

Machine Learning Algorithm and Software System Development for Industrial AI

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Abstract

The advent of deep learning (DL) technology followed by the emergence of a host of new AI technology in the fields of computer vision (CV), natural language processing (NLP), recommendation system (RecSys), and reinforcement learning (RL), has made a great impact in virtually all aspects of our lives. They have driven harsh competition in the self-driving car development race, created diverse chat-bots which enabled enterprises to serve and help customers without investing in human resources, written creative novels and composed new music pieces, and increased customer engagement by recommending the right products in e-commerce areas using advanced recommender systems.

However, we have not seen much progress in successful application of these ML techniques in the industry sectors. There are numerous reasons as to why. For example, the manufacturing equipment entails data drift and shift, hence those ML methods working well for general applications suffer from these concept drift. The computer vision applications in industry lots of times require extremely high accuracy, hence the allowable error is extremely small to the extent that even the state-of-the-art CV DL algorithms need lots of tunings and manual work. Some applications do not provide correct labels or the labels should be created by human engineers whose judgement is most of times subjective. There exist numerous other reasons, too, the part of which will be addressed in this seminar.

We introduce industrial AI and argue why this field is still a blue ocean with huge potential in both delivering business values to enterprises and making engineers' lives easier. We will present a few success stories of applying ML techniques to some of the most difficult industrial AI problems and show how we could make the breakthroughs. Then we present time-series machine learning (ML) algorithms and techniques and its applications in Manufacturing. Because virtually every data coming out of the manufacturing lines is time-series data, mastering and utilizing these techniques are critical for delivering quality ML solutions and services to the customers. We also address how we can resolve the dilemma of applicability of these techniques to specific domains and genericity and reusability of both algorithmic and software components. This balance is crucial not only for our own research and development, but also for delivering values to customers on time. We will end this seminar by emphasizing that for the successful development and delivery of working industrial AI solutions, the values delivered to customers, product roadmap, software system roadmap, and ML algorithm development should be well aligned.