

KOLLOQUIUM

Informatik-Sonderkolloquium

Learning a Hierarchical Compositional Shape Vocabulary for Multi-class Object Representation

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Hierarchies allow sharing of features between the visually similar as well as dissimilar classes at multiple levels of specificity. This makes them potentially suitable for learning and recognizing a higher number of object classes. However, the success of the hierarchical approaches so far has been hindered by the use of hand-crafted features or predetermined grouping rules. In this talk, I will present a framework for learning a hierarchical compositional shape vocabulary for representing multiple object classes.

The approach takes simple contour fragments and learns their frequent spatial configurations. These are recursively combined into increasingly more complex and class-specific shape compositions, each exerting a high degree of shape variability. The top-level vocabulary compositions code the whole shapes of the objects. The vocabulary is learned sequentially, layer after layer, statistically adjusting to the visual data. The lower layers are learned jointly on images of all classes, whereas the higher layers of the vocabulary are learned incrementally, by presenting the algorithm with one object class after another. Learning of the classes is supervised, where we assume that the positive and validation set of class images is given -however, we learn the hierarchical structure of each class in a completely unsupervised way. The experimental results show that the learned multi-class representation scales logarithmically with the number of classes and achieves the state-of-the-art detection performance at both, faster inference as well as training times.

(This is a joint work with Sanja Fidler and Marko Boben.)

Bio: Aleš Leonar is a full professor and the head of the Visual Cognitive Systems Laboratory with the Faculty of Computer and Information Science, University of Ljubljana. He is also an adjunct professor at the Faculty of Computer Science, Graz University of Technology. From 1988 to 1991, he was a visiting researcher in the General Robotics and Active Sensory Perception Laboratory at the University of Pennsylvania. From 1995 to 1997, he was a postdoctoral associate at the PRIP, Vienna University of Technology. He was also a visiting researcher and a visiting professor at the Swiss Federal Institute of Technology ETH in Zurich and at the Technische Fakultät der Friedrich-Alexander-Universität in Erlangen, respectively.

His research interests include robust and adaptive methods for computer vision, object and scene recognition and categorization, statistical visual learning, 3D object modeling, and biologically motivated vision. He is an author or coauthor of more than 160 papers published in journals and conferences and he coauthored the book *Segmentation and Recovery of Superquadrics* (Kluwer, 2000). He is an Editorial Board Member of *Pattern Recognition*, an Editor of the Springer Book Series *Computational Imaging and Vision*, and an Associate Editor of the *IEEE Transactions on Pattern Analysis and Machine Intelligence*. He has served on the program committees of major computer vision and pattern recognition conferences. He was also a program co-chair of the European Conference on Computer Vision, ECCV 2006. He has received several awards. In 2002, he coauthored a paper, "Multiple Eigenspaces," which won the 29th Annual Pattern Recognition Society award. In 2004, he was awarded a prestigious national Award for scientific achievements. He is a fellow of the IAPR and a member of the IEEE and the IEEE Computer Society.

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