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Title: Authority, Autonomy and Automation: The irreducibility of pedagogy to information transactions

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Abstract:

This paper draws attention to the tendency of a range of technologies to reduce pedagogical interactions to a series of datafied transactions of information. This is problematic because such transactions are always by definition reducible to finite possibilities. As the ability to gather and analyse data becomes increasingly fine-grained, the threat that these datafied approaches over-determine the pedagogical space increases. Drawing on the work of Hegel, as interpreted by 20th century French radical philosopher Alexandre Kojève, this paper develops a model of relational pedagogy which highlights three points of incompatibility with a datafied learning environment reduced to finite measures.

Firstly: Kojève's accont of authority in Hegel posits two aspects to the mimetic relation between teacher and student: recognition and realisation, which belong to the ipseity or about-self-ness of the subject, and are incompatible with a general definition of data. Secondly, the Hegelian approach to human historical time, in particular the assertion that time and desire are begun in the future, not the past, renders it incompatible with mathematical time as used in data processing. Finally, from these it is possible to derive a distinctive notion of the work *of pedagogy, grounded in Kojève's realist reading of Hegel, irreducible to information processing.*

In consequence of this threefold irreducibility, the paper draws attention to a need for relations of human pedagogical work to be inherent in the design of educational technologies and highlights the dangers of presuming a machine intelligence model in the design of learning environments.

Keywords: Hegel, educational technology, philosophy of information, Alexandre Kojève, Luciano Floridi, Ipseity

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Problematisation: The Datafied Subject

Controversy surrounded the 2012 award of $621,000 from the Bill & Melinda Gates Foundation to the National Centre on Time and Learning to use fMRI and Galvanic Skin Response to gauge degrees of engagement in the classroom (Kroll, 2012). The implicit identification of a pedagogically meaningful definition of student engagement with the neuro-physiological state measured by fMRI, and its association with efficiency or efficacy raise foundational questions about the nature of education. Of concern here is not only the question of whether such empirical measures can differentiate between the 'deep' attention required for meaningful learning and distracted forms of 'hyperattention' (Lewin, 2016); even assuming that were possible, such measures pose ethical and epistemic questions for teachers and teaching. Ethically, such a physiologically reductive conception of engagement challenges the long-standing characterisation of education as *witting and willing*, requiring some intentional commitment on the part of the learner (Peters, 1966). Intersecting this concern is an epistemic question regarding the neurological reduction of learning to a transfer of information, optimised when conditions are most conducive to its reception as transmitted. Such reductive assumptions are common in the design of learning analytics systems, in which inter-operability is achieved by narrowing possible formats through which learners may express forms of knowledge (Sclater & MacDonald, 2004) or by carefully determining contexts to remove extraneous variables (Siemens et al., 2011). This reductive-intentional problem set requires an analysis capable of bridging the ethical and epistemic dimensions of the philosophy of education and the philosophy of information. The range of behaviours, from attention to violent radicalisation (Dickens, 2015) which learning analytics software seeks to identify and modify on the basis of data mining grows every day.

Anxieties surrounding the values and purposes of education in contemporary Western society are both masked and exacerbated by the increasing emphasis on the gathering and ranking of data on performance, paradoxically differentiating purpose while homogenising measures of efficacy (O'Connell, 2015). These anxieties are paralleled in the world of work, in which the concept of general purpose machine learning raises existential questions for the relationship between humanity and the control of means of production (Kaplan, 2015; Spencer, 1996). This paper draws upon an understanding of human agency, recognition and responsibility from the Hegelian tradition, as interpreted by the French philosopher and civil servant Alexandre Kojève, and from personalist phenomenology, to develop a critique of the notions of authentication, time and work, both physical and intellectual, as conceptualised in the philosophy of computing and information. Through these critical insights, new directions for pedagogical work are proposed, focused upon the distinctively intentional nature of the human person. Hegel's conception of authority and recognition illuminates an aspect of human learning which is fundamentally relational and cannot be reduced to an informational description. This relationality has profound implications for both pedagogical work and pedagogic relations.

The assumptions on which learning analytic systems operate are derived from the philosophy of computing and information. This is the case whether the data analysed are written verbal responses (as in current mainstream systems such as RaiseOnline) or in the increasingly invasive and granular series of networked physiological sensor data characterised as the 'Internet of Things' (McEwen & Cassimally, 2014; Wolpe et al., 2015) as in the

fMRI case noted above. All forms of digital information transactions are subject to an information-theoretic conception of knowledge. Until recently the dominant model in the philosophy of computer science, because it is highly satisfactory in accounting for causal chains of information transferred between one information processor and another, accounted for knowledge thus:

> K knows that s is F = K's belief that s is F is caused (or causally sustained) by the information that s is F (Dretske, 1981).

Information, according to this information-theoretic conception, is meaningful well-formed data (Floridi, 2004): for a machine to know, it must possess a well formed sequence of data in an agreed format in which that data is meaningful, and that sequence must have been caused by informational transactions that sustain its meaning and attribution of a truth value. Attempts to more accurately represent the structures of human consciousness by introducing a symbol-grounding element – enabling machines to process internal images as if they were perceived externally (Steels 2008), or even to superimpose patterns as in Google's DeepDream – still treat minds/brains as information processors, treating the phenomena of internal 'images' as if identical to information processed through other causal channels.

While this model is highly satisfactory for the transfer and authentication of data between computer systems, it is fundamentally penurious if applied to human learning. This is so both because the subjective experience of the givenness of the phenomenon is not reducible to a faulty folk-psychology of internal 'images', as I have argued elsewhere (Lundie, 2015a) and because the recognition of the other in human pedagogical interactions is not reducible to a call-response-authenticate model of information transmission. It is this latter critique which is the focal point of this article. In contrast to the information-theoretic conception of knowledge, human educational experiences are necessarily perspectival, not intrinsic to packets of knowledge content but irreducibly particular to some subject. Human learners attribute value to their own educational experiences which is incommensurable with the value of the information acquired. In consequence, the pedagogical subject processes K(s is F) – their own experience of knowing – differently than the information that s is F. Human learners value their own information incommensurably with information simpliciter (Lundie, 2015b). Educational, as opposed to mere information-transfer experinces are also necessarily situated in interpersonal particularity (Guilherme, 2014).

Moving beyond previous work in this field, it is necessary to differentiate indexicality: the 'aboutness' of subjective experience which resides in the relation subject-purpose-object (Lundie, 2015a) from ipseity, the intrinsic 'myness' of the phenomenon as given. Derrida's treatment of 'enseignement', literally 'the making of signs' as a process of semiotic 'showing' gives pedagogical specificity to this distinction (Trifonas, 2002, p.106). The showing of a DVD of news clips and images of sectarian conflict which I report in (Conroy et al., 2013, p.132) is here illustrative:

> Students are sharing their own experiences, every one of them has a story to tell… At the end of the discussion, Mr D [the teacher] says, 'I wanted to bring what Jesus told into a modern context.'… beginning with the resource itself, media footage is transformed by its context from a transitory carrier of meaning to something of significance in the moral discourse.

While a trace of intentionality may remain in the act of pedagogy as 'showing', this information resides in the object, an 'aboutness'; in the act of showing, the intent, 'bringing' the parable of the Good Samaritan, is permitted to evaporate. In contrast, the ipseity of the pedagogical experience, the connection to personal stories and experience, resides in the subject. Intentionality might be assigned to a pedagogical act after the fact, as it is assimilated into broader values, ipseity on the other hand is immediate and intrinsic. It is impossible for education to take place which is not at the same time the education *of some subject*, part of the narrative concept of the self (Zahavi, 2005). Both intentionality and ipseity belong to the inward-facing content of human informational transactions, such that 'to undergo an experience necessarily means there is something it is like for the subject to have that experience' (Zahavi, 1999). The differentiation of these aspects of self-consciousness and their incommensurability (a) with eachother and (b) with information under the general definition, is at the core of the Hegelian conception of recognition.

Recognition, in Hegel, is the eseential ground of self-consciousness. In contrast to Husserl, who posits the equivalence of Being-for-itself and being given (Marion, 2002), Hegelian self-consciousness rests upon a fundamental incommensurability between the one who recognises and the one who is recognised[1]. The authority of the teacher, Kojève-Hegel asserts, is bound to the future, and thus bears an affinity with the structure of human-historical time, a structure which I will go on to show is very different to that of processing time as conceived in the philosophy of computing and information. Finally, work, which is also caught up with the Hegelian concept of time, is represented in Kojève's reading as intentional, negative and as struggle – points which mark out human work in contradistinction to the execution of the computer program. In the following consideration of recognition, time and work in Kojève-Hegel, I differentiate a domain of human education for the process of self-becoming – the development of authentic self-consciousness – and go on to differentiate this against a simulation of the same provided by certain technologically reductive pedagogies. In infinitely deferring the object of teaching, these reductive pedagogies also leave the subject incomplete, resulting at best in a simulacrum of education, devoid of meaningful intent, and at worst in a fractured simulacrum of selfhood, incapable of engaging meaningfully as subject.

Recognition, Authority and Authentication

Fundamentally, Hegel's celebrated notion of a master-slave dialectic posits a differentiation between recognition and the recognised. The ipseity of the phenomenon of recognising is not identical to the ipseity of being recognised – there is a fundamental inequality of relation. This situation renders human recognition, for Hegel, incompatible with a transfer-authenticate channel of communication as required by the information-theoretic conception of knowledge. The causal relation of recognition is one of submission, a point which Kojève bisects into twin anthropogenic behaviours of recognising (the phenomenon as experienced by the slave) and realising (the phenomenon as experienced by the master) (Kojève, 1969, p.8). In place of the single causal channel of symbol-grounding epistemologies, which posit an interiorisation of external phenomena, each phenomenon, in this Hegelian anthropology, is marked by the ipsative experience of these two irreducibly unequal channels

[1] Indeed, in a radical attempt to assert the completion of the Hegelian conception of history, Kojève in his later work begins to lose signt of this, himself positing something akin to the penurious notion of interchangeable call-authenticate recognition (Kojève, 2000) with the same penurious consequences for the project of self-becoming.

A→B≠B→A. These channels or behaviours are the only forms of mediation which pertain to human autonomy (Kojève, 1969, p.15), rendering it incompatible with a single-channel information-causal epistemology. The ipsative aspect of the phenomenon is distinct from metadata, because it is immediate, incapable of being transferred or mediated without changing its fundamental nature from self to other.

The place of autonomy in the Hegelian account of recognition helps to elucidate a particular thorny problem in which holds against any attempt to define machine intelligence in terms of a Turing-type test. The place of experience, of recognising the nature of one's learning (as opposed to merely being subject to heteronomous notions of 'attention (Lewin, 2016)) and of realising the work of pedagogy (to which we shall return) is on this model intrinsic to a human definition of intelligence. This brings it into direct contrast with the Turing test model of intelligence, which reduces the ipseity of experience to a mere epiphenomenon (Churchland, 1984). While we may accept the 'weak' thesis that 'learning' is a useful metaphor and model for the transfer and manipulation of information by computer processors, the Hegelian model proposed above precludes a 'strong' ontological identification of information transfer-and-authentication with learning (Searle, 1980). While Churchland's strong identification of the Turing Test with intelligence remains internally cogent, it follows from the fundamental incompatibility of the two ipsative dimensions of recognition and realisation that this serves as proof of the possibility of machine intelligence if and only if it also serves as proof of the impossibility of human intelligence.

While subsequent scholarship in the philosophy of computing and information has given serious attention to the ethical dimensions of the construction of the self in relation to the digital, acknowledging 'the question of who am I for you' (Floridi, 2013, p.224) as a meaningful aspect of human recognition, I contend that such accounts still fall short of answering the Hegelian challenge because they fail to take account of both the temporality and inequality of the other in a dialectic. Learning encounters mediated through online and digital agents do not have the status of a temporal other. Where students are treated as informational objects rather than as subjects who define themselves self-consciously in relation to context and to others, one half of the anthropogenic process is missing. Whereas the Turing Test does rest upon recognition – the recognition by one natural language user of another (Urquhart, 2004) – this form of recognition is not reciprocated by a realisation. The result of a self-construction based on relations with such misrecognised atemporal others may be that the learner begins to re-ontologise herself heteronomously. This is evident when learners learn how to respond as the system would like, in language the machine can understand, instead of in forms of expression mediated from the object of study. This is exemplified by a capable student 'feeling down and defeatist' when confronted with AS-Level Biology texts she 'dismissed as "too sciencey"' (Barden, 2014, p.562), representing not a limitation in the student, who responds well to more socially-mediated online learning, but a self-concept limited by the horizons of a reductive informational vocabulary.

Returning to the general definition of information as employed in the philosophy of information, an authentication channel is required such that data, under a well-formed language, can be meaningful to more than one agent. For Kojève's reading of Hegel, however, drawing on early Heideggerian scholarship,

> Self-Consciousness is simple-or-undivided Being-for-itself; it is identical-to-itself by excluding from *itself* everything *other* [than itself]. Its essential-reality and its absolute object are, for it *I* [I isolated

> from everything and opposed to everything that is not I]. And, in this *immediacy*, in this *given-being* [i.e. being that is not produced by an active, creative process] of its Being-for-itself, Self-Consciousness is *particular and isolated*. What is other for it exists as an object without essential-reality, as an object marked with the character of a negative-entity (Kojève, 1969, p.10 – translator's parentheses).

The immediacy of self-consciousness suggests an ontology for self-conscious data which cannot be *meaningful* in the sense employed by the general definition of information, because, as the ground of meaning, the self is incapable of communicating the same datum to another self without changing the meaning from ipseity, *I-ness*, to otherness. Or, as Ricoeur observes,

> [A]n event belonging to one stream of consciousness cannot be transferred as such into another stream of consciousness. Yet, nevertheless, something passes from me to you… This something is not the experience as experienced, but its meaning. Here is the miracle. The experience as experienced, as lived, remains private, but its sense, its meaning becomes public (1976, p.16).

Two fundamentally distinct conceptions of meaning are hence at work in the design of systems for the purpose of transfer-authentication of meaningful, well-formed data (the analytics component) about ipsative subjective experiences of relational pedagogy (the learning component), and the risk of equivocation fallacy is high. In place of communication – the analytic definition – self-conscious subjects must proceed by recognition – the learning definition. Self-consciousness, in Kojève-Hegel, requires the twin anthropogenic behavours of recognition and realisation, an irreducible inequality between sender and receiver. In contrast to a co-equivalence of information transfer in call-authenticate protocols, the Hegelian account of self-consciousness requires serious consideration to be given to the unequal nature of teacher-student relations as necessitating a form of authority. This is the case whether the direction of this relation persists across the course of many years, or alternates between recognition and realisation from moment to moment.

Published in occupied France in 1942, Alexandre Kojève's *On the Nature of Authority* represents the end-point of a line of thinking within Western political philosophy concerned with the definition of authority and the differentiation of just and unjust authorities[2]. Drawing on Platonic, Aristotelian, Hegelian and Scholastic traditions, Kojève proposes not a single definition, but a constellation of mutually irreducible authorities which bear a family resemblance in that they are clearly distinguishable from (indeed antithetical to) force. The authority of the father, predicated on generative priority, Kojève explicates with reference to the Scholastic philosophers, locating its potency in the past. The authority of the master over the slave, based on Hegelian relations of recognition finds its locus in the present; while the authority of the judge, predicated on equanimity,

[2] Following the Second World War, the question of a just or proper authority is rendered absurd by the atrocities of its exercise. Empirical findings in cognitive and individual psychology begin to pathologies the 'authoritarian personality' (Adorno et al., 1950) while Anglophone political philosophy reorients toward questions of economy and distributive justice (Rawls, 2009; Nozick, 1973) or community and identity (Sandel, 1998; Nussbaum 2004). Kojève, both in 1942 and in his mature work in subsequent decades, is somewhat exceptional, perhaps anachronistic, in still clearly addressing the same central question of authority in politics which animated Aristotle, Hobbes and Rousseau's analyses in previous centuries.

Kojève associates with Platonic eternal universalism. The authority of the teacher Kojève subsumes within an Aristotelian analysis of the authority of the leader over the band:

> with the Authority of the Master over the Pupil: the pupil renounces all reactions against the acts of the Master because he thinks that the latter is already in a position that he will reach only much later: the Master is more *advanced* than he is. The same observations apply in the case of… the Scholar or the Technician, and so on: they see the bottom of things while the uneducated see only the surface (Kojève, 2014, p.69).

This form of authority is based neither on the struggle of life and death (as in Hegel's more general thesis) nor on mere age or priority, as would befit an education which was purely cultural transmission, whether of the traditions of the distant past or of information pre-existent in the technosphere for mere micro-seconds. For Kojève, the authority of the leader/teacher is based upon the leader's *profundity,* the potential to anticipate beyond immediate need, and therefore finds its locus in the future. This association of teaching and time, in particular the locus of the teacher's authority in anticipating the future, although initially associated with an Aristotelian conception of authority, is also of significance to Kojève's analysis of Hegelian epistemology. Kojève emphasises Hegel's unique contribution in the incorporation of history, and human historical time, into philosophy.

Time, Concept and the Teacher

In his account of intellectual work, Kojève explores a problem of articulating a relation between temporal method and atemporal truth, in short, the problem of the conceptual order. Kojève defines 'Concept' as 'the complete system of concepts, the "idea of ideas"… the coherent whole of conceptual understanding that lays claim to the truth… a coherent whole of words having meaning" (Kojève, 1969, pp.100-101). The necessity of combining truth, meaning and idea into some totality suggests a relation more complex than that of the information-theoretic conception. It is meaning as predicated on the one recognised, rather than any Turing-type approach to meaning that is referenced here. As such, the Concept rests on the human, that is, the historical-temporal claim upon meaning in relation to truth. In contrast to attempts to represent Hegel as either idealist or dualist, Kojève emphasises that both the subjective and the objective belong in the realm of the real and relational. In order to reconcile the subjective-temporal and objective elements of Hegel's epistemology, Kojève asserts that the Concept *is time*. This relation holds because 'if everything that is *in* Time… always *changes*, Time itself does not change.' (Kojève, 1969, p.102). Historical time, for Kojève-Hegel, cannot be measured in bits-per-second. Linear, polynomial, non-polynomial and even exponential measures of processing time (Urquhart, 2004) fall short of the Hegelian relation between time-as-concept and the eternal. This is so because of the future-oriented nature of the human experience, as alluded to above, in contrast to the symmetrical nature of mathematical time. Because time, for Kojève-Hegel is human historical time, engendered by desire, the Concept, like the authority of the teacher, has its origin in the future (Kojève, 1969, p.134). This complex claim of a 4-way identity relation between time, concept, human desire and the authority of the leader/teacher requires further elucidation in order to explore its full pedagogical consequences.

Drawing on Hegel's analysis of Fichte, Kojève is at pains to point out that Hegel 'is even more "realist" than Descartes' (Kojève, 1969, p.151). Reading Descartes in the context of his Augustinian intellectual heritage, it is

legitimate to point to the role of the *ego cogito* as central to the relation between self and world, subject, object and intention (Lundie, 2015a), not as separating a material world from a mental or subjective one, but as essential to the mental ordering of the material. As such, Kojève's account of intellectual work is antithetical to a disinterested understanding of the '"Intellectual" who criticizes the real world in which he lives from the standpoint of an "ideal" constructed in the universe of discourse, an ideal to which one attributes an "eternal" value, primarily because it does not now exist and never has existed in the past' (Strauss, 1991, p.137). Hegel's dialectical differentiation between recognition and realisation as incommensurable components of the ipsative experience of self-consciousness adds a further dimension of analysis to such a realist account of the relation between human-historical subject and its agency in the ordering of the world. For Descartes, self-consciousness does not follow either from the *ego cogito* syllogism, nor from self-affection, 'but from my being acted on… by an other than me' (Marion, 2003, p.42). While a Turing machine may be recognised, engaged with and assigned being both as subject and object of such a relation, Kojève-Hegel here sketches something beyond a transcendental subjectivity – a two-directional relationality of being.

While in the master-slave authority relation the particularity of context for human deeds is 'always overshadowed by the further possibility of a complete indifference to life by one of the actors' (Pippin, 1993, p.147), the leader-band (teacher-student) authority relation is characterised not by uncertainty but profundity, the recognition of the leader as more fully capable of realising the future-oriented good of the band. Such relation is not reducible to the master-slave dialectic, which becomes more exclusively the focus of Kojève's later work, nor to the authority of the judge, where in Kojève's later work the imperative of equanimity suggests a reduction akin to the A→B=B→A symmetricality of the call-response:

> [the judge] neither loves nor hates [the actors], if he refers to their acts and not their persons and… if his intervention in their interaction will not and could not have been altered by the sole fact of interchanging A and B, A playing the role of B, and B that of A (Kojève, 2000, p.79)[3].

In his dialogue with Strauss, Kojève is keen to differentiate again the forms of authority: 'Tyrants… fear the brave, the just, and the wise; they must suffer the fact that they cannot enjoy the company of such virtuous souls because of this fear' (Pippin, 1993, p.143). The distinction between the master-slave relation and that of the teacher-student is not only that between present and future orientation, but between an expectation of fear, and one of benefit. Whereas for Hobbes it is the universal rationalistic order engendered by fear which is located in the future, Kojève's understanding of history and historical progress relies on a future-orientation to both

[3] Justice (the locus of authority of the judge) and recognition (the Hegelian locus of authority of the master) are to be distinguished from one another precisely in regard to the interchangeability of mediation. While all authorities are socially mediated (Pippin, 1993), justice requires impartiality. Kojève's emphasis on the dependence of philosophical concept on human historical possibility leads him in his later work to the conclusion that the revolution and the end of history, as theorised by Hegel, had already arrived. While this attempt to presage a final reduction and resolution to the Hegelian dialectic proves unconvincing, it is not entirely penurious for the argument advanced in this paper. The characterisation of Kojève as 'romantic bureaucrat', concerned primarily with the administration of authority-as-justice in established conditions of universal mutual recognition introduces the thesis that the sage-philosopher and the administrator have a shared *work* of making manifest this 'ideal' reality in the material social conditions of the polis (Groys, 2013). Under such an understanding, even should the first two incompatibilities – that of recognition/authentication and human-historical/processing time – be resolved, the critique that human (and specifically pedagogical) work is irreducibly distinct from machine work, remains valid.

concept and work, which creates a possibility for the realisation of mutual (though not interchangeable) recognition. In its present-oriented conservative rationality, the authority of the tyrant is distinct from this future-oriented rationality, and its relation to a transformative account of human work, as we shall go on to see. The distinction here in Hegel's future-oriented locus of philosophy and of teaching opens up the need for temporal, that is to say, human and intentional, work: 'the *historical* plane of *active social* life [is the only groud] where one argues by *acts* of Work (against Nature) and of Struggle (against men)' (Strauss, 1991, p.168).

Historical time for Kojève is necessarily conditional upon a purposive project of self-making (Pippin, 1993). This is so because Hegelian time is engendered in Desire. The Concept, equivalent to time, is begun in the future, not the past (Kojève, 1969, p.134) – Concept as having meaning predicated on the recognition of the teacher as the one who speaks, possesses an ontic quality. It is not merely in the prescience of the teacher as one possessed of more information about the physical or historical world in which his authority-as-profundity subsists. Rather, this authority has the character of 'speaking existence' (Kojève, 1969, p.133). In the acts of recognition and realisation which constitute the teacher/student relation, the student as other liberates the teacher ontologically with respect to nature (Kojève, 1969, p.18). The relation between nature and human work highlights a further tension between Hegelian and technological-informational pedagogies.

Pedagogy, Work and Programming

Having established a sense of the ipsative phenomena of human recognition and realisation as incompatible with the information-theoretic conception of knowledge, and the future-oriented nature of human-historical time as incompatible with mathematical processing time, it is possible to construct a model of the teacher and student as engaged in a relational, meaningful project of work. The conception of work advanced here, grounded in Hegel's realism and Kojève's critique of any attempt to separate an 'eternal' concept from the reality of human historical time, may be usefully contrasted with the operation of a computer program.

> A man can work hard risking his life for no other reason than to experience the joy he always derives from *carrying out* his project or, what is the same thing, from transforming his 'idea' or even 'ideal' into a *reality* shaped by his own *efforts* (Strauss, 1991, p.140).

The conception of work inherent in the information-theoretic conception of knowledge is of the processing of symbols already assigned meaning as though through the internalisation of an exterior language game. The semiotic problem, raised by Rumelhart (1986) comes closest to addressing this discrepancy between human, ipsative intelligence and machine 'intelligence'. Semiotic computing attempts, within the bounds of the two-directional causal relation of the information-theoretic account, to posit a triadic relation between signs, users and the interpretant (Fetzer, 2004). In so doing, semiotic computing attempts to reproduce the processes of meaning-making by which human minds assimilate new information to existing systems of thought. Even in such complex formulations, however, the outcome of intellectual work in any given computer program is already inherent in the program (Lundie, 2014), nothing is created by its execution that was not latent in its design, no matter how complex and unpredictable the outcome.

The concept of recognition as developed above is subtly but importantly distinct from the semiotic model of intelligence. While semiotics is concerned with the interpretant recognising another being as *standing for* or *meaning* a thing, grounding meaning in the symbol, Hegelian recognition is concerned with recognising the

other *in and of itself*, grounding meaning in self-consciousness generated in awareness of the other as other. As Hegel defines the concept, the totality of meaning, as synonymous with (human historical) time, any attempt to reduce learning to the application of an algorithm to data will be reductive, reducing the concept to an object within (mathematical) time. Learning is ceaseless, yet truth remains an empty set, the circle is never closed, and so learning is, for Kojève-Hegel, an "eternal task" (Kojève, 1969, p.109). Attempts to map the complexity of the human experience of learning in informational terms result in the reductive redefinition outlined above, for which reason machine 'learning' may only be understood as a soft metaphor, not synonymous with actual pedagogy.

Recognition, in contrast to programming, is essential to the satisfaction of the human as intentional being. To be unrecognised is to be unsatisfied, with potentially disruptive consequences (Agiomavritis, 2012). While informational work-as-programming passes through the processing agent, leaving the processor unchanged, recognition is bound up with a being or subject capable of positing itself as a totality distinct from its programming. The purely information-processing agent, transferring and authenticating knowledge without remainder, cannot enter into the act of teaching as realisation, nor of learning as recognition. In order for such a pedagogical relation to exist, for the *work* of pedagogy to take place, some *subject* must exist, posited in existence by its relation to the other. The subject must find itself in *want* of a knowledge, and that want leads to a truly human Desire "aware of itself as interior emptiness" (Ferguson, 2006, p.59).

> In contrast to the knowledge that keeps man in a passive quietude, Desire dis-quiets him and moves him to action. Born of Desire, action tends to satisfy it, and can do so only by the 'negation,' the destruction, or at least the transformation, of the desired object: to satisfy hunger, for example, the food must be destroyed or, in any case, transformed. Thus, all action is 'negating.' Far from leaving the given as it is, action destroys it; if not in its being, at least in its given form… But negating activity is not purely destructive, for if action destroys an objective reality, for the sake of satisfying the desire from which it is born, it creates in its place, in and by that very destruction, a subjective reality (Kojève, 1969, p.4).

According to Kojève-Hegel, all desire is bound up with the relations of recognition and realisation, desire exists in a person posited as subject by relations of authority. It is from this relation that desire, which is rooted in the future, emerges, and it is from the profundity of the teacher as capable of directing the work of realising sucj a future that authority and concept, the relational and the objective, can be reconciled.

Implications and Applications

Ipseity, the *isness* of the subjective self, derived from Kojève-Hegel, consists then in two mutually-irreducible and irreducible-to-information phenomena: recognition and realisation. Several implications follow for the relationship of pedagogy to information technology. Firstly, the proper role of technological mediations and enhancements can only be communication with a real (not artificial) teacher. It is clear that even in pedagogical accounts in which the authority of the teacher is radically detached from *concept* as informational knowledge (Ranciere, 1991) there remains a residual relation of recognition, derived from the prescience of the teacher. Furthermore, such prescience does not consist primarily in information about a completed circle of knowledge in the past, such as would be implied by a semiotic account in which the teacher grounds her authority in the

ability to connect new knowledge to systems of meaning, the origins of which are predetermined by informational meanings in the past. Far from merely 'the carrier of rational information' (Bailey, 2005, p.60) the teacher is model of the concept. The account presented above, however, derives the teacher/student relation from a future-oriented concept of work, grounded in a desire that is mimetic, not transmitted as information from teacher to student, but recognised as a form of social contagion; 'human Desire must be directed toward another Desire' (Kojève, 1969, p.5).

The mimetic account of teaching has been seized upon by advocates of anti-technocratic pedagogies (Crawford, 2015) but need not be penurious for the design of educational technologies. According to the account set out above, an information-theoretic account of knowledge still functions highly effectively as a metaphor in the design of information systems. The danger of such an account only occurs when the metaphor is taken for an ontology of the human learner, either deliberately or naively, and used in the design of systems for the transfer of knowledge to human subjects as though they were solely information processing agents. An example of this can be found in the reductive measure of 'attention' in the Galvanic Skin Response case with which this paper began, locating attention not as a function of Desire, necessitating anthropogenic relations of pedagogy, but merely as the opening of a neurological 'channel' for the transfer and authentication of data.

In this model, mediating technologies are not in themselves problematic; 'the I is absolute mediation' (Kojève, 1969, p.15). They may become so when the process of self-realisation and becoming is turned not against an 'other' capable of recognition, but only against an artificial echo (Floridi, 2013, p.224) such as the many curated 'selves' we may create through social media, an infinitely deferred other, or informationalised representation of the self. Then the potential for the subject to become detached from the capacity for the authentically human work of education arises. Platforms such as Khan Academy, which enable interpersonal pedagogical relations to arise have a great potential to extend the possibilities of authentic education, as do approaches which make use of the modularity of human experience (Benkler, 2013), enabling the subject to navigate a plethora of small and manageable pedagogical interactions each of which facilitate the unique direction of their self-realisation. The ipsative dimension of such technologies, however, is bound up with the future-oriented anthropogenic desire of self-realisation, and must not be confused with bespoke-tailored interaction with complex automation.

Foregrounding mimesis and recognition in pedagogy, recognising that the subject attains self-realisation not primarily through the acquisition of some object of knowledge but relationally, through engagement with an other who is distinctively, irreducibly and incommensurably *other*, the proper role is given to Desire as a future-oriented human-historical process. This process is not reproducible by artificial information agents, and as such technologies enhance education if and only if they facilitate the indeterminate and anthropogenic processes associated with the teacher/student authority relation. It is a necessary feature of that teacher/student relation that it acknowledge that which is irreducible – either to a common dataset among a group of students, or between teacher and student – this irreducibility poses challenges for learning encounters which are mediated solely by technology, in that the technology necessarily gathers and enables evaluation only of finite, datafied characteristics which can be at best a proxy for ipseity. Even where these proxies are increasingly fine-grained, as in the brain scanning and GSR cases highlighted at the outset, they do not amount to the 'unique particularized singularity… the particular *isness* of the self' (Conroy 2004, p.6) which is neither exhausted by nor equivalent to the total set of true information and metadata about the subject.

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