

6.3000: Signal Processing

Wrap Up

- 6.3000 Retrospective
- What Comes After 6.3000?
- Tell Us How To Improve 6.3000

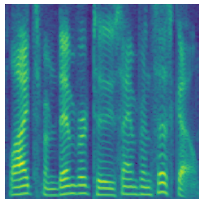
May 13, 2025

6.3000: Signal Processing – Content Retrospective

Signals are functions that contain and convey information.

Examples:

- the MP3 representation of a sound
- the JPEG representation of a picture
- an MRI image of a brain



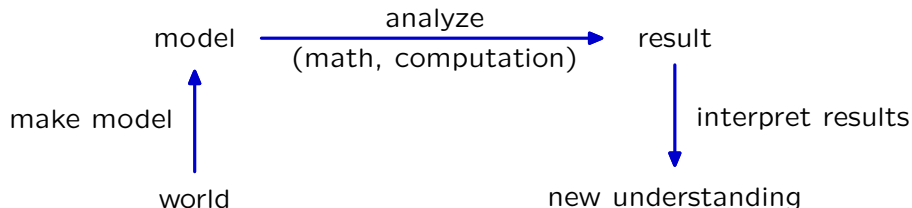
Signal Processing develops the use of signals as abstractions:

- **identifying** signals in physical, mathematical, computation contexts,
- **analyzing** signals to understand the information they contain, and
- **manipulating** signals to modify or emphasize information.

6.3000: Signal Processing – Content Retrospective

Our approach is the same as that in many technical disciplines.

- **model** some aspect of the world,
- **analyze** the model, and
- **interpret** results to gain a new or better understanding.



We tried to include examples of **all three** of these steps:

- develop math/computation skills to **analyze** signal processing problems
- recognize real-world **applications** and apply skills to solve them

Brief Summary of 6.3000 Content

Technical Topics

Fourier Series and Transforms
Sampling and Aliasing
Linearity and Time-Invariance
Convolution and Freq Response
DFT and FFT
Short-Time Fourier Transforms
2D Transforms

Applications

Musical Instruments
Speech (and Singing)
Communications/Modulation
Deconvolution/Deblurring
JPEG and DCT
MRI
Fourier Optics

Labs

\$5
Synthesizing Music
Echo Removal
Separating Harmonies
Identifying Chords
MIT Logo

What Might Come Next?

- 6.3010** (6.011) Signals, Systems, and Inference (Zheng, Hagelstein)
- 6.3020** (6.187) Fundamentals of Music Processing (Egozy)
- 6.3100** (6.302) Dynamic System Modeling and Control Design (White, Liu, Monardo)
- 6.C27** (6.S045) Comp Imaging: Physics and Algorithms (George Barthatthis, Rajeev Ram, Sixian You)
- 6.2060** (6.115) Microcomputer Project Laboratory (Leeb)
- 6.2300** (6.013) Electromagnetics, Waves, and Applications (Daniel, Assouly)
- 6.2370** (6.161) Modern Optics Project Laboratory (Warde)
- 6.4800** Biomedical Imaging with MRI (Adalsteinsson, Heldt, Lewis, Stulz, White)
- 6.4810** (6.021) Cellular Neurophysiology and Computing (Heldt)
- 6.4812** Cellular Neurophysiology and Computing (Heldt, Han)
- 6.5931** (6.812) Hardware Architecture for Deep Learning (Sze)
- 6.6300** (6.630) Electromagnetics (Hu)
- 6.6370** (6.637) Optical Imaging Devices and Systems (Warde)
- 6.7000** (6.341) Discrete-time Signal Processing (Ward)
- 6.7010** (6.344) Digital Image Processing (Rachlin, Lim)
- 6.7411** (6.450) Principles of Digital Communication (Chan)
- 6.8300** (6.819) Advances in Computer Vision (Sitzmann)
- 6.8371** (6.815) Digital and Computational Photography (Durand)
- 6.8620** [6.345] Spoken Language Processing (Glass)
- 6.8801** (6.026) Biomedical Signal and Image Processing (Alam)
- 6.8810** (6.556) Data Acquisition/Image Reconstruction in MRI (Adelsteinsson)
- 18.103** Fourier Analysis
- 18.104** Seminar in Analysis (CI-M)
- 18.085** Computational Science and Engineering I

Please Tell Us How To Improve 6.3000

We want to present course material in a way that encourages a deep **technical understanding** while also being **fun and engaging**.

We need your help and your feedback in order to make that happen.

Please use the next **15 minutes** to fill out the Registrar's Subject Evaluation and the 6.3000 End-of-Semester Survey.

- Fill out the MIT Subject Evaluation:
<http://registrar.mit.edu/subjectevaluation>
- Provide specific feedback on 6.3000:
go to "Survey" tab on 6.3000 website

Remember to **Submit your responses**

After you have finished, we will have an open discussion.