Prospectus

1. Title:

Generating Bathymetric Maps from Continuous Echosounder Data with ChatGPT

1. Research Question:

What depth gradients and bathymetric features exist across the lake bed of Lake Waco?

1. Objectives:
   1. Plot a series of depth measurements along a single boat track onto a map of Lake Waco.
   2. Visualize continuous depth gradients in Lake Waco along multiple boat tracks.
   3. Potentially create a continuous depth map for the entirety of Lake Waco, extrapolating from the combined data of multiple boat tracks.
2. Approach / Methods.

I will be working with raw echosounder data from the Powers lab sensor boat. I hope to provide ChatGPT with prompts to manipulate this data into meaningful visualizations, while minimizing the amount of code that I personally write or debug. First, I will see if ChatGPT can generate a simple plot of point depths from one boat track. Next, I will attempt to use ChatGPT to adjust depth measurements from multiple sample dates to account for temporal changes in lake water level, and plot multiple continuous boat tracks on a single map. If the previous attempts are successful, I will see if ChatGPT can extrapolate from this data to generate a continuous 3D bathymetric map of Lake Waco.

1. References

Horta, J., Pacheco, A., Moura, D., & Ferreira, Ó. (2014). Can recreational echosounder-chartplotter systems be used to perform accurate nearshore bathymetric surveys? Ocean Dynamics, 64(11), 1555–1567. <https://doi.org/10.1007/s10236-014-0773-y>

Powers, S. M., Barnard, M. A., Macleod, M. S., Miller, L. A., & Wagner, N. D. (2023). Spatially Intensive Patterns of Water Clarity in Reservoirs Determined Rapidly With Sensor-Equipped Boats and Satellites. Journal of Geophysical Research: Biogeosciences, 128(10), e2023JG007650. <https://doi.org/10.1029/2023JG007650>