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BIO 5100

Prospectus Outline

1. Title: Analyzing Sea Lion Aquatic Turning Performance Using AI Generated R Code
2. Research question(s): How quickly can sea lions turn underwater? How can X,Y coordinates from 2D tracked videos of turning sea lions be rapidly analyzed for biomechanical parameters?
3. Objectives:
4. Use ChatGPT and Copilot to generate R code that calculates the turning rate, centripetal acceleration, and g force of a sea lion aquatic turn from x,y coordinates extracted from a tracked 2D video
5. Document and compare ChatGPT and Copilot suggested R code for efficacy and occurrence of errors in R
6. Document and compare how ChatGPT and Copilot respond to prompts regarding R code errors
7. Approach/Methods: I will attempt to reproduce sea lion aquatic turning performance results from Leahy et al., (2021) using ChatGPT and Copilot to generate a comprehensive R code. I will generate an initial prompt using prompting and syntax suggestions from Liu et al., (2024). I will provide ChatGPT and Copilot with the same initial prompt, then I will give ChatGPT and Copilot each 10 consecutive attempts to produce functional code without manually revising the code. If errors arise in the code, I will only prompts ChatGPT and Copilot with “That code didn’t work, I got the following error [insert quoted error from R], please revise the R code to fix this issue”. If neither chatbot succeeds in 10 attempts, I will document my attempts to revise the code. I will save responses from ChatGPT and Copilot as separate .txt files and I will save generated code sequences as separate .R files.
8. References:

Leahy, A.M., Fish, F.E., Kerr, S.J., Zeligs, J.A., Skrovan, S., Cardenas, K.L., and Leftwich, M.C. (2021). The role of California sea lion (Zalophus californianus) hindflippers as aquatic control surfaces for maneuverability. Journal of Experimental Biology, 224 (20): jeb243020.

Fish, F.E., Hurley, J., and Costa, D.P. (2003). Maneuverability by the sea lion Zalophus californianus: turning performance of an unstable body design. Journal of Experimental Biology, 206, 667-674, https://doi.org/10.1242/jeb.00144

Liu, Y., Le-Cong, T., Widyasari, R., Tantithamthavorn, C., Li, L., Xuan-Bach D. Le, X.B.D., and Lo, D. (2024). Refining ChatGPT-Generated Code: Characterizing and Mitigating Code Quality Issues. ACM Transactions on Software Engineering and Methodology, https://doi.org/10.1145/3643674