

VIGRE Funding Report

(due 30 days after semester of support)

Semester/Summer and Year:

Fall 2008

Name: Daniel Reich

List the graduate courses you have taken this semester (including independent studies), your grades, and the instructors:

Course	Title	Grade	Instructor
Math 920	Dissertation	S	Leo Lopes

List the title, date and location of any talks you have given, either here or elsewhere:

The Most Likely Path Problem, 10/12/08, The INFORMS Annual Meeting
 My Summer Internship at the Target Corporation, 11/7/08, Program in Applied Mathematics Brown Bag Colloquium
 Stochastic Networks: Tractable Approaches for Identifying Strategic Paths, 12/15/08, Dissertation Defense

If you are working on your dissertation, include a one paragraph description of your research progress. If you have not yet begun dissertation research, describe your progress toward finding a dissertation topic and advisor and beginning that research.

In the final week of this Fall semester, I defended my dissertation. During the semester my advisor and I submitted our second publication on stochastic shortest path problems. In this paper, we develop an approach for efficiently preprocessing directed acyclic networks. Our method introduces a dynamic programming algorithm for identifying subnetworks on which a given edge is restricted. Restrictions on these subnetworks are then aggregated in an Integer Programming model, which is the final phase in our preprocessing algorithm. We provide proofs of correctness and our computational results provide evidence that our method is both highly effective and efficient in practice. Additionally, this Fall semester we began working on another research project related to the Brazilian power system. In this work, we introduce a method for utilizing clustering as a means of restructuring independent rainfall forecasts into a scenario tree where events are dependent on prior events. The scenario tree is input into a stochastic optimization model that is used in practice in Brazil to determine prices for electricity. We introduce measures for variability introduced by both the choice of scenario tree topology and by clustering. Our preliminary computational results serve to provide a foundation for continuing this research with more extensive computations.

List publications, if any.

Reich, D. and L. Lopes. The most likely path. Submitted to Networks, 2008.
Reich, D. and L. Lopes. Preprocessing stochastic shortest path problems on directed acyclic networks. Submitted to INFORMS Journal on Computing, 2008.

Check all activities you completed during the funded period:

Academics:

- Independent Study
- Oral Comprehensive Exam
- Commence Thesis Research
- Conference attendance
- Conference participation
- Complete PhD

Professional development and outreach:

- AP Calculus Visit
- High School Workshops
- Undergraduate Research Project
- Undergraduate Research Seminar
- Super TA
- Mentoring junior graduate students for the qualifying exams
- RTG (help organize)
- Research Seminar (help organize)

Other (please specify)

Concluded thesis research and passed dissertation defense (with minor revisions).
Organized the Software Interest Group Seminar.
Submitted an NSF International Research Fellowship Program proposal; and applied for other postdoctoral and faculty positions.

Attach a brief statment about your academic progress and professional development during the period of support.

VIGRE Fall 2008 End of the Semester Report

Daniel Reich

December 18, 2008

In the final week of this Fall semester, I successfully defended my dissertation. During the semester my advisor and I submitted our second publication on stochastic shortest path problems [Reich and Lopes, 2008]. In this paper, we develop an approach for efficiently preprocessing directed acyclic networks. Our method introduces a dynamic programming algorithm for identifying subnetworks on which a given edge is restricted. Restrictions on these subnetworks are then aggregated in an Integer Programming model, which is the final phase in our preprocessing algorithm. We provide proofs of correctness and our computational results provide evidence that our method is both highly effective and efficient in practice.

This Fall semester we also began working on a research project related to the Brazilian power system. In this work, we introduce a method for utilizing clustering as a means of restructuring independent rainfall forecasts into a scenario tree where events are dependent on prior events. The scenario tree is input into a stochastic optimization model that is used in practice in Brazil to determine prices for electricity. We introduce measures for variability introduced by both the choice of scenario tree topology and by clustering. Our preliminary computational results serve to provide a foundation for continuing this research with more extensive computations.

This Fall I also had both the opportunity and financial support (VIGRE travel, Herbert E. Carter Travel Award and Dr. Lopes) to present our research at the INFORMS Annual Meeting in Washington DC. Prior to the conference I attended the Future Academician Colloquium, which included sessions dedicated to navigating the job hunt, developing a successful research program, becoming an effective teacher, and dealing with work-life balance issues. Additionally, through the INFORMS Job Placement Service I had the opportunity to interview for several postdoctoral positions during the conference week.

In addition to completing the research needed to successfully defend my dissertation; and attending the INFORMS Annual Meeting, the VIGRE support I received this semester allowed me to devote a significant amount of time to applying for postdoctoral and faculty positions. Included in these applications was a proposal for the NSF International Research Fellowship Program sponsored by Professor Kate Smith-Miles, who as of January 2009 will be Head of the School of Mathematical Sciences at Monash University in Melbourne, Australia.

As part of my professional development activities for this Fall, I organized the Software Interest Group (SWIG) seminar. The goal of SWIG is to promote and advance computer and software literacy among the members of the department through meetings, talks, and discussions. I previously organized the SWIG seminar during the 2006-2007 academic year and have presented many SWIG talks throughout the last three years.

References

- D. Reich and L. Lopes. Preprocessing stochastic shortest path problems on directed acyclic networks. *Submitted to INFORMS Journal on Computing*, 2008.