Title: Ski jump launch trainer (ski jump)

Date: 9/19/2025 - 9/25/2025

Client: Prof. Walter Block and Dr. Azam Ahmed

Advisor: Prof. Randy Bartels

Team:

- Team Leader: Kenneth Sun

- BSAC: Caleb White

- Team Communicator: Presley Stellflue

- BPAG: Sarah Kong

- BWIG: Matthew Niemuth

Problem statement: Develop and prototype a comprehensive training system that will allow young skiers learning to jump direct comparison of their technique to professionals utilizing force plates and motion capture.

Brief status update: The team was able to meet with Prof. Bartels at the beginning of the week and received his personal insight and perspective of the project and its goals. He provided valuable advice on how to approach thinking about appropriate designs for the project, which revolved around basing a rationale on a set quantitative metric and then examining which considered design would directly influence the most correlative variables to this metric. The team took this advice and used it to complete a Design Matrix of three potential design options. The image provided below in the 'Current Design' section, is the idea the group deemed best and is a force-insole X motion capture system that will record various points of data to form a sound netwonian perspective of the scenario. The team also got in contact with the Mechanical Engineering team participating in this project.

Difficulties / advice requests: No notable difficulties thus far

Current design:
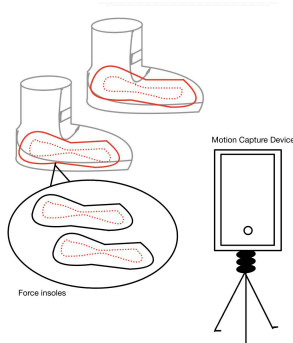
Summary of Weekly Individual Accomplishments:

- <u>Kenneth Sun</u>: Met with advisor and summarized advisor's advice for the team to ponder on and brainstorm. Helped with the Design matrix during the group meeting. Continued research on OpenSim for our meeting with Dr.Willie on Friday.
- <u>Caleb White:</u> Continued research into different forms of data capture for the decision process of the design matrix. This mainly focused on IMU systems that use an arbitrary 3D coordinate system to find physical changes in the user through comparative changes in the coordinate values of each unit. Contributed to the group's design matrix as well, providing advice along with my own personal contribution.
- <u>Presley Stellflue:</u> Set up a time and date to meet with our client, Dr. Ahmed. Began initial individual research concerning the physics and dynamics of the sport. Concluded that we will have to look into the biomechanics of the skier and their spine and skeletal system for the proper function of our design. Sketched design ideas for our three design possibilities and did research on the benefits and limitations of each design.
- <u>Sarah Kong:</u> Completed one half of the machining training required and learned more about the other machines available to us. Met with advisor and contributed to the design matrix. Continued research on the force plate insoles prices.
- <u>Matthew Niemuth:</u> Helped brainstorm ideas for design matrix designs after talking with the team about our advisor's advice. Helped come up with criteria for design matrix to measure designs by as well as helping score each design. Also wrote out why we scored half of the design 1 criteria how we did.

Upcoming Team Goals: Next week the group will begin working on the preliminary design presentation. This presentation will force the group to come up with a detailed explanation of the proposed design which will help with kickstarting the early stage fabrication and testing process. The group is meeting with Prof. Willie to go over the motion capture and force plates on Friday, September 26th, and will use the knowledge gained from this experience to guide design considerations that will be shared during the presentation. The team also hopes to find out the

clients practice schedule in order to coordinate times when the team can travel to the ski hill to provide insight into environment conditions.

Upcoming Individual Goals:
- Kenneth Sun: Begin to define a experiment. Have operational definition, a independent/dependent variable, hypothesis. Begin to work on the framework of the experiment from intro to background and then begin to look into methods that we could use to collect data. Go to ski hill this weekend or during next week to learn more about the location and use that to help our methods section draft. Finally begin looking for force plate insoles.
- Caleb White: Use the knowledge gained at the meeting with Prof. Willie to build a better understanding of the logistics of the teams design. Meet again with Prof. Bartels and build a strong understanding of what he is looking for in the preliminary presentations. Look further into OpenSim and begin testing the internal markerless motion capabilities of the software.
- Presley Stellflue: I will do more research on understanding the concept of the ski jump and how the physiology and biomechanics of the jumper affect the jump and the skier's flight time. Also will get more comfortable with the concepts of force plates and motion capture.
- Sarah Kong: Apply what we will learn about OpenSim and the application of force insoles to the development of our design. Gather more information about the costs of force plate insoles and possible alternatives if those are out of our budget.
- Matthew Niemuth: get familiar with OpenSim software, force plates, and motion capture systems with Prof. Willie so I can effectively help our team use those in our prototype. Go to the ski hill with the team at some point to learn how we can use the hill in our research methods. Also ,get an understanding from Dr. Bartels what he wants in our preliminary design presentation next week to begin working on the presentation.

Materials and expenses:

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	Cost Each	Total	Link
Category 1									
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
							TOTAL:	**$0.00**	

Timeline:

Task	Sep			Oct					Nov				Dec	
	12	19	26	3	8	17	24	31	7	14	21	28	5	10
Project R&D														
Research	X	X	X	▓	▓	▓	▓	▓	▓	▓				
Design			X	▓	▓	▓	▓	▓	▓					
Prototyping				▓	▓	▓	▓	▓	▓	▓	▓			
Testings							▓	▓	▓	▓	▓	▓		
Deliverables														
Progress Reports	X	X	X	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	
PDS		X												
Design Matrix			X											
Prelim Presentation				▓										
Prelim Report					▓									
Final Poster													▓	
Final Report														▓
Meetings														
Client		X		▓		▓			▓		▓		▓	
Advisor	X	X	X	▓	▓	▓	▓	▓	▓	▓	▓		▓	
Website														
Update	X	X	X	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓

Filled boxes = projected timeline

X = task was worked on or completed