

# On the impact of activity recognition in monitoring cognitive decline

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## KEYNOTE ABSTRACT

The world senior population is projected to double as a percentage over the whole population in the next decades. In order to preserve or improve the quality of life of this population, as well as to keep healthcare costs sustainable, it is important to better support their ability of independent living. Cognitive decline is a major threat to independent living; it may be experienced in normal aging but it may also lead to mild cognitive impairment (MCI) and more serious neurodegenerative cognitive disorders. Early detection of cognitive decline, accurate diagnosis and monitoring of its evolution for early intervention are a priority. Researchers have found that subtle differences in performing instrumental activities of daily living (IADLs) as well as the recognition of subtle errors while performing IADLs may be useful for MCI diagnosis as well as to differentiate different forms of cognitive disorders. However, occasionally performing ability tests in equipped rooms on medical premises has several shortcomings including cost and reliability of results. Pervasive computing coupled with intelligent data analysis can have a major role in this application domain by continuous monitoring of activities at home during daily life. This idea has been at the core of several recent research projects.

The main challenges that we are facing are: a) reliability, unobtrusiveness and affordability of the sensor infrastructure, b) precision and robustness of techniques for IADL recognition, c) effectiveness of algorithms for recognizing *fine-grained* abnormal behaviors identified by clinicians as relevant indicators, d) identification of relevant patterns through long-term data analysis, e) privacy-awareness of data acquisition and management, f) effectiveness of visualization and interaction tools for clinicians.

This talk will discuss the above challenges, report the experience on using hybrid statistical and knowledge-based techniques for addressing the recognition tasks, and identify critical aspects still to be investigated.

## TECHNICAL REFERENCE

D. Riboni, C. Bettini, G. Civitarese, Z. H. Janjua, and R. Helaoui, Smartfaber: Recognizing fine-grained abnormal behaviors for early detection of mild cognitive impairment, *Artificial Intelligence in Medicine*, 2016.

## KEYNOTE SPEAKER BIOSKETCH

Claudio Bettini is professor of computer science at the University of Milan, where he leads the EveryWare laboratory (<http://everywarelab.di.unimi.it/>). He received his PhD in Computer Science from the University of Milan in 1993. He has been post-doc at IBM Research, NY, and, for more than a decade, an affiliate research professor at the Center for Secure Information Systems at George Mason University, VA. His research interests cover the areas of mobile and pervasive computing, data privacy, temporal and spatial data management, and knowledge management. On these topics he has coordinated several research projects and extensively published in leading conferences and journals. He has been serving as PC Chair and General chair in the organisation of major events in the Mobile and Pervasive Computing areas. He has been associate editor of *The VLDB Journal*, the *Journal of Pervasive and Mobile Computing*, *IEEE TKDE*, *PeerJ Computer Science Journal*. In 2011 he founded EveryWare Technologies, a startup developing innovative mobile apps. He is a member of ACM SIGMOD and IEEE Computer Society.

