**Hearables: A keyhole into the state of body and mind**

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**Abstract:** Future health systems require the means to assess and track the neural and physiological function of a user over long periods of time, and in the community. Human body responses are manifested through multiple, interacting modalities – the mechanical, electrical and chemical; yet, current physiological monitors (e.g. actigraphy, heart rate) largely lack in cross-modal ability, are inconvenient and/or stigmatizing. We address these challenges through an inconspicuous earpiece, which benefits from the relatively stable position of the ear canal with respect to vital organs. Equipped with miniature multimodal sensors, it robustly measures the brain, cardiac and respiratory functions. Comprehensive experiments validate each modality within the proposed earpiece, while its potential in wearable health monitoring is illustrated through case studies spanning these three functions. We further demonstrate how combining data from multiple sensors within such an integrated wearable device improves both the accuracy of measurements and the ability to deal with artifacts in real-world scenarios. This framework opens up the avenues for a subsequent use of a number of machine learning paradigms, from lifelong learning to Big Data, to be used in a real world application of utmost importance - new generation health systems.

**Biography:** Danilo P. Mandic is a Professor in signal processing with Imperial College London, UK, and has been working in the areas of adaptive signal processing and bioengineering. He is a Fellow of the IEEE and member of the Board of Governors of International Neural Networks Society (INNS). He has received five best paper awards in Brain Computer Interface, runs the Smart Environments Lab at Imperial, and has more than 300 publications in journals and conferences. Prof Mandic has received the 2019 Dennis Gabor Award by the International Neural Networks Society (for outstanding achievements in neural engineering), and the President Award for Excellence in Postgraduate Supervision at Imperial. His work on Hearables appeared in IEEE Spectrum, MIT Technology Review and has led to several granted patents in this area.