Chapter 16
Supercomputers: A Philosophical Perspective

Jeremy Horne
International Institute of Informatics and Systemics, Mexico

ABSTRACT

Supercomputers solve very large-scale complex problems efficiently and expediently – simulating societies, modeling the weather, or mapping genes, etc. Perhaps the most complex task of all is simulating our brains. The physical mapping of organic components to an artificial architecture is daunting, but more so is identifying the mental content referred to as "consciousness." Creating a human mind is not impossible; what appeared out of reach yesterday is near reality now – a mind embodied in a machine. More profoundly, we may become our own gods, religion merging with science, a "supercomputer brain" encapsulating consciousness, reason, rationality, intelligence, etc. Can we overcome human bias in looking at ourselves, humans creating their own minds, our living as simulations in a virtual world, and computers actually solving social problems? If ultimately these developments amount to creating ourselves as a god, humanity looking at itself through itself, we may not like what we see.

INTRODUCTION

This chapter of *Research and Applications in Global Supercomputing* is an interdisciplinary treatment of the language of supercomputing from the perspective of philosophy, more precisely, thinking about how supercomputers may actually communicate with us. Attention is called to the word "research" in the book's title, with two considerations: what motivated supercomputers and what the rapid changes of pace in supercomputer technology means for us. That is, supercomputers act as a "talking point" in philosophy, carrying us into more profound areas of discourse, a primary one being humanity's fate.

What motivated supercomputers has the same basic answer as for the reason motivating computers – to simplify and make a more accurate accounting of things. This can be said for the abacus, and even numbers, themselves. Supercomputers are used primarily to attack complex computations as found in thermodynamics, meteorological modeling, geophysical

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seismic activity prediction, and nuclear explosion dynamics. Yet, what if we ask about perhaps the most complex entity, the human mind-brain, the very core of our being? What is it, what is its purpose, and what may be its future?

If the ultimate purpose of supercomputers is to construct a "supercomputerbrain", numerous discussions about the nature of what happens inside our brains are brought forward, perhaps the immediately relevant one being the nature of consciousness. We talk of "consciousness" as if we know what it is, but we keep reminding ourselves that the "hard problem" makes identification elusive. However, if we discover what consciousness is, what then? How will it be contained in an artificial brain? What of a situation where the "mind" that we replicate in a supercomputer then looks at us? Will it be a mind independent of us or identical, a mirror image? What will be the implications?

In managing complexity, during the past 500 years humans have followed the Cartesian method of subdividing a whole so as to be able to manage it by managing the pieces, a result being what we might call today an "information glut". Pieces recombine to produce other wholes, but the apprehension of that overall complexity has remained elusive. Supercomputers in superseding the limited architecture of the human brain offer the distinct possibility of achieving that apprehension. What they ultimately "report" to us is what we face. What are time, consciousness, or even something relatively mundane as identifying the best socioeconomic solution? Perhaps a yottaflop (or higher) supercomputer coupled with quantum computing would be able to model reality accurately by recombining elements and even predicting outcomes. It would be as if all the brains in the world were working at once and for an extended period of time. In this way, we accelerate human development and possibly learn of our future.

MAIN FOCUS OF THIS CHAPTER

Supercomputers: A Philosophical Logic Perspective will provide somewhat of an overview of how supercomputer technological development may apply in recreating the human mind-brain. I also will focus on provoking discussion about emergence in an artificial brain by interweaving ideas somewhat repetitive but in different contexts. In other words, it is not the fascination of a brain's construction and how the architecture of a supercomputer might be mapped to it that is the focal point here but the implications. I assume that the technology will be there to meet the challenges. Given the rate of growth in our knowledge of brain functions, especially in the past few decades, it would not be surprising to see its functionality replicated in the relatively near future. Neuroimaging advances and nanotechnology are two areas that may make at least a physical replication possible. The principle issue in producing a fully functioning brain is knowing precisely what the supercomputer will emulate, and what we think is a mind, thinking, and consciousness. Many times it is safer just to ask the question, but one cannot act on questions. When we find the answer we must be prepared for more dramatic problems, such as those concerning policy.

Such discussions are common prior to major technological development, noted in the historical controversies surrounding the atomic bomb, cloning, and extraterrestrial planet colonization. We are at the edge of what may be considered an hour of decision in solving humanly-caused problems. I explore a number of concerns, speculations, and other observations. In this tradition, the reader of this chapter will be taken beyond the details of the technology of applications and be brought face-to-face with a central reason why supercomputers ultimately are being developed: to manage complexity, in particular the complexity of thinking. More profoundly, there is a discussion about humanity being its own god(s)