

EE 599 Wavelets and Graphs for Signal Processing and Machine Learning

Most practical signal processing and learning systems use signal transformations, e.g., MFCCs (Speech recognition), SIFT (Computer vision), DCT (Image and video compression). In this class we will focus on:

- how to **design** transforms,
- how to use them to **represent** signals,
- how to **learn** transforms from data.

We study transformations for **time series**, **speech** and **audio**, for **images** and **video**, and for signals defined on **graphs** (e.g. for sensor networks, social networks or similarity graphs in learning applications)

- Bases and dictionaries, dictionary learning
- Sparse signal representations and compressed sensing
- Multirate digital signal processing, filterbanks and Wavelets
- Wavelet extensions — X-lets (Curvelets, Contourlets, Directionlets, etc)
- Graph Signal Processing basics
- Sampling, filtering of graph signals, graph learning
- Applications to machine learning, signal processing and compression discussed throughout the semester

Instructor: Antonio Ortega, ortega@sipi.usc.edu

Current schedule: 10-11:50am MW

Units: 4

Required courses: EE 441 or EE 510, EE 483 or instructor permission.

Grading: Homework, 2 Midterms, Project (report and presentation)