ÖAGM/AAPR 2013 – The 37th Annual Workshop of the Austrian Association for Pattern Recognition

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The 37th Annual Workshop of the Austrian Association for Pattern Recognition took place May 23–24, 2013, in the Plenary Hall of the new City Hall of Innsbruck, Austria, under the motto *Pattern Recognition and Computer Vision in Action*, and was attended by 56 participants.

The program was composed of 2 Keynote Talks by high-profile researchers from outside of Austria, 7 Featured Talks by established researchers and rising stars from the Austrian computer vision community, 2 special talks by the two Microsoft Visual Computing Award recipients, 11 contributed talks, and 9 posters. The contributed talks were selected from 14 submitted articles by peer review. Each article was reviewed by three members of the program committee. The 11 accepted articles are available on arXiv.

A Best Paper award was presented to Roland Perko for the paper

> Roland Perko, Thomas Schnabel, Gerald Fritz, Alexander Almer, Lucas Paletta, *Counting people from above: Airborne video based crowd analysis.*

A Best Student Paper award sponsored by the company M-BOX (Schwaz, Austria) was presented to Tanja Schilling for the paper

> Tanja Schilling, Tomáš Pajdla, *Euclidean Upgrade from a Minimal Number of Segments.*

The best papers were selected by the Conference Chairs based on the reviewers' ratings and comments, as well as their own critical jugdment.

The opportune moment was seized to announce and honor the two recipients of the Microsoft Visual Computing Award 2013:

> Chris Wojtan, IST Austria
> Kristian Bredies, University of Graz

The ÖAGM/AAPR 2013 Workshop Chairs,
Justus Piater and Antonio J. Rodríguez Sánchez

Keynote Speakers

Jean Ponce (INRIA and ENS, Paris, France): **Modeling visual recognition**

Abstract – This talk addresses the problem of automated visual recognition, that is, deciding whether an instance of some object class, for example, a chair, a person, or a car, is present in some picture, despite shape and color variations within the class, as well as viewpoint and illumination changes from one photograph to the next. After a brief historical discussion of the field, from early geometric methods to the current variations on bags of features and deformable part models, I will discuss some of our recent work that addresses issues such as taking explicitly into account shape and/or viewpoint variations within a category, selecting discriminative parts, and handling weak forms of supervision in tasks such as image categorization, object detection, image cosegmentation, and video interpretation.

Biography – Jean Ponce received the Doctorat de Troisieme Cycle and Doctorat d'Etat degrees in Computer Science from the University of Paris Orsay in 1983 and 1988. He has held Research Scientist positions at the Institut National de la Recherche en Informatique et Automatique, the MIT Artificial Intelligence Laboratory, and the Stanford University Robotics Laboratory, and served on the faculty of the Dept. of Computer Science at the University of Illinois at Urbana-Champaign from 1990 to 2005. Since 2005, he has been a Professor at Ecole Normale Superieure in Paris, France, where he now also serves as Head of the Department of Computer Science. In 2003, Dr. Ponce was named an IEEE Fellow for his contributions to Computer Vision, and he received a US patent for the development of a robotic parts feeder. He has served on the editorial boards of Computer Vision and Image Understanding, Foundations and Trends in Computer Graphics and Vision, the IEEE Transactions on Robotics and Automation, the International Journal of Computer Vision (for which he served as Editor-in-Chief from 2003 to 2008), and the SIAM Journal on Imaging Sciences. He was Program Chair of the 1997 IEEE Conference on Computer Vision and Pattern Recognition and served as General Chair of the year 2000 edition of this conference. He also served as General Chair of the 2008 European Conference on Computer Vision. Dr. Ponce is the co-author of Computer Vision: A Modern Approach, a textbook that has been translated in Chinese, Japanese, and Russian, and whose second edition came out in 2011.

François Fleuret (IDIAP, Martigny, Switzerland): *Boosting in Large Dimension Feature Spaces*

Abstract – It has been shown repeatedly that combining multiple types of features is an efficient strategy to improve the performance of machine learning techniques, particularly in computer vision. However, the use of multiple families of features increases the computational cost during training, which is usually linear with the feature space dimension.

I will present in this talk different strategies to reduce that computational cost in the case of Boosting. This classical learning procedure builds a strong classifier iteratively by picking at every iteration a weak learner to minimizes a loss in a greedy manner. Dealing with feature spaces

of large dimensions is usually achieved by sub-sampling a few features instead of using them all. The techniques we have developed use knowledge accumulated over previous Boosting iterations, or prior to starting the learning, to bias the sampling efficiently toward sub-families of features which are likely to provide a good reduction of the loss.

Experiments on several data sets demonstrate that such strategies are far more aggressive during training and indeed reduce the loss more efficiently, often by one or two orders of magnitude.

Biography – François Fleuret got the PhD degree in mathematics from the University of Paris VI in 2000 and the habilitation degree in applied mathematics from the University of Paris XIII in 2006. He has held positions at the University of Chicago, USA, and at the INRIA, France. Since 2007, he is the head of the Computer Vision and Learning group at the Idiap research institute in Switzerland, and is faculty member at the École Polytechnique Fédérale de Lausanne (EPFL) as Maître d'Enseignement et de Recherche since 2011. His research is at the interface between statistical learning and algorithmic, with a strong bias toward computer vision. He is the author/co-author of 60 reviewed journal and conference papers, serves as Associate Editor for the Transactions on Pattern Analysis and Machine Intelligence (TPAMI), and is or was expert for the Netherlands Organization for Scientific Research, the Austrian Research Fund, the Finish Research Council, and the French National Research Agency. He is the coordinator of the MASH European project.

Featured Speakers

Margrit Gelautz (TU Vienna): **Recent Advances in Local Stereo Matching**

Abstract – In this talk we address recent research in the field of local stereo matching, with a focus on adaptive support weight algorithms. In particular, we present a new stereo matching algorithm based on fast cost volume filtering that achieves high-quality disparity maps at real-time frame rates. Furthermore, we show an evaluation study that compares the performance of different adaptive support weight aggregation schemes. Finally, potential applications of the stereo-derived disparity maps for 3D film post-processing are discussed.

Vladimir Kolmogorov (IST Austria): **Discrete optimization algorithms in computer vision**

Abstract – A Basic *Linear Programming relaxation* is a popular approach for discrete optimization in computer vision. I will describe recent results that completely characterize classes of optimization problems (from a certain family) for which this relaxation is exact. These classes include submodular functions, bisubmodular functions, and some new tractable classes. I will then talk about potential applications of bisubmodular functions. Time permitting, I will switch topics and talk about pattern-based CRFs for sequence data.

Christoph Lampert (IST Austria): **Visual Scene Understanding**

Abstract – It is one of the holy grails in computer vision research to build automatic systems that can understand images on a similar level as humans can, i.e. answer questions such as "What objects are visible in this

scene?", "How do they interact?", and even "What is going to happen next?". It is only recently that computer vision has made significant progress in these directions, mainly driven by the development of new machine learning techniques and the availability of large amount of image data. Im my talk I will give a short overview of the state-of-the-art in the field, and highlight some of the work done in my group at IST Austria.

Thomas Pock (TU Graz): **Non-smooth Convex Optimization for Computer Vision**

Abstract – In this talk, we propose and analyze a flexible and efficient first-order primal-dual algorithm that is particularly suitable for solving large-scale non-smooth convex optimization problems. The algorithm comes along with guaranteed convergence rates, which are known to be optimal for first-order methods. A further advantage of the algorithm is, that it can be efficiently parallelized on graphics processing units, hence allows to solve some problems even in real-time. We will show applications to several computer vision problems ranging from optical flow estimation to 3D reconstruction.

Peter Roth (TU Graz): **Mahalanobis Metric Learning for Image Classification**

Abstract – Mahalanobis metric learning was recently of highly scientific interest in both, machine learning and computer vision. The main idea is to exploit the (discriminative) structure of the data and to explicitly learn a new metric providing much more meaningful distance measures. These can later be used for learning more effective classifiers or for direct k-nearest-neighbor matching. Thus, we first discuss metric learning from a very general point of view and discuss when it could be a beneficial tool for classification tasks. Then, we give an overview of (a) specific popular approaches which have been successfully applied for different applications and (b) of novel methods especially trying to reduce the computational effort during training. Finally, to demonstrate the benefits and to highlight the differences between different approaches, we discuss results for specific tasks such as face and person recognition.

Robert Sablatnig (TU Vienna): **Multispectral Image Acquisition for Manuscript Research**

Abstract – Manuscript analysis and reconstruction has long been solely the domain of philologists who had to cope with complex tasks without the aid of specialized tools. Technical scientists were only engaged in recording and conservation of valuable objects. In recent years, however, interdisciplinary work has constantly gained importance, concentrating not on a few special tasks only, like the development of OCR software, but comprising an increasing amount of relevant interdisciplinary fields like material analysis and document reconstruction. Within the framework of the Austrian Science Fund project "Critical Edition of the New Sinaitic Glagolitic Euchology (Sacramentary) Fragments with the Aid of Modern Technologies", philologists, image processing specialists and chemists are working together in an endeavor to analyze and edit three Old Church Slavonic parchment codices written in Glagolitic script.

Within our framework, a multi-spectral representation of the page acquired is the basis for our subsequent analyses since this data representation holds a great potential for increasing the readability of historic texts,

especially if the manuscripts are (partially) damaged and consequently hard to read. The readability enhancement is based on a combination of spatial and spectral information of the multivariate image data, a so called Multivariate Spatial Correlation. Additionally, Independent Component Analysis (ICA) and Principal Component Analysis (PCA) have been successfully applied for the separation and enhancement of diverse writings. Results show, that the readability my be enhanced by 70%. Furthermore we apply layout analysis and the structure of the character is characterised by its skeleton and dissected into trokes and nodes for an automatic formal classification of static, i.e. as they look like, graphetic attributes. The automatic character feature classification represents the starting point from where we will single out those features for computer processing that are able to mark a character distinctly in order to facilitate script reconstruction, automatic amendments of (incompletely preserved) letters, and OCR.

Michael Zillich (TU Vienna): **RGBD Vision for Robotics**

Abstract – The introduction of afforable RGBD sensors like the Microsoft Kinect or Asus Xtion has had a large impact especially on (indoor) robot vision, replacing stereo or more complex range sensing devices. Many traditionally hard 2D vision problems suddenly became a lot more tractable. In this talk I will give an overview of ongoing work in our group on RGBD-based scene segmentation, object reconstruction, recognition, classification and tracking, as well as their applications to typical robotics tasks such as finding and fetching items.

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