Let the Machines out. Towards Hybrid Social Systems.

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1 INTRODUCTION

When Alan Turing proposed the imitation game as a method to investigate the question if machines can think, he described a social system. However, the various disciplines that have pursued this seminal enquiry rarely touch base with sociological concepts. Cybernetics developed into various interdisciplinary fields, yet it was mainly rooted in physiological models. In the meantime, the mainstream of AI focused on cognitive problem solving, predominately from a top-down approach. Traditional cognitive science rests on the concept of organisms as information processing systems - so does Artificial Life, but from a biological simulation perspective. The recently revitalised branch of machine learning has been successful in deploying bottom-up models combined with large amounts of data. Large scale simulations of the brain are expected to deliver new knowledge about the human brain. ”Second-generation” cognitive science and developmental robotics are embodied and apply neural computation.

One might be tempted to say that progress has been made on brains, bodies and on models of minds. I claim that there is something largely missing in this picture, which is the social aspect. There is Social AI, and it embraces a wide variety of topics and concerns - from Stafford Beers cybernetic vision of society to simulations of interacting agents, complex systems theory, language, imitation and social learning, social network analysis and social bots, enactment, human-machine interaction, augmented and virtual environments, robot assisted therapy and behavioural game theory, to name a few. I also would like to include autonomous weapons, computer worms and viruses, in particular crypto-ransomware, into this context of social systems. From the other side, an interdisciplinary bridge is constructed under the label of digital sociology. The process of mutual approximation is accompanied by prolific discourses around machine ethics and emerging legal issues. A recently introduced topic of discussion is if robots should pay taxes.

So AI observes sociology, and sociology observes AI - yet they do not share a coherent theoretical program and fundamental ontological questions are still left to the philosophers. To propose an alternative route, I consider Niklas Luhmann’s theory of social systems as a suitable foundation for guiding the development of hybrid social systems. A hybrid social system is understood as a social assemblage in which minds and machines mingle: humans, machines, certain things, cyborgs. Some animals are welcome, too.

To this end, I present a few selected features of Luhmann’s theory and briefly visit some of their theoretical foundations: distinctions, in particular the distinction between system and environment, autopoietic systems, radical constructivism, and (second order) cybernetics. I speculate about some of the implications that arise from developing hybrid social systems based on this particular direction of systems theory.

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2 ROOTS

The following description focuses on five major influences of Luhmann’s theory that are relevant for the present discussion.

Distinctions: The abstract foundation for Luhmann’s theory lies in the distinction between distinction and identity. The formal background has been developed by George Spencer-Brown in his calculus of indications. While his work ”Laws of Form” can be read as the description of a specific logical calculus, Spencer-Brown’s intention is ”proto-logical”. It demonstrates that the fundamental operation of a system is drawing distinctions (as opposed to constructing identities).

System/Environment distinction: There are two fundamentally different ways to observe a system. Traditionally systems are understood by relations between their elements. In AI, these elements are constructed as agents that perceive, act and communicate. The behaviour of the system is then observed and analysed according to certain metrics, either derived from the individual behaviours or as emergent properties. The second approach, going back to Ludwig von Bertalanffy, identifies the relevant distinction for a system as the one between the system and its environment. Those systems are operationally closed and are located within the respective environments of each other.

Autopoietic systems: the term ”autopoietic system” was coined by Chilean biologists Humbero Maturana and Francisco Varela. Autopoiesis denotes the capability of a system to produce and when necessary reproduce their own elements. To observe autopoiesis, the respective system references are crucial. Biological cells are autopoietic systems; they (re-)construct their own elements. Humans grow legs, but do not re-grow a lost one. Axolotls do, however, with the help of some friends.

Radical constructivism: An epistemological position regarding the distinction between a system and its environment arises from the school of radical constructivism. According to this view, knowledge is not construed as a representation of an external reality, but as a state of the system that enables some fit with the environment. Theories of acting/enactment arrive at similar conclusions from different premises.

Second order cybernetics: the original concept of cybernetics was developed by Norbert Wiener in his groundbreaking description of self-regulating control loops. Second order cybernetics developed these concepts further by introducing the observer into the observation. We arrive at systems of observers observing each other. This paradigm shift is comparable to the one from Newton to Einstein. It

also leads to a significant but - I would argue - unavoidable conceptual complication.

3 SOCIAL SYSTEMS

Luhmann ties up these strands into an intrinsically general theory of systems. He himself focuses on the development of a social theory based on the work of Talcott Parsons. He incorporates Spencer-Browns concepts of distinction and indication as the fundamental operations of a system. In general, he distinguishes biological, psychic, and social systems. These systems can be structurally coupled, say, while writing a paper about systems theory. Yet spiking neurons, thoughts and an almost finished draft that is expected for publication are located in different systems that operate with fundamentally different distinctions. For Luhmann, these systems are operationally closed, They are operating in an autopoietical manner by reconstructing their own elements, and are irritated but not determined by their respective environments. This means that in Luhmann's context we cannot talk about concepts like social aspects of cognition, or observe an external environment that is part of the cognitive system. Nor can a biological system itself be social. In my opinion this separation has the benefit to be precise about the distinctions that we observe: in this case that the part/whole distinction has been replaced by the one between system and environment.

Social systems (interactions, organisations and institutions) and psychic systems (minds) operate with meaning. Meaning is understood as a medium in which a system can observe the distinction between actual and potential as a form. Communication can only take place through a social system. It requires the structurally coupled minds to be able to distinguish between information and utterance (Mitteilung) and to form expectations about future communication from the side of the counterpart. Luhmann also locates knowledge within the social system, rather than in the individual mind or brain.

4 HYBRID SOCIAL SYSTEMS

Let us return to the imitation game, and ask how the perspectives I have sketched out above point to hybrid social systems. I have mentioned that the imitation game constitutes a social system, one in which the participants have well-defined roles and tasks. Still it is a playful setting, which is a point that is widely overlooked. The objective for the machine is to cheat, by pretending to be a woman in place of the original male participant. It is also a game that hasn't been won for the machines yet, despite the current enthusiasm for conversational interfaces.

More importantly, Turing devised the test to operationalise an idea while avoiding definitions of the concepts he had set out to investigate. Within a distinction-based approach we can be comfortable with the idea that no a priori definition is possible or needed for this kind of endeavour. Instead, we need to construct and observe the ontological theatre, as Andrew Pickering calls it.

The system/environment distinction likewise supports Turing's approach. We do not need to model a system from the biological ground up and hope it will display social behaviour. Instead, we may begin with the affordances of the social system. An agent participating in a hybrid social system should be able to act contingent on the kind of system, e.g. an interaction, organisation or institution. As an autopoietic system, it needs to be able to develop and reproduce its elements. It also requires an environment to co-develop with under evolutionary pressure. The task of the agent, its operation on a fundamental level, is to draw distinctions.

Radical constructivism suggests that social systems involving artificial agents may construct knowledge in a way that is not only structurally different from human knowledge - it may outright contradict some of our beliefs. During a debate, we treat the statements of our counterpart as opinions, not as facts. In the same manner, an artificial agent forms opinions as consequences of the autopoiesis of the system. These opinions might not necessarily be ours. In a social system, dissent does not cause logical contradictions. Instead it is processed through different selections in the medium of meaning.

Finally, artificial social agents need to be exposed to social situations in order to develop. What the machines need to do is to learn continuously without (permanent) supervision. They also need to expose a sufficiently large surface of perception and interaction: machines that play, robots that go hitchhiking or share our beds or roam the campus while politely avoiding humans, machines that perform art for a robotic audience, artbots that judge each other, exhibitions where humans need not apply, social bots that influence elections. These approaches are being explored and we need more of them.

When we design hybrid social systems, the key lies not in designing the system, it lies in the interaction between the system and its environment. This suggests to release the machines from the lab as soon as a minimum of functionality is implemented. The machines need to be out there and they need to be among us.

5 CONCLUSION AND FURTHER WORK

Nearly three quarters of a century after Turing devised his test, the imitation game is still suitable to direct our efforts towards hybrid social systems. Even when deep learning has successfully tackled conversation (I imagine based on a similar strategy as the one for playing Go), Turing's methodology is still valid for pursuing the puzzles that remain unsolved.

Cybernetics and Artificial Intelligence have in more than one sense parted ways during the last decades. While AI has been more and more able to demonstrate practical success, it rarely reflects its epistemological foundations. Cybernetics, on the other hand, has been abandoned for the wrong reasons. In my view the complexity imposed through second order observation is a necessary condition for understanding social interactions. The question is not how to evade the problem but how to implement it. I think it will be fruitful to reexamine both paradigms, especially in the light of recent progress in robotics and machine learning. With this in mind, Luhmann's theory has the benefit to enable analysing, describing and constructing systems within a coherent ontological framework that accounts for biological, psychic and social systems. Therefore I propose to model interactions between human and non-human agents as hybrid social systems. Only on the level of social systems the machines will become more human.

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