A NOVEL METHOD FOR ARTIFICIAL INTELLIGENCE LITERATURE SURVEY

TITLE : Towards artificial general intelligence via a multimodal foundation model

AUTHOR : Nanyi Fei

DESCRIPTION :

Multimodal (visual and textual) foundation models typically take image-text pairs as input and model the correlation between two different modalities in their pre-training data. Although existing multimodal foundation models have shown promising results on fast learning/transfer and cross-modal understanding tasks, the majority of them make the assumption of strong semantic correlation over the input image-text pairs (e.g., image-caption pairs) and expect exact matches between the objects/regions in an image and the words in a piece of text .This seriously limits these models' generalization abilities because the strong semantic correlation assumption is often invalid in the real world and multimodal data following this assumption is limited (e.g., only millions of image-caption pairs are collected by years of human annotation). This situation becomes worse when latest multimodal foundation models often employ object detectors to obtain meaningful image regions and adopt a single-tower network architecture for better modeling the fine-grained region-word matching (i.e., taking the concatenation of image regions and text words as input). These two common practices (i.e., object detectors and the single-tower architecture) are both computationally costly and thus unsuited for real-world applications. Particularly, as for the latter, given a query in cross-modal retrieval (text-to-image or image-to-text), all possible query-candidate pairs need to be fed into the model to compute matching scores, resulting in large latency in retrieval.

PUBLISHED IN : 2022

TITLE **:** The Embeddings World and Artificial General Intelligence

AUTHOR **:** Chehreghani, M H

DESCRIPTION :

From early days, a key and controversial question inside the artificial intelligence community was whether Artificial General Intelligence (AGI) is achievable. AGI is the ability of machines and computer programs to achieve human-level intelligence and do all tasks that a human being can. While there exist a number of systems in the literature claiming they realize AGI, several other researchers argue that it is impossible to achieve it. In this paper, we take a different view to the problem. First, we discuss that in order to realize AGI, along with building intelligent machines and programs, an intelligent world should also be constructed which is on the one hand, an accurate approximation of our world and on the other hand, a significant part of reasoning of intelligent machines is already embedded in this world. Then we discuss that AGI is not a product or algorithm, rather it is a continuous process which will become more and more mature over time (like human civilization and wisdom). Then, we argue that pre-trained embeddings play a key role in building this intelligent world and as a result, realizing AGI .We discuss how pre-trained embeddings facilitate achieving several characteristics of human-level intelligence, such as embodiment, common sense knowledge, unconscious knowledge and continuality of learning, by machines.

PUBLISHED IN : 2022

TITLE **:** Unifying Causal Inference and Reinforcement Learning using Higher-Order Category Theory

AUTHOR **:** Sridhar Mahadevan

DESCRIPTION :

We present a unified formalism for structure discovery of causal models and predictive state representation (PSR) models in reinforcement learning (RL) using higher-order category theory. Specifically, we model structure discovery in both settings using

simplicial objects, contravariant functors from the category of ordinal numbers into any category. Fragments of causal models that are equivalent under conditional independence -- defined as causal horns -- as well as subsequences of potential tests in a predictive state representation -- defined as predictive horns -- are both special cases of horns of a simplicial object, subsets resulting from the removal of the interior and the face opposite a particular vertex. Latent structure discovery in both settings involve the same fundamental mathematical problem of finding extensions of horns of simplicial objects through solving lifting problems in commutative diagrams, and exploiting weak homotopies that define higher-order symmetries. Solutions to the problem of filling "inner" vs "outer" horns leads to various notions of higher-order categories, including weak Kan complexes and quasicategories. We define the abstract problem of structure discovery in both settings in terms of adjoint functors between the category of universal causal models or universal decision models and its simplicial object representation.

PUBLISHED IN : 2022

TITLE **:** Classical surrogates for quantum learning models

AUTHORS **:** Franz J. Schreiber, Jens Eisert, Johannes Jakob Meyer

DESCRIPTION :

The advent of noisy intermediate-scale quantum computers has put the search for possible applications to the forefront of quantum information science. One area where hopes for an advantage through near-term quantum computers are high is quantum machine learning, where variational quantum learning models based on parametrized quantum circuits are discussed. In this work, we introduce the concept of a classical surrogate, a classical model which can be efficiently obtained from a trained quantum learning model and reproduces its input-output relations. As inference can be performed classically, the existence of a classical surrogate greatly enhances the applicability of a quantum learning strategy. However, the classical surrogate also challenges possible advantages of quantum schemes. As it is possible to directly optimize the ansatz of the classical surrogate, they create a natural benchmark the quantum model has to outperform.

We show that large classes of well-analyzed re-uploading models have a classical surrogate. We conducted numerical experiments and found that these quantum models show no advantage in performance or trainability in the problems we analyze. This leaves only generalization capability as possible point of quantum advantage and emphasizes the dire need for a better understanding of inductive biases of quantum learning model

PUBLISHED IN : 2022

TITLE : Understanding Terminologies of CAT Tools and Machine Translation Applications

AUTHORS : Zaki Muhammad Zayyanu, John Ogboji, Nwanjoku Chukwunonyee Anthony

DESCRIPTION :

The research tends to make a clear description of Machine Translation for users to be familiar with terminologies related to Machine Learning and precisely CAT tools (translation applications).The purpose of this paper is to broaden the scope of the use of translation technology and to explore its application in translation. There have been issues relating to Machine Translation .Since most translators are not familiar with translation aids, it is , therefore , necessary for translators to explore the translation applications. Translation can be achieved in different ways i.e. human and machine. Consequently , human translation lacks speed and accuracy hence, translation application must come into play. One can find a variety of such applications online. The software assists human incapabilities and limitations in different ways especially for translation memory which assists the translator to be consistent and coherent in using terminologies. This paper applied analytical and description approaches of translations. The study finally observed that each translation software has its unique identity and most of the sophisticated ones are not free. The researcher traced the processes or systems that support CAT tools such as machine language, machine learning ,and finally features and metrics of evaluating Machine Translation. The researchers, therefore, concluded that translation without machine technology will definitely be difficult especially when translation involves huge tasks and different languages.

PUBLISHED IN : 2017