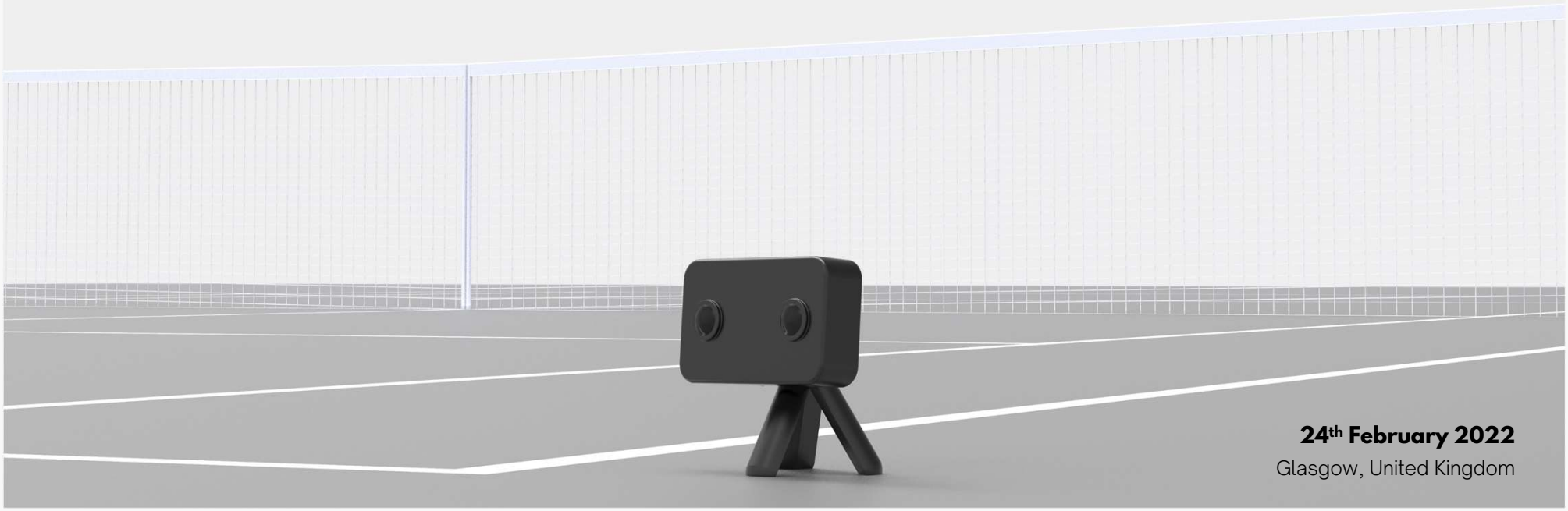
Tennis Pro

Place. Record. Improve.



24th February 2022

Glasgow, United Kingdom

Presentation Summary

Who am I?

Euan Gibson-Smith

5th Year MEng Product Design Engineer

Experience in Sector:

LTA Accredited Level 2 Tennis Coach

National Level Tennis Player (GUT Men's 1st Team)

The Problem

Tennis players have no way to critique their play in real time

Tennis is incredibly complex, and players struggle to identify and improve upon weaknesses in their game. The feedback mechanism required for self analysis is currently missing.

Filming yourself from one direction is not beneficial

The task of filming yourself is currently challenging, and players want to see themselves from multiple directions, rendering a single camera time consuming and ultimately useless

Tennis players need a coach to improve. Why is this?

What if there was a way to improve without having to see a coach?

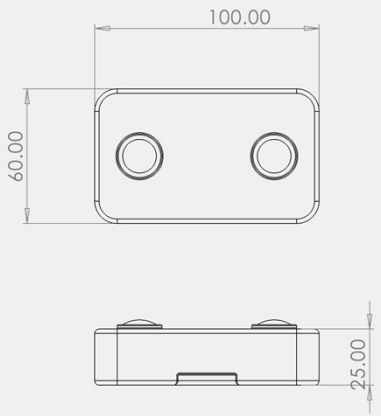
What if there was a product that enabled a tennis player to view, identify and improve upon weaknesses in their own game, reducing the dependence on a coach to improve?

Introducing*

Tennis Pro

The world’s first portable multi-cam AI coaching system

Tennis Pro is the first AI stereoscopic camera system to be used in tennis, enabling a player to record and track their play from multiple directions.

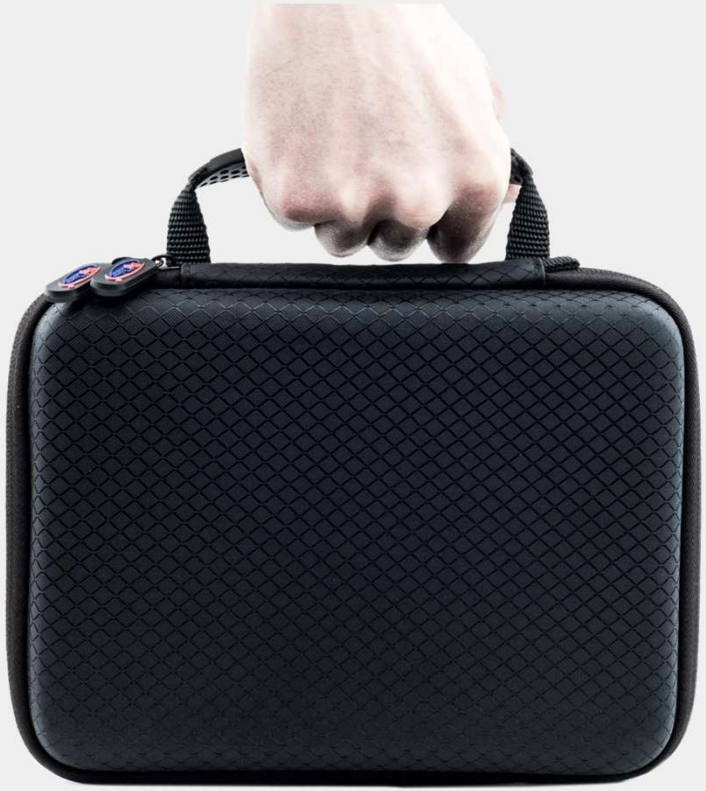


Units: mm

* This model is a representation of a current prototype and will likely change.

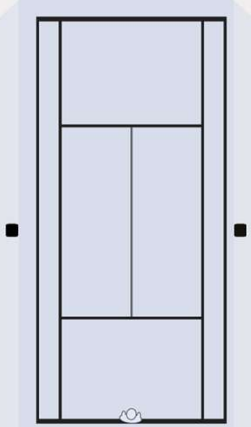
Take it Anywhere

With a footprint small enough to fit in any tennis bag, and over 5 hours battery life per camera.

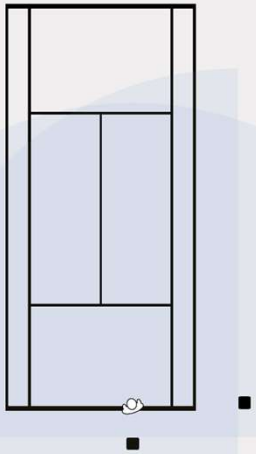


Easy Set Up

Quickly place the cameras to
the desired location and record



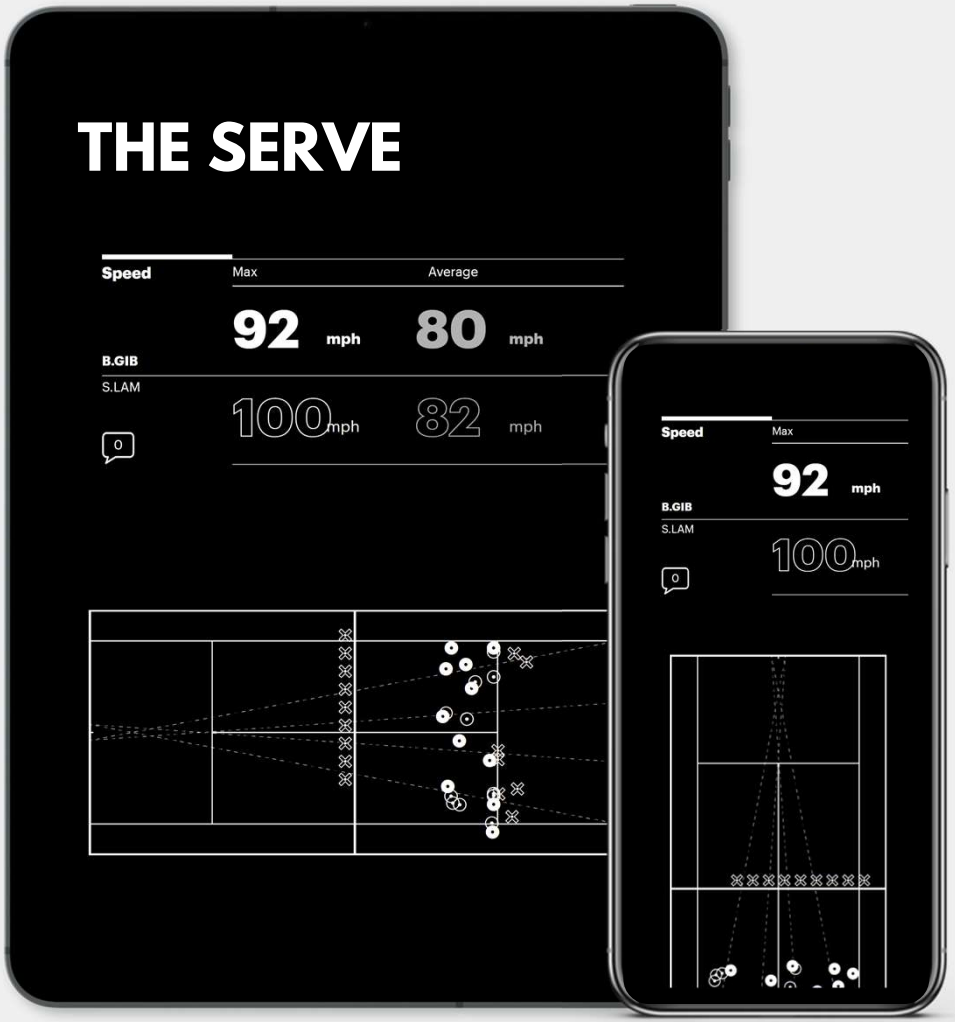
Training



Analysis

Track Your Play

View essential statistics in real time, to better understand your training



Featuring

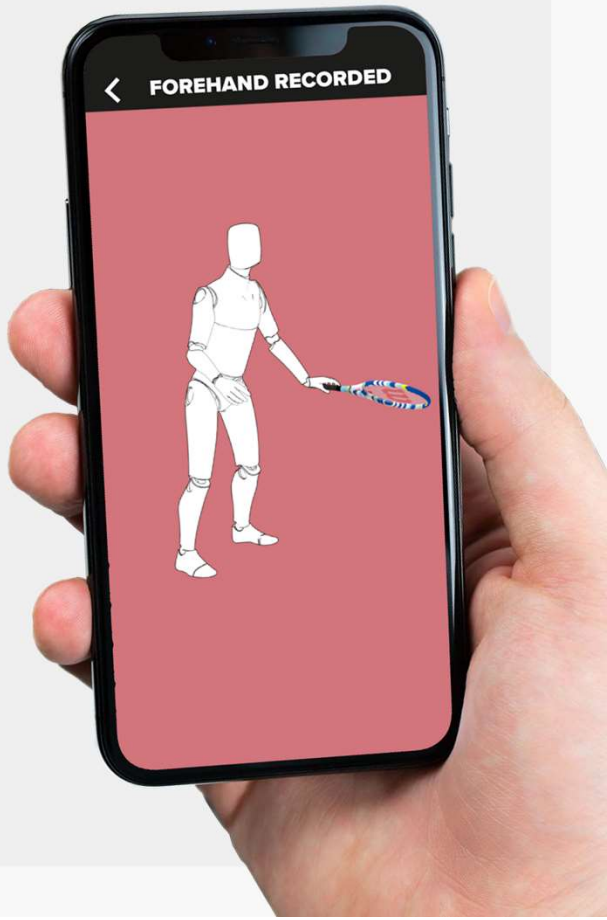
Virtual Coach

Receive AI instructed coaching tips for specific shots.

01 Record your shots and **observe it back from any direction.**

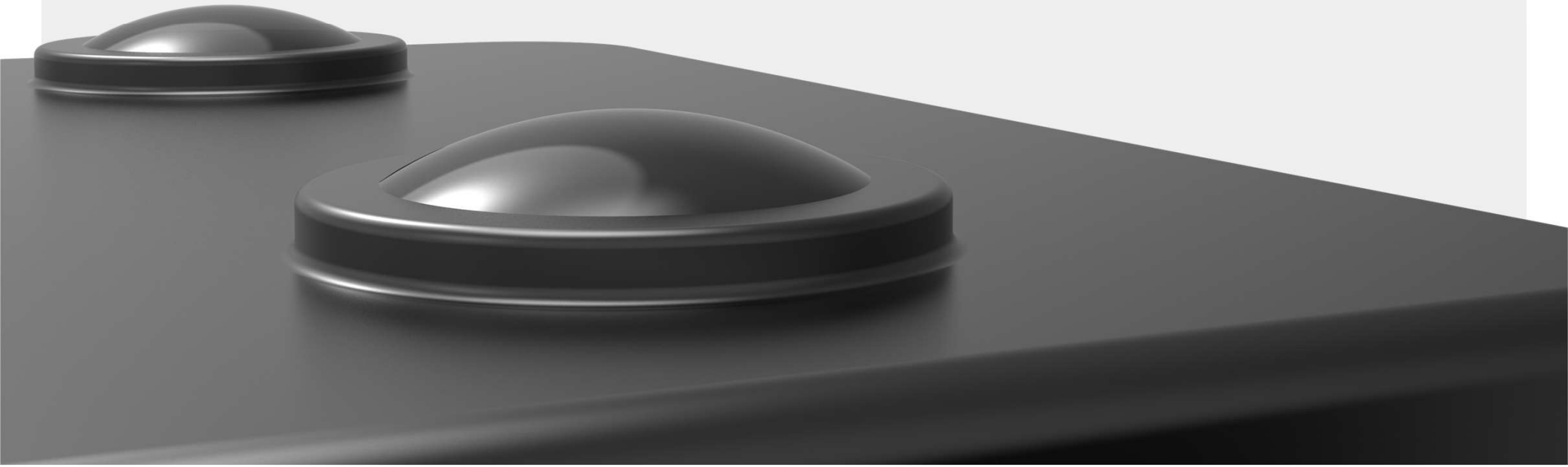
02 Compare your technique to the professionals

03 Receive feedback on all aspects of your body such as power, joint angles, rotation and more



Allocation of Funding

The technology and need for financial investment.



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3445225/

1. PREPARATION PHASE

1. Start

Personal preference, needs to have a stable balance.

- Balance / Centre of Gravity

2. Release

Release of ball into the air, in line with the baseline. Approximately 100° Arm Abduction

- Shoulder angle

3. Loading

Phase to generate potential energy. Looking at shoulder and pelvis lateral rear tilt, trunk and torso rotation and front knee bending load.

- Knee bend angle
- Torso / Trunk Rotation
- Tilt angle - shoulders and pelvis

4. Cocking

Utilisation of shoulder to lengthen path to the ball to increase potential energy. Main focus on shoulder, elbow and wrist.

- Shoulder external rotation anle
- Elbow flexion
- Wrist extension / radial flexion

2. ACCELERATION PHASE

5. Acceleration

Acceleration of racquet towards ball, release of generated potential energy

- Lead knee extension / lift force generated
- Shoulder tilt
- Speed of acceleration

6. Contact

Contact with the tennis ball, optimally 110° ± 15° shoulder joint angle. Elbow flexion (20° ± 4°), wrist extension (15° ± 8°), front knee flexion (24° ± 14°) Trunk is tilted 48° ± 7°.

- Shoulder abduction angle
- Elbow and wrist flexion
- Front knee and trunk tilt

3. FOLLOW-THROUGH PHASE

7. Deceleration

High forces 0.5-0.75 times body weight put through shoulder (can be as high as 300Nm). Ideal racquet position based on intended serve (here is flat serve)

- Calculated force through shoulder
- Angle of the racquet post serve
- Power transferred to ball

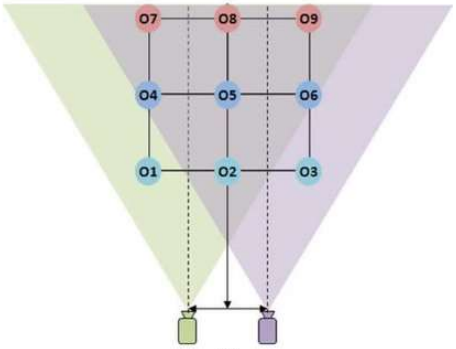
8. Finish

Landing of serve and further deceleration through leg. Optimal landing as shown to assist with balance and getting back into play.

- Leg landing and associated angles
- Force through leg
- Balance

How does it work?

- The two cameras auto-calibrate by using the standardized lines on the tennis court
- AI utilizes Human Pose Estimation, to locate a person and built a motion captured 3D model.
- AI also tracks the bounce of the ball, enabling tracking of shots
- The stereoscopic set up on each camera can compare pixel difference, granting highly accurate distance and depth mapping

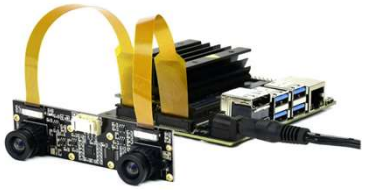


(b)

What stage am I at

Looks Like Product

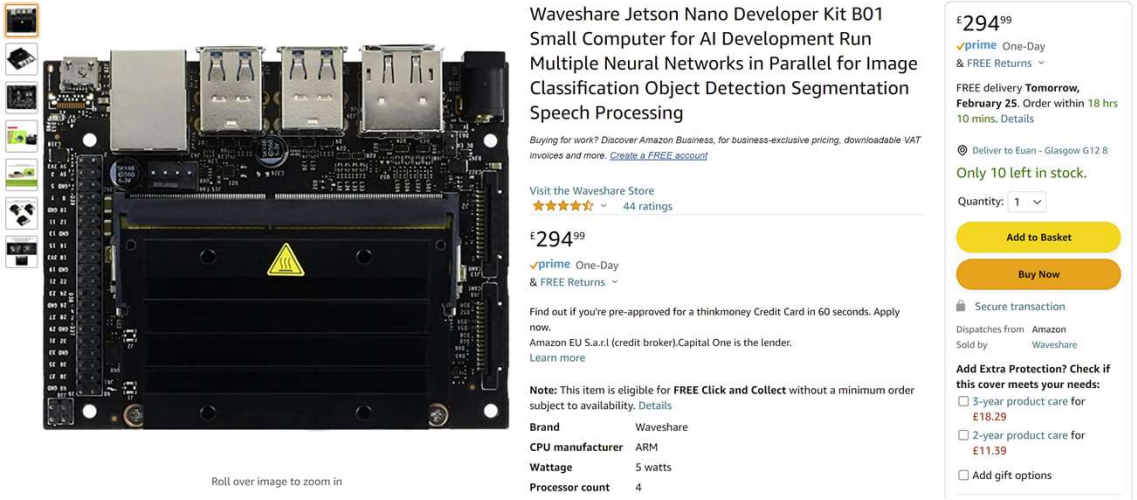
- Further iterate product
- Finalize product design
- Finalize UX/UI
- Manufacture “looks like” prototype



Works Like Prototype

- Test AI capabilities on developer-based chipset
- Implement and finalize prototype code to deliver key outputs for a tennis player.

Required Components



Funding Allocation	Cost
1 x Nvidia Jetson Nano Developer Kit	£294.99
4 x 180 FOV Camera Modules	£72.16
Total (including extra wiring and cables)	£400

Thank You

I will now take any questions you may have

Tennis Pro
2 Stereoscopic Camera set up

Benefits of Investment

- Bridge the gap between a concept and a prototype with real components that would be used in the final product
- Deliver a works like prototype at the Degree Show that would be able to track a player and replay their stroke, giving them beneficial AI stats

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