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Recent progress in computational modeling of human visual attention

Ali Borji
University of Southern California, USA

Over the last two decades, the inter-disciplinary fields of attention, visual saliency, and search have attracted a lot of interest incognitive sciences, computer vision, and machine learning. The high complexity of natural environments requires the primate visual system to combine, in a highly dynamic and adaptive manner, sensory signals that originate from the environment (bottom-up) with behavioral goals and priorities dictated by the task at hand (top-down). I will talk about recent efforts in three directions: 1) Bottom-up attention: I will give a snapshot of biological findings on visualattention,theoretical background on saliency concepts and models, and successful applications of models, 2) Top-down attention: I will describe our neuromorphic algorithms to predict, in a task-independent manner, which elements in a video scene might more strongly attract the gaze of a human. Multi-modal data including bottom-up saliency, "gist" or global context, physical actions, and object properties (using example recorded eye movements and videos of humans engaged in various 3D video games, including flight combat, driving, first-person, running a hot-dog stand that serves hungry customers) are utilized to associate particular scenes with particular locations of interest, given the task (e.g., when the task is to drive, if the scene depicts a road turning left, the system learns to look at that left turn), and 3) Intent decoding: I will present two examples of successful task decoding including search target in synthetic search arrays or natural scenes, and the question under which an observer viewed a scene (i.e., Yarbus' classic experiment)

Biography

Ali Borji received the BS and MS degrees in computer engineering from the Petroleum University of Technology, Tehran, Iran, 2001 and Shiraz University, Shiraz, Iran, 2004, respectively. He received the Ph.D. degree in cognitive neurosciences from the Institute for Studies in Fundamental Sciences (IPM) in Tehran, Iran, 2009. He is currently a postdoctoral scholar at iLab, University of Southern California, Los Angeles where he has been since March 2010. His research interests include computer vision, machine learning, and neurosciences with particular emphasis on visual attention, visual search, active learning, and scene & object recognition, and biologically plausible vision models.

aliborji@gmail.com

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