Intelligent analysis and probing of server anomaly detection for power consumption

Problem Statement

The maintenance of the servers/infra is becoming challenging task. The servers are stationed at closer to place of business which often means no ideal power supply, network connection, trained staff. In such an environment infrastructure safeguard and maintenance becomes extremely unpredictable and difficult. Due to poor network/harsh physical environmental conditions the traditional methods of remote monitoring and maintenance will not work, since it completely depends on the connectivity to datacenter and multiple applications running within the server.

There are several servers which can be found that are ideal since some stipulated time. When there is situation where application consumes more power and the user may or may not be have enough resources to measure the consumption and thus to analyze on overall power consumption. it is extremely difficult job to identify such servers and keep track of the same.

As the usage and dependency on infra increased, the following challenges exists in maintaining the server.

- Identifying the servers where applications running consumes more power than expected.
- Detecting the failures of the system in real time
- Detecting the component malfunction which will lead to poor performance
- Detecting the overuse/under use of resources which leads to physical damage of the components.

Idea is to analyze the data and come up with predictive model for maximum and minimum power required for each and every application by considering multiple parameters. Thus, to save the energy.

Brief Solution Description

In the last decade, extended efforts have been poured into energy efficiency. Several energy consumption datasets were henceforth published, with each dataset varying in properties, uses and limitations. For instance, building energy consumption patterns are sourced from several sources, including ambient conditions, user occupancy, weather conditions and consumer preferences. Thus, a proper understanding of the available datasets will result in a strong basis for improving energy efficiency.

Based on the analytical study, a novel dataset has been presented which is an annotated power consumption anomaly detection dataset. The latter will be very useful for testing and training anomaly detection algorithms.

Accordingly, a novel visualization strategy based on using power consumption and predict the model based on the number/ type of the application running within the system is implementation logic and identify anomalous power usage.

What's new?

- Novel implementation of predicting and monitor any application power consumption which helps to save the wasting of energy.

Detailed Solution

Recent studies have shown that buildings are in charge of more than 40% of power consumption demand and greenhouse gas emissions around the world. Indeed, this steady growth in energy consumption has been closely tied to the increasing number of population and the rising levels of prosperity. Moreover, even climate conditions in certain regions of the world obliged households to call for more energy for heating, cooling, cooking and refrigeration needs.

In current industrial laboratories that contains multiple number of servers and there exists multiple applications running on top of server. Maintaining and analyzing the power consumption plays vital role. Considering below parameters to build the model

Considering different protocols, hardware and software specifications and also state of different parameters such as health state, power state and connections, Below are few parameters for monitoring data which help us finely tune the hyperparameters of the models.

1) System utilization
2) Maximum system power consumption
3) Minimum system power consumption
4) Average System power consumption
5) Maximum Inlet temperature
6) Minimum Inlet temperature
7) Average Inlet temperature
8) Maximum CPU Utilization
9) Minimum CPU Utilization
10) Average CPU Utilization
11) Maximum memory Utilization
12) Minimum memory Utilization/Average memory Utilization
13) Maximum IO Utilization

Solution workflow Architecture for Model training:

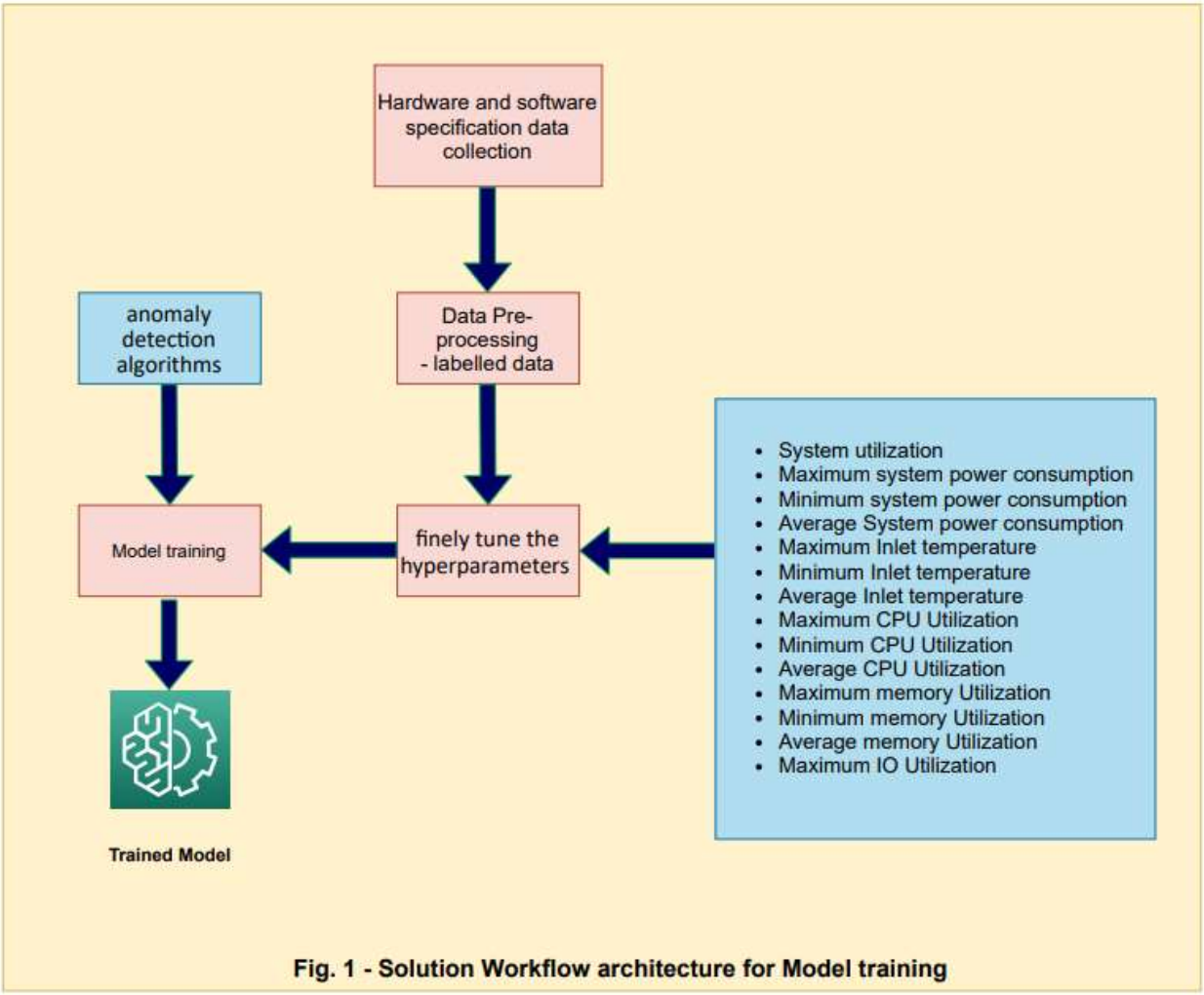

Fig. 1 - Solution Workflow architecture for Model training

Workflow Explanation:

1) Since the power consumption depends on both hardware and software parameters, the data collection process contains for both including power, thermal.
2) The data preprocessing is applied on the dataset and captures only required data and processes only labelled data further
3) Considering the hyperparameters the model gets trained and the list acts as a feature for the predicting model.
4) An anomaly detection algorithm is applied to train the model
5) Analysis can be made using Time series algorithm such as ARIMA based prediction of future system usage.
6) The prediction model is saved for deployment to predict power consumption.

Benefits

1) Intelligent methodology to analyze the data can provide bigger insight of power consumption data considering multiple parameters
2) Essentially, this solution proposes a visual logging aspect of server data than crude data. Which will provide tailored inferences which are easier to understand and implement.
3) Failure of the system can be minimized since prediction model captures the upcoming failures well in advance and helps to take necessary actions.