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ARTIFICIAL INTELLIGENCE FOR COMPLEXITY THEORY

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Abstract. In this continued series of work, we present the theoretical and practical results towards reasoning with modern methods of Artificial Intelligence (AI). We justify our methodology with help of illustrative examples from Computer Science relying on the regular expression matching algorithm and application of the proposed solution for the task of identifying files consistency according to the unknown format. We will also give several notable proofs to the classical theorems which in some sense are coherent to the terms like AI and algorithmic complexity, however, or at least, nowadays they're solved involving the huge amount of hardware resources and together constitute the new formation in the modern age with help of specifically crafter hardware modules – we're still about to represent the model in more classical understanding from the point of view of computational complexity, concise reasoning and computer logic within the classical models, theorems and proofs as the base approach of estimating the costs needed to build Artificial Neural Networks (ANN) or Machine Learning (ML) data.

Keywords: artificial intelligence, parsing, algorithm.

Introduction

We are giving clear statement that the prevalence of artificial intelligence technologies like ML has gained final success in applied sciences like medicine or Computer Vision (CV) [1].

Since these times, it continues to grow up in the field of application and extension to the real-life circumstances.

However, we define the question of if artificial intelligence has a consciousness and how it'd change the state of the matter if this would be completely proved and researched. On this occasion still it's necessary to estimate that network of neural nodes cannot produce the clear conscious mind as human being can be. We address this question for further investigation from psychological point of view with the main focus on cognitive abilities of the artificial intelligence which cannot be achieved by simply simulating the neural network.

Artificial Intelligence, or simply AI, and its consciousness is a general question of the modern Computer Science, which is highlighted in the press by many researchers [2, 3]. We are to answer the question whether it's important and whether it's possible. Of course, we give our argument towards the fact that psychology and self "I" of any mind cannot be followed from the chaos produced by the neural network, thus, all the arguments made towards the fact that AI can be conscious based upon latest knowledge and technology cannot be addressed to the main point of view as per analogy of the human "I" and his modus operandi.

The data volume as a starting point of view are estimated as very big in gigabytes of pure textual data in order to train the neural network. This is a very challenging task as gaining such big amount of data and successful storage of the trained neural network means the decision to take care of Big-Data hardware. Thus, Big Data for AI could be a good trend nowadays leaving the hope of free services around the globe in order to be cheap and safe and generally free of charge.

Artificial Intelligence and its consciousness don't adhere to the economic stability and grow as in the modern time the computer programmer profession will be replaced by clever AI. This is tied not only to programmers but also to other list of professions which will simply vanish due to the process of globalization of AI.

There's another point of view which is meant to be the artificial intelligence for the not good intentions. Of course, there's a way to train the neural network against the prohibited type of data. Thus, if we, for example, would train the network against the binary codes of executables and their source codes, this will lead to the reverse engineering which is a prohibited method of obtaining source codes of programs from their packaged content. The same malicious method can be applied to password guess and other tasks

which involve the example to be seeded from the large amount of sample data.

ChatGPT and other modern trends of artificial intelligence are already gone to practice due to the need of automated assistant in business processes. This could be a question addressed to economics, however, still due to the prevalence of the automated solutions there's no need of human interaction, thus, the proficiency and artificial intelligence remains an open question in labor market.

The clear consciousness of the artificial intelligence, we, thus, address to the psychological, psychical and physiological processes of the brain, when human neurons transfer the signal from one point on the brain to another. As this is already done in artificial networks, we still cannot conclude that artificial neural network can replace the human brain functionality due to the presence of the term psychiatry – we call it a Freud conjecture, when still trained data model cannot acquire the self-"I" – thus, it can be modelled as a separate kind of entity available on the control environment like hardware and programming languages to be operated.

We also give the notion to the rapidly growing interest of variety of communities for Machine Learning. We give the definition of algorithm of Explainable Machine Learning in order to define the extensible role of the ML in the field of algorithmic approach rather than resorting to the classical approach of neural networks.

O-notation and equivalence of complexity classes

Starting from this point we define the complexity from big-O notation which can be relative as to the fact which is outlined to be a definitive argument towards AI operability and algorithms' complexity. In fact, they're linear, however, the big amount of data and slow performance make their choice towards choosing more effective solutions.

In this section we define the relation between complexity classes like equivalence, less or greater as for the two compared algorithms:

$$O\big(f(n)\big) \sim ? \, O\big(g(n)\big). \tag{1}$$

This can be achieved during the maximal load of both algorithms measured by functions in (1). This maximum value can be achieved only by the limit in the following form:

$$r[f(n), g(n)] = \lim_{n\to\infty} \frac{f(n)}{g(n)} = \lim_{n\to\infty} \frac{f\prime(n)}{g\prime(n)} = \begin{cases} 0, O\big(f(n)\big) < O(g(n)) \\ C, C > 0, O\big(f(n)\big) = O(g(n)). \\ \infty, O\big(f(n)\big) > O(g(n)) \end{cases} \tag{2}$$

Here in (2), *C* is a constant value and is valid if only both complexity classes are equal, which can be derived by derivative rule of any degree.

Thus, we simplify our relation to the following form:

$$r(f, g) = \begin{cases} 0 \\ C, C > 0. \\ \infty \end{cases} \tag{3}$$

The derivative rule is also in common can be evaluated as follows:

$$\lim_{n\to\infty} \frac{f(n)}{g(n)} = \lim_{n\to\infty} \frac{f\prime(n)}{g\prime(n)} = \lim_{\substack{n\to\infty \\ k>0}} \frac{d^k[f(n)]}{d^k[g(n)]}. \tag{4}$$

Algorithms and definition of their complexity can be found in [4]. Further in this article we will show the strict proof of the complexity classes P and NP using non-trivial occasion which is defined in comparative work [5].

NP-completeness and hash functions

Here we give the proof of the existence of hash function which can be defined by a hash of the fixed length, for example, as it's defined in MD5 to be 128 bits.

Since for the input, there're only fixed number of possible ways of giving the collision to the one-way function, we define the probability of collision as follows:

$$p(n) = \frac{2^{128}}{2^n} = 2^{128-n}. \quad (5)$$

As the one-way function is defined on all the input space the probability (5) will be measured towards common input as follows:

$$\lim_{n\to\infty} p(n) = 0 \Rightarrow \exists f(x). \quad (6)$$

Where in (6) *f(x)* is a one-way function which exists since the probability of collision is defined on the whole set of the input and randomly defined function will never collide. The latter is true for non-random functions if they're relevant to the common case of dependence from the input size given by the parameter *n* in (5) and (6).

On account for "P versus NP" theorem we get the following from (4):

$$O(n!) = O\left(n^k\right). \quad (7)$$

The (7) holds true as we can see further:

$$\lim_{n\to\infty} \frac{n^k}{n!} = \lim_{\substack{n\to\infty \\ k\to\infty}} \frac{d^k(n^k)}{d^k(n!)} = \lim_{\substack{n\to\infty \\ k=n}} \frac{n!}{n!} = 1. \quad (8)$$

Thus, from (8) it follows that P equals NP.

Smart parsing and position automata

The position automata are deterministic finite automata with the definition of the position as an additional parameter in follow function for the state, position and label of the outgoing edge.

The parsing within the AI is defined as a way of complementing of any of the trained models to the input data which can be formatted with help of position automata.

We can also conclude that position automata are reminiscent to the state explosion effect. The smart parsing, thus, gives the possibility of the trained data to be applied for the identification of the common format.

The task above can be also defined by the alternating regular expression with the definition of all the combinations of subgroups given by brackets in the final pattern string. Thus, at each step of the algorithm we collect the matched input file towards the pre-defined pattern with help of neural network which records each generation of learning for each of the input files.

The brackets can be formed as a full combination of valid patterns which together give the entire template of the input in the pre-defined file format, while the other input strings can be matched against sparse tree with the assumption that ending leaves of this tree are closed under &-operator artificial state.

The construction above gives the possibility of recognizing the common format of files grouped by their extension.

Conclusion

The questions of artificial intelligence and its consciousness as well as the global impact of it on the natural processes like economics and labor market are also given followed by the research practice and knowledge.

Thus, we devise more concept from the term Artificial General Intelligence (AGI) on the very urgent question of the human labor which will be replaced in the near future by AGI according to the predictions from opinions raised in press and which wasn't raised in science. The ethical question beyond this fact is to provide the AGI with the consciousness model so that it could be addressed to the worker's burden. This ethical question isn't limited to the loss in labor market and the underlying conditions where AGI can be used for malicious intentions – that's still the question of advocacy and policy as well.

We have also given the answer to the P and NP in limit spaces as it follows that they are equal in

general.

We have also proposed the algorithm based upon artificial states in automata to identify the input file format based upon the trained amount of data.

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ЕСЕПТЕУ ТЕОРИЯСЫНА АРНАЛҒАН ЖАСАНДЫ ИНТЕЛЛЕКТ

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Андатпа. Осы жалғасты жұмыс сериясында біз жасанды интеллекттің (ЖИ) заманауи әдістерімен ойлаудың теориялық және практикалық нәтижелерін ұсынамыз. Біз өз әдістемемізді информатикадан көрнекі мысалдар көмегімен тұрақты өрнектерді сәйкестендіру алгоритміне және белгісіз пішімге сәйкес файлдардың сәйкестігін анықтау тапсырмасы үшін ұсынылған шешімді қолдануға негіздейміз. Біз сондай-ақ белгілі бір мағынада ЖИ және алгоритмдік күрделілік сияқты терминдерге сәйкес келетін классикалық теоремаларға бірнеше маңызды дәлелдер келтіреміз, бірақ, немесе, кем дегенде, қазіргі уақытта олар аппараттық ресурстардың үлкен көлемін ескере отырып шешіледі және бірге жаңа формацияны құрайды. қазіргі заманда арнайы құрастырылған аппараттық модульдердің көмегімен – біз әлі де классикалық модельдер, теоремалар мен дәлелдер негізінде есептеу күрделілігі, қысқаша пайымдау және компьютерлік логика тұрғысынан модельді классикалық түсінуде көрсетеміз. Жасанды нейрондық желілер (ЖНЖ) немесе Machine Learning (ML) деректерін құруға қажетті шығындарды бағалау тәсілі.

Кілттік сөздер: жасанды интеллект, талдау, алгоритм.

ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ ДЛЯ ТЕОРИИ СЛОЖНОСТИ

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Аннотация. В этой продолжающейся серии работ мы представляем теоретические и практические результаты рассуждений с использованием современных методов искусственного интеллекта (ИИ). Мы обосновываем нашу методологию наглядными примерами из области компьютерных наук, опираясь на алгоритм сопоставления регулярных выражений и применение предложенного решения задачи определения непротиворечивости файлов по неизвестному формату. Мы также приведем несколько примечательных доказательств классических теорем,

которые в некотором смысле согласуются с такими терминами, как ИИ и алгоритмическая сложность, однако, по крайней мере, в настоящее время они решаются с использованием огромного количества аппаратных ресурсов и вместе составляют новую формацию. в современную эпоху с помощью специально созданных аппаратных модулей – мы все еще собираемся представить модель в более классическом понимании с точки зрения вычислительной сложности, лаконичных рассуждений и компьютерной логики в рамках классических моделей, теорем и доказательств в качестве основы подход к оценке затрат, необходимых для создания данных искусственных нейронных сетей (ИНС) или машинного обучения (МО).

Ключевые слова: искусственный интеллект, синтаксический анализ, алгоритм.

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