

## Customer Background

Our client, Renee Murray, is a dance instructor at the Patti and Rusty Rueff School of Design, Art, and Performance. She works with students to create forms of art through dance and integrates these projects with digital technologies allowing people to interact with the art they create.

Renee previously used the Purdue VIP to create a project they called motionpose. It was used inside a Purdue gallery called "In Motion" during the fall 2024 semester.

## Problem Statement

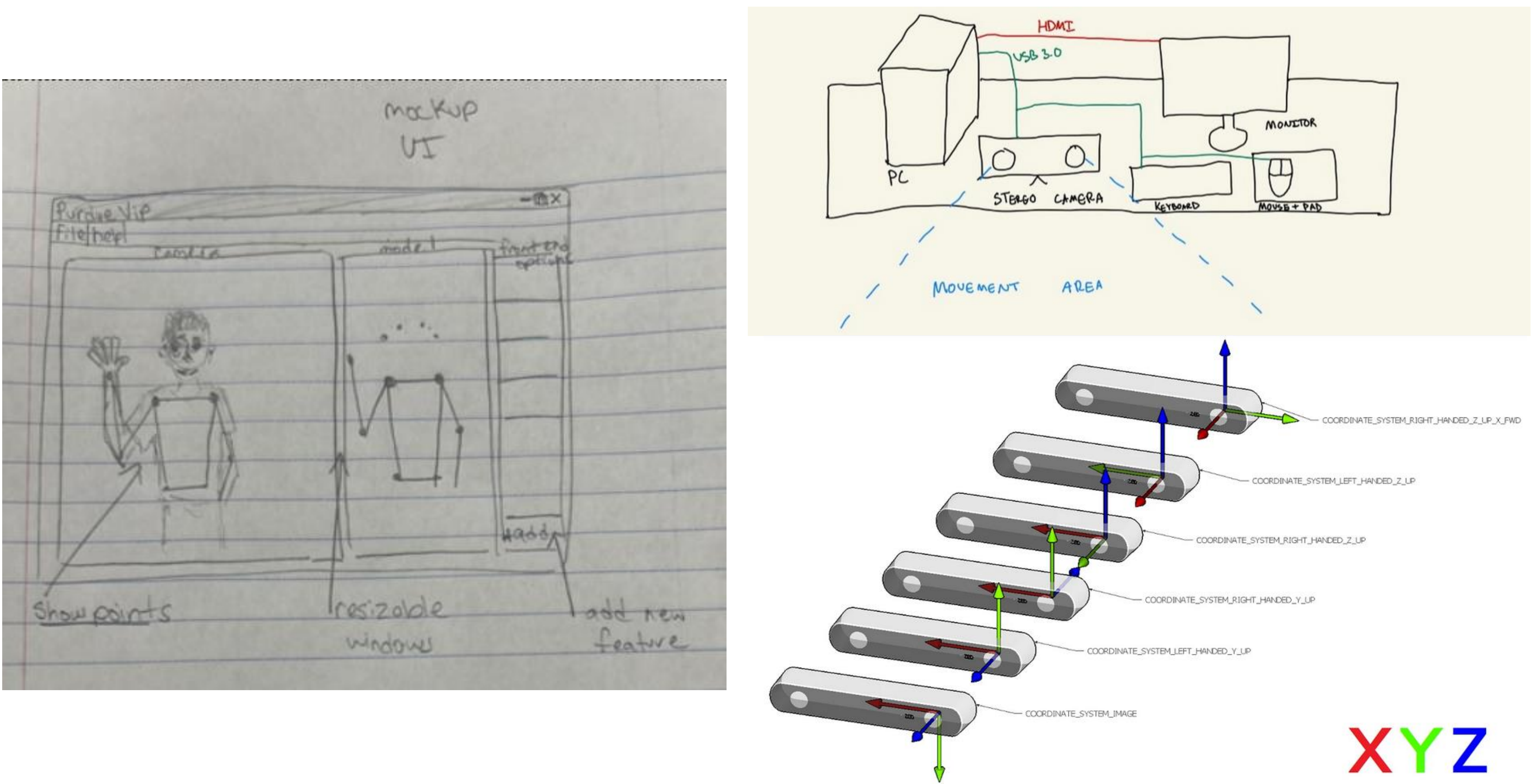
As a dance instructor, Renee wanted to intertwine machine learning (ML) and art to create interactive art exhibits. She aimed to achieve this through motion capture; however, the first iteration used an intensive motion tracking ML model. This caused extremely high system latency. The model was also not capable of tracking a person's depth from the camera.

Furthermore, the user interface was built using a framework meant for websites and lacked ease of use. Starting the program was overcomplicated and required executing multiple programs from a command-line interface. Renee sought the aid of the Purdue Capstone Senior Design students to tackle these limitations and create an improved motion-capture system.

## Requirements

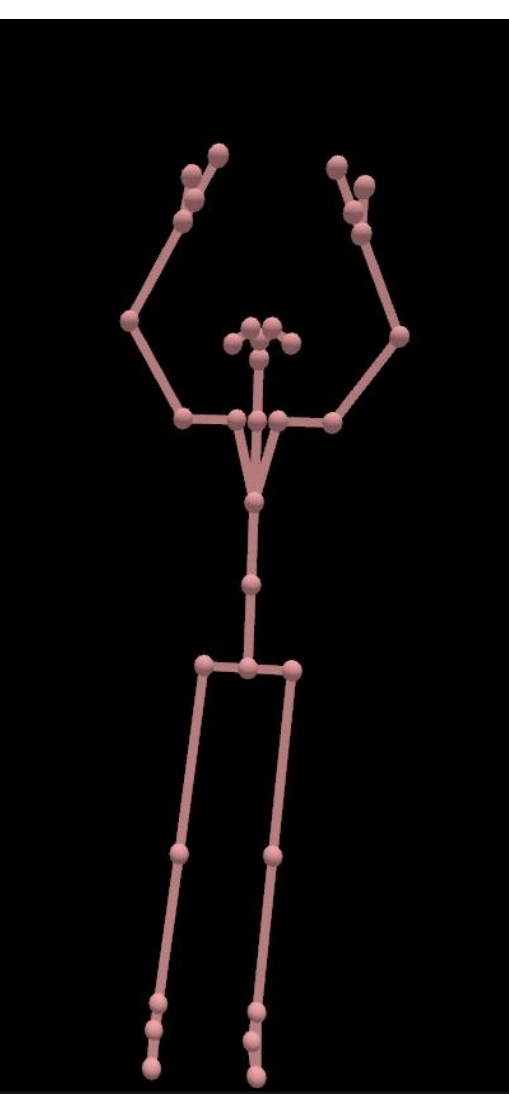
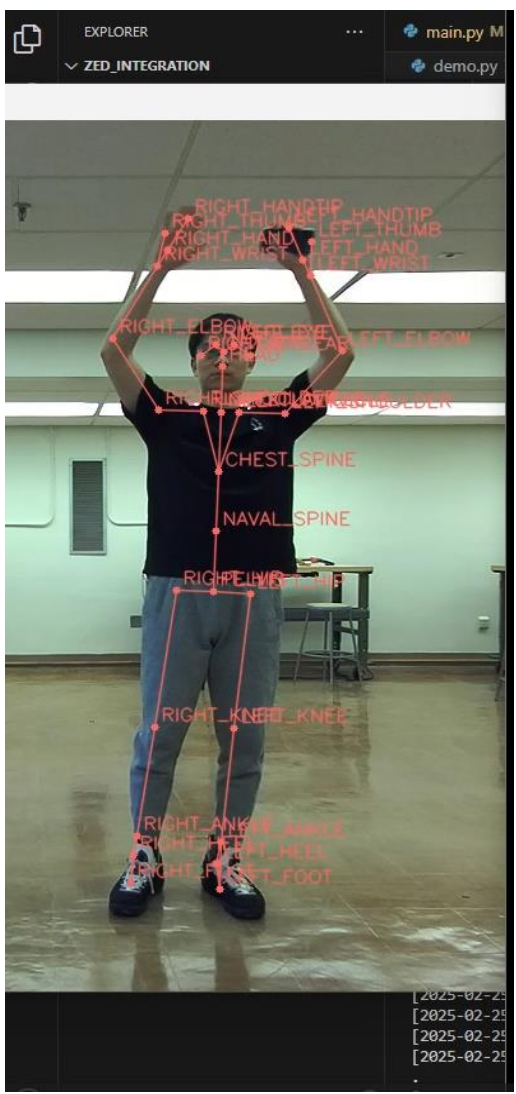
Req #	Requirement	Description	Test
1	Develop a packaged executable application	one-click start	Test executable across different platforms (Windows, Mac)
2	Add Z coordinate	Z Coordinate tracking accuracy and art effects	Test Z coordinate tracking accuracy
3.	Reduce System Latency	Current system causes bad experience	Latency before and after the change of device
4	Documentation	Documentation through out our project is available	Well organized technical documentation
5	Determine maximum number of people in frame	Backend limits by ZED 2i camera for multi-person tracking	Test system by increasing the number of people

## Experimentation / Concept Exploration

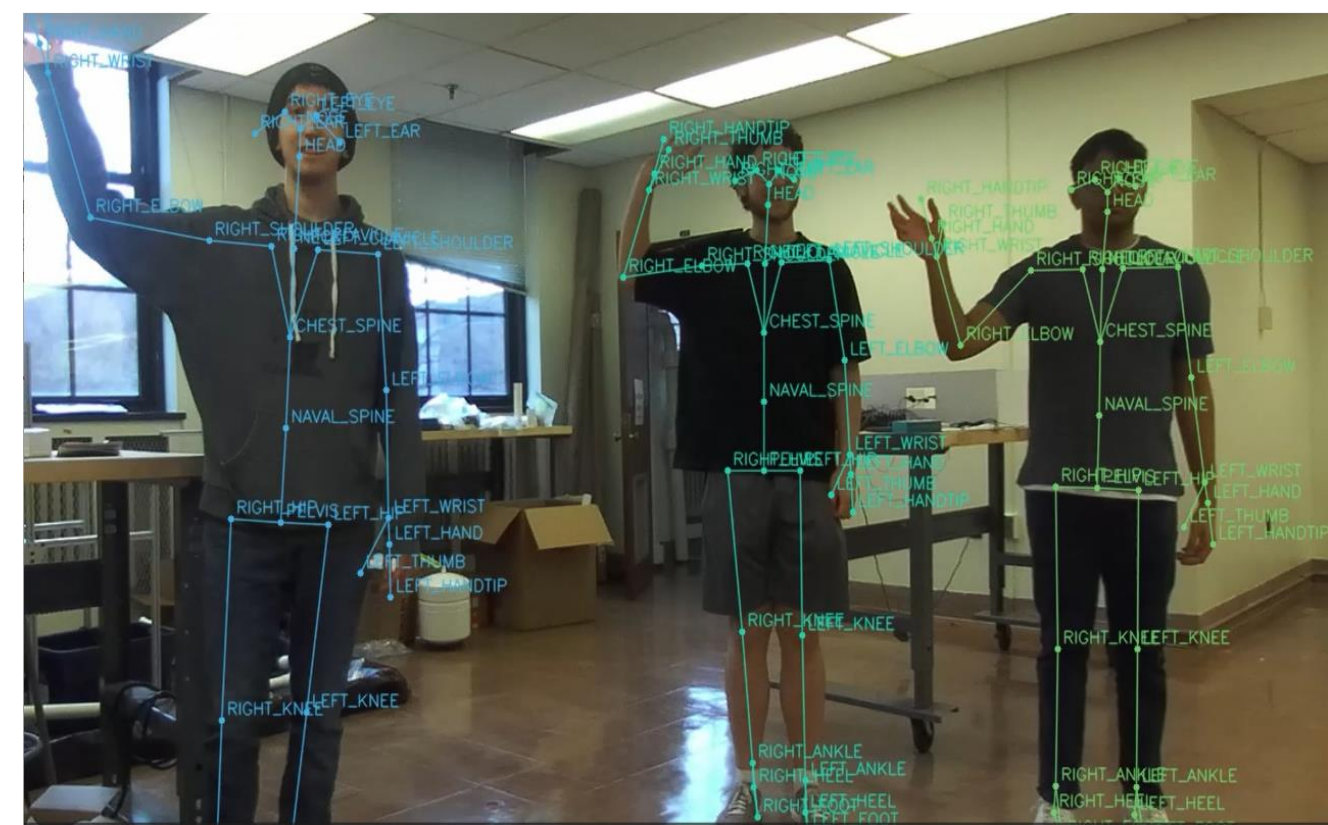


## Final Design

Full Skeleton tracking of multiple people on the optimized system



ZED 2i: The stereoscopic camera at the heart of our project

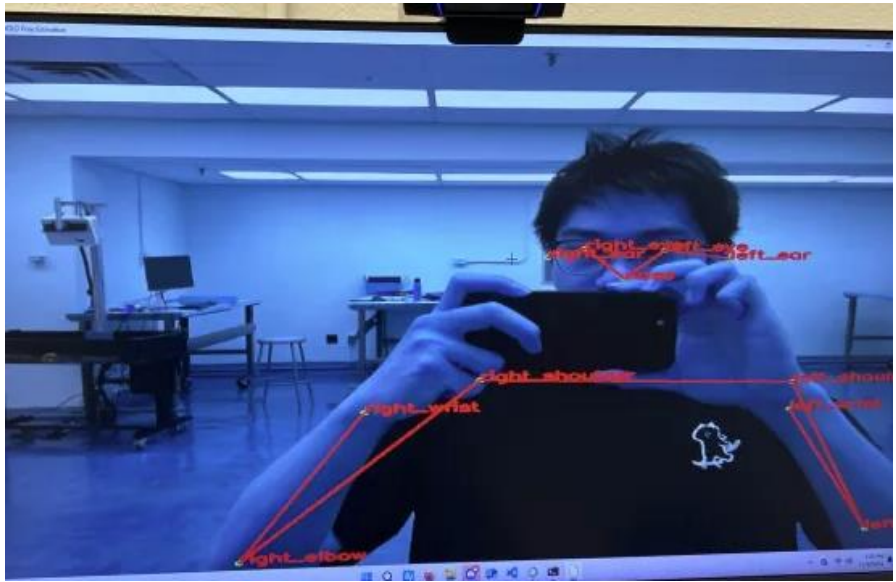


Visualized 3D through rendered skeletons



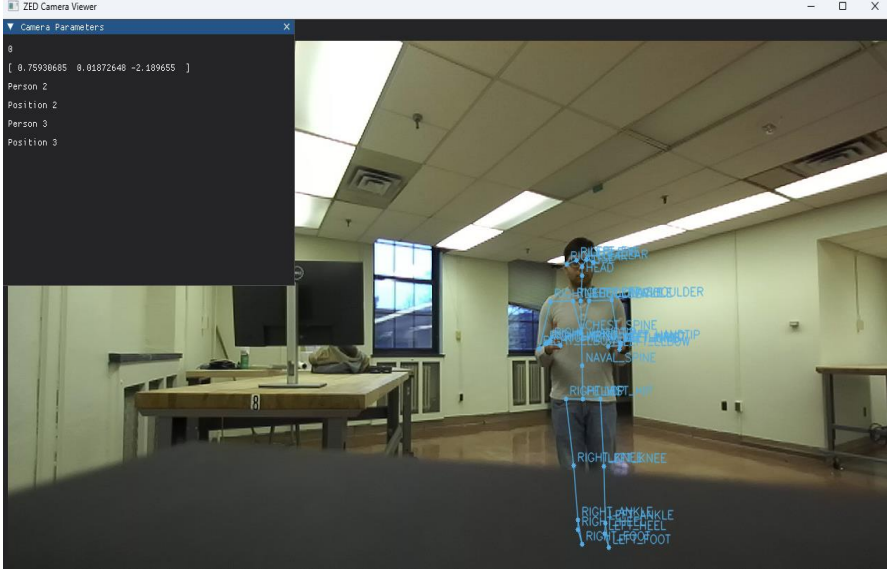
## Development Timeline

**August 2024:** Onboarded with existing motionpose

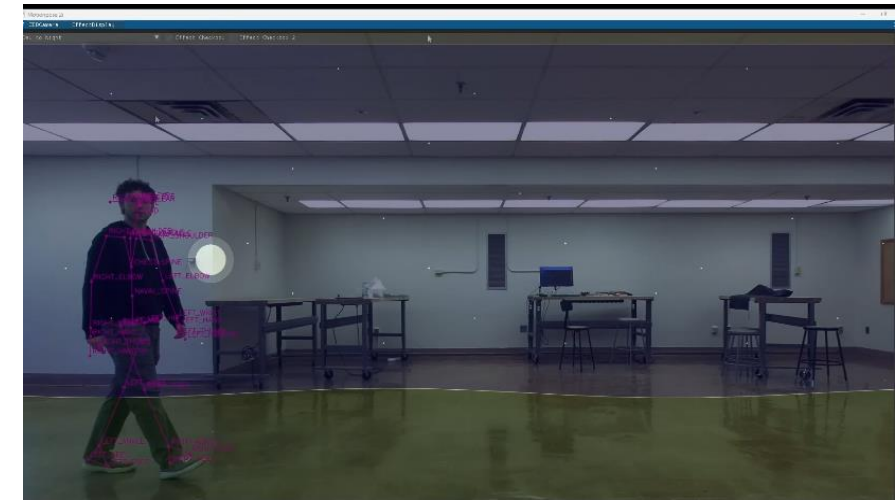


**October 2024:** Began development with Zed 2i Camera

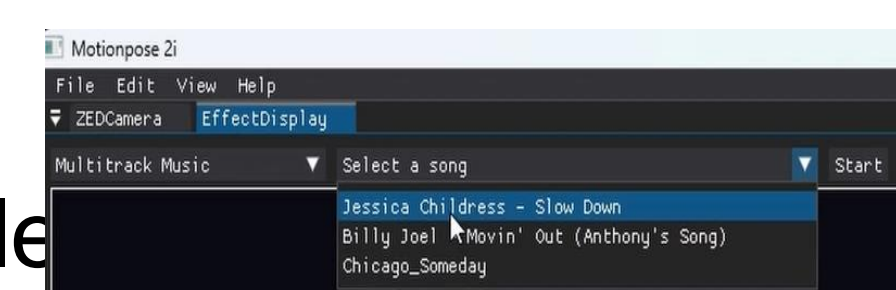
**December 2024:** Successfully integrated Zed 2i camera into motionpose



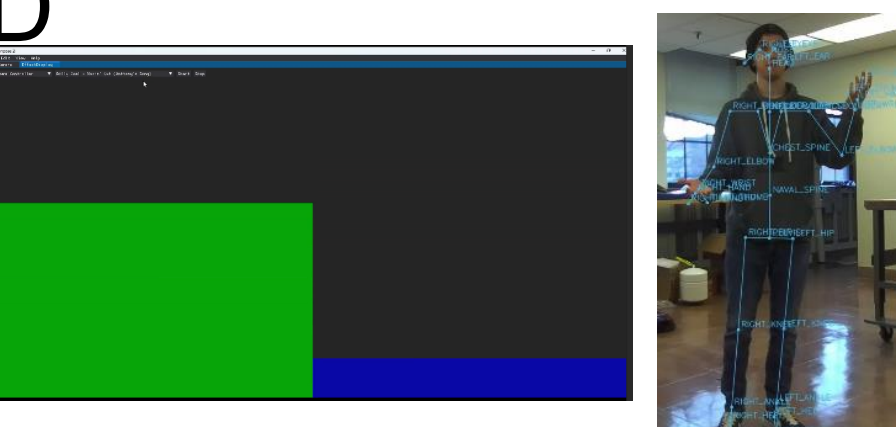
**January 2025:** Scrapped previous React frontend for DearPyGUI (DPG)



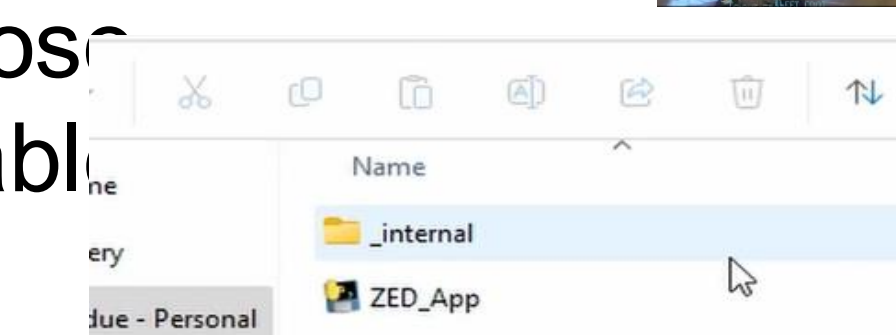
**February 2025:** First successful 2D art effect



**March 2025:** Functionally complete DPG frontend, first successful 3D art effect, first successful audio effect



**April 2025:** Packaged "motionpose 2i" project into one-click executable to finalize work



## Testing

Req #	Test Name	Test Description	Test Results
1	Starting application	Double click on application and ensure GUI starts	Application starts as expected
2	Test UI	Ensure UI elements are interactable, and camera & skeleton overlay work	GUI responds to changes correctly
3	Test latency	Move aggressively and ensure system follows in real-time	Negligible system latency
4	Test effects	Select each effect and ensure it works as intended	Effects work as intended