

# CogNovo: Cognitive Innovation for Technological, Artistic, and Social Domains

**Diego S. Maranan, Frank Loesche, Susan L Denham**

CogNovo, Cognition Institute, School of Psychology, University of Plymouth  
Plymouth, United Kingdom  
{diego.maranan, frank.loesche, s.denham}@plymouth.ac.uk

## Abstract

CogNovo is a multi-national doctoral training programme offering a research network for cognitive innovation, both as a new field of artistic and scientific investigation, and as a strategy for research and innovation. We summarize the programme's goals, themes, members, partners, and projects in this paper.

## Keywords

Cognitive neuroscience, computational modelling, humanities, experimental psychology, creative industries, cognitive robotics, game design, PhD programmes, cognitive innovation, interactive arts

## Programme overview

Why is novelty creation and selection so important for cognitive functioning? Is it necessary for autonomous knowledge acquisition in artificial systems? What is the relationship between novelty, usefulness, and creativity? Can a deeper understanding of perception and the generation of ideas help forge new links between cognitive science, technology, the arts, and the humanities, thus creating new opportunities for innovation? CogNovo<sup>1</sup> is a multi-national doctoral training programme that addresses such questions. Based in the Cognition Institute at the University of Plymouth (UK), CogNovo focuses on interdisciplinary research in cognition, novelty, and creativity. The programme aims to disrupt single-field research and to establish a rigorous basis for cognitive innovation and a research training programme in which new researchers learn to adopt the self-aware, multi-faceted process of cognitive innovation (exploration/speculation, explanation/synthesis, and exploitation/implication), applicable both to their research activities as well as their professional and personal development.

## Programme themes

CogNovo is characterized by a wide-ranging interdisciplinary approach, formed by combining the following complementary streams:

The **experimental psychology** stream involves studying perceptual, developmental, and cognitive aspects of creativity as well as developing innovative solutions to problems

in alarm design, medical communications, decision-making, and cinema technologies, thus providing new insights into the basis for sustainable social innovation.

The **interactive and creative arts** stream explores the role of and effects on cognition in the creative process within a range of artistic disciplines including digital games, music, interactive sound, and dance. This stream also explores the dynamics of social creativity within interacting groups through direct engagement with creative practices.

The **cognitive neuroscience** stream explores the neural and physiologic basis for cognitive innovation and the relationship between cognition, novelty and creativity. CogNovo fellows will apply neuroimaging technologies to investigate creativity in imagery and deception, and how novelty detection helps to shape cognition and inspire creative responses and outputs.

The **humanities** stream takes a transdisciplinary approach to broadening the scientific ear of CogNovo fellows by offering new ways of thinking about problems not normally considered within the scientific community. A particular focus is on the human values important for sustainable innovation in technological applications.

The **computational modelling** stream develops bio-inspired models that provide testable explanations for creative cognitive processes. Computational modelling provides important links between cognitive neuroscience and experimental psychology and a basis for developing novel intelligent cognitive technologies.

The **cognitive robotics** stream tackles the problem of developing human-like cognition in artificial robotic systems. It examines the role of artificial creativity in the development of artificial cognition.

Training workshops that relate to these themes have already been held. These workshops have focused on research methods (April 2014), experimental approaches (June 2014), and computational modelling (September 2014).

## Programme Members and Partners

There are currently 25 doctoral students from 15 countries in the programme. They are supervised by a team of over 45 University faculty members from across a range of disciplines, and by over 25 external academic and private industry partners from Europe, Asia, and North America. Fourteen of

<sup>1</sup>Official website: <http://www.cognovo.eu>

the research fellows are funded through the European Commission's Marie Skłodowska-Curie Actions programme, and the other eleven are funded directly by the University. The Marie Skłodowska-Curie Actions programme provides generous research funding to students alongside ample opportunity to gain experience abroad and in the private sector during the course of their studies.

### Example Projects

Each of the 25 fellows works on a distinct project related to novelty, creativity, and cognition. This section describes a selection of the projects to demonstrate the range of concerns tackled within CogNovo.

**I Sing the Body Electric (Project 8)** explores how the Internet is changing patterns of creative cognition and behaviour. It examines how the Internet is influencing the creation of music by exploring how ideas propagate through Web-based communities.

**Participative Interactive Gaming (Project 9)** investigates notions of play through a series of experimental games and playful interactions that take place in mixed reality environments. The project involves artistic research into various aspects of complex systems such as neural network models and dynamical systems with chaotic behaviour.

**Early Cinema and Cognitive Creativity (Project 10)** investigates the temporal resolution and inter-frame nature of analogue and digital film projection and its effect on the cognition of the cinema spectator. It explores whether the cognitive experience of cinema has changed as a result of the transition from analogue to digital cinema projection.

**Creative Solutions in Alarm Design (Project 12)** aims to create a framework for alarm design research to develop an understanding of the cognitive semiotic underpinnings of both the design and interpretation of auditory alarms.

**Creative technologies for behaviour change (Project 13)** translates insights from Elaborated Intrusion theory into novel treatments for unhealthy lifestyles, with a specific focus on social robotics and mobile apps to stimulate imagination and suggest mental imagery to users.

**Unconscious Creativity: The Eureka moment (Project 16)** focuses on the process of creative problem solving by understanding how to overcome impasses and the role of restructuring problems. It will look closely at neural activity in order to develop a model of the emergence of novel insights.

**Neural Concept Sampler (Project 17)** computes and represents concepts found in musical patterns using neural networks in order to generate innovative pieces of music using neural networks' conceptual representations of musical fragments.

**Moral cognition and creative thinking (Project 19)** brings together experimental psychology, psychopharmacology and robotics to investigate predictors of moral decision making in state-of-the-art virtual environments in order to model real life moral behaviours.

**Creating a voice for engagement and trust (Project 21)** aims at creating an artificial voice for a robot that sounds trustworthy, based on phonetic and prosodic characteristics of English accents. A specifically-designed trust game is used

to analyse more trustworthy voices and their characteristics in detail.

**Understanding the Human Object (Project 24)** questions the idea of establishing a working consensus between different disciplines and their views and on the rhetoric within scientific modelling, through the creation of a class of provocative objects that may reconcile or conflate opposing sentiments.

**Intuitive Interface for Robotic Remote Control (Project 25)** aims to design flexible, intuitive, and largely reconfigurable telerobotic interfaces, drawing on psychological and kinaesthetic analysis to investigate the quantitative and qualitative dimensions of movement.

### Summary

CogNovo aims to develop a ground-breaking training programme in cognitive research for technological, artistic, and social innovation. We look forward to further CogNovo training workshops in public outreach (January 2015), entrepreneurship (May 2015), social creativity (July 2015). We expect that these sessions – in addition to the Humanities Perspectives conference *Off the Lip* (September 2015) and a Cognitive Innovation Summer School (July 2016) – not only will develop among CogNovo fellows the advanced expertise and transferable skills that will prepare them for successful careers in academia and industry, but will also strengthen the worldwide network of leading research labs and innovative industries within which CogNovo is embedded.

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