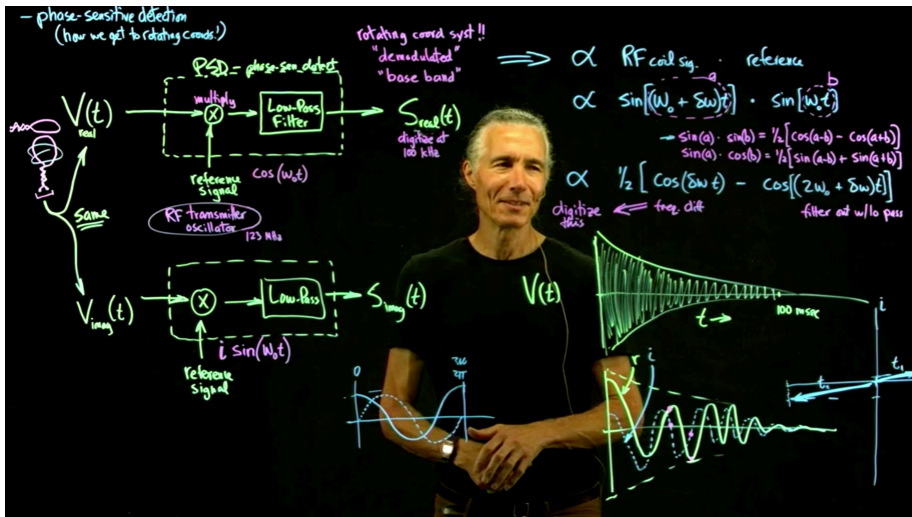


PSY 569/769: Foundations of Neuroimaging

Professor Marty Sereno
Fall Semester 2022



I am happy to offer the SDSU course Foundations of Neuroimaging one last time.

I direct the SDSU Imaging Center sited in the north campus Engineering and Interdisciplinary Sciences Complex, which houses a 3T research-dedicated MRI magnet (Siemens Prisma).

Have you wondered how imaging using MRI *really* works? Or how electrical

signals measured on the scalp are generated or localized? Do you want to learn how to reconstruct/inflate/3D-print/animate your own cortical surface? (or cerebellum!) Maybe you've always wanted to understand how the Fourier transform relates to MRI, or perhaps just really understand the Fourier transform, period.

If so, this class is for you! It will take you through the background needed to deeply understand how modern neuroimaging works at a pace that you *will* be able to keep up with. We go slower than a typical engineering course, but we won't skimp on the math.

This course uses the Learning Glass lecture recording system, which makes it super easy to review the tricky parts. This wide-ranging course is designed to:

- explain precession/excitation/recording/contrast of magnetic resonance signals and echoes by understanding the Bloch differential equation and its solutions
- compute the Fourier transform, use it to explain how the static field, RF excitation, and gradients create k-space data, and understand how reconstruction works
- diagram and understand the main classes of anatomical/functional pulse sequences
- understand diffusion, perfusion, and spectroscopic pulse sequences
- understand the mathematics behind the generation/localization of EEG/MEG signals, cortical surface-based methods, and how to combine them w/fMRI

This class is designed for upper-division undergraduate and graduate students in *psychology, biology, computer science, engineering, physics, and philosophy*. There are two take-home MATLAB problem set midterms and a final paper on a narrow topic (undergraduate 5 pages, graduate 10 pages). There is an extra, advanced graduate lecture every week (others welcome). Undergraduates and graduates will be graded on independent scales.

For more info, contact Dr. Marty Sereno at: msereno@sdsu.edu

Prerequisite: PSY 101 and/or permission of the instructor.

Class times: MWF 9:00–9:50 AM, F 8:00–8:50 SSW 2667 (Learning Glass Studio)

Syllabus/ClassWebPage: <https://mri.sdsu.edu/sereno/569>