



**Department of Computer Science
St. Francis Xavier University
Presents**

**Tensor-based Lyapunov Control Strategy for
Mobile Neural Networks Cloud Offloading**

by

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Mobile cloud (MC) offloading migrates heavy computation from mobile devices to remote cloud resources or nearby cloudlets. It is a promising method to alleviate the struggle between resource-constrained mobile devices and resource-hungry mobile applications especially when users want to execute neural nets models on mobile devices. Because mobile phones have different characteristics in daily use, such as network environment, phone model, remaining power, etc. These problems are collectively referred to as limiting factors in this article. These limiting factors often have a significant impact on the offloading results. Therefore, making high-quality offloading decisions at execute time is difficult especially when we want to achieve global optimization. In order to optimize the energy consumption of the mobile phone under these limiting factors, an energy-efficient offloading-decision algorithm named tensor-based Lyapunov equation is proposed. This algorithm determines how many layers of the neural nets should be executed locally, cloudlet or cloud. The algorithm is able to minimize the average total energy consumption on mobile devices while ensuring that power, response time and cellular data satisfy given constraints. According to preliminary experimental results, compared to a single local or remote execution, the tensor-based Lyapunov control strategy algorithm can significantly reduce the energy consumption while only sacrificing a small portion of response time. From the final simulation data, this algorithm can reduce energy consumption by about 36 %. Furthermore, because more limiting factors are considered, the algorithm can better simulate the real environment and improve the user experience.