FW-HTF-P: Future of Work for Strength and Movement Training Professionals (Award #2129012)
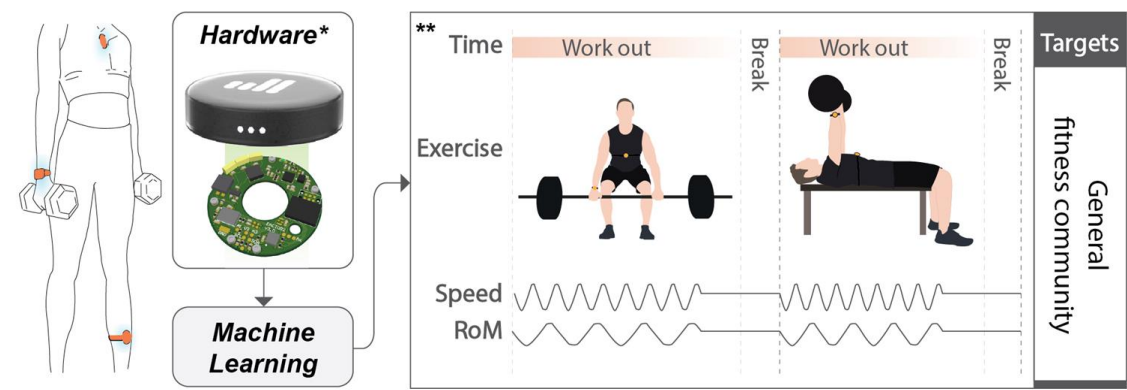## PI: Conor Walsh, Harvard University, walsh@seas.harvard.edu

I. Research on Current Work, Workers & Technologies

- Interviewed with **56 workers**, **11 work environment representatives**, surveyed with **281 workers** in the Strength and Movement Training Professionals (SMTPs).
- More than **one million SMTP jobs** with higher than **20% growth** in ten years, **$71.1B market size** estimated in total in 2020.
- The increasing number of **remote sessions** and the high demand of **quantified measures**.
- **97%** of NCAA coaches answered it is **useful to quantify athlete performance** while **55%** are **restricted** to have one by **high costs** of the systems.
- With current technologies, trainee's successful **adherence rates** for remote programs are as low as **40%**.

Current technologies		
Excel	✗ No automation	
KEISER Kaiser machine	✗ No portability	↑ High cost
Exercise wearables	✗ No measurements (ex, RoM, …)	

"I had limited access to remote therapy, but it is exciting to see more in the future. Upside is better continuity of care and greater accessibility." (<u>An occupational therapist with 3 years of experience</u>)

II. Future Work, Future Workers & Future Technologies

Future Work
- ✓ Quantitative objective measures (e.g., RoM, muscle strength level)
- ✓ Less administrative burden of reporting outcome and communicating with clients

Future Workers
- ✓ Richer interaction with client, driving adherence and improving outcomes
- ✓ Lower administrative burden, and better client adherence scaling SMTPs' income

Future Technologies
- ✓ Automatic exercise prescription, assessment, and progress monitoring

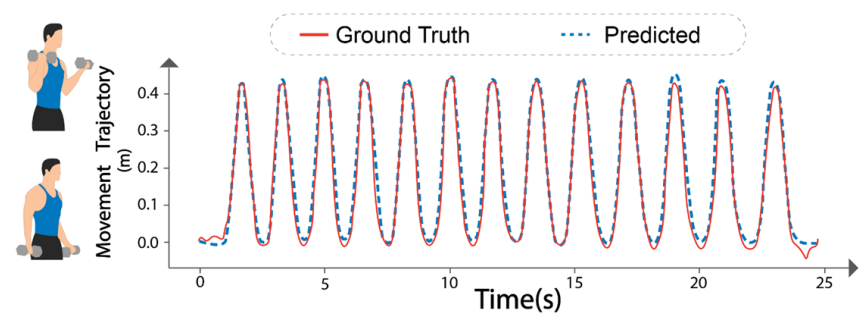

III. Hardware & Experimental Methods

* Wearable hardware including Inertial Measurement Units (IMUs)

** Estimates beginning and end of each exercise set, exercise type (classification), and movement velocity/trajectory.
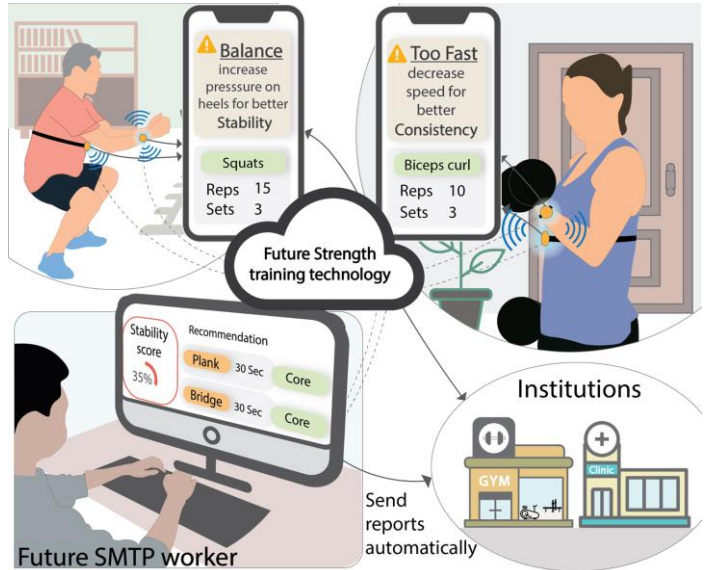
IV. Estimation Results

	Classification accuracy
Non-exercise	**98%**
Bench Press	**97%**
Squat	**98%**
Deadlift	**95%**

- Trajectory error less than **0.02m** (Root Mean Squared Error)
- Overall classification accuracy ~**98%** for 12 major target exercises including squat, bench press, and deadlift.