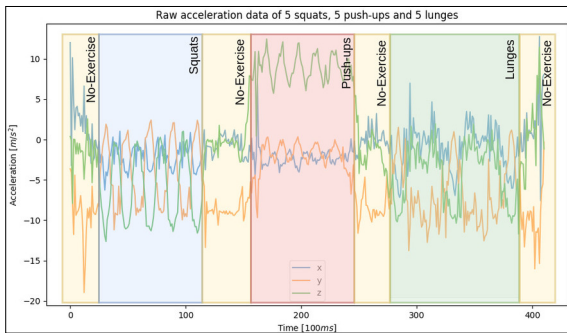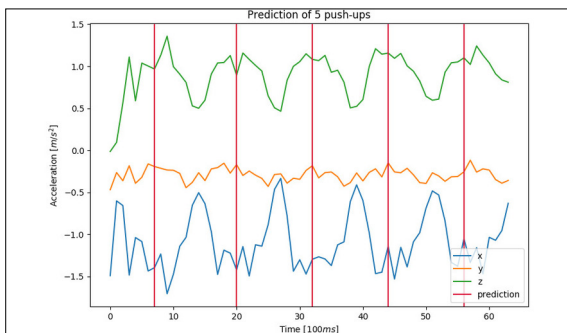|	
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Subject Area	Software and Systems

Samuel Kurath

Deep Squat

Autonomous workout recording

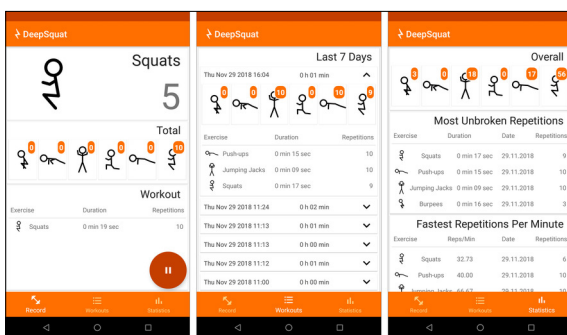Exercise type classification

Repetition counting

Objective: Athletes in sports want to continuously improve their capability to outperform their opponents. In addition to the expertise of their coaches, more and more technical gadgets are consulted to measure and enhance performance. The digital revolution in sport doesn't stop at the professional level. It is also common in amateur sports. As a result, new approaches to usage as well as technical aids are constantly being developed.

The goal of Deep Squat is to reduce the effort in tracking fitness workouts with an autonomous exercise recognition and repetition counting. Similar attempts are done by Pernek et al., RecoFit or Khaylo. Instead of using additional hardware, Deep Squat tries to achieve comparable results by using only of a smartphone and a built-in accelerometer.

Solution: For that purpose, applications have been developed to collect labeled sample data to compile a dataset of acceleration and gyroscope data from burpees, climbers, jumping jacks, lunges, push-ups and squats. Based on that data, a deep neural network has been trained to classify the different exercise types. Further, the collected data has been manually labeled with a point marking every single repetition. Other deep neural networks are then able to detect these points and determine the number of repetitions.

Result: The result of this is an Android app called Deep Squat that combines neural networks to classify exercises and counting repetition in real time.
The app achieves accurate results in classifying different exercise types. However, the counting part doesn't predict the exact number of repetitions all the time and thus leads to an unpleasant user experience. Nevertheless, Deep Squat shows that the sensors and the computing power of a modern smartphone are able to recognize different exercise types and count repetitions in real time.

Deep Squat App