EECS 351 PROJECT

DSP AND DATA COLLECTION

THE PAST (AND PRESENT) OF DSP

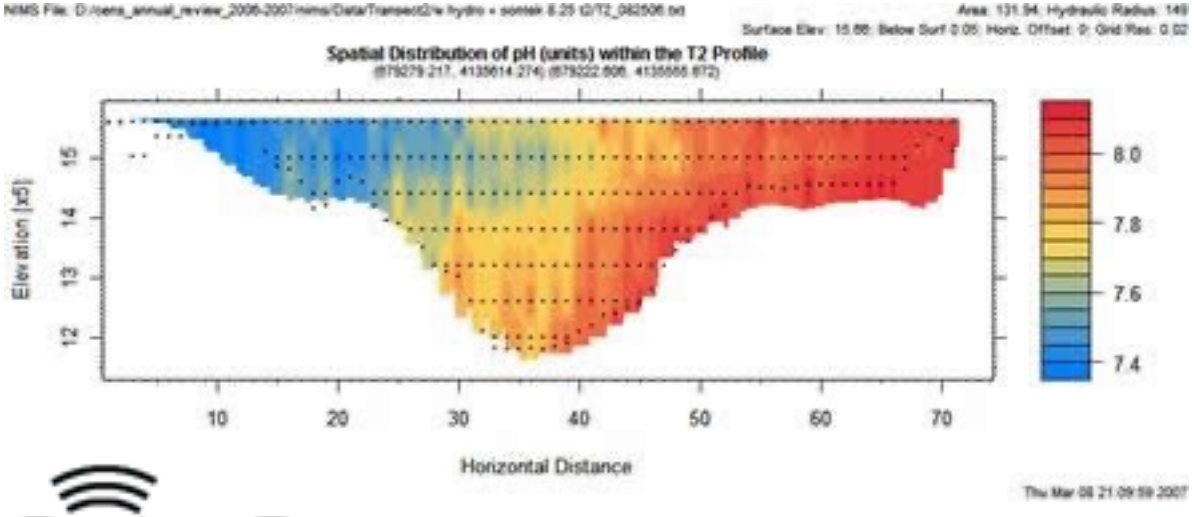
- Digital Signal Processing, as I said on the first day of class, is a discipline where we learn how to store, process, and communicate vastly different types of signals all with one digital device.
- Sampling, Filtering, Processing
- Example: .wav and .mp3 files, .jpg
- Example: Imaging and Communications
- Often uses sinusoidal signals to model real world phenomena, thus the Princehood of the Complex Exponential

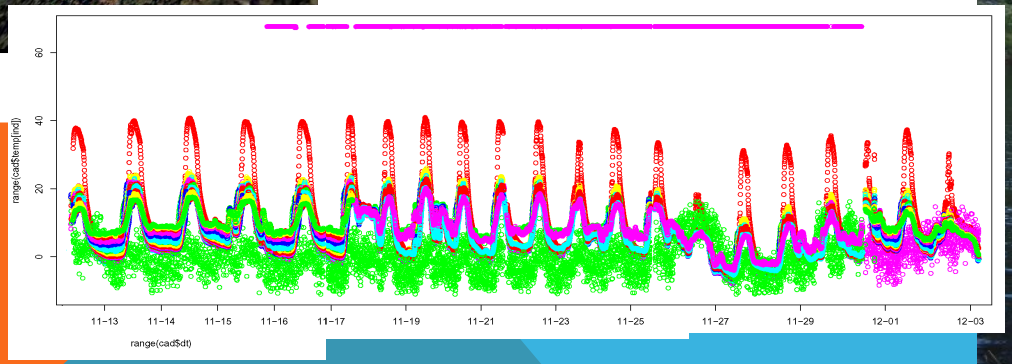
DSP FOR DATA PROCESSING

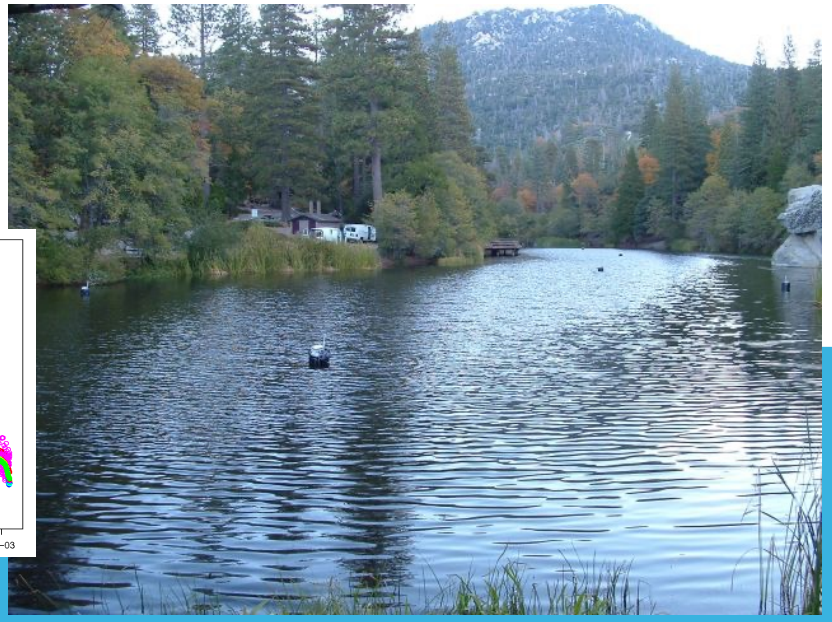
- In the modern era, people/businesses/governments collect data everywhere and anytime.

- Let's collect and process some of our own!

CENS ENVIRONMENTAL DATA







PROJECT GROUPS

- Groups of 3-4, chosen by you.
- If you can't find a group, on Piazza I have posted a "search for teammates" functionality. Post here and if you still can't find a group by the deadline, I will assign you to a group.
- You will propose a data analysis project using some DSP tools we learn in class, as well as using one tool from out of class!

PROJECTS GROUPS

- Teammates will grade each other, and I will incorporate those at my discretion into a team grade and an individual grade. So please be conscientious of being a good partner.

- If your team is having trouble working together, ideally you will let me know well before the deadline. We can often find a work-around.

PART 1: DATA

- **Collect data – from the web, from research faculty, or from your own devices!**
  - You can collect data with your computer, your phone (images, audio), or audio equipment at Dude
  - You may use pre-existing datasets, and we will help you identify sources if you seek assistance. Probably this semester there will be a lot of this. Feel free to search online or request data from faculty who work on things you find interesting!
  - If you have other ideas, please discuss them with the GSI and me. We might be able to get sensors like depth, thermal cameras, light field cameras, vibration sensors, etc if you are interested!

PART 2: DSP TOOLS FROM IN CLASS

- At least three of:
  - Frequency-domain analysis
  - Processing the signal in a different basis
  - Sampling continuous-time signals: showing how to choose the sampling rate, demonstrating aliasing
  - Linear systems: e.g. moving average, differentiator
  - Studying system propertes: e.g. stability, causality, linearity
  - Low-pass filters, high-pass filters, notch filters
  - Image processing techniques (2D filters, 2D fourier xform)

PART 3: DSP TOOLS FROM OUT OF CLASS

- At least one from out of class.
  - GSIs will start a post on Piazza; please ask questions and continue to ask for ideas if you need more.
  - Anything that requires processing of digital signals!

PROJECT DELIVERABLES

- **Make a website for your project.**
  - This is the final report. It should contain a report of everything you did, be easy to navigate, demonstrate how you met all the expectations of the project. Use it to show off what you've done to potential employers!
- **Submit a zip file of your code and data**
  - Included in the zip should be a small demo that we will run to check the capabilities of your code.

PROJECT DELIVERABLES

- **Make a website for your project.**
  - Make sure it is easy to navigate
  - Make sure you display what you did over and above what exists built-in.
  - Discuss your results – strengths and weaknesses of your approach and how you might improve if you were to do it again.
  - A page that describes how the three in-class tools were used and how the one out-of-class tool was used.
  - A page that says what each team member's contribution was.

PROJECT DELIVERABLES

- Submit a zip file of your code and data
  - Include a README that describes all dependencies
  - Include a small demo – ideally that can run in a short amount of time and show a small scale version of your overall project – as demo.m or demo.py
  - If your data is larger than 1GB, and it is publicly accessible, submit only a portion of it, including what you need for the small demo. Put the public link for the data in your README.
  - If your data is larger than 1GB and is not publicly accessible, talk to us about your options.

FILL IN THE BOXES

	Mathematics or Theory	Algorithms	Application
Creativity			
Technical Merit and Understanding			
Effort			

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Communication			

TIPS

- Don’t get hung up on what you choose for your project. Pick something your whole team is excited about. Almost any signal-processing related idea has some great paths that you could go down. It doesn’t have to be perfect.
- You don’t have to build something that gives state-of-the-art results or works amazingly well. You can in fact show failed results and failed attempts as part of this project.
- The most important thing therefore is to COMMUNICATE WHAT YOU DID and your thoughts on it, discussion of it, analysis of it, etc on your final report website. If everything you tried got only marginal improvement, explain that! Show us all the things you tried, tell us why you thought it would work, figure out why it failed. Show the failed examples, give evidence for why those particular examples didn’t work.
- Give examples, illustrations, etc on your website. Show outputs from different stages of your algorithm. If your project does image processing, show lots of images at intermediate stages of your algorithm. If your project does audio processing, put the clips up so users can play and listen.
- YOU MUST REFERENCE ALL IMAGES. A blanket claim to all images as your own or coming from a website’s free available image library is fine (if true), but other than that any image that comes from somewhere else must be cited or else it is plagiarism. Err on the cautious side.
- Please, please post questions on Piazza. Put up code snippets for parts that seem way too slow (esp if they are for loops in Matlab) and ask for help improving them. Post passages from research papers that don’t make sense to you and ask for help to clarify. Ask about built-in libraries. There are so many resources but we don’t know what you need unless you ask!

APPROXIMATE TIMELINE (SUBJECT TO MINOR CHANGES)

- Feb 10 groups finalized
- First brainstorm of two project ideas by Feb 24
- March 22 project topics finalized
- April 5 progress report
- Final Presentations Apr 11/13/18
- Projects due Apr 26 (website and zip of code) and teammate eval due Apr 27.