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Author

Ullman, Shimon

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Recognition, Categorization, and the Emergence of Meaning

Prof. Shimon Ullman (shimon.ullman@weizmann.ac.il)

Samy and Ruth Cohn Professor of Computer Science
Department of Computer Science and Applied Mathematics
Weizmann Institute of Science
Rehovot 76100 Israel

I will describe an approach to the recognition of object categories and individual objects, as well as their meaningful parts structure. Starting with a collection of images containing examples of an object category, such as 'face', 'car', or 'horse', the scheme constructs a category representation, and then uses it to identify novel members of the category as well as their parts and sub-parts at multiple levels. The acquired object representation uses a hierarchy of shared sub-structures called fragments, selected by maximizing the information delivered for categorization. Recognition of objects and their parts is obtained by a feed-forward sweep from low to high levels of the hierarchy, followed by a top-down sweep which exploits global context to resolve local ambiguities. For the purpose of individual object recognition, fragments representing different appearances of the same object part are combined in the representation into abstract 'semantic features', which are invariant to large changes in appearance. I will describe results of learning novel categories and objects, and discuss future directions at the boundary of vision and cognition.