



Università  
Ca'Foscari  
Venezia

**PROJECT ACRONYM AND TITLE:** Hume-Nash Machines: Context-Aware Models of Learning and Recognition

**FUNDING PROGRAMME:** Samsung - Global Research Outreach

**CALL:** Samsung - Global Research Outreach 2015

**SCIENTIFIC FIELD:** Contextual recognition, multi-agent game theory, multimodal analysis of social signals

**HOST DEPARTMENT/CENTRE:** Dept. of Environmental Sciences, Informatics and Statistics

**SCIENTIFIC RESPONSIBLE:** Marcello Pelillo

**FINANCIAL DATA:**

Project total costs	Overall funding assigned to UNIVE
€ 87.326,00	€ 87.326,00

**ABSTRACT:**

We aim to develop a computational framework for pattern recognition and machine learning problems which is grounded in the primacy of relational and contextual information at both the object and the category levels. We shall deal with semantic categorization scenarios involving a number of interrelated classes, the common intuition being the idea of viewing classification problems as non-cooperative games, whereby the competition between the hypotheses of class membership is driven by contextual and/or similarity information encoded in terms of payoff functions. Contrary to standard classification algorithms, which are based on the idea of assigning similar objects to the same class labels, thereby neglecting category-level similarities, our model will conform to the more general “Hume’s similarity principle” which prescribes that similar objects should be assigned to similar categories. According to this perspective, the focus shifts from optimality to Nash equilibrium conditions. Particular emphasis will be given to evolutionary game-theoretic models which offer a fresh dynamical systems perspective to learning and classification problems.

We aim to apply our Hume-Nash algorithms to the analysis of multimodal “social signals” emerging among several subjects engaged in an interaction scenario. One of the fundamental issues in the recognition of social signals is that, by definition, they do not exist in isolation, but are a result of the interaction of two or more agents. This calls for a context-aware approach which takes into account local environmental information, and game theory appears to be a natural, yet unexplored framework to use. The main idea is that the social cues detected, their evolution and their interplay among the interactants can be modeled as strategies in a multi-agent evolutionary signaling game thereby allowing us to determine the agents’ interactions and intentions, and the whole group dynamics. These cues will be captured using the

multimodal audio/visual appearance of the interactants which include, for example, gaze, gesturing, body posture, global/local body motion, speech features, etc.

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<b>Planned Start date</b>	<b>Planned End date</b>
<b>1<sup>st</sup> October 2015</b>	<b>30<sup>th</sup> September 2016</b>

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**PARTNERSHIP:**

<b>1 Università Ca' Foscari Venezia</b>	<b>Venice (IT)</b>	<b>Coordinator</b>
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