

# An Introduction to Human Computation and Games with a Purpose

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**Abstract.** Crowdsourcing and human computation are novel disciplines that enable the design of computation processes that include humans as actors for task execution. In such a context, Games With a Purpose are an effective mean to channel, in a constructive manner, the human brainpower required to perform tasks that computers are unable to perform, through computer games. This tutorial introduces the core research questions in human computation, with a specific focus on the techniques required to manage structured and unstructured data. The second half of the tutorial delves into the field of game design for serious task, with an emphasis on games for human computation purposes. Our goal is to provide participants with a wide, yet complete overview of the research landscape; we aim at giving practitioners a solid understanding of the best practices in designing and running human computation tasks, while providing academics with solid references and, possibly, promising ideas for their future research activities.

**Keywords:** Crowdsourcing, Human Computation, Games With a Purpose.

## 1 Introduction

The Web has evolved from a publishing platform to a collaborative and social tool, where users spend time online for sharing information and opinions, cooperating in the execution of tasks, playing games, and participating to the collective life of communities. Crowdsourcing [1] and human computation [2] are novel disciplines that exploited such an evolution to enable the design of computation processes that include humans as actors for task execution. In such a context, Games With a Purpose [3] are an effective mean to channel, in a constructive manner, the human brainpower required to perform tasks computers are unable to perform, through computer games. Gamification techniques are applied where the lack of motivation is mining the efficiency of the users. Although these topics are rather new, Human Computation and Games With a Purpose and Gamification rapidly became interesting topics of research, with widespread adoption in industry.

Our tutorial targets academics and practitioners that would like to understand how human computation and game design techniques could be applied to personal and enterprise content management systems. The tutorial is divided into two parts. The first part introduces the core research questions in human computation, with a specific focus on the techniques required to manage structured and unstructured data. The second part delves into the field of game design for serious task, with an emphasis on games for human computation purposes. Our goal is to provide the ICWE research community with a solid understanding of the best practices in designing and running human computation tasks, with references to the most relevant works in the field.

## 2 Tutorial Synopsis

The tutorial will address several aspects of Human Computation, Games With a Purpose and gamified applications; it will provide an overview of the methods, techniques, and tools that can be used to successfully include crowds in applications and systems.

The intended length of the tutorial is 3 hours over two sessions. The first session will focus on providing a comprehensive background on human computation, introducing the discipline from a historical, industrial, and academic point of view. Attendees will be presented with the best practices in human computation tasks design, with specific insights on performer selection, task allocation, task optimisation, and result aggregation issues. We will then provide an overview on industrial human computation platforms (e.g. Amazon Mechanical Turk<sup>1</sup>, Crowdfunder<sup>2</sup>) and state-of-the-art systems [4] and frameworks [5]. In addition, we will provide an in-depth analysis for some of these systems, focusing on the ones published in scholarly articles (e.g. CrowdDb [6], CrowdLang [7], Crowdsearcher [8] [9], DeCo [10]); we will discuss the design choices of these systems, analyse their areas of application (e.g. database, information retrieval, multimedia information retrieval), and enumerate desiderata for the next generation of human-enhanced data management systems.

The second session of the tutorial will be centred on describing techniques used to improve the engagement of the performers in a platform. We will introduce two complementary streams of development, respectively represented by *Application Gamification* [11] and *Games with a Purpose* [3], addressing their commonalities and differences. By referring to the best practices used in traditional literature on game design [12] [13] [14], we will analyse the structure of a game, the design of game mechanics, and the development process of a typical digital game. The design process for Gamified Applications and Games with a Purpose will be outlined, with an emphasis on the design of suitable game mechanics for the former and on the design and match of tasks for the latter. During the presentation, the most prominent examples such as ESP Game [15],

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<sup>1</sup> <https://www.mturk.com/mturk/>

<sup>2</sup> <http://crowdfunder.com/>

FoldIt [16], Ingress<sup>3</sup>, Yahoo! Answers<sup>4</sup> will be showcased. The session will end with a brief introduction to open source or proprietary tools and frameworks for the development of gamified application and digital games for the web, including UserInfuser<sup>5</sup>, OpenBadges<sup>6</sup>, Badgeville<sup>7</sup>, Haxe<sup>8</sup>, and Unity<sup>9</sup>.

### 3 Biographical Sketch

*Alessandro Bozzon* is an Assistant Professor at the Delft University of Technology, with the Web Information Systems group. His research interests are into the fields of data and information management on the Web, with specific focus on Semantic Web technologies, human- and social-computation, and data integration. His current research aims at defining a foundational theory for hybrid human and automatic information management systems, by studying the theoretical models and the technical means to achieve this integration.

*Luca Galli* is a Phd Student at Politecnico di Milano. His research interests involves Data Mining and Text Mining, Human and Social computation, Game Design and video games development technologies (innovative middleware architectures, game engine architecture, multi platform deployment). His current research aims at integrating traditional game paradigms and gamification techniques in the design and implementation of human enhanced applications.

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<sup>3</sup> <http://www.ingress.com/>

<sup>4</sup> <http://answers.yahoo.com/>

<sup>5</sup> <https://code.google.com/p/userinfuser/>

<sup>6</sup> <http://openbadges.org/>

<sup>7</sup> <http://badgeville.com/>

<sup>8</sup> <http://haxe.org/>

<sup>9</sup> <http://unity3d.com/>

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