. & University:	LSI,UPC
M.Sc. Th. Advisor:	Ariadna Quattoni
M.Sc. Th. Advisor e-mail:	aquattoni@lsi.upc.edu
Observations:	
Student’s Name: (if already known)	

3. M.Sc. Thesis Description

Main issues / Brief Description:

The goal of this project is to implement an automatic content-based image retrieval system using machine learning techniques. More specifically, we will learn domain specific similarity functions from user-feedback using ranking methods.

Detailed Description:

A content-based image retrieval system is an engine that given an image query returns the most relevant pictures in a database, that is, the images in the database most related to the query image. For instance, in the example below the images in the first row are query images, and the images below are related images that the retrieval system returns.

Most commercial content-based image-retrieval systems use low-level image representations such as texture or color histograms. Recently, there has been a growing interest on learning high-level 'semantic' image representations that are better suited to a specific retrieval domain. For example, one might wish to use one image representation for a museum's image database and a different one for a news image domain. The main idea of this project is to use machine learning techniques to derive domain specific image representations from user interactions with the retrieval system.

The goals of this project are:

1) Review the state of the art algorithms for learning representations from user feedback. 2) Develop novel algorithms that combine unsupervised techniques for learning low dimensional representations (e.g. Principal Component Analysis) with supervised techniques for learning from user feedback (e.g. Ranking Perceptron). 3) Implement a content-based image retrieval system for a given domain and test the different algorithms on a real image database.

[1] J. Sivic and A. Zisserman. “Video Google: A Text Retrieval Approach to Object Matching in Videos”. Proc. ICCV 2003.
[2] G. Chechik, V. Sharma, U. Sharit and S. Bengio. “Large Scale Online Learning of Image Similarity through Ranking”. Journal of Machine Learning Research,2010.
[3] A. Frome, Y. Singer, F. Sha and J. Malik. “Learning Globally-Consistent Local Distance Functions for Shape-Based Image Retrieval and Classification”, Proc. NIPS 2005.
[4] Lowe and David G. “Object recognition from local scale-invariant features”. Proc. Of ICCV 1999.

[1] Myung Jin Choi, Joseph Lim, Antonio Torralba, Akan Willsky, Exploiting Hierarchical Context on a Large Database of Object Categories,CVPR, 2010
[2] A. Quattoni, A. Torralba, Recognizing Indoor Scenes,CVPR 2009.
[3] A. Quattoni, M. Collins, T. Darrell, Transfer Learning for Image Classification with Sparse Prototype Representations,CVPR 2008.
[4] A. Quattoni, M. Collins, T. Darrell, Learning Visual Representations using Images with Captions, CVPR 2007 (B).
[5] A. Quattoni, S. Wang, L.P. Morency, M. Collins, and T. Darrell, Hidden-state Conditional Random Fields, IEEE PAMI, 2007 (A).
[6] A. Quattoni, M. Collins, T. Darrell, Conditional Random Fields for Object Recognition,NIPS 2004.

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