Falls are the leading cause of injury for elders in Canada, which can often mean the end of independent mobility.

> Providing a wearable device that monitors gait to predict falls in seniors as early as 3 weeks in advance which notifies physicians and family members to take remidating measures for prevention.

Status Quo

30% of seniors in Canada experience at least 1 fall each year. This results in a direct cost to our healthcare system of **$2 billion each year**. Falls can result in hip fractures, reduced mobility, loss of independence, and even death. These injuries can be detrimental to overall quality of life.

- **1/3** of seniors who are hospitalized for a fall are discharged to long term care.

- Seniors who fall and are sent to hospitals spend an average of **22 days** there.

- **35%** of the resulting injuries from a fall are broken or fractured bones.

- There are currently **no commercially available products** to predict and prevent falls.

> Solving this problem would significantly reduce the amount of critical injuries seniors experience while saving the healthcare system up to $2 billion dollars.

Solutions

Smart Monitoring for Fall Prediction

Falls don't happen out of the blue and they are often a result of slow decline in balance that older people might not even notice.

Technology that can detect subtle changes in an older person's gait can alert a doctor or caregiver of the increased likelihood of a fall before it happens so they can take advised remediating measures.

Solution features:

1) Measures gait of an elderly individual.

2) Detects anomalies that indicate an increased risk for falling within the next 3 weeks.

3) Notifies family members via text message & physicians via email so they can take their preferred course of action.

Methods and Tools that can be Leveraged to Analyze Gait

Ten years of research performed at TigerPlace in Missouri showed that people whose gait slowed by 5 centimetres per second within a week had an 86% probability of falling during the next three weeks. Shortening of stride had a 50 percent probability of falls within three weeks.

IoT Sticker / Wearable Device	Microsoft Kinect Sensor	Tri-Axial Accelerometer
Non-invasive IoT stickers or a wearable device to be placed on shoes can be leveraged to monitor reduction in the length and height of steps, increase in dual foot contact time, and reduction in gait speed.	Microsoft Kinect sensors can also be leveraged to take in the silhouette images that display the kinetics of an individual to measure gait more accurately.	Non-invasive tri-axial accelerometers can be applied on the individual's lower back to quantify the body's movements, and applies different algorithms to the data to extract valuable information on temporal and spatial aspects of the individual's gait (including step length, step height, step cycle and more).
If it passes a certain threshold, the caregiver, doctor or family member will be notified to heighten supervision of the senior.	Silhouettes are extracted from orthogonal views, from which 3D voxel models can be created.	In this way, we can effectively monitor the change in a senior's equilibrium and gait over time, and accurately predict a senior's fall three weeks before the event.
An action plan will be provided on the mobile app to help with remediation.	Passive gait analysis algorithms have been developed for the depth camera and the two-webcam system to monitor passes in set thresholds.	

With the direct costs associated with falls among seniors in Canada estimated to increase to $4.4 billion in the next 10 years, this solution will disrupt the healthcare industry enable greater mobility and autonomy.