What is a rover?

A rover is a device designed to help us explore and answer key questions about Mars because Scientists believe Mars may have once supported life. With their ability to move around and investigate multiple locations, rovers have given researchers access to much wider swaths of Mars and have provided compelling evidence that the planet was once much more habitable than it is today. The main purpose of a rover is to look for signs of life on Mars.

Sensors used on a Rover

For sensors, I will be mentioning the sensors used in Perseverance rover, the latest and most advanced rover launched by NASA in 2021

1. Mastcam-Z

Mastcam-Z is a mast-mounted camera used to zoom in focus and take 3D pictures and video at high speed to allow detailed examination of distant objects.

1. Supercam

The Supercam examines rocks and minerals, With the help of laser spectrometers and camera it can identify chemical materials present in the rock from a distance up to 7 meters

1. SHERLOC

Scanning Habitable Environments with Raman & Luminescence for Organics & Chemicals. SHERLOC uses camera lasers and spectrometers to search for organics and minerals that have been altered by watery environments and may be signs of past microbial life

1. PIXL

Planetary Instrument for X-ray Lithochemistry. . It identifies chemical elements at a tiny scale. PIXL also has a camera that takes super close-up pictures of rock and soil textures. It can see features as small as a grain of salt!

1. MEDA

The Mars Environmental Dynamics Analyzer is known as MEDA. It makes weather measurements including wind speed and direction, temperature and humidity, and measures the amount and size of dust particles in the Martian atmosphere.

1. RIMFAX

Radar Imager for Mars’ Subsurface Experiment

RIMFAX uses radar waves to probe the ground under the rover.

Difference between Rover and a Robot

**Robot**: A robot is a programmable machine capable of carrying out tasks autonomously or semi-autonomously. This broad category includes various types of machines, from industrial robots that automate manufacturing processes to household robots like vacuum cleaners

**Rover**: A rover is a specific type of robot designed primarily for traversing the surface of a planet or celestial body. Rovers are typically used for exploration and scientific research, equipped with instruments to collect data about their environment

In summary, while all rovers are considered robots due to their programmable nature and ability to perform tasks autonomously, not all robots qualify as rovers. Rovers are specifically designed for mobility on planetary surfaces and equipped for exploration tasks, distinguishing them from the broader category of robots that can serve various functions across different environments.

Autonomous tasks rovers are expected to perform

Again I will be talking about NASA’s Perseverance rover.

NASA’s Perseverance rover uses robotic autonomy to achieve its mission goals on Mars. Its self-driving autonomous navigation system (AutoNav) has been used to evaluate 88% of the 17.7-kilometer distance traveled during its first Mars year of operation.

The presence of landing hazards near the delta led to the development of the onboard autonomous terrain-relative navigation (TRN) system, which is able to command late diverts away from hazardous areas when landing on the martian surface . TRN did prevent a landing in the sand ripple–filled Seitah crater, placing the rover just east of that feature.

The AEGIS system enables automated science data collection. AEGIS allows data to be acquired from scientifically interesting targets without requiring ground communication at times not otherwise possible such as during or immediately after long drives. Activity scheduling is another autonomous capability that has been developed for Perseverance The rover attitude is updated as it drives using gyros to integrate attitude changes at high rates, updating its pose at 8 Hz. AEGIS intelligent targeting begins with the acquisition of a wide-angle source image with an onboard camera. For autonomous target selection on Mars 2020, the rover’s stereo NavCams are used.