Identify one or two examples of robots for each of the seven categories of robots mentioned in class. Submit your selected examples as a list of youtube links with 2-3 line explanations for each.

1. Manipulators: These are arm-like mechanisms that are made of small segments joined together by revolute, sliding joints, etc. Manipulators can be used to lift, move or manoeuvre heavy, hazardous materials, sometimes to and from places inaccessible normally. Various categories of robotic manipulators include serial manipulators, remote manipulators and parallel manipulators.
   Examples:
   - ▶ Animation of Canadarm3, Canada's contribution to the Lunar Gateway
   - ▶ Dorna: fast, powerful and precise robotic arm

2. Mobile Robot: These types of robots are not fixed in one position. They gauge their surroundings and navigate without physical or electro-mechanical guidance. Alternatively, they can have a pre-defined route that it travels in a controlled space.
   Examples: ▶ A Robot You Can Throw

3. Aerial Robots(UAV): These are commonly called drones and are a type of unmanned aircraft. They involve various levels of automation and can be controlled by a remote control held by a human operator.
   Examples: ▶ DRDO Conducts Successful Flight Test Of Abhyas

4. Autonomous Underwater Vehicle: These robots travel underwater and are used in underwater exploration and research. They also have military applications in the Navy for surveillance, etc. They require little or no input from the remote operator.
   Examples: ▶ REMUS 600 Autonomous Underwater Vehicle

5. Soft robots: These are robots that are heavily inspired by living organisms. They are made from materials that are highly compliant. Their flexibility and deformability make them adaptable to highly complicated tasks and also improves safety around humans.
   Examples: ▶ Soft Robotics' octopus-inspired robots industrial grippers

6. Microrobots: These are robots with dimensions less than 1 mm. They are useful for handling minuscule objects and components. They are cheap and can be used in bulk to explore areas of potential danger.
   Examples: ▶ Tiny, Robotic Bees Could Change the World | National Geographic

7. Hybrid Robots: These robots consist of both electrical and biological components and are controlled using a computer.
   Example: ▶ Elowan: A Plant-Robot Hybrid

Review the most common types of motors and summarize them with a 2-3 sentence description of each of them.

1. Brushed DC motor: These types of motors, which run on a direct current power supply, contain a stator and a rotor. The stator has copper brushes on the inside. The copper brushes wear down over time and require proper replacement. The speed of the rotor depends on the operating voltage and the strength of the magnetic field. The direction of the current is reversed in every half of the cycle so as to maintain a constant direction of rotation.

2. Brushless DC motors: In a BLDC motor, the stator is a permanent magnet and the coils are fixed in place on the stator. When current passes through these coils, a magnetic field is generated whose magnitude depends on the current passing through the coils. We can change the direction of this magnetic field to rotate the motor.

3. Stepper Motors: In these types of motors, the rotor moves in steps i.e., by a fixed amount of degrees. The stator of a stepper motor consists of small coils spread across its inner circumference. When a particular coil is active, the rotor rotates so as to align itself with the generated magnetic field. By activating the coils in a particular order, we can have a stepper rotation effect.

4. Servo Motors: These are used to precisely control angular or linear position, velocity and acceleration. It consists of a closed-loop mechanism that takes in position feedback through a position encoder and adjusts its motion and final position. More sophisticated servo motors also use speed feedback.

5. Synchronous AC motor: In a steady-state, the rotation of the shaft of this motor is synchronized with the frequency of the current supplied. The stator of a synchronous motor creates a magnetic field that rotates in time with the line current oscillations. In turn, the rotor consisting of permanent magnets rotate in step with the stator field.

6. Induction Motor: In these types of motors, the electromagnetic induction from the magnetic field produced by the stator winding produces current. This current is used to rotate or produce torque. So, electrical connections to the rotor are not required for an induction motor. Additionally, the rotational rate of the rotor is slightly slower than the stator speed.