Overview
Charcot-Marie-Tooth (CMT) is a neurological disease that was first discovered in 1886. CMT attacks peripheral nerves, which carry signals from the brain and spinal cord to peripheral muscles and tendons such as those in the hands and feet. CMT is caused by the mutation of proteins that are involved in the peripheral nerve axon. As a patient with CMT ages, muscles and tendons slowly lose their function, making walking and holding objects difficult. Marty Kester is a lively individual who was diagnosed at age nine with CMT. Now 60 years later, Marty has lost the sufficient hand and grip strength needed to hold a fork or spoon and lift it to his mouth. Dr. Everett Hills and occupational therapist Jana Poole have helped to take care of Marty in Hershey and are facilitating this project through the Central PA SCI Support Group to help Marty do as much as he can on his own. The goal of this project is to design and manufacture a durable device to hold eating utensils that will aid a person without hand strength to feed himself.

Objectives
The primary objective is to design a utensil device that allows Marty to eat independently. Marty has tried several prototypes of utensil holders over the years, all of which have room for improvement and have failed due to fatigue. For Marty, this project holds a great significance, as it is very important to him to not appear to be a person with a disability, to appear different, or to draw pity. The utensil must satisfy the customer needs and be easy to use, durable, safe, lightweight, have rotation and locking abilities, and must allow for versatile utensil usage.

Approach
• The team visited the sponsor and patient, Marty, at Hershey Medical Center to obtain a better understanding of the patient and sponsor’s needs.
• External and internal searches were performed to understand current market products and generate new, unique concept ideas.
• Three of the brainstormed concepts were selected and compared to the device Marty previously used to eat through an AHP Matrix.
• The gear design concept, developed by the team members, was selected as the final design concept and was pursued further through CAD drawings and prototyping.
• A series of prototypes were created in SolidWorks and were 3D printed.
• Testing was done via computational simulations and physical trials.
• The team visited Marty throughout the semester to get feedback on the device and make improvements.

Outcomes
The final prototype was 3D printed in ULTEM thermoplastic so that it is dishwasher safe, and cost a total of $150. The material is very durable and contains a universal utensil and pre-attached utensils for Marty’s use. Magnetics were used on the device to allow for easy utensil insertion and removal. Marty was satisfied with the outcome and ranked it a 4.5 out of 5.