

# CS/MATH 5486: Advanced Optimization.

**Instructor:** (1) Dr. Alexey V. Onufriev, 2160C Torgersen Hall  
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Office Hours: TBA

**Course Notes:** See the web site

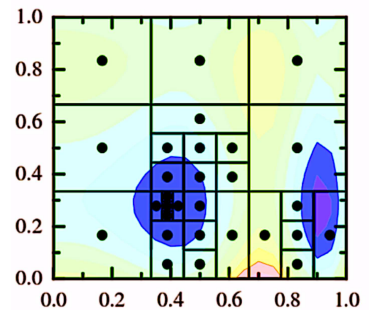
**Midterm:** NONE

**Pre-reqs:** Can be waived. Talk to instructor.

**Final exam:** Final project report.

**Course Website:** <http://courses.cs.vt.edu/cs5486/onufriev>

**Course purpose and structure** This course gives students hands-on experience with advanced optimization techniques used in modern science/engineering. Students will also gain experience with high performance computing relevant to optimization problems. The focus is on practical aspects of the problem. We will start with the basics, then progress to the hardest and important problem – finding global optimum of a function in multiple dimensions. Various approaches, common pitfalls and workaround will be covered, including the issue of robustness of computed optima. In addition to “classic”, practical and widely used optimization techniques, we will touch upon novel, emergent ones, including quantum annealing. Optimization methods relevant to Machine Learning will also be discussed.



Students will work in groups (depending on the class size) on realistic projects. Students will learn about modern high performance computing and software relevant to the course goals. Numerical methods relevant to the projects, as well as useful UNIX tools will also be covered. Access to real computational facilities will be provided.

The course will include instructor’s lectures, guest lectures, student presentations, hands-on “labs”, and work on the project.

In the past, students from different disciplines and departments (Physics, Bio, CS, GBCB) took a version of this course from me, which made it a multi-disciplinary experience. Not everyone is expected to have the same background. Note that the course has no connection to CS/MATH-5485 (Numerical Analysis and Software, Part I), the latter is not a prerequisite for “Advanced Optimization”.

**Grades** Final grade: about 80 % will come from the project and student presentations, about 20 % from the warm-up homeworks.

**Special Accommodations.** If any student needs special accommodations because of a disability, please contact the instructor during the first week of class.