

Title: Ski jump launch trainer (ski jump)

Date: 10/03/2025 - 10/09/2025

Client: Prof. Walter Block and Dr. Azam Ahmed

Advisor: Prof. Randy Bartels

Team:

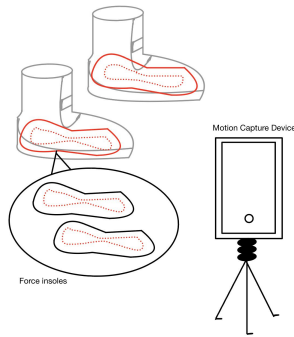
- Team Leader: Kenneth Sun
- BSAC: Caleb White
- Team Communicator: Presley Stellflue
- BPAG: Sarah Kong
- BWIG: Matthew Niemuth

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's main deliverable focus this week was the preliminary report. The team worked together to write a report that described the research, design ideas, and future fabrication as well as testing plans. The team also visited the Blackhawk Ski Club with Finn this weekend to test out the motion capture system and gained a more detailed understanding of how to move forward with the data collection phase. This would most likely involve using a 2D motion capture software in combination with force insoles and accelerometers. The team also met with Prof. Bartels to discuss how to adjust the project scope with respect to the more qualitative scoring of the youth athletes. Focusing more on getting specific data metrics and doing statistical analysis to correlate some metric with some outcome.

Difficulties / advice requests: Figuring out exactly what sensors to utilize to quantify the more qualitative aspects of ski jumping (IMU's or not).

Current design:



Summary of Weekly Individual Accomplishments:

- Kenneth Sun: Went to ski hill to test out position of cameras to capture takeoff and early flight portion of jump. Discussed and figured out weaknesses of each athlete with coach Finn to work on data collection more tailored to each jumper.
- Caleb White: Visited Blackhawk ski club to visualize the system in place as well as determined locations of the two tripod+camera configurations. Helped the team complete the Preliminary Report by filling out various sections and going over ideas with other members. Determined the possible need for a timing system for appropriate jump timing for the athlete going down the hill.
- Presley Stellflue: 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, along with finding scientific articles to reference for the dimensions of our designs.
- Sarah Kong: Presented the preliminary design presentation, talking about the PDS and accelerometers. Visited Blackhawk Ski Club hill with the team and researched more about the biomechanics behind ski jumping to help narrow down the scope of the project. Contributed to the preliminary report and filled out the expense spreadsheet.
- Matthew Niemuth: Presented preliminary design presentation with team. I also went to the ski hill with the team to figure out the placement of cameras for the motion capture system. Helped complete the preliminary report.

Upcoming Team Goals: The team is planning to return to the Blackhawk Ski Club this upcoming week to test Dartfish or Kinovea after learning about the limited Wifi signal available at the hill. The group has also decided to begin fabricating force insoles rather than purchasing which is more cost effective since the only necessary sensor to measure ground reaction forces while jumping would be at the ball of the foot.

Upcoming Individual Goals:

- Kenneth Sun: Discussed and figured out next steps for project post preliminary deliverables. Have sophomores work on fabricating force insoles for each of the athletes and having juniors focus on 2d motion capture.
- Caleb White: Use the information provided by Coach Finn to determine a quantitative reference metric for the data being collected. Because of different scoring than expected, the gauge of a good vs bad jump is much more preferential to executed form compared to distance than previously thought. Begin to test out Dartfish using the videos already provided by Coach Finn. Order sensor materials from appropriate vendors such as Digikey.
- Presley Stellflue: Will become more familiar with the motion capture technology and how to apply it to our research. I will also gather more research and information on the process to build or purchase force plate insoles for our design.
- Sarah Kong: Begin the preliminary work of fabricating the force plate insoles, as the template is already made in Bambu Studio we just have to resize it. Start ordering materials for this fabrication and add to the expense spreadsheet.
- Matthew Niemuth: Begin prototyping or get a plan for prototyping force plate insoles that can fit in various-sized ski boots for the different athletes participating in the study. Also, go to a Blackhawk ski team practice to hopefully begin collecting data from the athletes.

Materials and expenses:

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	Cost Each	Total	Link
Motion Capture System									
Tripod	60 inch tripod with adjustable height legs, compatible with smartphone adapters.	Amazon Basics	WT3540	Amazon	B005K P473Q	10/1/25	\$25.99	\$51.98	Amazon Basics 60 inch Lightweight Tripod with Bag, Black
Tripod Mount Adapter	Smartphone holder, vertical and horizontal mount adapters. Pack of 2	Sharing Moment Co.	H-200112	Amazon	B07S8 TTH34	10/1/25	\$6.99	\$6.99	SharingMoment Premium Smartphone Holder/Vertical and Horizontal Tripod Mount Adapter
							TOTAL:	\$58.97	

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	X	X									
Design			X	X										
Prototyping				X										
Testings														
Deliverables														
Progress Reports	X	X	X	X	X									
PDS		X												
Design Matrix			X											
Prelim Presentation				X										
Prelim Report					X									
Final Poster														
Final Report														
Meetings														
Client		X												
Advisor	X	X	X	X	X									
Website														
Update	X	X	X	X	X									

Filled boxes = projected timeline

X = task was worked on or completed