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February 1, 2012

Lynne McNamara, Ph.D.
Executive Director
Vietnam Education Foundation
2111 Wilson Boulevard, Suite 700,
Arlington, VA 22201

Dear Dr. McNamara:

The Department of Industrial and Systems Engineering at the University of Florida has been very fortunate to collaborate with two students funded via the Vietnam Education Foundation (VEF): Ms. Trang Nguyen and Ms. Yen Tang. Over the past several years, both Trang and Yen have excelled in our classroom and have shown impressive growth in their technical and communication skills. We have found both of them to be exceptionally talented, and more importantly, outstanding representatives of their native Vietnam.

Our graduate program is widely regarded as one of the leading programs in Operations Research and Industrial and Systems Engineering in the world (we are currently ranked 15th by *U.S. News and World Report*) and we have students from nearly 25 different countries. Trang and Yen contribute to our commitment to cultural diversity, but not at the expense of academic rigor, as they are clearly capable of academic success.

In response to your request, this letter strongly supports the continuation of the VEF. The students being supported are extremely well qualified. Furthermore, they are flourishing in our program, which is proven by the research that they are producing – it is of the highest caliber and will lead to solutions to a variety of problems in important application areas. It is believed that these students can take these skills back to their native Vietnam and apply them to pressing problems of national importance or become academics at leading Vietnamese universities or top researchers at relevant laboratories.

The following summaries provide an overview of the work that Trang and Yen are performing. My intent here is not to overload you with jargon or details. Rather, my intent is to describe the difficulty of the work they are performing – and performing with distinction. I believe that understanding this helps provide motivation for the VEF to continue its mission.

Since joining the University of Florida, Trang has been studying complementarity problems and more precisely mathematical programs with complementarity constraints (MPCCs) under the supervision of Dr. J. P. Richard (University of Florida) and Dr. M. Tawarmalani (Purdue University). MPCCs have numerous practical applications in business, engineering, and economics because these so-called complementarity conditions arise in the mathematical modeling of games and equilibria. The study of equilibria is in turn very important, because it establishes how rational agents make decisions in competitive situations with limited resources, e.g., how motorists seek to travel on congested roads, how businesses make decisions, and even how biological systems tend to evolve over time. Technically

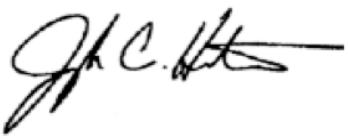
speaking, nonlinear programming problems containing differentiable constraint functions can be reformulated in a higher dimensional space using these optimality conditions. Trang has developed convexification techniques for linear programs with linear complementarity constraints (LPCCs) that generalize the Reformulation-Linearization Technique of Sherali and Adams and have similar convergence properties. She also studied certain complementarity problems appearing in KKT systems. For such problems, she showed that all nontrivial facet-defining inequalities can be obtained through a simple procedure that aggregates constraints and use McCormick relaxations of bilinear terms. Finally, she has studied the problem of generating strong cutting planes, in the space of the original variables, from the optimal simplex tableaux of the LP relaxation of LPCCs. She has shown that a geometric study of these sets lead to stronger cuts than those currently used in practice, and lead to finitely convergent cutting plane algorithms for these problems.

Yen has been studying bilevel integer programming problems under the supervision of Dr. J. C. Smith and Dr. Richard. Bilevel problems involve interacting agents at two distinct levels: some individual (which we refer to as the leader) makes a set of decisions first, to which agents (the "followers") must react. The leader anticipates the reactions of the followers so as to choose a best possible strategy. Bilevel problems have a wide variety of management, economics and military applications. Much of the literature has dealt with problems where variables in the follower problems are continuous. Yen's research is devoted to the study of these problems when the following problems contain binary decision variables. These problems are intrinsically harder and no general methodology is currently available for their solution. Her technical contributions arise in the study of mixed-integer bilevel min-max problems, in which a leader seeks to minimize a follower's maximum objective, and where both the leader and the follower decisions can be restricted to be integer. She has developed a new methodology to solve this class of problems by constructing an easily solvable restriction of the follower's problem, and iteratively refining this restriction until the procedure converges to an optimal leader-follower solution. Yen has proven that her algorithm is finitely convergent. She has also implemented her algorithm and evaluated its performance on several families of problems. She is currently working on applying her results to other problems and developing further theoretical results.

In all, we have found Trang and Yen to be outstanding students with bright futures as scholars. We believe that their achievements are indicative of most scholars supported by the VEF, and thus, the program should be continued. First, it provides an opportunity for excellent students to receive an outstanding education that can be used to the betterment of society. Second, it provides a mechanism for top schools to identify, and help support, these students. And third, it provides a fantastic way in which to learn about each other's cultures. Trang and Yen are excellent students, but they are also excellent ambassadors. Thus, they are clearly fulfilling the VEF mission.

I hope you find this letter helpful. Please let me know if I can be of further assistance.

Sincerely,



Joseph C. Hartman
Professor and Chair