

# Work Package for Collision Detection Helmet

To complete and build a functioning collision detection helmet at the end of the course. The following deliverables need to be completed. These are:

- **Electronic Components (Microcontroller, Accelerometer and Power Supply) Connected To Helmet**
  - To proceed with any form of testing, development, or data analysis, we first need to have a “bare-bones” prototype of a helmet with all the electrical components connected.
  - A way to secure the microcontroller and accelerometer to the helmet needs to be developed where it does not interfere with the protection provided by the helmet while also protecting the electrical parts from being damaged during a collision.
  - A system to deliver power to the electrical components needs to be developed whether that be in the form of a battery or a wired connection to the helmet (during the prototype phase)
  - This task would mainly be assigned to EE students as they have the background knowledge in circuits and power supplies to complete the task. As a CS student tasked to the software implementation, my job is to assist in the brainstorming of possible solutions and help the EE majors implement our solutions if they need it.
- **Data Collection and Analysis of Collisions with Different Material**
  - Since different materials compress differently under stress, it is crucial to collect data such as amount of acceleration experienced by helmet and time of collision when the helmet collides with different materials. Some examples of this are collision with other helmet, collision to the ground and combinations of different angles and materials.
  - Once the data is collected, the CS students will develop a system to plot the acceleration over time of the collision to obtain a waveform to better differentiate how collisions differ from one another.
  - With the waveforms, a library of reference can be developed so that the helmet can identify whether the waveform of the current collision resembles any of the ones in the library and identify the severity of them.
  - The CS students would need experience or knowledge with plotting software and familiarize themselves with how the sensor outputs the data and how the signals/sensor data can be converted into comparable values.
- **Database To Store and Manage Sensor Data from Helmet**
  - CS students need to develop and maintain a database that can receive and log sensor data sent from the helmet.
  - The database would need to be able to categorize which data is received from which helmet and store them accurately to be referenced by the program to calculate the final impact experienced by the player.
  - Database will also need to store a ‘history’ of prior collisions and players.
  - CS students would need a good foundation and understanding in databases and SQL to implement this deliverable.

- **Code That Determines Severity of Collision**
  - CS students also need to develop a program that would take sensor data from the database, compare the data to thresholds and determine if the parameters surrounding the collision align with what is common in concussive collisions.
  - If it determines that there are signs of a concussive collision, it will send an alert to the user device.
  - CS students will need to experience in C++ as this is the agreed upon language that the code will be built with.
  
- **System Or Application to Receive Alerts from Program**
  - A system needs to be developed for the end user device to receive alerts or notifications that provides information regarding a potential concussive impact.
  - This system could be an application that needs to be compatible with iOS and Android or could be delivered via SMS.
  - CS students would need to find a platform that is compatible with modern day smart phones or devices that is easily accessible in order to alert staff.