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A Consumer Service Composition Framework for Cloud Computing Environment

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Abstract

Cloud services provide cloud consumers with different computing models such as software-as-a-Services (SaaS), Infrastructure-as-a-Service (IaaS), Data-as-a-Service (DaaS), and other IT related services (XaaS). These cloud services are provided on easy, scalable and on-demand manner. Also, the pay-as-you-go feature of the Cloud computing technology enables the service providers to offer their services with different configurations according to the service level agreement (SLA). So, a challenge is brought out from the proliferation of cloud services from different Cloud providers. These services overlap the functional properties but diverge in non-functional behaviors (i.e., Quality of Service, QoS). These QoS properties are used as differentiating factors for selecting the best services among functionally equivalent services.

On the other hand, Cloud consumer is mostly seeking a long-term economically driven business relationship with cloud service providers. However, he doesn't benefit from their available discounts on multiple different cloud services. Also, the composite service with the best current QoS performance is not necessarily the best after a period of time. Therefore, consumer' QoS requirements must be satisfied using all involved cloud services during the whole period of composition. Hence, he will face a challenge to select proper services that minimize his long-term cost function.

To tackle the problem of composing the best cloud services that minimize the consumer cost function, this thesis has proposed a Deep Learning Based Service Composition (DLSC) framework. It addresses the problem as a multivariate time series analysis. It uses the long short term memory (LSTM) network to accurately predict the future behavior. Then, it processes the service composition as a multiple objective problem using the particle swarm optimization algorithm (PSO).

To evaluate the proposed DLSC framework, a comparative study has been conducted using a real dataset called Integrated Cloud Services Dataset (ICSD), which is developed also in this thesis to involve the functional, nun-functional, and cost parameters. The

experimental results demonstrate the importance of considering long term composition and its impact on minimizing consumer cost function. Our DLSC composition framework outperforms other prediction approaches in terms of the prediction accuracy and composition accuracy. The averaged precision value using our DLSC framework is increased by **21%** relative to existing framework.