

BME 3211 Fall 2024

Interpreting the plots and analyses from your coding assignment

Like for the debates, please link your comments with features in the plots.

COP Standing Balance

- 1) [1 pt] Describe five observations about the COP plots. What is one main takeaway from that figure? There are many potential takeaways (many comparisons can be made, both vs. one, EC vs. EO, different subjects, etc.)

Answer: Although ML values have a margin on the AP ones for BothEC and BothEO, this effect seems to be less pronounced in the case on OneEC, especially for Subject 2. The values of BothEC and BothEO also seem to remain more consistent across different subjects, whereas the subplots for OneEC and OneEO have very little in common. Subject 1 appears to have a very predictable COP distribution for both AP and ML.

- 2) [1 pt] Which condition is the most demanding balance task based on sway length? How did you come to that conclusion from your plots and calculations?

Answer: OneEC displays a considerably higher average sway length than all the other balance tasks. This can be observed in the bar plots and implies higher demands, since the sway is a way of balancing force to keep the balance stable.

Stance during walking

- 1) [1 pt] What do you observe is different in the plots between plotting the data by time compared to plotting the data by percent gait cycle?

Answer: The data plotted by percent of gait cycle appears to have slightly less variation between iterations when compared to that plotted against time.

- 2) [1 pt] According to your plots, how consistent are GRFs? Also, discuss consistency across trials within each subject and direction.

Answer: For the most part, the GRFs remain very constant across different iterations, except in the case of Mediolateral GRF. Furthermore, this consistency is slightly more evident in the GRFs vs % plots.

- 3) [1 pt] According to your plots, how consistent are GRFs across the 3 subjects? Be sure to comment on differences by direction.

Answer: However, the plots clearly display inconsistency when it comes to the Medial Lateral readings; across both trials and subjects it appears to behave somewhat chaotically. Overall, GRFs seem to be consistent under certain circumstances only. Namely, Vertical and Anterior Posterior measures seem to remain the most consistent from one subject to the next, as well as between iterations.

Jumping

- 1) [1 pt] According to the Figure 1 and the calculations, which jump type (counter movement or squat) should you use to jump higher? Justify your answer based on the plots and analyses.

Answer: All subjects seemed to perform significantly better when utilizing the countermovement (CM) technique, this was consistent across all plots and analyses regardless of method used (impulse or airtime), which serves as a strong indicator that said technique might be superior across the board .

- 2) [1 pt] Compare the maximum jump heights calculated for the 2 approaches (impulse-momentum vs. time in the air). Make at least 5 comments. Potential topics include: differences/similarities in the means, differences/similarities in the variability (i.e. standard deviation plotted as the error bars), consistency across subjects, etc.

Answer: The Impulse method yielded higher peak heights than Time in Air for all cases except the Squat Jump for Subject 1, in which the latter exceeded by less than 0.002 m or 0.2 cm. The converse is true, however, when comparing the variance. In such case, Time in Air had the wider range, for the exception of the fifth subject's CM Jump; where the difference was 0.0003 larger for Impulse. The variability in peak values between subjects did not seem to differ too much between the two methods, both fluctuated at a similar rate. Furthermore, the previous observation holds true when comparing these properties between the two techniques. **ONE MORE**

- 3) [1 pt] Table 1 shows the values for jump height based on flight time and net impulse in auto-generated reports for standing jumps provided by Noraxon that you saw in class.

Table 1: Jump heights from the Noraxon auto-generated jump reports.

Subject	Height based on net impulse (cm)		Height based on time in air (cm)	
	CMJ	Squat	CMJ	Squat
S1	25.4 ± 0.69	20.6 ± 1.09	24.6 ± 0.48	20.8 ± 0.97
S4	20.9 ± 0.65	18.6 ± 0.76	20.8 ± 0.66	18.4 ± 0.73
S5	26.6 ± 0.55	20.8 ± 0.81	25.5 ± 0.76	20.1 ± 1.09

How do your calculations compare? How are they similar? How are they different?
What is a potential reason that they are different?

Answer: They are similar in that the heights calculated using air time are lower than those obtained from impulse. They differ in the values obtained, with a significant discrepancy between the standard deviations obtained. Perhaps this difference comes from the calculations themselves, be it roundoff errors or slight differences in the equations used.

Reflection [1 pt]: Of all the class assignments, activities, and topics, which one will you remember most and why?

Answer: It will be this assignment without a doubt, it was the longest and most involved. Additionally, the work volume herein will have a lasting impact in my coding performance.