Chapter 1
An Ethical Framework for Interconnected and Self-Organizing Moral Machines

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ABSTRACT

Technology is responsible for major systemic changes within the global financial sector. This sector has already developed into a comprehensive network of mutually connected people and computers. Algorithms play a crucial role within this network. An algorithm is in essence merely a set of instructions developed by one or more people with the intention of having these instructions performed by a machine such as a computer in order to realize an ideal result. As part of a development in which we as human beings have ever higher expectations of algorithms and these algorithms become more autonomous in their actions, we cannot avoid including possibilities in these algorithms that enable ethical or moral considerations. To develop this ethical or moral consideration, we need a kind of ethical framework that can be used for constructing these algorithms. With the development of such a framework we can start to think about what we as human beings consider to be a moral action executed by algorithms that support actions and decisions of interconnected and self-organizing machines. This chapter explores an ethical framework for interconnected and self-organizing moral machines.

INTRODUCTION

The theme of this essay is the major systemic changes confronted by the global financial sector in general and particularly in the trade in financial products. Within this essay I will focus specifically on the dominant role played by technology and technological applications within the context of these changes. Algorithms play an essential and valuable role within the financial sector. Take, for example, the visualization of all sorts of information and being able to exchange and share this information between the parties involved, irrespective of their time and location. Algorithms have become increasingly autonomous during the past decade, their artificial intelligence has increased and this artificial intelligence has allowed

them to act more independently and make complicated decisions at speeds that exceed human powers of observation. Whether we like it or not, these algorithms currently dominate the financial markets and the large majority of the global financial transactions are performed without any human interference. The development of systems that are ever more interconnected with networks in which algorithms act autonomously and influence the global trade in financial products raises new questions concerning, for example, the need for an '*ethical framework*'. This framework could enable us to further consider if and how these machines and their algorithms could be taught a form of morality as part of their development. In the second part of this essay, I will deal specifically with the question of whether and how concepts such as ethics and morality could be related to technology and whether and how machines and algorithms that act increasingly autonomously could be taught a form or ethics and morality.

Enframing

Many foundations of the current financial and social crisis lie in the unstoppable rise of technology and the use of technological applications during the past decade and mankind's inability to give sufficient meaning to these developments. The rise of the personal computer, the Internet and the mobile phone has been unstoppable during the past twenty years, as noticed by van Lier (2015). We can now conclude that a mobile phone is available for each average world citizen. Of all the mobile phones sold worldwide, more than 40% are smartphones with a memory capacity that exceeds that of a desktop computer from eight years ago. On the basis of the resulting networking, new technological applications were invented, which became a social and economic force. I am referring to developments also known as social media such as Facebook, Twitter, Instagram, LinkedIn and Whatsapp. Who would have thought twenty years ago that the largest companies in the world would be IT companies such as Google, Apple, Microsoft or Samsung. And that a small company such as Whatsapp with approximately 100 employees is able to show the global telecommunications giants that their existing business model based on modern elements such as calling and texting has come to the end of its life cycle. These telecommunications giants are now also forced to sit and watch how their crucial role, which arose in the middle of the previous century, is replaced with data bundles and devices that communicate with each other in networks of the postmodern society. Whether we like it or not, all of these changes have an unprecedented influence on our daily life and work and our experience of reality. The end of this technological revolution is not yet in sight and in the years to come we will be confronted with more technological developments and applications arising therefrom. We are on the brink of a new phase in technological evolution and, in addition to people, more and more objects are interconnected in these networks and enabled to exchange and share information mutually and with people. As van Lier (2015) states, apparently ordinary and traditional objects such as cars, televisions, passport, books, sports shoes and medical implants will be or have already been interconnected in these networks. We also want to use and wear more portable information elements such as Google glasses, smart watches, OMsignal t-shirts or Nike shoes so that we are able to share information about ourselves with others. And as if this is not yet enough, we are also confronted with new developments resulting from the convergence of nano-, bio- and cognitive technology with IT. This convergence has been possible because our understanding of nanoscience and nanotechnology and how to manipulate matter with this technology is growing. According to Bainbridge and Rocco (2005), these new combinations of technology will enable:

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