Implementable Bounds for a Neural Networks Algorithm in Communication Traffic Control

Alexandru Murgu

***Abstract*— The traffic control problem for communication networks has been widely considered either from the standpoint of traffic assignment, including linearizations of the nonlinear traffic pattern around the "nominal" regime and variational inequalities approach, or from the more classical standpoint of flow networks theory. When the traffic stream is time varying, additional computational effort is required, and the problem complexity becomes NP-hard, even when we want to solve some of its discrete time approximations (it is also NP-hard if we have interval uncertainty in some of the parameters).**

In this paper, an idea from continuous bounding approach often encountered in Linear Programming (deterministic or stochastic) is used to build a learning algorithm for the bound movement over the successive approximation of the true solution, trying to capture a "local" landscape of a convex functional. We implement the learning algorithm in a feedforward neural network (FNN) based on some merit function discriminating the quality of the solution bounds. Because the traffic pattern (that we want to control by using this learning mechanism) is stochastic, we need to check the convergence properties ensuring that the learning algorithm is asymptotically stable. For that, a suitably chosen stochastic Lyapunov function is used. Finally, we report some simulation results for a Gaussian flow pattern, and we draw the main conclusions of this research.

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The author is with Department of Mathematics, University of Jyvaskyla, FIN-40351 Jyvaskyla, FINLAND, Email murgu@julia.math.jyu.fi.

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