Politecnico di Torino

N-MON

KICK-OFF

Presented by Group - G

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OVERVIEW

- Introduction
- State of the Art
- User requirements
- Functional requirements
- Technical requirements
- WBS
- Gantt Chart

INTRODUCTION*

The Problem: The Hidden Vulnerability of GNSS

- Modern society critically dependent on GNSS for different purposes
- Malicious radio devices known as “jammers” are cheap, easy to acquire, and can blind GNSS receivers
- Real-world impact: **Organized cargo theft** (e.g., Gucci case study)
  - Thieves jam tracking systems to blind fleet monitoring
  - High-value goods stolen while systems are compromised
  - Professional monitoring solutions too expensive for wide deployment

The solution: An Intelligent and Autonomous Guardian

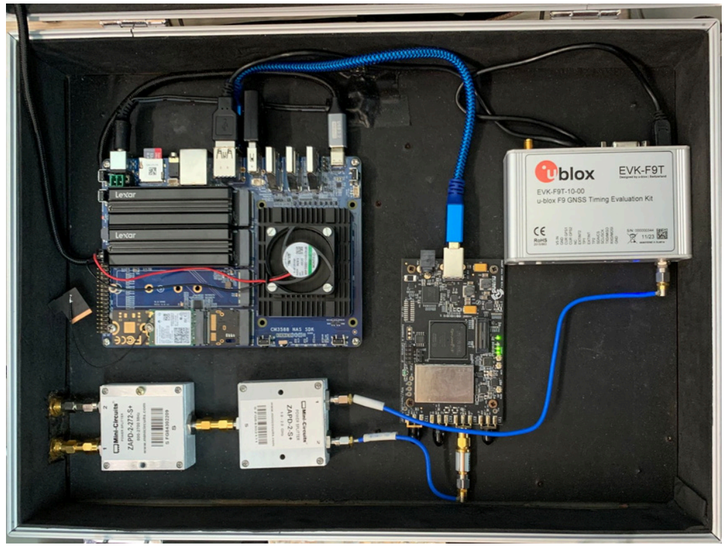
- Small, cheap monitoring station deployed on trucks that constantly monitor to the GNSS frequency bands
- Using advanced signal processing algorithms, the system analyzes the radio spectrum to identify anomalies in real time
- Thanks to ML and NN the system can distinguish between clean or a disrupted signal
- Once a jammer is detected and classified, the system automatically notify the company of the current situation and sends an alert to a central station

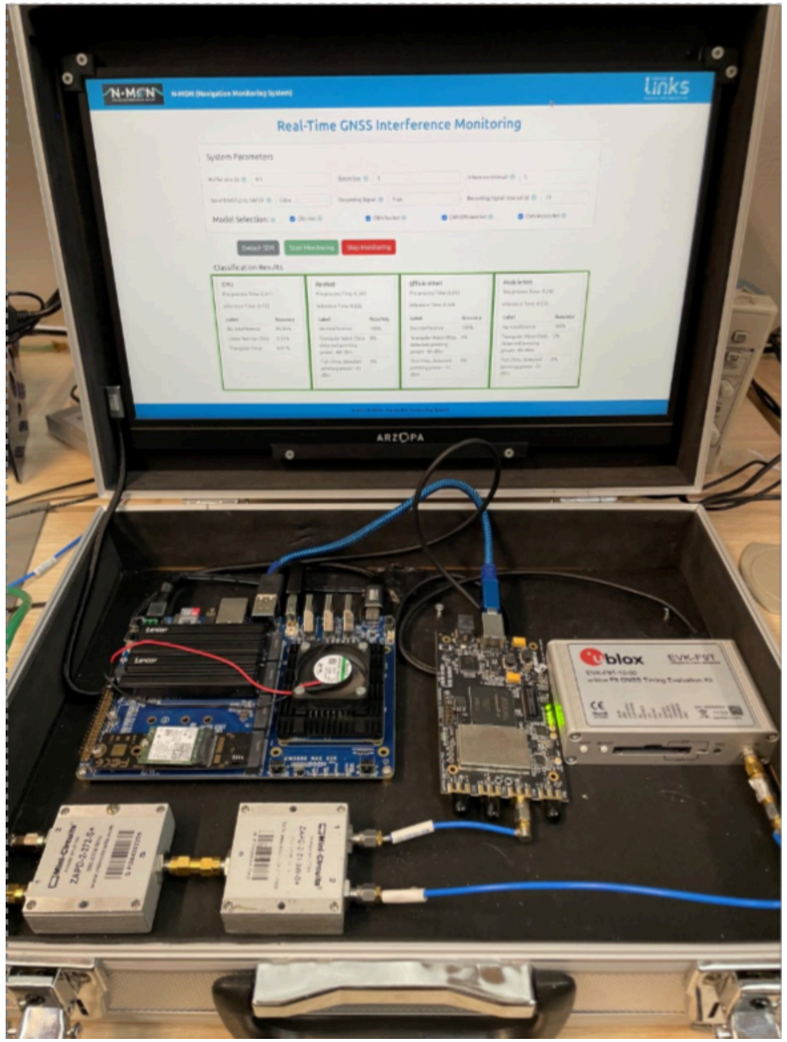
*Meeting with the tutor on date 15/10/25

STATE OF THE ART

What to do?

- Resize the existing device in terms of dimensions and weight
- Reduce the cost of the current configuration while maintaining a similar level of performance





Tutor Iman Ebrahimi Mehr’s setup

USER REQUIREMENTS

- **(UR-1)** : the user should be able to deploy and operate the system simply by connecting power and network, without complex configuration procedures
- **(UR-2)** : user should have a simple, intuitive way to see if GNSS signals are clean or compromised, and what type of interference is disrupting them
- **(UR-3)** : user need automatic warning delivered to the central station when jamming is detected

FUNCTIONAL REQUIREMENTS

The system must be able to perform the following operations:

- **(FR-1)** : constantly monitor GNSS signals (L1 band) multiconstellation
- **(FR-2)** : acquire and then process GNNS signals in order to extract time-frequency representations
- **(FR-3)** : integrate a Neural Network to divide those signals into predefined interference categories
- **(FR-4)** : correctly identify and classify the type of jamming interference when present
- **(FR-5)** : provide the user a simple UI to visualize the output of the NN and signal status
- **(FR-6)** : automatically send an immediate warning if jamming is present to both the UI and a control center

TECHNICAL REQUIREMENTS

We will need the following technologies and tools to implement the project:

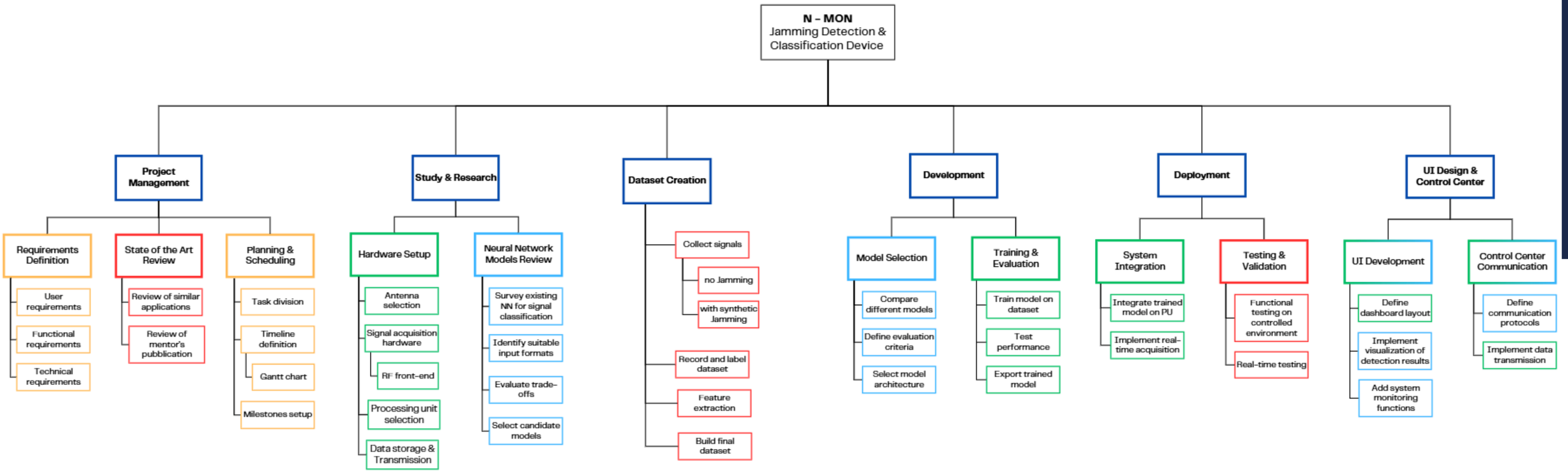
- **(TR-1)** : HW components to acquire, digitalize GNSS signals from L1 band with sufficient sampling rate and bit depth for jamming detection
- **(TR-2)** : computational unit supporting real time NN inference and signal processing operations
- **(TR-3)** : signal processing tools (libraries, STFT implementation, preprocessing algorithms) to process the input data
- **(TR-4)** : test environment with capability to generate synthetic jamming signals with defined JSR
- **(TR-5)** : web based UI accessible from desktop and mobile browsers

TECHNICAL REQUIREMENTS

- **(TR-6)** : real time classification and result visualization
- **(TR-7)** : protocols to provide reliable external connection to comunicate with remote control center
- **(TR-8)** : target cost lower than current laboratory setup
- **(TR-9)** : reduced dimensions compared to existing laboratory setup

** target values such as sampling rate ,bit depth ,number of classes, JSR range and cost reduction will be consolidated at SRR due to Hardware Setup and Neural Networks Models Review research tasks

WBS



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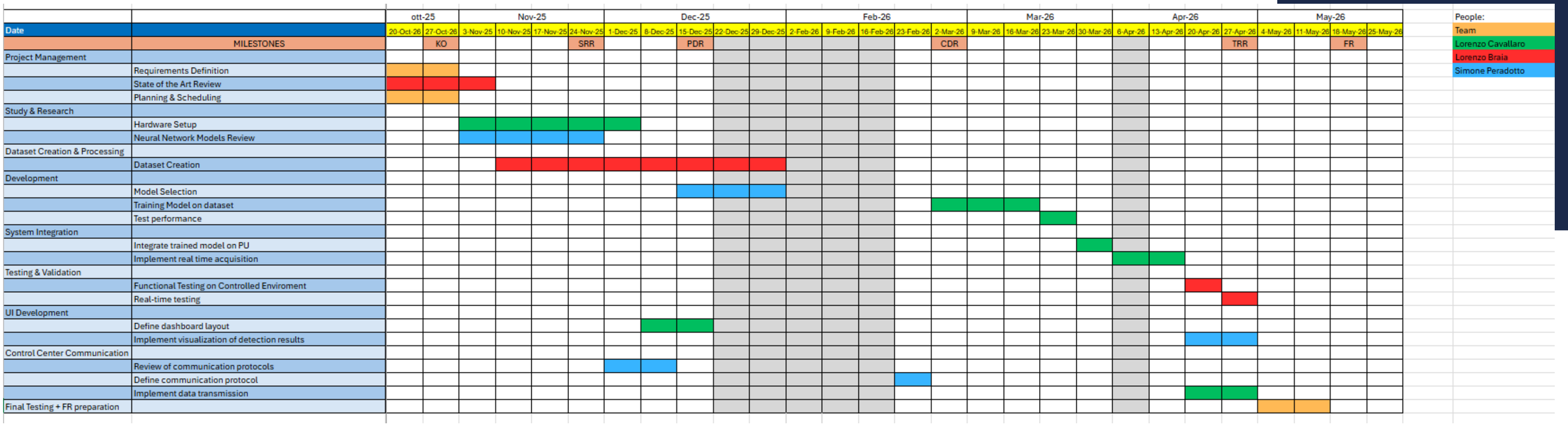
GANTT CHART



		ott-25		Nov-25				Dec-25					Feb-26					Mar-26				Apr-26				May-26			
Date		20-Oct-26	27-Oct-26	3-Nov-25	10-Nov-25	17-Nov-25	24-Nov-25	1-Dec-25	8-Dec-25	15-Dec-25	22-Dec-25	29-Dec-25	2-Feb-26	9-Feb-26	16-Feb-26	23-Feb-26	2-Mar-26	9-Mar-26	16-Mar-26	23-Mar-26	30-Mar-26	6-Apr-26	13-Apr-26	20-Apr-26	27-Apr-26	4-May-26	11-May-26	18-May-26	25-May-26
	MILESTONES		KO				SRR			PDR							CDR								TRR			FR	
Project Management																												
	Requirements Definition																											
	State of the Art Review																											
	Planning & Scheduling																											
Study & Research																												
	Hardware Setup																											
	Neural Network Models Review																											
Dataset Creation & Processing																												
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Development																												
	Model Selection																											
	Training Model on dataset																											
	Test performance																											
System Integration																												
	Integrate trained model on PU																											
	Implement real time acquisition																											
Testing & Validation																												
	Functional Testing on Controlled Enviroment																											
	Real-time testing																											
UI Development																												
	Define dashboard layout																											
	Implement visualization of detection results																											
Control Center Communication																												
	Review of communication protocols																											
	Define communication protocol																											
	Implement data transmission																											
Final Testing + FR preparation																												

People:
Team
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Lorenzo Brala
Simone Peradotto

Link accessible with Polito credentials :

https://politoit-my.sharepoint.com/:x:/g/personal/s343420_studenti_polito_it/EVHoF8byxhZOuSA_gHzWz6ABPUtiU81AzwQXv3SZYcAgyA?e=vecgTL

THANK YOU!

For your attention