

Deep Learning, Generative Adversarial Networks and Domain Adaptation – Technologies that will Transform Clinical Research and Health Care

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Abstract

Recent advances in Computer Vision (CV), especially in deep learning and Machine Learning (ML) have the potential to transform clinical research and health care. Over the last decade, my group has developed deep learning systems for the detection and recognition of faces, emotions, objects and actions, as well as CV algorithms for markerless motion capture and gait analysis – this has resulted in dramatic performance on unconstrained image and video data. In addition, we have shown the effectiveness of Generative Adversarial Networks (GANs) for domain adaptation with applications in semantic segmentation and object recognition. We have also studied the problem of forensic examiners and deep learning algorithms working together. In this talk, I will describe some of these developments and discuss potential applications of deep learning in the health sciences, including multi-modal data fusion, prediction of undesirable outcomes from medical signals and images, evaluating pain based on facial expressions and monitoring patients (e.g. video EEG) and their movements. While the prospects of ML for transforming health care and clinical research are exciting, several challenges such as learning from small-annotated data or large unlabeled data, adapting/generalizing ML algorithms to related and novel tasks and designing communicable ML techniques remain to be addressed.

Bio of Rama Chellappa

Prof. Rama Chellappa is a Distinguished University Professor, and a Minta Martin Professor of Engineering in the ECE department at the University of Maryland. His current research interests span many areas in image processing, computer vision, machine learning and pattern recognition. Prof. Chellappa is a recipient of an NSF Presidential Young Investigator Award and four IBM Faculty Development Awards. He received the K.S. Fu Prize from the International Association of Pattern Recognition (IAPR). He is a recipient of the Society, Technical Achievement and Meritorious Service Awards from the IEEE Signal Processing Society. He also received the Technical Achievement and Meritorious Service Awards from the IEEE Computer Society. Recently, he received the inaugural Leadership Award from the IEEE Biometrics Council. At UMD, he received college and university level recognitions for research, teaching, innovation and mentoring of undergraduate students. In 2010, he was recognized as an Outstanding ECE by Purdue University. He received the Distinguished Alumni Award from the Indian Institute of Science in 2016. Prof. Chellappa served as the Editor-in-Chief of PAMI. He is a Golden Core Member of the IEEE Computer Society, served as a Distinguished Lecturer of the IEEE Signal Processing Society and as the President of IEEE Biometrics Council. He is a Fellow of IEEE, IAPR, OSA, AAAS, ACM and AAAI and holds six patents.