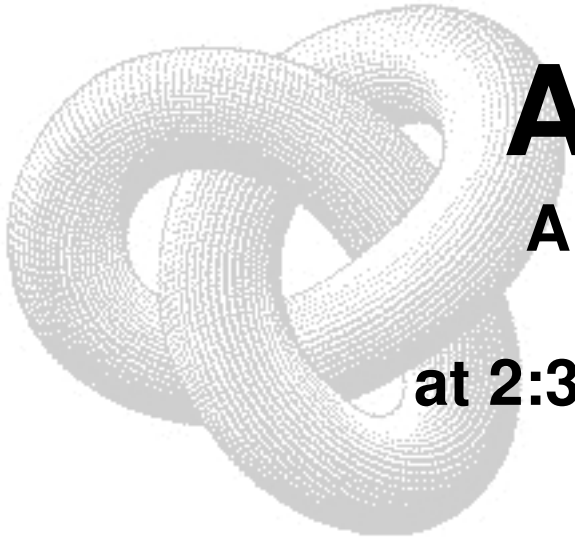
Lectures on Pure and Applied Math

Research Topics in the Mathematical Sciences



Announcing

A Seminar Presentation on March 4, 2016 at 2:30 pm in North Hall 104

at The University of New Haven
Note the rescheduled time and date

Dr. Ali Jafarian

Department of Mathematics and Physics
The University of New Haven

Title: Mathematics of Computerized Tomography

Abstract:

One of the main topics in Medical Imaging is Computerized Tomography (CT), which involves reconstruction of cross-sectional images of an object, and consequently its whole 3-dimensional image. This is done by using attenuation coefficient (function), which is a function that quantifies the tendency of the object to scatter or absorb an x-ray of a given energy. The attenuation function is unknown, but its integral along different line segments in the cross section can be determined using Beer's Law. This requires a great deal of computation of line or plane integrals. From a pure mathematical point of view, the problem is reconstruction of a function, defined in a compact region in a plane, from the knowledge of its integrals along many different line segments in the region. In 1917, J. Radon solved this mathematical problem in a different context. No real application of the Radon work (Radon Transform) was known until early 1970s. At that time, G.N. Hounsfield used Radon Transform to invent an x-ray computerized tomography scanner, for which he received a Nobel Prize in 1979. (Hounsfield shared the prize with Allan Cormack, who independently discovered some of the algorithms). Since then, CT scan machines have gone through many stages of improvements. The innovations not only have been in the design of the machines, but also in the algorithms and techniques used to recover, filter noise, and improve the quality and clarity of the pictures, as well as making the process faster. In the early 1990s, wavelets found their way in medical imaging. They are used instead of the Fourier Transform in the "inverse problem", i.e., the reconstruction of the image from the data captured by the detectors.

In this talk we review the background and some of the essentials and try to illustrate how medical images are constructed.

Further Information

For further information, please contact Angie Domschine at the Department of Mathematics, Office: Maxcy 204, 203-932-7250, ADomschine@newhaven.edu.