Polymers and the Smart Machines

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Smart polymers have been around for decades, with varied applications in many areas to exploit their nonlinear response to different types of stimuli. There is now the expectation of employing polymers, not necessarily smart, to produce sensors and actuators for smart machines. One straightforward use is in actual components of a robotized, automated machine. However, even more relevant will be the use of such polymer devices to generate data and feed a machine learning system to take advantage of Big Data methodologies. The latter smart machines are being built with the convergence of two important movements. On one hand, data from ubiquitous sensing are stored and curated in order to become machine readable; on the other hand, computational linguistics methods are being used to "teach" machines to read. In this lecture, examples of these movements will be provided with sensing data from electronic tongues to correlate with the human perception of taste, and of biosensing data to develop a computer-assisted diagnosis system. As for the ability of machines to acquire language, the use of complex networks and information visualization will be illustrated in classifying text. Most importantly, if these movements are successful one may envisage a new paradigm in which knowledge will be generated by machines, with no human intervention for the first time in history. The implications of such a shift in science and technology paradigms for the job market will be discussed, highlighting the new demands for the training of polymer scientists and engineers.