

DEPARTMENT OF MATHEMATICS

VIGRE Funding Report

(due 30 days after semester of support)

Semester/Summer and Year:

Summer 2009

Name: Rebecca Stockbridge

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

Course	Title	Grade	Instructor
N/A			

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

N/A

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.

Following an independent study in Spring '09, I have been working with Dr. Guzin Bayraksan in Systems and Industrial Engineering. I will continue to work on solution validation techniques in stochastic optimization with Dr. Bayraksan this semester, and aim to take my oral exams in Spring '10.

List publications, if any.

N/A

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)

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

VIGRE Report, Part II - Summer 2009

Rebecca Stockbridge

I spent the majority of the summer working on the theoretical underpinnings of a bias-reduction method for stochastic programs. This technique will be used to reduce the bias of statistical estimators used in solution validation algorithms, in particular the Averaged Two-Replication Procedure (A2RP). I focused on proving the consistency of several statistical estimators with bias reduction applied. The bias reduction technique eliminates the initial i.i.d. nature of the random variables present in the problem, which significantly complicates the analysis. However, I have shown that the resulting non-i.i.d. distributions converge weakly to the true distribution of the random variables. This result combined with other tools such as epi-convergence and uniform strong law of large numbers under non-i.i.d. settings allowed me to complete the consistency proofs for the point and interval estimators of the optimality gap after bias reduction.

I spent the last few weeks of the summer running computational experiments to test the behavior of A2RP with bias reduction for small sample sizes for a particular stochastic program. The technique succeeds in reducing bias, and also provides narrower confidence intervals on the optimality gap without significantly reducing their validity. This reduction in confidence interval width is particularly pronounced when the candidate and optimal solutions coincide.

This fall I intend to extend the bias reduction technique to the Multiple Replications Procedure (MRP). MRP creates a different variance estimator, and hence a different interval estimator, of the optimality gap compared to A2RP. I will first begin my study of MRP by running similar computations to those described above in order to gain an understanding of the effect of our bias reduction technique on MRP. I will then aim to prove the consistency of relevant statistical estimators as above. The next step is testing both the A2RP and MRP solution validation algorithms with bias reduction for a wider range of stochastic programs.

In terms of professional development, I greatly enjoyed participating in the new class-to-class meetings at the end of the summer. They provided an excellent opportunity to meet and advise the incoming first year class, as well as to gain insight into the experiences of advanced graduate students. I am very much looking forward to participating in the Tucson Math Circle this fall.