The purpose of this project is to establish a human-assisted robot arm capable of operating with minimal user effort. Multiple sensors are used for the arm to make movements. To elicit finite movement, the arm performs a chess demonstration. The chess pieces’ locations on the board are detected with photoresistors on each of the 64 spaces. A chess API enables auto-performance.

AR3 - physical robotic arm used for movement
Drivers - designed for motors to communicate with one another, as well as the computer
Stepper Motors - six main motors for movement
Sensors/Cameras - Time of Flight (ToF) cameras
Microcontrollers - Arduino Mega, Arduino Uno, Raspberry Pi, and Teensy 3.5 used to interface
Chessboard - with a photoresistor at each of the 64 spaces, the system is able to detect each piece

Kinect Camera Driver - uses a driver to support RGB & IR depth image transfer and registration
ROS Interface to Kinect and Img. Broadcaster - IAI Kinect2 package includes a bridge between driver and ROS, receiving data from the sensor and publishes topic of sensor_msgs with HD images
CenterNet Keypoint Triplets for Obj. Detection - Tensorflow Object Detection API with a centernet SSD model
Object Retrieval via Coordinate Transform

ROS Noetic Ninjemys - set of packages including controller interfaces, managers, transmissions, and hardware interfaces are applied; packages use encoder data and a point for joint position control
AR3/Gripper Interface & Driver - hardware interfaces are used in conjunction with drivers, which send and receive commands to the controllers to command position-based joints
Movelt and Rviz - motion planning framework uses plugin to access the ros_control nodes; Movelt Rviz plugin makes a virtual environment possible

Multi-Arm Collaboration – with both arms assembled, can now find ways for them to interface
Full Chess API Implementation – autonomous play
Interdisciplinary Work – biomedical applications