Critical Theory

and the Digital

David M. Berry

Critical Theory and Contemporary Society

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Critical Theory and the Digital

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David Berry
Oslo, July 2013

LONG ago, the mice had a general council to consider what measures they could take to outwit their common enemy, the Cat. Some said this, and some said that; but at last a young mouse got up and said he had a proposal to make, which he thought would meet the case. "You will all agree," said he, "that our chief danger consists in the sly and treacherous manner in which the enemy approaches us. Now, if we could receive some signal of her approach, we could easily escape from her. I venture, therefore, to propose that a small bell be procured, and attached by a ribbon round the neck of the Cat. By this means we should always know when she was about, and could easily retire while she was in the neighbourhood."

This proposal met with general applause, until an old mouse got up and said: "That is all very well, but who is to bell the Cat?" The mice looked at one another and nobody spoke. Then the old mouse said:

"IT IS EASY TO PROPOSE IMPOSSIBLE REMEDIES."

Æsop, (Sixth century B.C.), *Fables*.

1

Introduction

This book is primarily concerned with thinking about the relationship between critical theory and the digital. In particular, I attempt to engage with critical theory to directly address the challenge of computation. As such, the aim is to understand how we can think about computation as part of the social totality and also to provide the means to develop an immanent critique in relation to it. There is still much work to be done in humanities and social sciences to understand and critique the computational, and it is a social phenomenon that is accelerating in its growth and ubiquity, adding to the complexity of theorizing the digital adequately. This book is, therefore, a contribution to *questioning* the digital or what we might call the *computal*, and creating the possibility of thinking in an age when thinking is increasingly being delegated into the machines. As our societies are increasingly becoming computational, and with it the attendant tendency of computational systems to reify all aspects of everyday life, it is crucial that we attend to the mechanization of reification and the dangers presented when these processes crystallize into systems, institutions and consciousness itself. This reified world is 'smart', digital and is increasingly colonized by computationally enhanced networks, objects and subjects.

Indeed, the world is transitioning from analogue, structured in most part by the physicality of destination, to the digital. A new *industrial internet* is emerging, a computational, real-time streaming ecology that is reconfigured in terms of digital flows, fluidities and movement. In the new industrial internet the paradigmatic metaphor I want to use is real-time streaming technologies and the data flows, processual stream-based engines and the computal interfaces that embody them. This is to stop thinking about the digital as something static and object-like and instead consider its 'trajectories'. Here I am thinking about the way in which scripts function to create loops and branches, albeit of a highly complex form, and create a stable 'representation', which we often think of as a digital 'object'. Under the screen surface, however,

there is a constant stream of processing, a movement and trajectory, a series of lines that are being followed and computed. Twitter suggests the kind of real-time experiential technology that I am thinking about and the difficulty we have in studying something unfolding in this manner, let alone archiving or researching, without an eye on its processual nature.[1]

This change calls for a critique of computational knowledge and as such a critique of the society producing that knowledge. In other words, the critique of knowledge calls for us to again question the movement of instrumental reason into all aspects of social life. As Schecter argues in relation to the original research questions that drove the Frankfurt School,

> Max Weber's analysis of instrumental reason suggests that the objectively revolutionary aspects of modernity and industrialization is the real possibility of human emancipation from economic scarcity as well as from mythology and irrational belief systems. Yet this revolutionary potential is accompanied by the simultaneous risk of the rise of an increasingly one-dimensional society governed by a form of narrowly strategic reason . . . such reason would be unable to address questions of ethics or aesthetics, and would be empowered, at the same time, to undermine the authority of political decision-making bodies to regulate economic processes. (Schecter 2007: 71)

This growth in instrumental reason, as rationalization, facilitates the reduction of thinking to a form of reason wedded to economic necessity, and as the Frankfurt School would argue, the domination of nature. The move towards an informationalization of society, particularly in the over-developed economies in the twenty-first century, has intensified this process, with the growth of a computational world overlaying the physical world, and which, to a greater extent, has been delegated with the logic of rationalization and instrumental reason. This also signals a move away from a previous 'digital' era that was tangential to the capitalist economy, but nonetheless facilitated many economic growth regimes associated with it, such as ICT, finance-led and so forth. Instead we are entering a post-digital world in which the digital has become completely bound up with and constitutive of everyday life and the so-called digital economy.

Nonetheless, people have become accustomed to living in the previous 'historical', digital world that was, actually, only partially computational, and in many ways wasn't computational at all. A result of this is that the older notion of the 'digital' deeply influences the way people understand and think about the computational itself – for example, representational forms of pixels, bitmapped images and low-resolution 'digital' graphics. In hindsight, for example, it is possible to see that CDs and DVDs were actually the first

step on the road to a truly computational media world. Capturing bits and disconnecting them from wider networks and constellations of computational systems, placing them on plastic discs and stacking them in shops for us to go, visit and buy seem bizarrely pedestrian today. Yet, people tend to think in terms of these categories of 'digital' as 'printed/encoded' on to packaged and boxed discrete objects, not only for born-digital content, but also for those that have been relatively easily transformed into digital forms, such as film and television.

This shift also includes the move from relatively static desktop computers to mobile computers and to tablet-based devices. Indeed, according to the International Telecommunications Union (ITU 2012: 1), in 2012 there were 6 billion mobile devices (up from 2.7 billion in 2006), with YouTube alone streaming video media of 200 terrabytes per day. Indeed, by the end of 2011, 2.3 billion people (i.e. one in three) were using the internet (ITU 2012: 3), creating 1.8 zettabytes of data and expected to grow to 7.9 zettabytes by 2015 (Kalakota 2011). To put this in perspective, a zettabyte is equal to 1 billion terabytes or information storage capacity equal to 10^{21} bytes or 1,000 exabytes or 1 billion terrabytes – clearly at these scales the storage sizes become increasingly difficult for humans to comprehend. In comparison, a DVD-R can hold about 4.7 GB and a dual-layered Blu-ray disc can hold about 50 GB. A zettabyte is therefore roughly equal in size to 43 billion Blu-ray discs or 250 billion DVDs.[2] Combining this explosion in data creation and usage with the increased embedding of microprocessors in all sorts of everyday devices, from washing machines to coffee-makers, highlights the extent to which we rely on computational systems and software. All of these chips need software to run, without which they would essentially be plastic, metal and glass bricks, and they all produce streams of data which are increasingly networked and stored. As Andreessen argues,

> Six decades into the computer revolution, four decades since the invention of the microprocessor, and two decades into the rise of the modern Internet, all of the technology required to transform industries through software finally works and can be widely delivered at global scale. . . . Over two billion people now use the broadband Internet, up from perhaps 50 million a decade ago. . . . In the next 10 years, I expect at least five billion people worldwide to own smartphones, giving every individual with such a phone instant access to the full power of the Internet, every moment of every day. (Andreessen 2011)

The previous *destination model* – a static, object-oriented model of the digital – draws heavily from a world that was constructed in major part due

to material constraints on the delivery of things, but also due to social and historical habits that we took for granted – walking to the shops, waiting for a release date to queue up to buy something, sitting in lectures and seminars, or even visiting friends on quite trivial social matters. This model was clearly constrained by physical limitations, but there was also an element of corporate planning that built release windows, geographical regions and so on into our everyday experience of goods and services. The same applied to non-networked computers and phones which were built and supplied through the same distribution systems of their pre-digital contemporaries. This destination model also justified readings of the computational claiming that the 'digital' had changed very little at all in the status *quo* – the digital was seen as being a process of back-office rationalization, often disconnected with the everyday experience and use of products and services, with newspapers being the exemplar of an industry that failed to recognize the challenges of the digital world. With hindsight, though, it is becoming increasingly clear that the computational is shifting the way in which certain forms of knowledge are created, used, disseminated and consumed across the global economy – including the emergence of the internet-of-things and 3D printing technologies, such as 3D printed guns, prosthesis and so forth. Cheaper, faster and more reliable hardware is combining with new computer languages, frameworks and programming practices to open new spaces of possibility for the 'digital' and this transforms both our understanding and knowledge.

Computation is fundamentally changing the way in which knowledge is created, used, shared and understood, and in doing so it is changing the relationship between knowledge and freedom. We are starting to see changes in the way we understand knowledge, and therefore think about it. It encourages us to ask questions about philosophy in a computational age and its relationship to the mode of production that acts as a condition of possibility for it. Indeed, following Foucault (1982) the 'task of philosophy as a critical analysis of our world is something which is more and more important. Maybe the most certain of all philosophical problems is the problem of the present time, and of what we are, in this very moment . . . maybe to refuse what we are' (Dreyfus and Rabinow 1982: 216). Here we might consider Lukács discussion in *History and Class Consciousness* of Kant's distinction between metaphysical and direct knowledge of nature, which Kant holds to be impossible, and our experience of nature which Kant 'insists is mediated by a priori categories of the understanding' (Schecter 2007: 74). Lukács argues that the distinction within this philosophical structure may represent the 'entrenchment of the division of mental and manual labour – something politically conditioned and historically contingent – than any "natural" or eternal limit to cognition' (Schecter 2007: 75). Kant offers a passive role to the

senses, and an active role to the categories – unity, plurality, totality, reality, negation, limitation, inherence, causality, reciprocity, possibility, existence and necessity. Lukács argued that Kant had internalized the division of labour in society and had built it into his theory of knowledge. Therefore, it is no surprise that he also supported the economic development of capitalism and political values of liberalism of his time. In a similar fashion today, the computational industries raise the productive powers of the economy to the level at which it is feasible to consider an economy of abundance and therefore the abolition of material necessity as an objective possibility. But it still nonetheless separates the mental and sensual dimensions of production such that people find it increasingly difficult to critically discuss freedom, potential and need.

Computational over-production becomes an end in itself, even to the extent to which it strips the cognitive capacity of labour from production, both material and social – through technologies of anticipatory computing and notions like 'augmented humanity'. It is likely that we should expect to see new philosophies and metaphysics emerge that again entrench, justify and legitimate the values of a particular accumulation regime. This calls for attentiveness to the tendency of philosophers to declaim their situatedness and historical location, and develop critical approaches to what we might call metaphysics of the computational and to the forms of computational ideology that legitimate a new accumulation regime. Which is not to say that the computational has no benefits nor potential contribution to human emancipation, indeed the critical project is to make these possibilities explicit while simultaneously contesting non-democratic and authoritarian trajectories.

Take that most mundane of everyday communicational technologies: the telephone. Using the telephone in everyday life has changed dramatically with the digitalization of the telephone network and the rise in data services for communication – the telephone has become an increasingly 'smart' media device. Here, I am particularly thinking of the contrast between wired, 'electric' switching technology and digital packet-switching services and new data-centric services. While bandwidth was expensive due to physical constraints, the former economic structure of the telecommunication services made a lot of sense, but today, with smart allocation and adaptive use of spectrum being made possible by digital technology, the plunge in price of data bandwidth, and the giant leaps in computational capacity and corresponding reduction in the size of the packages that contain them, the mode of communication shifts towards a real-time streaming digital world (see Berry 2011a). Blockages still exist, such as telecommunication companies reluctant to break with a billing and accounting model that is deeply embedded in their corporate DNA to

charge by time (voice) or bandwidth usage (data) even when this distinction starts to make less and less sense, especially for Voice Over Internet Protocol (VOIP) presence-at-a-distance services like Skype and Facetime (see Lash 2002: 59). However, we can already see the contours of a new communicational landscape appearing before us, and which, as computational media, is enticing to use and interact with. Our phones become smart phones, and as such become media devices that can also be used to identify, monitor and control our actions and behaviour through anticipatory computing. While seemingly freeing us from the constraints of the old wired-line world of the immobile telephone, we are also increasingly enclosed within an algorithmic cage that attempts to surround us with contextual advertizing and behavioural nudges (see, for example, Berry 2012d; Roberts et al. 2012; Morozov 2012b).[3] Indeed, as Steiner (2013) argues, a lot of money is now poured into the algorithms that monitor our every move on the social media sites that have become so extraordinarily popular,

> [Facebook] built the tools and the algorithms that still monitor the unimaginable amount of data pouring into Facebook every hour of every day. Part of the reason that Facebook has proven so "sticky" and irresistible to Web surfers is because [Facebook] built systems to track people's mouse clicks, where their cursor stray, and what page arrangements hook the largest number of people for the longest amount of time. All of this click, eyeball, and cursor data gets strained, sifted and examined. . . . Having a nearly captive audience of billions makes it all the easier, and lucrative, to sell ads that can be targeted by sex, income, geography, and more. (Steiner 2013: 204–5)

There are other less obvious examples of this surveillance taking place through digital devices, such as sat-nav devices, laptops, tablets and e-books. Companies have varying degrees of openness about the extent to which they collect data about their users, and also varying degrees of transparency and opaqueness in the user controlling it. E-books and tablets are a useful example of the disciplinary monitoring of the reader by the device through software, such as the case of Amazon mass deletion of Orwell's 1984 from people's Kindle reader, but this has not held back the explosion in readers/users of e-readers. Indeed, the 'number of those who read e-books increased from 16% of all Americans aged 16 and older to 23%. At the same time, the number of those who read printed books in the previous 12 months fell from 72% of the population aged 16 and older to 67%' (see Raine and Duggan 2012). For writers like Carr (2012) this may also signal a change in knowledge and our reading practices at a profound level,

> If book readers continue to shift from the page to the screen, as seems likely, the text of books will end up being displayed in a radically different setting from that of the printed or scribal page that has defined the book for the first 2,000 years of its existence. That doesn't mean that readers won't be able to immerse themselves in books anymore. The technology of a book is not rigidly deterministic. The skill of the writer still matters, as does the desire of readers to get lost in stories and arguments. But the importance of the technology in shaping reading habits (and publishing decisions), particularly over the long run, shouldn't be discounted. If the technology of the page provided a screen against the distractions of everyday life, encouraging the focus that is the essence of deep reading, the computer screen does the opposite. It inundates us with distractions, encourages the division of attention. It fights deep reading rather than encouraging it. (Carr 2012)

We will return to this question later in the book but it is a useful signposting of how changes wrought in digital technology are increasingly articulated and amplified in media debates about what we might call cognitive technologies. Additionally, these new digital technologies form path dependencies that can become strengthened and naturalized as platforms, therefore becoming self-reinforcing, creating a circle of technological leaps and accelerations. These new forms of knowledge platforms are built to structure our reading in particular ways, opening the possibility of distracted and fragmentary reading habits in contrast to deep reading, which may make it difficult to develop critical reflection or offer space for contemplation. Indeed, these changes highlight the importance of asking the question of how technologies might be restructured, regulated or rearticulated, together with the socio-economic institutions that control the labour process, in order to enable the digital to contribute to a project of emancipation through the possible abolition of scarcity and the transformation of work into an aesthetic pleasure (Schecter 2007: 81).

The computational device itself, whose contents would previously have been in the bounded medium of the printed book, presents another example of the move to real-time experiences. This has the potential for transforming the private reading experience of books, with the possibility of semi-public and public readings in as much as the text can be located around what is increasingly thought of as a three-screen system. That is that we will use three different-sized reading and watching screens within our everyday life. The ethics of reading are also embedded in this technical system whereby what was previously conceptualized by Xerox Palo Alto research labs as tabs, pads and boards becomes universalized through technical distribution. Hence, the *tab* (phone) is private, *pad* (tablet) is public/semi-public and the *board* (TV) is public. The book is, then, increasingly dissolved into the user experience

(UX) of a three-screen experience, a world of tabs, pads and boards. Reading is potentially no longer located in a single object, but is automatically synced between phone and tablet, such that the 'book' that one is reading is increasingly understood as a causal, real-time streaming media, which may be picked up and put down with no attention to context/container – indeed writing is also possible in a similar way. With the advent of the third screen of the three-screen world, the 'board' (of which the AppleTV and Xbox One are, perhaps, prototype versions), one wonders how reading might be spread over these three devices/screens and what effects that might have, and also the potential for new writing forms – e.g. simultaneous display of different pages, characters, structures, etc. on the three screens while reading. One only has to look at experiments with two screen games (e.g. tablet and TV) to see that, although this is still in its early phases, there are some interesting new forms of reading and writing under development.

Today, we are additionally inundated by an information deluge that can be overwhelming and difficult to manage without computational means and monitoring through web-bugs and 'compactants' (or computational actants) (Berry 2012d: 391).[4] As Sterling (2012) argues, bringing the currently fragmented algorithmic ecology into a tighter coupling heralds an 'industrial internet', thus,

> The full potential of the Industrial Internet will be felt when the three primary digital elements—algorithmic devices, algorithmic systems and algorithmic decision-making—fully merge with physical machines, facilities, fleets and networks. (Sterling 2012b)

Indeed, these noticeable shifts in the mode of production and the modes of communication increasingly challenge our actual understanding of humanity *qua* humanity as reflected in debates over reading skills, neuromarketing, behavioural nudges and so forth. These digital elements are thought to soften the boundaries between human and machine and pose questions for philosophers and theorists about human autonomy and distinctiveness (see Fuller 2011; Stiegler 2010).

To illustrate, in Freestyle Chess the battle lines are no longer drawn between human and computer, but rather between different teams or assemblages of human and non-human actors – inevitably called Chess 2.0. As Kasparov writes about his experience of playing chess as part of a human-chess-computer assemblage,

> Having a computer program available during play was as disturbing as it was exciting. And being able to access a database of a few million games

> meant that we didn't have to strain our memories nearly as much in the opening, whose possibilities have been thoroughly catalogued over the years. But since we both had equal access to the same database, the advantage still came down to creating a new idea at some point. . . . Having a computer partner also meant never having to worry about making a tactical blunder. The computer could project the consequences of each move we considered, pointing out possible outcomes and countermoves we might otherwise have missed. With that taken care of for us, we could concentrate on strategic planning instead of spending so much time on calculations. Human creativity was even more paramount under these conditions. (Kasparov 2010)

Literally, the chess players are only 'autonomous' in as much as they might sit in front of the chessboard. Contrary to previous notions of self-contained grandmaster chess players, these players rely on augmented computational analysis and computing firepower to attack their opponents – they become 'chess centaurs' (half human, half machine). In other words, 'one had to enter into a grey area in which it was no longer clear who would be the horse or the rider in the course of a chess game' (Freestyle-Chess 2010). To ensure that pure engines, which are non-human computational assemblages, would not compromise the play (a previous final had been won purely computationally), tournaments in free chess now have regulations that moves have to be made manually on the physical chessboard, that is, that a human is required to be a member of the team.[5] Likened to the thrill of driving a fast car, the use of offloaded calculative abilities of computers to augment the players' skills is no longer an argument for the transcendence of humanity by computers, but, rather, a new abstract machine for human-computer interaction. Again Kasparov argues,

> The surprise came at the conclusion of the event. The winner was revealed to be not a grandmaster with a state-of-the-art PC but a pair of amateur American chess players using three computers at the same time. Their skill at manipulating and "coaching" their computers to look very deeply into positions effectively counteracted the superior chess understanding of their grandmaster opponents and the greater computational power of other participants. Weak human + machine + better process was superior to a strong computer alone and, more remarkably, superior to a strong human + machine + inferior process. (Kasparov 2010)

This is a useful reminder that these new digital technologies are not the sole driver of social and political change, but far from it, as will be argued throughout

this book. Rather, the key point is that technology offers specific affordances within certain contexts which enable and disable certain forms of social and political interactions. Putting it another way, certain technologies within historical and social contexts serve to accelerate styles and practices of life, and marginalize others. But crucially they are also linked to associational structures of the specific network, organizational form and processes used to achieve a certain 'performance'. To comprehend the digital we must, therefore, know it from the inside, we must know its formative processes. We can therefore think of technologies, and here I am thinking particularly of digital technologies, as being *embedded* in an important sense. The coming political contestations over the future of the digital will no doubt involve attempts to disembed the digital from political debate and forms of democratic control (see Berry 2008) – exemplified by attempts by the International Telecommunications Union (ITU) to exert full control over the internet structures (see Kampfner 2012). However, we have to remain cognizant of the processual, local and situated moments that make computational systems possible. In other words, we have to be careful not to reify computation and lose its 'processual' aspect. Often these processes are inscribed and documented in standards, such as TCP/IP, the key protocol of the internet. However, these standards are not objects; they are layers of text that require a 'reprocessing' within computational systems – and more specifically in computational processes.

Indeed, the digital is in many ways the creation of a constellation of standards, canonical ways of passing around discrete information and data, that creates what we might call *witnesses* to the standard – software enforcing the disciplinary action of these standards, such as application programming interfaces (APIs). Owning and controlling standards can have a political economic advantage in a post-Fordist society, and much jostling by multinational corporations and governments is exactly over the imposition of certain kinds of technical standards on the internet, or what Galloway (2006) calls protocol.

Returning to the political economy of computational technologies, it is notable that digital technologies are often thought of as somehow autonomous, or separated from the political sphere. Indeed, it often suits technologists and technology advocates for it to be seen that way (Berry 2008). This is especially true in situations where painful decisions are being made in lieu of technology being implemented, for example, the replacement of factory workers by computers. Thus, technology itself can serve as an important seemingly neutral 'force of nature' within (and sometimes exogenous) to our societies. Indeed, as technologies move towards a real-time digital mediation of interaction and stream-based activities that are becoming normalized and naturalized into our everyday lives, we are told that this *is* the future. That

is, 'real-time streams' are an ongoing project or computational imaginary. However, this is also a moment in which the shape of the real-time digital world is still open and being built around us, and therefore is subject to possible intervention, critique and questioning. A key concept in relation to the exploration of the digital in this book is the concept of *possibility*, the idea that the digital contains possibilities which may be hidden or obscured, but which remains possible nonetheless. In exploring the concept of possibility, constellations of concepts will be outlined that enable us to explore the historical processes stored in the digital, or more concretely in particular digital objects and processes, and hence form the basis of their actuation and limitation.

The key premise of this book is the relatively uncontroversial claim that the digital (especially, software) is an increasingly important aspect of our post-Fordist societies. However, we have not yet found adequate means to provide a critical response to its multifaceted surfaces. The digital world is increasingly creating destabilizing amounts of dis-embedded knowledge, information and processing capabilities that undermine the enlightenment subject – this forms an important background to critical approaches to computation. Indeed, the book takes a synoptic look at the phenomena of the digital and tries to place the digital within a theoretical and historical context. It does this through an engagement with critical theory to understand the profound ways in which the digital is challenging the way in which we run our politics, societies, economies, our media and even our private everyday lives. As Schecter argues,

> In the second half of the twentieth century, capitalist recodification and reterritorialization is confronted by its own limits, according to Deleuze and Guattari. They suggest that capitalism helped produce the bases of its own demise, but not by producing a unified proletariat that seizes control of the means of production. The system has set a dynamic of de-territorialization in motion that will eventually elude its normatising control – it will be unable to produce the subjects it needs to sustain capital-labour whilst [reining] it in and commodifying the desires of the multitude. (Schecter 2007: 200)

In contrast to the predicted emergence of the 'schizophrenic', Deleuze and Guattari's notion of a new destabilizing subject of de-territorialized capital, we are instead beginning to see the augmented human offered by anticipatory computing. Elements of subjectivity, judgement and cognitive capacities are increasingly delegated to algorithms and prescribed to us through our devices, and there is clearly the danger of a lack of critical reflexivity or even critical thought in this new subject. This new augmented subject has the potential to be extremely conservative, passive and consumerist, without

the revolutionary potential of the 'schizophrenic'. Indeed, the norms and values of the computational economy can be prescribed quite strongly as a society of control, limiting action, thought and even knowledge. This we might understand as the danger of a transition from a rational juridical epistemology to an *authoritarian-computational* epistemology. We will return to this issue in detail in the later chapters.

Although this book outlines the general contours of critical theory, it is not intended as a comprehensive guide to critical theory itself, or as an introduction to it. Indeed, the reader is directed to the work of others who cover this material extremely competently and offer useful and helpful exploratory readings (see Held 1997; Jarvis 1998; Jay 1973; Schecter 2007, 2010; Thomson 2006; Wiggershaus 1995). The question this book will address is how can critical theory contribute to this critique of the digital, and what can be drawn from the critical project of the twentieth century, notably from the Frankfurt School, in order to orient and inform a critical purchase on the real-time digital world of the twenty-first century.[6]

Critical theory has always had some engagement with the questions raised by technology, and with the speeding up of the technological feedback and feedforward loops offered by real-time systems – as changes in technology accelerate at an increasing pace – it is crucial that the critical literature engages with these new stream-based iterations of digital technology. These rapid changes present real difficulties for critique, both as a practice and as politics, when attempting intervention or seeking to question the direction of travel with such a fast-moving target. Thus the growth of the digital, both as a technical ensemble and as a global disciplinary system, raises important questions for critical thought today, and the way in which critical approaches can make a meaningful contribution to its development and effects. Not that critical theory must chase the latest digital fad or internet meme, of course, but it must engage with the structures and foundations of the digital. These need to be explored both in their materiality and in their ideological affordances, not only to offer critique, but also to develop new concepts and ways of thinking in relation to the new streaming technical world.

The challenge for a critical theory of the digital is to critique what Adorno calls *identity thinking* and a form of thinking that is highly prevalent in computational rationalities and practices. Here, identity thinking is understood as a *style of thought* that aims at the subsumption of all particular objects under general concepts, and as a result the particular is dissolved into the universal. The distance between computational knowledge and reality is entirely closed when we think we have succeeded in framing reality within these computational categories and by means of computational methods. This is a dangerous assumption, as it is a short step towards new forms of control,

myth and limited forms of computational rationality. So there is an urgent need for a project exploring in what sense critique and critical thought can address the computational (see Golumbia 2009; Berry 2011). That is, to explore the dangers and the possibilities offered by digital technologies towards the project of human emancipation and how critical theory can contribute through praxis to that project.

Why study the digital and software?

The focus on digital technologies requires approaches that can provide a holistic understanding of the interconnections and relationships that technologies introduce into everyday life and action. Indeed, 'computers provide an unprecedented level of specification and control over every aspect of human society (and the rest of the environment)' (Golumbia 2009: 216). More specifically, the computer, is a symbolic processing device that has had, and will continue to have, important repercussions for society. As Winograd and Flores (1987) argue, this means that at least some of the analysis of the implications of digital technology must lie within the domain of language itself, as code is both a text and a mechanism,[7]

> The computer is a device for creating, manipulating, and transmitting symbolic (hence linguistic) objects. Second, in looking at the impact of the computer, we find ourselves thrown back into questions of language – how practice shapes our language and language in turn generates the space of possibilities for action. (Winograd and Flores 1987: 7)

This includes the development of a way of thinking about and critically examining what Borgmann (1984: 14) called the technological furniture of our age. Arguably our technological furniture is vastly greater in scope and deeper in its penetration of all aspects of everyday life than any previous system. Following Moore's Law, which states that computing power would double every 18 months, we are now at an important juncture, as the surplus computing power is enormous and its application to social life and even social control is growing, such as demonstrated by drone technologies, which is highly reliant on computation, which can monitor and even kill at a distance.

We will therefore also need political praxis, and in some instances that political praxis will be technical practices such as cryptography and encryption, the practices of restricting what one is reading and writing in digital systems. One might think of it as the technical re-implementation of the bourgeois

liberal private sphere in code, and indeed, the space to gather one's thoughts, think privately and apply one's reason critically without being observed is a crucial requirement for a healthy democratic society, provided it is balanced with the public use of reason to debate and contest societal questions. As Assange argues,

> the universe, our physical universe, has that property that makes it possible for an individual or a group of individuals to reliably, automatically, even without knowing, encipher something, so that all the resources and all the political will of the strongest superpower on earth may not decipher it. And the paths of encipherment between people can mesh together to create regions free from the coercive force of the outer state. . . . Cryptography is the ultimate form of non-violent direct action . . . a basic emancipatory building block. (Assange 2012: 5–6)

This is an extremely suggestive notion that cryptography as a basic emancipatory building block will be a key site of contestation in a computational society, and may be manifested by cryptocurrencies, such as bitcoin. Indeed, it seems likely that these new forms of crypto-spaces will be hugely important as a new site of counter-politics, and a new subject position that Assange calls cypherpunks who 'advocate for the use of cryptography and similar methods as ways to achieve societal and political change' (Assange 2012).[8] It is clear then that this potential should be fully developed and made available for widespread democratic use and for that it will require political praxis. But while attempts have been made to understand this situation in terms of a liberal moment, that is to defend a space of so-called 'privacy', the reality is that there is no possibility that an individual, even one as ruggedly individualistic as the neo-liberal subject, can singularly resist the collection of 'data exhaust' that we leave as we go about our daily life and the computational means to watch, analyse, predict and control us. Even going 'off the grid' creates data trails as our colleagues, friends and families continue to talk about us, post pictures or these systems even postulate 'data ghosts', computationally created avatars, created by social network analysis that is able to determine the contours of the absent person. We are also complicit in our own handing over of data and which often plays on individualism as a justification through notions such as 'citizen science'. Examples include the recent move towards the analysis of our internal microbiome constitution through companies that offer identification, classification and diagnosis based on our internal bodily microbes, by organizations such as uBiome and American Gut, or our genes through companies such as 23andme.[9] This leads to a focus on a radical 'now', in as much as the mass collection and