CHAPTER III

TASK-BASED CUSTOMIZATION

In this chapter, we will introduce the concept of task-based customization and also provide some backup arguments for the benefit of algorithms that follow this concept.

3.1 Concept of Task-Based Customization

As described in Chapter 2, customization is an approach in machine learning to modify/improve a model in order for it to yield better result. The most important requirement for customization is having the new dataset which we want the model to be adapted to. Also, in order to estimate the improvement from customization, it will require the minimum knowledges about the goal, which is the type of the task which the customization is made on. It is obvious that these knowledges are necessary for customization and by some more consideration ones can see that they are sufficient to perform a customization. However, with additional information, we should be able to perform even better.

Suppose that we do not know about any additional information other than the necessary ones for performing customization. It is obvious that the inner decision of the process will not be clarifiable and thus could only be estimated by observing outputs of some inputs we provide to the process. In simpler words, we must treat the process as a black box. Methods for using the information from this black box can be separated into two kinds. The first one is to keep the black box for future use by conducting some decision process on it and its results instead of using them as the entire process. The other one is to extract the available information from the black box, and then use the information to create a new process that can be clearly identify, and thus discard the black box.

The most common additional information that is used in customization will be the information about the model. Knowing the exact method for calculation of the process will surely yield better understanding than trying to

extract them by observing the results obtained from providing the model with the input. Moreover, once the model is known, the algorithm can alter the inner parameters in meaningful way which will sensibly yield better results.

The other bit of additional knowledge is the algorithm that is used to create the model. Many algorithms may produce similar kind of models which perform the same task. They usually have the same final goal, but the difference between them can be either how they strive to reach that goal or the definition of how they interprete the final goal into the measurement used by the algorithm. For the first case, there are two alternatives in trying to optimize a goal. One method would yield better result but require a lot of resources while the other method may be faster but not guaranteed to provide the optimum solution. For the second case, a good example is dimensionality reduction. The common goal for dimensionality reduction is that the resulted data yields good result for the upcoming task, but each algorithm may interprete the subgoal to achieve this result differently.

3.2 Advantages and Drawbacks

An obvious statement is that, in general, model-specific algorithms should yield better result than task-based customization. However, there are many cases in which task-based customization is necessary due to the lack of information or available methods, e.g. models are in the forms that cannot be interpreted easily, the process is a black box by its nature, there is no algorithm for customization for the model.