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Detecting Near-Fall Events

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What does your future health look like? Well, I can give you a bit of a hint. There are some things that we can track in the present that give us insights into our future health. We can track our cholesterol levels to get a sense of our risk for heart disease. Or, we can track our nutrition and exercise to get a sense of our risk for diabetes in the future. But, what if we want to know more? Are cholesterol and nutrition the only things that we can track? Or, are there other hidden clues about our future health that are yet to be fully explored? My research aims to detect movement patterns in our daily lives that give us insights into our future risk for falls.

One out of three older adults experience a fall every year. These falls have serious consequences, including fractures, hospitalization, and even death. Current research focuses on detecting falls when they happen. But what if instead we focused on predicting falls before they even occur? Current ways to predict fall risk include a variety of clinical tests. However, these tests rely on our history of imbalance, which, in turn, relies on our relatively unreliable memory.

These tests also can't take into account all of the different environments that we see on a day to day basis. My research aims to better predict fall risk by detecting near-fall events. Near-falls, as shown, are like close - calls.

They're those moments where you lose your balance, but you're able to recover by holding onto a table or moving your body back and forth. A recent study found that 75% of fallers had experienced a near-fall in the previous year. To track near-falls, I will be using a wearable sensor that tells us about our motion and position in space.

This sensor is the same one that we find in our smartphones tells us if which way we're tilting our phone, or how many steps we've taken in a day. For my experiment, I will be recruiting 20 participants. They will perform a variety of near-fall simulations in the lab, gathering a total of 700 near-fall events. Then, they will continue to wear the sensor throughout the rest of the day to gather real-life measurements of their motion.

After collecting this variety of motion data, I will be analyzing it using a machine learning algorithm. This algorithm takes in various bits of information from the motion data to predict whether or not a near-fall has occurred.

The specific information I'm interested in has to do with the frequency of our motion. That is, the number of vibrations our body makes each second. I think that near-falls are going to have higher frequencies compared to normal daily movements. So, it turns out that cholesterol and nutrition aren't the only things that we can track to gain insights into our future health. A better understanding of near-falls can give us a glimpse into our future risk for falls.
