San José State University
Department of Mathematics

Spring 2009

Math 203: Applied Mathematics Project

Instructor: Slobodan Simić

Office: 318A MacQuarrie Hall

Phone: (408) 924-7485 (email is a better way of contacting me)

Email: simic@math.sjsu.edu

Web: http://www.math.sjsu.edu/~simic/Spring09/Math203/camcos09.html

Scientific sponsor: Dr. Jeffrey Scargle, NASA-Ames, email: jeffrey.d.scargle@nasa.gov

Time and location: Tuesdays and Thursdays at 9 AM in MH 331B, and as needed

Required Text: There is no textbook for this class.

Books we will probably use (but not required):

- Richard Feynman, QED, Princeton University Press, 2006 (or older edition)
- Richard Feynman, The Feynman Lectures on Physics, Addison Wesley Longman, 1970 (or newer edition)
- Desmond J. Higham and Nicholas J. Higham, MATLAB Guide, SIAM, 2005 (or older edition)

Prerequisite: Instructor consent

Office hours: Tuesdays and Thursdays 11–1:30

Homework: There will be no formal homework. However, you can do much of your work on the project at home, especially if you have MATLAB on your personal computer.

Tests: There will be no tests or exams. However, there will be a formal final presentation and a final report (see below).

Grading policy: Credit/No credit.

Project outline: The first couple of weeks of the semester I will be more or less lecturing to bring everybody up to speed. I will start by talking about the basics of causal set theory and the Feynman path integral/sum, then tell you about the main results of the related last year's CAMCOS project. I or a team member will give everyone a quick introduction to MATLAB, which we will be using extensively throughout the semester. After this initial warm-up, we will start our research with the hope of accomplishing some of the goals listed below.

Main goals: The central question we will investigate is: *Is the speed of a photon a function of its energy?* This may sound a little crazy, but it is a question physicists have been asking in recent years. The question is also motivated by a recent launch of the NASA GLAST satellite, which will try to collect observations that will help affirm or deny this hypothesis. We will do our investigation in a simplified computational setting of a 1+1D and/or 2+1D model of causal set theory using the so called Feynman path sum approach. Our research will be both theoretical (i.e., mathematical) and computational (i.e., via simulations in MATLAB).

An auxiliary goal is to investigate and understand the causal set theory itself, e.g., to try to understand how the combinatorics of a causal set relates to the continuous physical data we are used to (such as time, distance, velocity, etc.). We will try to incorporate more sophisticated physics and mathematics into our model and improve our algorithms to be able to work with larger causal sets as well as average our results over more computational runs. Other goals will be formulated as the project develops.

Logistics: There will be one or two team leaders. They will be in charge of (and paid for) setting the agenda for team meetings, writing up notes, making sure everyone is contributing to the team, etc.

On **May 14** there will be a formal presentation to the audience of students, faculty, administrators, friends and family. We will also produce a final report, written in LaTeX(which you will have to learn). The unofficial deadline for the report is mid-June. The report is supposed to be of a near publishable quality.

Participation: Essential. Unlike in regular classes, in this "class" your continuous participation to the team effort is absolutely crucial.

Feedback: I appreciate constructive feedback, which you can give me via the anonymous feedback form on the class web page, by email, or in person.

Academic integrity: From the Office of Student Conduct and Ethical Development: Your own commitment to learning, as evidenced by your enrollment at San José State University, and the Universitys Academic Integrity Policy, require you to be honest in all your academic course work. Faculty are required to report all infractions to the Office of Student Conduct and Ethical Development. The policy on academic integrity can be found at

`http://sa.sjsu.edu/student-conduct`.

Campus policy in compliance with the Americans with Disabilities Act: If you need course adaptations or accommodations because of a disability, or if you need special arrangements in case the building must be evacuated, please make an appointment with your instructors as soon as possible, or see them during office hours. Presidential Directive 97-03 requires that students with disabilities register with DRC to establish a record of their disability.

Class attendance: According to University policy F69-24, Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.