

# ROBOSAT

## Autonomous robot navigation in the wild using satellite-based 3D geographical information

### 1. Brief description

Our project aims to provide a scalable MultiGIS high-quality data collection platform through the use of a quadrupedal robot that can autonomously perform long-distance missions in challenging environments, such as Alpes mountains or Finnish forests.

### 2. Objectives

- To develop a quadrupedal robot and a sensor payload for scalable autonomous data collection in the wild.
- To provide increased accuracy and robustness of GNSS algorithms using MultiGIS data fusion
- To offer novel large-scale open-access MultiGIS data with automatic labelling

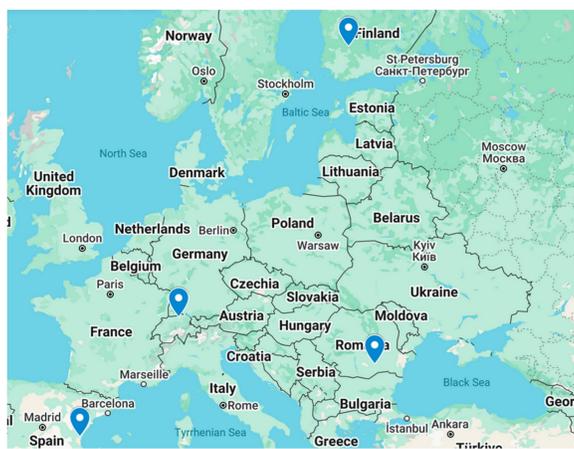
### 3. Team

Three-universities and one SME:

- **Tampere University, Finland.** Expertise: GNSS, wireless positioning, sensing, and communications, RF Fingerprinting and interference mitigation. Coordinator: Prof. Elena Simona Lohan
- **ETH, Switzerland.** Expertise: automation, mapping, control theory, and legged-robot research. PI: Prof. Marco Hutter
- **Universitat de Valencia, Spain.** Expertise: computer science, database management, machine learning. PI: Joaquin Torres Sospedra
- **CITST, Romania.** Expertise: machine learning/artificial intelligence, robotics, exploitation. PI: Irina Mocanu.



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### 4. ETH ANYmal ROBOT



ANYmal is a quadrupedal robot designed for autonomous operation in challenging environments

### 5. Examples of use cases



Images generated with ChatGPT

### 6. Expected Impact

**Scientific & technological impact:** High quality, multi-dimensional sensor data (GIS, GNSS, RGB-D images, etc.) along with novel tools to aid accessibility and develop novel algorithms will be provided to facilitate beyond the state-of-the-art research and commercial uses. The tools developed, the knowledge and open-access databases generated in the project will directly contribute to applications of GIS in geographical research that requires a high level of accuracy and multi-dimensional data in unconstrained environments.

**Transversal impact to other future emerging technologies:** Multi-dimensional data collection in unstructured terrains is directly supported by the project development and undeniably valuable for our pilot environments (mountains and forest) and related applications such as forestry, environment, search and rescue.

**Economic and societal impact:** Through the development of improved skills for mapping and navigating in unstructured environments, autonomous machines can support logistics applications in rural places or even serve as tools for more exotic yet relevant applications where typical therapy/health aid is not possible.

**Educational impact:** We will not only share the results with researchers through publications and at scientific events but expect to host and educate students at all levels at their academic development.

**Workforce impact:** The universities involved in ROBOSAT will train a new generation of engineers skilled in addressing multidisciplinary challenges at the intersection of several fields including wireless navigation, robotics, autonomous systems, GIS, statistical signal processing, ML/AI, database management and programming.

**Strategical impact on critical infrastructures:** Robustness to GNSS interferences and joint GIS-GNSS algorithms for enhanced interference management are highly relevant in view of the recent geopolitical situation in Europe

### Contact details

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### 4. Envisaged approach

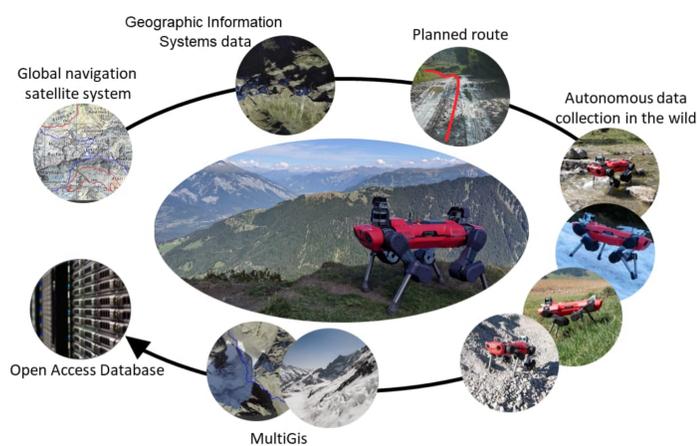


Illustration of a mission chain of our entire envisaged approach

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