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ARTIFICIAL NEURAL NETWORKS AND TRANSLATION

НЕЙРОСЕТЕВЫЕ МЕХАНИЗМЫ ПЕРЕВОДА И ИХ ЗНАЧЕНИЯ

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Abstract. Relevance of the issue under study is enough high to worry and speculate about it, because technologies now are reaching the step, there it was not expected to see about 5–6 years ago. The purpose of the article is to understand, is it possible in the near future to make machine translator based Artificial Neural Network (ANN) able to remove live translators. The leading approach to the study is to compare statistical translation, translation by neural network and translation by professional live translator, to see how high quality of translation by machine interpreter. The article considers the basic concepts of ANN, as well as modern artificial translators. The results showed that Artificial Intelligence developed on a very high level, but we are still at a great distance from technologies of that level and near future, it will eliminate professional translators, though, artificial translators influence on increasing level of language knowledge. The article may be useful for people interested in mechanisms of translation and for translators of all levels, as well as for programmers who are interested in Artificial Intelligence (AI) and all kind of translators, who want to know the future of their profession.

Аннотация. Актуальность вопроса исследования связана с быстрым развитием информационных технологий. Цель статьи — разобраться, возможно ли в ближайшем будущем сделать машинный переводчик на основе искусственной нейронной сети и сможет ли такой вид переводчика заменить живых переводчиков. Ведущим подходом к исследованию является сравнение статистического перевода с переводом нейросети и с переводом профессионального живого переводчика, чтобы увидеть, с целью выяснить насколько высоко качество перевода машинным переводчиком. В статье рассматриваются основные понятия искусственных нейронных сетей, и современных искусственных переводчиков. Результаты показали, что искусственный интеллект развит на очень высоком уровне, но мы все еще на большом расстоянии от технологий такого уровня, и в ближайшем

будущем он не сможет полностью устранить профессиональных переводчиков, хотя искусственные переводчики влияют на повышение уровня знания языка. Статья может быть полезна людям, заинтересованным в механизмах перевода, переводчикам всех уровней, а также программистам, которые заинтересованы в искусственном интеллекте и переводчикам, которые хотят узнать будущее своей профессии.

Keywords: linguistics, language, translation, speech, text, semantics, words, neural network, artificial neural network.

Ключевые слова: лингвистика, язык, перевод, речь, текст, семантика, нейронная сеть, искусственная нейронная сеть.

Artificial Neural Networks (or ANN) is a computational model and its implementation, built by the principle its biological analogue. Machine learning is the basis of ANN, which is represented by group of methods. These methods provide perception and processing all of information that could be useful for solving a problem. Deep Learning (DL) is one of the main methods in ANN. DL is represented by set of algorithms, trying to simulate and build high level abstractions in data with an architectures, which consists of set of nonlinear transformations. The use of Deep Learning lets us to refuse manual choice and attribute configuration, by training attributes without a master or with partial involvement of a master, and then master should use efficient algorithm and hierarchical extraction of attributes [3]. Researches in this field aim at improving the operations with large amounts of unmarked data. Some of solutions appear because of achievement in neuroscience field and interpretation data processing goals and building communication models in the nervous system, such as neural coding. The main task of the nevous system is to determine the relationship between stimulus and neuronal responses and the relationship of electrical activity between neurons in the brain.

For the first ten years, translation sites worked as dictionaries: they received a word / phrase / text on the input and went on to the database searching for a translation corresponding to the word. This system, even by those standards, to put it mildly, did not cope with its tasks, giving only translated, but not meaningful sentences at the output. Such failures did not make long wait for improvement or even a complete replacement of the algorithm on which an inanimate translator should work. Once neural networks were widely used in various spheres of life, the rapid growth in the popularity of the use of ANN technology did not bypass the matter of translators [1– 2].

In the modern world, there are translators of different levels. 80% of all translators are busy with fulfilling the requirements of legislation, 20% translating instructions to medical products, machine tools, using additional software to compile glossaries of terms. 3% of these 20% are distinguished, specifically artistic translators, translators of scientific and technical literature and simultaneous interpreters (1). However, the ANN, which can learn to understand someone else's speech and correctly build one's own through DL, can greatly simplify the work for all of them. Can this same but improved ANN ever completely eliminate the need for live translators? To answer this question, we need to find out some others.

Currently, one of the most advanced and up–to–date translation mechanisms is the GNMT (Google's Neural Machine Translation) ANN. Its peculiarity is that it consists of a "basis of meanings" for each word or expression that is formed by comparing possible variations in the meaning. In addition, GNMT analyzes sentences, breaking them into parts that carry a semantic load. In this way, the "basis of meanings" is obtained, which makes it possible to bring the translation to a fundamentally new level. With the use of this database, a GNMT can translate any language pair from several available languages and all this occurs at the expense of a "universal" language, which is so far understandable only by this neural ANN (2). However, is it possible to improve this machine translation mechanism more essential?

Yes, let's say we just increase the number of hidden layers, thereby complicating the algorithm, getting some increase in the quality of the translation. Layers can be added infinitely, but then raises question of memory, and generally the profitability of such a solution. After all, each added layer makes the algorithm at times more complicated and often slower. Thus, we get that winning by quality, we lose almost all the other parameters. With that said, improvement of algorithm will also give some improvement of mark, and due to the DL method, the system just improves itself with time.

Despite these possibilities, the machine translation mechanism based on ANN in some aspects will never be able to reach the human level of speech and translation. At first, because such responsible tasks as simultaneous interpretation require a translator with great knowledge and vast experience in the negotiations, but apart from that they require translator to understand the interlocutor not just at the semantic level, but at the level of emotions. Perhaps a ANN can learn to recognize a person's emotions by how and what he says, but too much responsibility in such a delicate matter where a couple of incorrect words can lead to irreparable consequences. It does not matter how perfect is your translation mechanism, it is always easier and often more accurate for a human to determine the feelings and emotions of the interlocutor. Moreover, each person is inclined to express emotions in his own way and already in this case, it will be practically impossible to build a universal algorithm for "determining the mood". There is also another problem for the mechanism — it is a constant update of meaning basis and meaning of words. In any language, words can be divided into a lot of attributes, one of which is age. Over time, with words and expressions, many phenomena can occur from change of meaning to extinction. It will lead to the fact that, in the course of contextual analysis, ANN cannot give a certain result with some probability due to the fact that this or that expression is in an unstable position, because of what its meaning remains inaccurate and blurred, which will not allow 100% confident in the translation. In such cases, a person will have to interfere with the work of ANN and make changes in it, and hence it follows that a fully automated system cannot be created, we can only come closer to an ideally correct basis of meanings for a certain period of time.

In conclusion, let us remember the main question: Can ANN ever eliminate the need for live translators? We can be sure, that the answer is "No". As already noted above, most translators are simply necessary by law, they have long been possible to replace the computer, due to the ease of work, but it did not happen and will not. The use of ANN will significantly increase the overall quality of the translation, a more qualitative and understandable translation will at the same time be more accessible, but this will not affect the professional sphere in any way.

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