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Idriss Aberkane

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Article abstract

Let us consider the industrial and economic impact of genetic programming and its generic availability to the masses. Is the interaction between genetic programming and the so-called “cognitariat” the beginning of a “genetic revolution” in the industrial sense ? Can we theorise a genetic marketplace, based on the dynamic of bids and asks for genetic algorithms to be made-to-order and leverage any daily routine, thus trading value ? Can genetic algorithms be crossbred to achieve a phenomenon similar to animal domestication, with a transition from wild to domestic type and heterosis, and can such a pressure for domestication percolate to macroeconomic value ? Which economic marketplace would allow such an economic phenomenon to happen and percolate least impeded ? Here I consider the economic implication of evolving genetic algorithms to address any repetitive human task, within a grand genetic marketplace composed of bidders and askers that would be using, evolving and breeding genetic programs (“bots”) and manipulating them as “bot breeders” to leverage their own economic output. I define a cryptocurrency on the buyer’s side, conceived to represent a unit of genetic purchasing power, which I call a “botcoin”.

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Idriss Aberkane

Résumé : Considérons l'impact économique et industriel de la programmation génétique et de sa disponibilité générique auprès des masses. L'interaction entre la programmation génétique et le "cognitariat" est-elle le début d'une "révolution génétique" dans le sens industriel? Pouvons-nous théoriser un marché génétique, basé sur la dynamique de l'offre et de la demande, dans lequel des algorithmes génétiques seraient assemblés à la commande pour démultiplier n'importe quelle routine quotidienne, et ainsi représenter une valeur commerciale? Les algorithmes génétiques peuvent-ils être croisés dans une dynamique comparable à la domestication, avec une transition du sauvage au domestique, et des phénomènes d'hétérosis? Une telle pression de domestication peut-elle percoler en une valeur macroéconomique remarquable? Quel modèle de marché pourrait permettre un tel phénomène économique d'exister le plus facilement possible? Je considère ici les implications économiques du métier consistant à évoluer des algorithmes pour automatiser n'importe quelle tâche humaine répétitive, dans le cadre d'un marché génétique composé d'acheteurs et de vendeurs qui élèveraient et sélectionneraient des programmes ("bots") et les manipuleraient comme des "éleveurs" pour maximiser leur productivité économique. Je définis également une cryptodevise côté acheteur, conçue pour représenter une unité de pouvoir d'achat génétique, le "botcoin".

Mots clés : Economie de la Connaissance, bitcoin, botcoin, algorithme évolutionnaire, auto-organisation, théorie de la valeur.

Abstract : Let us consider the industrial and economic impact of genetic programming and its generic availability to the masses. Is the interaction between genetic programming and the so-called "cognitariat" the beginning of a "genetic revolution" in the industrial sense ? Can we theorise a genetic marketplace, based on the dynamic of bids and asks for genetic algorithms to be made-to-order and leverage any daily routine, thus trading value ? Can genetic algorithms be crossbred to achieve a phenomenon similar to animal domestication, with a transition from wild to domestic type and heterosis, and can such a pressure for domestication percolate to macroeconomic value ? Which economic marketplace would allow such an economic phenomenon to happen and percolate least impeded ? Here I consider the economic implication of evolving genetic algorithms to address any repetitive human task, within a grand genetic marketplace composed of bidders and askers that would be using, evolving and breeding genetic programs ("bots") and manipulating them as "bot breeders" to leverage their own economic output. I define a

cryptocurrency on the buyer's side, conceived to represent a unit of genetic purchasing power, which I call a "botcoin".

Keywords: Knowledge Economy, bitcoin, botcoin, evolutionary algorithms, self-organisation, theory of value.

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Botcrafting and Botbreeding : A Simplified Economics of Evolutionary Algorithms

Idriss Aberkane

I. Introduction

The purpose of this article is to outline an ad hoc economic paradigm for genetic programming. If programs represent economic value, self-writing and self-evolving programs may imply self-generated or automatically-generated value. This poses fascinating scientific questions, especially for the economist. Simply put, the economy of genetic algorithms is non-standard.

The rationale is quite simple : genetic algorithms can generate value, and this value is special. Hence, how will one trade it ? These are some foundations of the economic study of genetic programming. Its interest of course, is to lead to innovating economic theories, for the economy of genetic programming could be quite different from that of other commodities. Let us here investigate some of its possible microeconomic, macroeconomic and financial principles.

Knowledge workers, as Davenport (2013) put it, are those who “think for a living”. Berardi (2004) using marxist concepts and historical materialism, referred to lower class and middle-class knowledge workers as a “cognitariat”, namely a loosely-defined group of workers whose only tradable work is cognitive. In the same way that the proletariat would sell their arms, the cognitariat would sell brainwork, with almost no bargaining power, and therefore, at the smallest possible price. The remuneration of Ph.D students and postdocs in the academic world, barely equal, and very often inferior, to the GDP per capita of their country anywhere in the world, is a textbook example of this disciplined social class, highly educated though very poorly aware of the socio-economic injustice of its status.

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II. Knowledge workers

The definition of the proletariat held in that they did not own any share of the means of production, be they land, herds or factories. This has been generally true of the current cognitariat, owning not any share of their laboratories, office space, servers etc. Technological revolutions have increased the occurrences of enterprises with a relatively low barrier to entry (e.g. “garage entrepreneurship”) but the scalability of such businesses has remained highly dependent upon capital. This order of things has seemed rather impossible to change. However, the advent of cryptocurrencies has demonstrated the possibility of establishing a fiat currency from scratch, independently from central money suppliers and governing bodies, with a relatively low volatility on the medium term. Peer-to-peer capital, encrypted furthermore, can profoundly challenge the supremacy of centralised fiat capital in the economy. But as any revolution, it must be first considered ridiculous, then dangerous, and eventually self-evident, if and only if entrepreneurs, not inventors, make it “cute”, that is, simple and adoptable. For cryptocurrencies to become mainstream, their best message should be “don’t be afraid !”.

If there is a category of workers who think or write for a living, software developers must clearly belong to it, and own only a very limited share of the global means of production, that is, a few computers. Genetic programming however, can profoundly alter this socio-economic order of things, with at least two disruptive elements :

Genetic way out of the cognitariat (1)

A genetic programmer does not only write for a living ; their softwares also write themselves. If softwares are sellable, genetic programmers can own “herds” in silico. They can create and expand capital out of nothing. The same could be true of knowledge workers altogether, but the ability to back a solid fiat cryptocurrency on the value of such silicon-based “herds” opens the possibility of an associate complex in silico finance, and hence the access to a possible substitute to regular fiat capital.

The novelty of genetic programming, for the cognitariat, is that you not only write, but also “breed” for a living, with software husbandry an equivalent of animal husbandry etc. This, in a way, could be the beginning of a massive, highly disruptive, silicon agriculture, with the concept of a “genetic domestication”, the domestication of genetic programs, and later, entire genetic ecosystems. In this article, I call this phenomenon”botbreeding”. It immediately underlies the concept of in silico harvest, which one can suspect may not display seasonality (or could they ?), taylor-made crops, serendipitous crops etc.. The behaviour of such botbreeders, and their in-silico herds, this entire Silicon agriculture, is

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surely an exciting new paradigm with non-trivial anthropological significance, that may compare with that of agriculture and domestication.

III. From Physiocracy to Silicocracy

Self-organisation is not new to economics, which is historically the science of oikos, namely the environment. Physiocracy is at the origin of the term economy, and is the doctrine according to which any economic value is reducible to natural value. The advent of contemporary biomimicry, circular economy and The Blue Economy, among many others, is fulfilling this doctrine in a surprisingly modern way, that economists could not have anticipated just a few decades ago.

Thus, in a way, nove sed non nova : there was a biology to economy and then there is a biology to softwares. Steve Jobs famously reminded, in 1984, that "software is the oil of the 80s and the 90s"; evolutionary programming is adding two critical dimensions to this statement, however : softwares that write themselves and softwares that produce human-competitive results, that is, solutions that are either comparable or better than human-established ones. The "Humies awards" are one salient manifestation of this trend ; genetic programs can produce value that would compete with that of the cognitariat, just as the steam engine did compete with the value of the early proletariat. Ultimately, this value could "free" the cognitariat from certain of their tasks and allow them to become a sort of meta-cognitariat, that is, a supervisor of cognitive automata.

So, software is a type of oil ; and indeed, the man considered in 2015 to be the richest by some media is a software mogul, not an oil magnate. The new dimension of genetic programming is that now there is a biology to it. The suspected economic consequences must be partly comparable to that of physiocracy. Another self-made value for the cognitariat would be productivity leverages : there are still, today many repetitive tasks to knowledge workers, from very simple cases of office or laboratory life to more complex collective ones. Since advanced full-spectrum software literacy is not quite achieved in any economy yet, any cognitarian faced with a repetitive task could not write their own piece of software to remedy to it. If softwares were fully tradable however, or, more importantly, software generators, then one could specify precise constraints for genetic programs to evolve towards practical adoptions in working conditions, for such programs to evolve towards maximal ergonomics, etc.

Programs evolving towards maximum productivity and maximum adoption could be economic game changers. So could be programs evolving with much less constraints, or unexpected ones, yet proving serendipitously to be of economic or even, more surprisingly, of emotional value.

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Botcrafting (2)

Botcrafting is the activity consisting in designing made-to-order genetic algorithms, for example to automatise a human task for a given client.

Botbreeding (3)

Botbreeding is the activity consisting in evolving genetic algorithms without a precise order, or with one's own set of constraints, in hope of selling them.

The founding principle of Silicocracy is therefore that one may evolve an ecosystem of algorithms, in silico, of which one may extract piecemeal value. Holding a universe of fitness landscapes and genetic algorithms in silico could become equivalent to holding acres of forest, arable plains or herds of cattle. The next step, of course, would consist of extracting and selling the value of these goods, or cross-breeding them with codes evolved from other landscapes, in hope of achieving heterosis (hybrid vigor). The expectation of such an algorithmic heterosis, in itself, could make software markets more liquid by providing a strong incentive for exchanges. Trade, in general could be defined as the negotiated exchange of value between breeders, with such familiar effects as comparative advantages and limited rationality likely to emerge. Now that we have expressed such micro and meso-economic Silicocracies, we may outline some aspects of their macroeconomics.

IV. Soft markets and soft finance : trading places for algorithms

A complete financial ecosystem could be compatible with the idea of silicon-based agriculture ; once one considers the possibility of turning genetic algorithms into cash crops, and their massive commoditisation altogether, one can consider their more advanced, derivative physiocracy. Rather than raw materials of course, such an agriculture would directly produce services, and thus possess some aspects of the service industry (its elasticities, for example) and some aspects of the primary industry. Again, it is expected to be not seasonal, thus having a rather continuous harvest, with technological improvements dramatically improving the profitability of such or such algorithmic search, others making it irrelevant, etc.

What could be some derived products of in silico harvests ? Which insurances, which futures, which options, which bonds and which shares ? Could there be cooperatives, or mutual genetic funds sharing computing capability ? Surely one of the most essential ressources of such a "silicoculture" would be floating operations per second (flops), but also the human ingenuity of the breeder. The ability to maximise value out of a given "head" (an evolved program) would also be an art in itself : pieces of code

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could be traded separately, possibly with other codes to determine the optimality of their piecemeal trading...

The mercantile exchange of genetic algorithms or algorithmic material would immediately pose the problem of their fungibility, which is fascinating in itself : to which extent will one bit of code be considered equivalent, and thus financially interchangeable ,with another ? Could the quality of bits of code, or systems, if they come to be sold as well, be assessed and guaranteed ? Which composites could ensure the standardisation of the intrinsic diversity of a large spectrum of genetic materials, and would it even be desirable ?

For the moment, let us suppose that a sufficient clarity has been achieved in the posting of algorithmic specifications for a market to be established between bidders and askers. Bidders would be botcrafters (sellers with a precise target in mind) and botbreeders (sellers having developed their algorithms without an initial target among askers) having fresh algorithms to offer, each fitting precise enough specifications, either made-to-order from the specifications of askers (botcrafting) or anticipated or serendipitously emerged from the art of botbreeders. The creation of a novel breed of code could end up comparable of that of a novel breed of, say, wheat, rice, cattle, etc. It also seems that demand should establish and distinguish the different algorithmic markets, for which a possible basic unit would the family of task to automatise. Caffeinated drinks, for example, establish a family of commodity markets (from tea to maté to coffee). The same could go for a large diversity of tasks normally performed by knowledge workers.

The market between askers and bidders will ultimately need to evolve beyond barter, and this is where an ad hoc currency would be needed. A cryptocurrency seems the most adequate to fit this need, but the rules of its supply and value would remain to be decided. The rate of exchange of bitcoin, for example, is established by the flow of exchanges between it and regular currencies, usually the US dollar. It is not backed by knowledge per se, but by mining, which is correlated with computing power (in flops) or ingenuity : for example, it is possibly to hijack computing power from the Web, through zombie machines recruited on massively multiplayer online games for example, to achieve competitive bitcoin mining without having to amortise a costly proper computing infrastructure.

Huang et al. (2014) have called “botcoins” the monetising of stolen computing cycles. The “botcoin” I introduce here however, is not comparable :

Botcoin (4)

A fiat cryptocurrency representing one unit of purchasing power on trading places for algorithms.

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Holding botcoins would represent the ability to purchase algorithmic value. Since this value would also represent saved time, money etc, it could remain convertible, just as bitcoins. One difference with the most widely used cryptocurrency however is that there would not necessarily be a need for miners, or a fixed asymptotic money supply (as is the case for bitcoins). The money supply of botcoins could be established by consensus, pegged to the volume of exchanges, or established in any other way so as to preserve the liquidity of markets and, of course, discourage excessive hoarding. The founding purpose of botcoins would be to increase the liquidity of trading places for algorithms and to facilitate the commoditisation of programs by establishing a trustable intermediate between made-to-order programming and en passant purchases, that is, purchases executed by a third party, of value that was created for another client.

Botcoin could also be correlated with another currency theorised by Pierre Collet (personal communication), the ECU for Evolutionary Currency Unit, representing, on the bidder's side this time, one unit of evolutionary computing power. The joint creation of currencies to standardise and liquefy purchasing power on both the bidder and asker's sides would be designed to accelerate even more the commoditisation of softwares.

VI. Conclusion

Although it may seem revolutionary, the economy of evolutionary algorithms, unsurprisingly, seems relatively close to physiocracy. Its consequences remain non trivial, because the breeding of algorithmic value, a value that writes itself, that has the intrinsic potential of surprising its breeder, and that actually represents a service rather than a material - although physiocracy as been overlooked as a theory of services rather than of materials, as the advent of the notion of ecosystem services has quite clearly demonstrated - remains novel in itself.

The commoditisation of softwares, accelerated by the technology of genetic programming, is a very fertile case study for the economist. It may pose at least three questions : why achieve it ? how to achieve it ? what kind of economy will emerge from it ? For example, what could be the emerging elasticity and cyclicity of such novel "botmarkets". The consequences of the commoditisation of softwares on microeconomic, mesoeconomic and macroeconomic productivity should also be considered.

The present outline leaves much room for improvement, which was precisely its purpose, but it has attempted to establish enough clear concepts to found the study of in silico economics.

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