UMAP in the Era of Pervasive Computing and Big Data
Challenges of the Future

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- The Internet of Things (IoT) concept could refer to a connected world based on the proliferation of a number of intelligent devices and services that bring smartness in an ecosystem, enhancing communication, increasing speed, social inclusion, etc.
- Or, it could refer to a new reality around people that at a far extreme is liable to affect their (subjective) perception and draw questions with regard to what is right and wrong. Since, the convergence of the physical and the virtual life becomes even more obvious and creates different semantics of understanding for the flow of information from one agent to another that its acceptability and impact will need to be evaluated with different rules and regulations.
- The IoT is a network of real-time interconnected agents that is everywhere reproducing its own intelligence. A global brain where, in simple terms, each cell is a human/user, each neuron the message he/she sends and the synapses the interaction. The yielded accumulated information from this process maintains its presence and contributes to the formulation of its collective intelligence that will keep growing.
- A challenge is to identify the effect of the "leading" role of the technology in the evolution. There is an increased likelihood (or even danger) that technology will drive developments into directions with no clear reasoning and strong grounds at its basis. In this "war of apps" there is the risk that the pure technological-driven developments will not contribute to the solution of real problems and concerns that could be proven beneficial for the users.
- In the business sector, software will undertake a big part of the market. A complete solution should be composed by a sensor, processor, radio, and operating system in one place. However, it is still not clear how the operating system will be positioned in this setting, as it is not clear how the whole economic system will function and where it will balance. Servers have already been transformed into virtual servers, since they are not anymore figuring as a central point of a system with physical presence. They are gradually designed for specific jobs/ functionalities and are virtually found i.e. on the cloud.
- At the enterprise level, there will be a growing cross industry competition but at the same time a rising necessity for collaboration. The rate of companies absorbing other companies will increase substantially, taking advantage of their unique expertise, in order to stay competitive.
- A key challenge for the new generation of tools and services is to provide an enhanced positive user experience, satisfying the unique user. In simple words, user should be able to use them without being necessary to undergo through training, change their way of thinking or their everyday life activities. Now, the need for

adaptivity and personalization is even more recognizable since these two research areas through their philosophy, methods and techniques can create hybrid solutions that could adequately support the generated specialized use cases, where it is a fact that every user will be at the same time a peer of the IoT.

- Each peer has unique traits, abilities, experiences, etc. that directly affect another. It is therefore of paramount importance to increase the quality of information delivered in order to increase users' comprehension, usability and decision making.
- The vast amount of dynamic data produced by all agents over the network should not be driven by pure data models, but rather should be processed in a user-centric manner, generating "meaningful" services, visualizations, etc., based on enriched user models.
- Adaptivity and personalization should not focus only on a design level enhancing users interaction and usability, but at the same time at a network level where intelligent techniques should decide for the volume and kind of information that need to be retrieved by the various network nodes (and multi-contextual interaction points) given the particular objectives and needs of a unique peer.
- IoT refers to a digital ecosystem totally different than the ones we are familiar with. It embodies millions of real-time edge nodes, which constitute a system similar to a biological one and probably we should start considering other prevention or recovering strategies and methods. In a similar way with what the body does for defending ad-hoc localized attacks, we should develop more intelligent security algorithms that first have to "diagnose the symptoms" before tackling the diverse multi-objective attacks.