

# Final presentation SmartServe Ball

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Wathelet

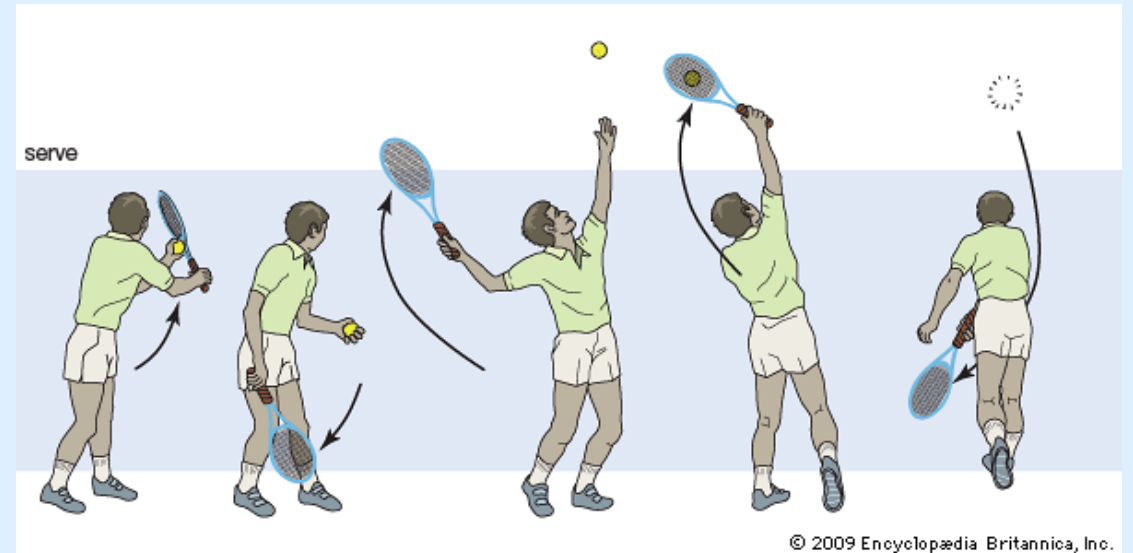


## Video



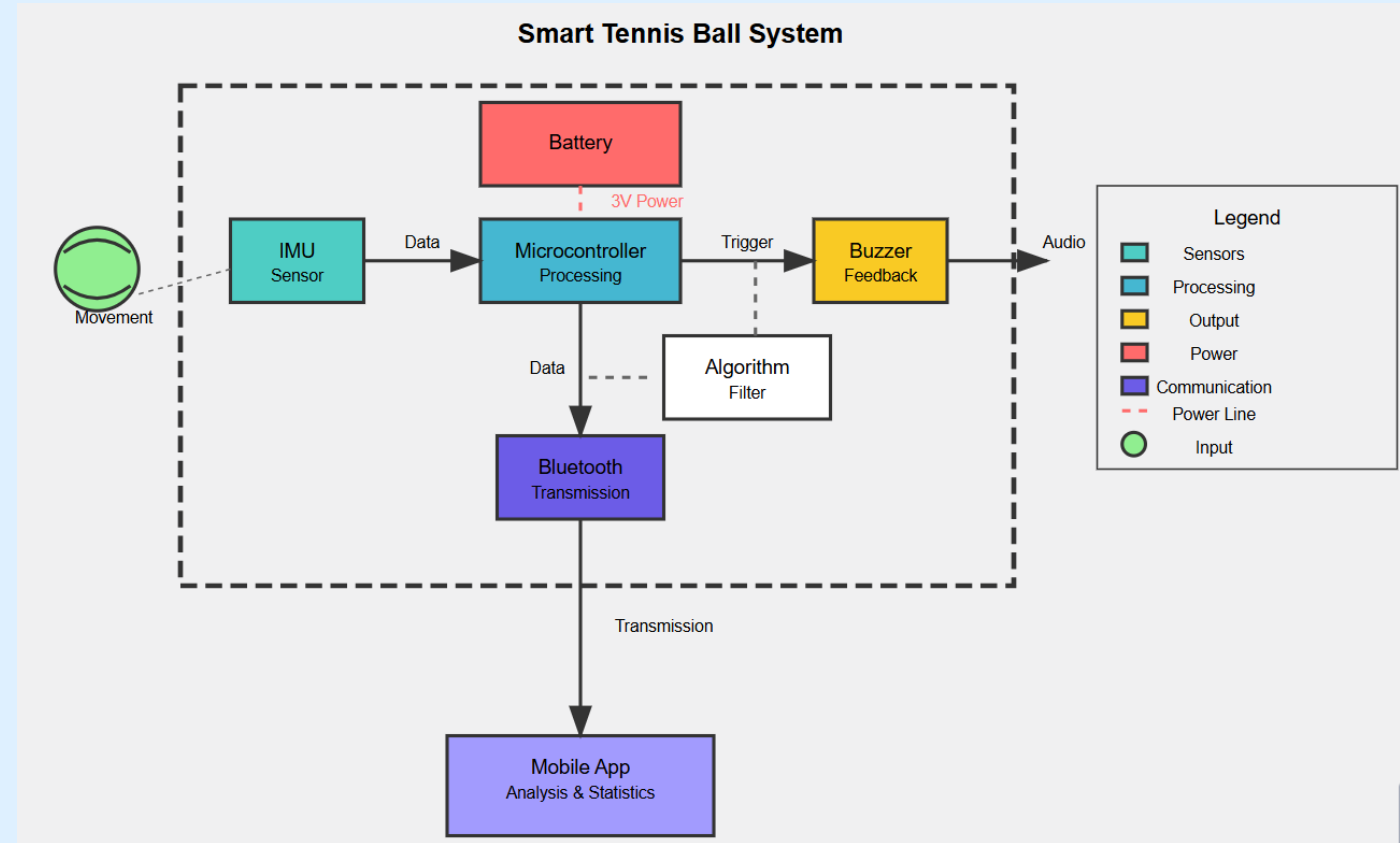
# Problem Statement

- Difficult evaluation of tennis serve timing
- Alternative solutions:
  - Coach → unreliable
  - Video analysis → expensive setup



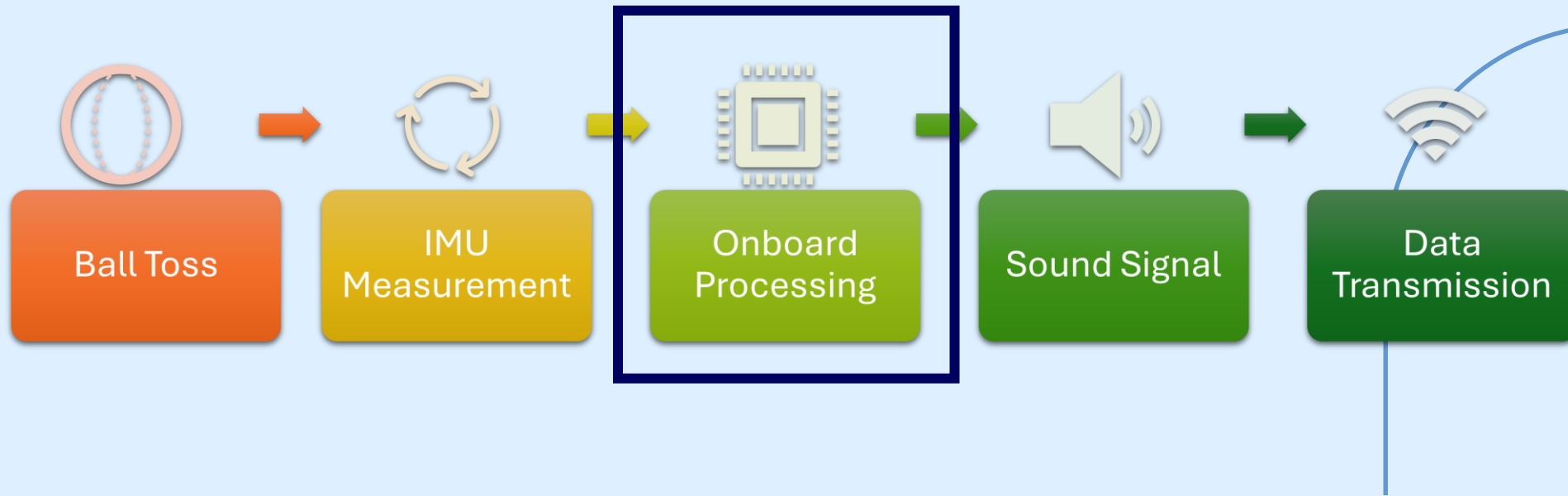
# Technical design

- Seeed Studio XIAO nRF52840 Sense board
  - IMU
  - Microcontroller
  - Bluetooth module
- Integrated electrical circuit with buzzer and coin battery
- Training foam ball

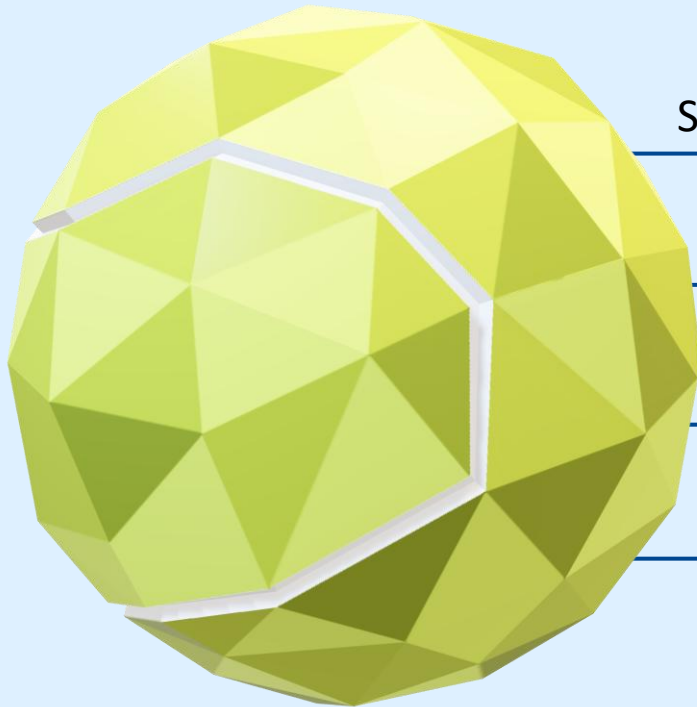


# Technical design

- Velocity reconstruction from acceleration
- Freefall detection: flight time
- Apex detection → trigger acoustic feedback



# User Interaction



Simple Setup

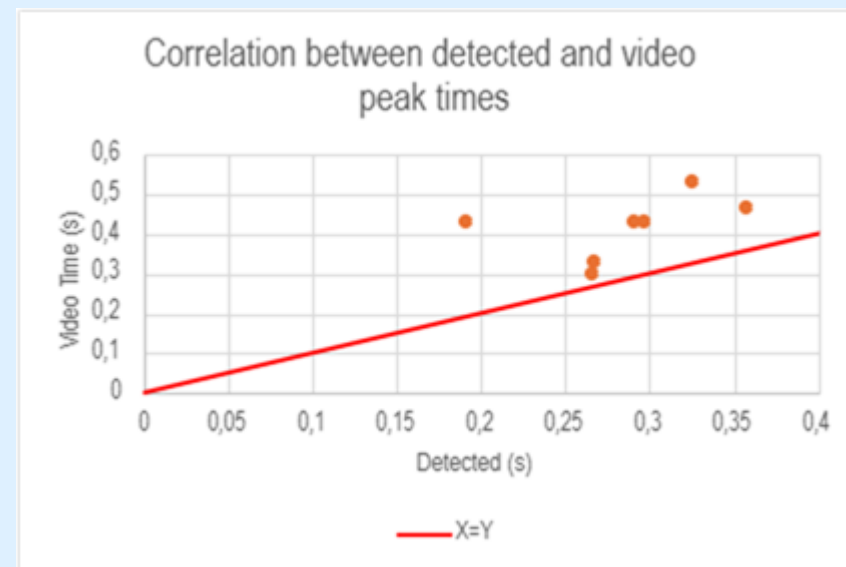
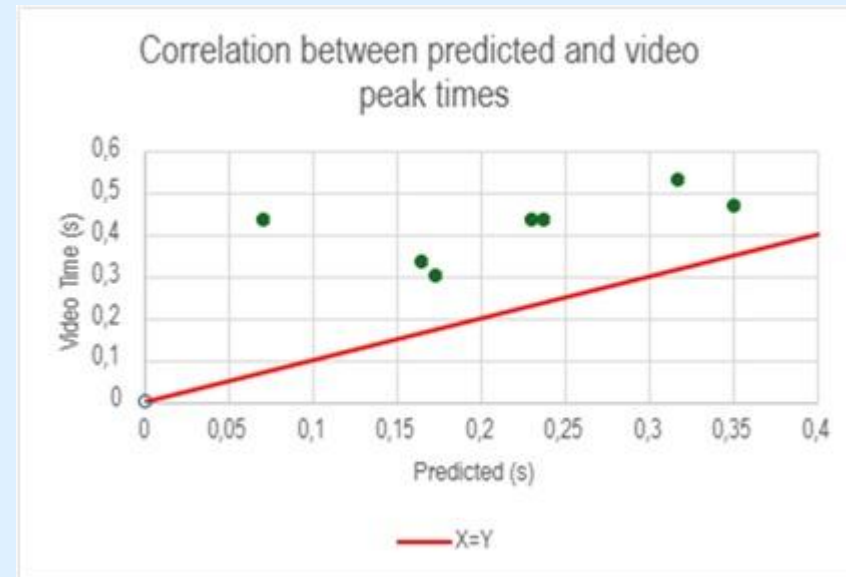
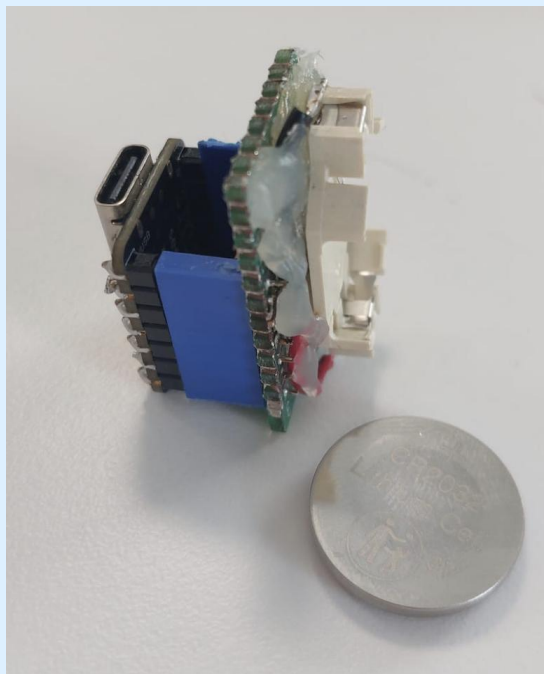
Real Time Feedback

Reduce training costs

Progress tracking

# Results

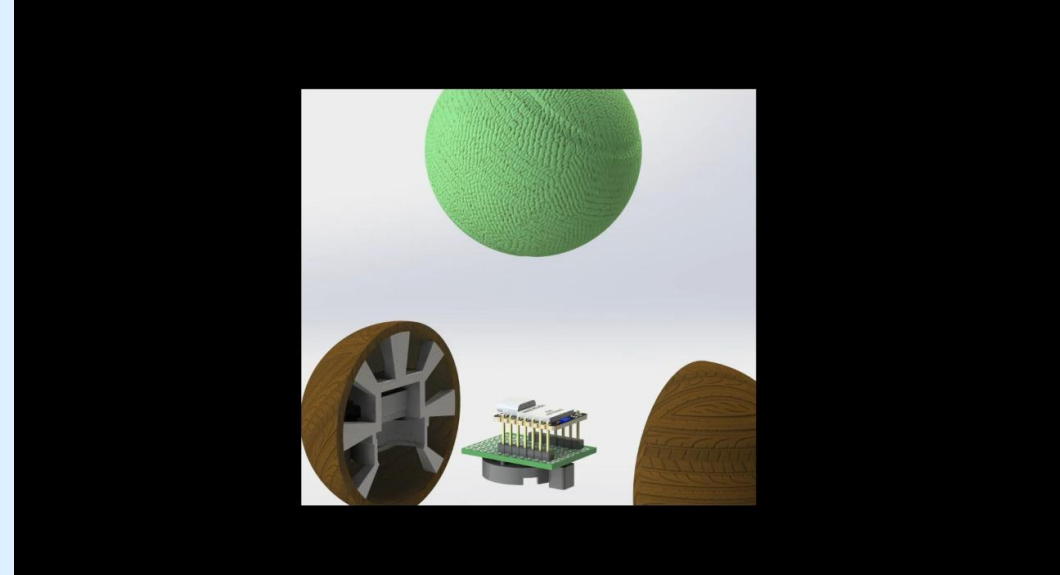
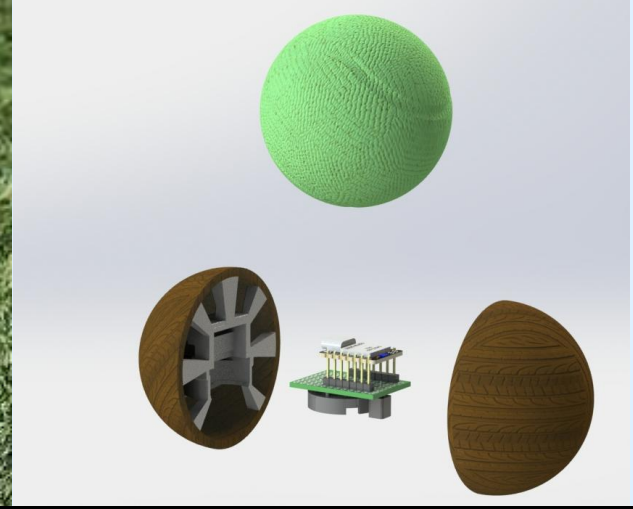
- Prototype works
  - Bluetooth streaming
  - Buzzer
- Mean error (based on 7 test throws)
  - Predicted vs Video:- 47.7% ( -0.19 seconds)
  - Detected vs Video:-30.5% (-0.13 seconds)
- Higher throws are better





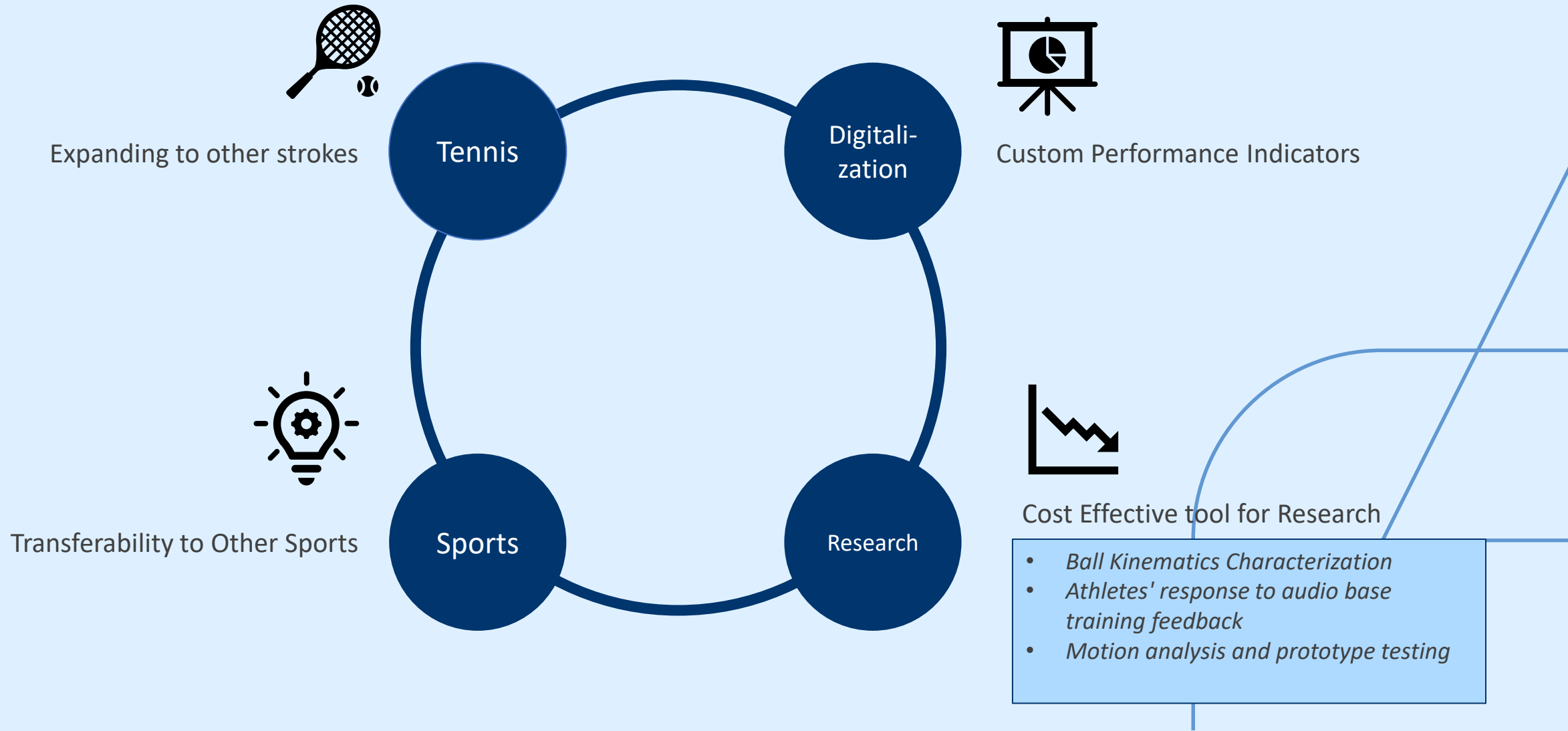
# What's next

- Integration into a real tennis ball
  - Provide sufficient integrity
  - Center of rotation
  - Affect minimal initial properties
    - Weight
    - Balance
    - Elasticity
- Improve accuracy
  - Both detection and video validation
- Onboard data storage → delayed transmission
- App design for progress tracking





# Other Uses



# Project Methodology

The group dynamic is centered around an open table discussion.

- Brainstorming
- Collectively discuss ideas
- Parallel work

## Positive

- Weekly meetings
- Strong communication

## Lessons learned

- More communication between members about their work
- Seeking help at an earlier stage when stuck

