



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

SPACE SOFTWARE AND DATA SYSTEMS

A satellite in space produces a fountain of information. Data Systems oversees the technologies involved in spacecraft onboard data handling (OBDH) system.

The University of Bologna is involved in research activity about Space Software and Data Systems related to telecommand protocols, image analysis, data fusion, and firmware design.

The research of the University of Bologna covers a wide range of topics:

- Software for telemetry protocols, erasure resilient codes, automatic repeat request
- Software/firmware for FPGA/DSP implementation of space communication transceivers
- Software for InterPlanetary Internet Protocols
- Software for Mobile Edge Computing and Caching in Satellite Communications
- Image sequence analysis, image registration, videogrammetry
- 2D/3D Planet surface analysis, measurements and mosaicing 3D rendering of simulated surfaces
- Multi-sensor remote sensing
- Data fusion of IMU and visual information from 3D image analysis
- Mobile SLAM algorithms for 3D scene reconstruction
- Software for autonomous and image-based attitude determination of LEO satellites

HIGHLIGHTS

The University of Bologna participates in:

- the creation of the *Solar System Internet Delay/Disruption Tolerant Networking* ([DTN](#)) service on the International Space Station (NASA).
- **CCSDS** (*Consultative Committee for Space Data Systems*) definition of international standards for software systems aimed at packet erasure correction in space communication protocols (in collaboration with the main international space agencies).

Different research groups have established an **extensive network of collaborations** with several institutions and research centers at national and international level, such as: ASI (Italian Space Agency), DLR (German Aerospace Center), ESA, JPL (Jet Propulsion Laboratory), NASA.