The project will be assigned on Nov 7, and will be due Dec 7. You may work in a team of up to 3 people. The project should be no more than 5 pages and be professionally written in LaTeX. All code used must be submitted with the project. Code may be submitted as appendices and does not count as part of the five pages. You will prepare a presentation of your results to present on Dec 7.

Possible topics:

1. PageRank algorithm. Explain how the PageRank algorithm works. This is discussed in Chapter 2 of your text. Write a code to simulate the algorithm, and answer problems 21 - 27 in Chapter 2.

2. Effects of fossil fuel burning in the atmosphere. Show how the equations in problem 21 of Chapter 7 are derived. This would involve reading the papers referenced in the problem. Discuss the validity of the model. Answer problem 21.

3. Applications of singular value decomposition/principal component analysis. Problems 13 and/or 14 of Chapter 10 could be developed into a project. This would involve explaining what a principal component analysis is and how it is implemented.

4. Numerical methods for non-isotropic media. All of the methods for approximating solutions to differential equations that we have considered so far have assumed an *isotropic* medium. In other words we have assumed that the medium is the same everywhere. This resulted in equations with constant coefficients. If one assumes the medium varies in space one obtains equations with variable coefficients. Develop schemes for solving the 1D wave and diffusion equations and the 2D Laplace equation with variable coefficients. Simulate illustrative examples.