EE 5900 I: Special Topics in Signal Processing
"(Cy)Math for AI in Engineering and Computing -- Emerging Leaders' Studio"

Credits: 1 or 2, repeatable course

Time: arranged. Email instructor. Tentative: monthly 3-4pm Friday or biweekly 3-4pm Friday.

This course will provide the enrolled students with (i) an understanding of how to better explain mathematical (math-based AI/ML/STEM) concepts to others who are new to it, and (ii) how to apply the learned skills on their own learning and on their research presentations or their college teaching, e.g., realizing that linear algebra is not making sense because they could use a review of certain high school algebra topics. It will also provide students with a much-needed understanding of how to respectfully interact with others, including those from very different backgrounds than their own. It would involve:

- An hour of tutoring K-12 or ISU students in math weekly with on-the-job feedback provided by Education undergrad TAs. K-12 tutoring will be coordinated via CyMath and ALEKS.com will be provided to students to serve as a base for tutoring. Time: Tues or Thurs 3-4 or Sat 10-11. *Outcome: write a reflection of the skills you learned (math or otherwise) and how those skills help with your research, college teaching (TA) or your own learning*.
- Attend a monthly lecture on teaching pedagogy. One each will be provided by Dr Heather Bolles (Math, math ed), Dr Jiyoung Yi (Education, math ed), Dr Selim (CprE, Engin ed), and a K-12 classroom teacher. Time: arranged. *Outcome: provide a summary of main ideas you learn*
- **(2 credit option:)** Term paper and a seminar that presents a summary of the term paper: Pick a topic from either Math-for-STEM-Education or from Math-for-ML/AI and do a literature review and or write your own version. Starting notes and guidance will be provided by the instructor. Apply the concepts (math concepts, study habits, communication/teaching skills) learned from tutoring on your own learning and presentation. Topics
    - (Education) K-12 math skills needed for success in AI or STEM: what K-12 math topics, and what soft skills (e.g. ability to do homework) are most critical for success in these fields.
    - (Education) College math skills needed for successfully becoming an AI/ML professional or researcher/educator/scientist
    - (Math for ML and AI) ML/AI models and algorithms for STEM – focus on a subset
    - (Math for ML and AI) Random Matrix Theory for ML and AI – focus on a subset

The course will be relevant to Engineering, Math, Stat, Comp Sci graduate students as well as to junior and senior undergraduate students from EE, Math, Stat. It may interest Physics and Chemistry majors also.