This workshop seeks to augment human decision making by exploiting synergies across two areas of AI research where exciting research progress has been made in recent years, but which so far have not had an explicit common venue. The first area has to do with powerful new learning techniques that may have the potential to automatically learn complex tasks by directly training on massive amounts of raw data, much of which may be unlabeled, unstructured, and multi-modal in form (natural language text/speech, audio, video, and others). These techniques include deep learning, manifold learning, sparsity-based techniques, and transfer/cross-modal learning and inference methods. Researchers employing such techniques have recently achieved quantum performance leaps in speech and image recognition tasks, and have also demonstrated the ability to learn complex feature representations entirely from unlabeled data. The second area has to do with enabling computers to understand and work with naturalistic input from humans, in the form of natural language speech or text, visual input such as gestures or facial expressions, and haptic (touch-based) inputs. The most exciting demonstrations of these capabilities in the last few years include Question-Answering systems such as Watson and Wolfram Alpha, and commercially deployed personal assistant technology such as Siri, Google Now, Dragon Mobile Assistant, Nina, and TellMe. Synergistic advances in these two trends could vastly improve human decision making in many scenarios, including information overload (such as driving), cognition impairment (for example Alzheimer’s) or collective (multi-objective) decision-making (such as conference program scheduling, disaster response).

Cognitive computing is an emerging research topic inspired by a vision of how this unification could lead to a new generation of computing systems enabling genuine human-machine collaboration. According to this vision, we may soon be able to build computing systems capable of understanding high-level objectives specified by humans in a natural language, autonomously learning how to achieve the objectives from data in the domain, reporting results back to humans, and iterating the interactions via sequential dialog until the objectives are achieved. As building and deploying such systems may require major platform improvements with respect to size, power usage, and so on, there is also a significant focus in cognitive computing on alternative hardware, such as brain-inspired or other non-von Neumann architectures.

Unlike expert systems of the past, which required inflexible I/O and hard-coded expert rules, cognitive computing systems will process natural language and unstructured data and learn by experience, much in the same way humans do. They will utilize deep domain expertise to provide decision support and help humans make better decisions based on available data, whether in healthcare, finance or customer service. In traditional AI, humans are not part of the equation, yet in cognitive computing, humans and machines work together. To enable natural interaction, cognitive computing systems use image and speech/audio recognition as eyes and ears to perceive the world and interact more seamlessly with humans. By using visual analytics and data visualization techniques, cognitive computers can display insights from data in a visually compelling way. This sets up a feedback loop wherein machines and humans may learn from each other.
In this context, the aim of the workshop is to draw the attention of the AI community to three primary research challenges of cognitive computing: (1) innovative hardware systems to support cognitive functions (possibly inspired by neuronal wetware); (2) cognitive experience interfaces (speech/vision/touch); and (3) software systems that emulate automatic learning of cognitive functions in humans (reasoning, perception, communication, goal-seeking, and so on or emulate actual neurophysiological mechanisms and algorithms that support human cognition.

The workshop will feature 4 full papers, 6 short papers, 5 invited speakers and a panel discussion. Thus it promises to be an exciting day of insightful and thought-provoking discussions.

– Biplav Srivastava, Aurelie Lozano, Janusz Marecki, Irina Rish, Ruslan Salakhutdinov, Gerald Tesauro, Manuela Veloso