Movement classification in soccer

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Background and STORY

- Whether it's the multimillion-dollar FIFA world cup, beloved by fans worldwide, or a ball kicked between 2 backpacks set up as goalposts, its hard to deny the popularity of soccer, football, whatever you call it.
- And yet, soccer also has one of the highest rates of lower limb injury in sports, injuries which can rob athletes of their confidence, time on the field, and even their careers.

0:22 – research and project

- Evidence-based training programs have been shown to reduce the risk of injury. Part of the design process involves tracking what activities players take on the field, and how often; as certain activities, such as sudden changes of direction, are more likely to cause injury than others, like standing.
- This activity classification is normally done by expert video analysis, however this is time consuming and labour intensive.
- What I aim to do is to create a wearable sensor-based algorithm that can recognize and track these on-field activities, like an analyst in a box.

1:00

- The sensor is called an inertial measurement unit, and it measures motion. So it measures the kinematics of different activities, like how fast a player is speeding up, whether they are turning, et cetera. These measurements can be used to identify what activity is happening at a given moment.
- I will train a machine learning algorithm to classify different activities, based on this kinematic data. Essentially, I will train a computer to think like a coach or a spectator, so that it can tell when a player is jogging vs sprinting, for example, based on sensor data.

- Additionally, by including information about what activity the player was doing before, I can work in context. A player's history can be used to determine the likelihood that they transitioned from one activity to another, based on typical transitions made in the past. This can be used to check the output from the machine learning algorithm.
- This context layer can be swapped based on player position, which may improve the accuracy of the overall algorithm.
- To do this, I will be working with the UBC varsity womens soccer team, and collecting competition data during their fall season. Each player will be instrumented with a sensor, placed on their lower back, near the center of gravity. I will also be recording video footage, and matching the kinematic data from the sensors with the activities happening in the video, to train the algorithm.

2:25 - Conclusion

- In this way, the little analyst in a box can help coaches and athletes monitor how they are exposing themselves to injury
- There is a wealth of evidence-based injury prevention routines, but it's unrealistic to expect players to spend multiple hours on injury prevention, at the expense of practice time.
- Using this system, a coach can have more information, to build an efficient personalized training regime for each athlete.
- This could be adapted at any level: From professional players to youth athletes who just want to play the sport that they love.