



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

ARCES Ricerca: Dall'elettronica al cloud, dal dato all'Intelligenza Artificiale

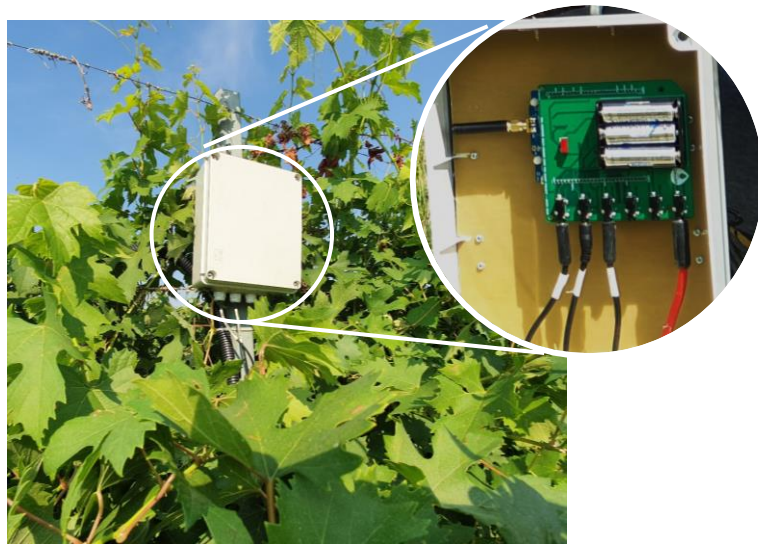
Prof. Marco Di Felice

Advanced Research Center on Electronic Systems

Dipartimento di Informatica – Scienza e Ingegneria

Competenze del centro

- **Piattaforme software** per gestione/valorizzazione/fruizione dati IoT
- **Interoperabilità** dati/software in sistemi distribuiti
- **Analisi dati** mediante tecniche di AI
 - Integrazione di tecniche di edge AI *su dispositivi low-power*



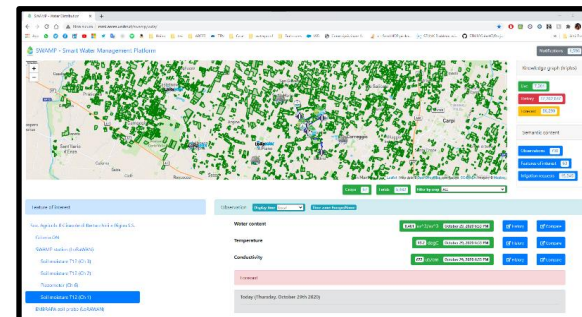
DISPOSITIVI DI CAMPO



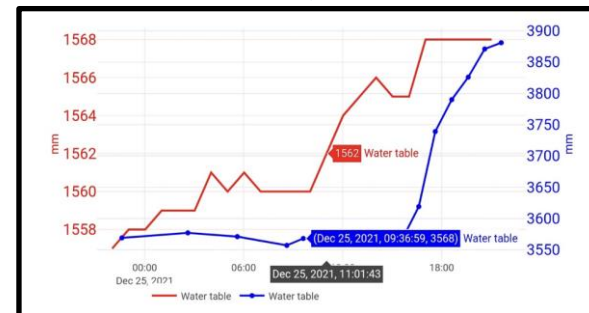
DATI



PIATTAFORMA SW

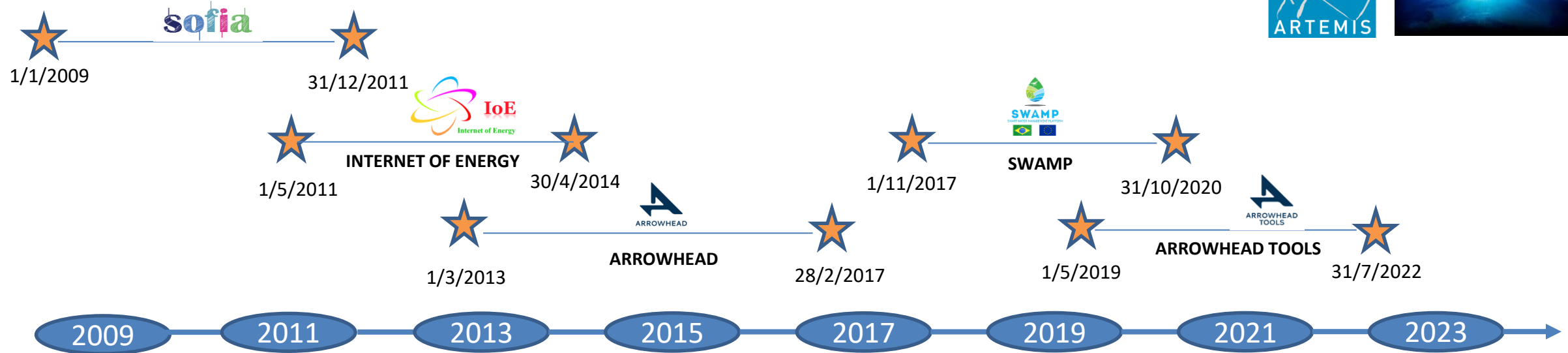


ANALISI & VALORIZZAZIONE DATI



14 Anni di Progetti di ricerca ... in 1 slide

Ricerca su **piattaforme software ed interoperabilità semantica**



- Progetti **ARTEMIS/ECSEL + H2020** (Swamp)
- Focus su *piattaforme dati ed interoperabilità*, IoT o pre IoT (smart spaces)
- **Applicazioni**: smart city, smart mobility, smart industry, smart agriculture, SHM
- Starting point: sviluppo piattaforma interoperabilità con **NOKIA Research**
- Funding **3M€ circa** (+500K in arrivo)
- Dipartimenti partecipanti: **DEI, DISI, DICAM, DISTAL**



14 Anni di Applicazioni ... in 1 slide

Ricerca su **piattaforme software ed interoperabilità semantica**

The diagram illustrates the SWAMP (Smart Agriculture/Monitoring) system architecture. It features a central cloud labeled "Lepoda Network". On the left, there are several components: "APP" (represented by a smartphone icon), "Sensori in campo" (field sensors), "Control Room", "Modelli della RETE di distribuzione idrica" (water distribution network models), "MODELLI AGRO-IDROLOGICI" (agro-hydrological models), and "STIMA DEL FABBISOGNO IRRIGUO" (irrigation demand estimation). On the right, there are "PIATTAFORMA SERVIZI" (service platforms) and a photograph of a vineyard. The system is supported by "Knowledge graph (triples)" with live, history, and forecast data, and "Semantic content" including observations, features of interest, and irrigation requests. The bottom of the slide features the text "SMART AGRICULTURE/MONITORAGGIO IDRICO (EU H2020 SWAMP)" and the SWAMP logo.

The diagram illustrates the SMART ELECTRIC MOBILITY (ARTEMIS IoE / Arrowhead) system architecture. It shows a central "CITY SERVICE INFORMATION BROKER" connected to "ELECTRIC VEHICLE" and "USER SMARTPHONE" components. The system provides "Energy Info for Altitude Difference" (Downhill: -0.15(kWh), Uphill: 0.18(kWh), Flat: -0.03(kWh), Total: 0.0(kWh)) and "Energy Info for Path Length" (Downhill: 162.2(kWh), Uphill: 304.57(kWh), Flat: 1756.92(kWh), Total: 3676.05(kWh)). It also includes an "Altitude Graph" and "Recharge options, charging route planning". The bottom of the slide features the text "SMART ELECTRIC MOBILITY (ARTEMIS IoE / Arrowhead)" and the IoE and Arrowhead logos.

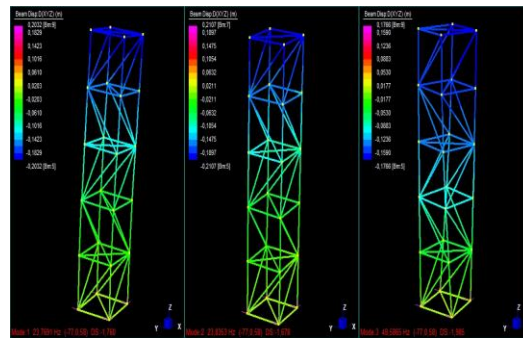
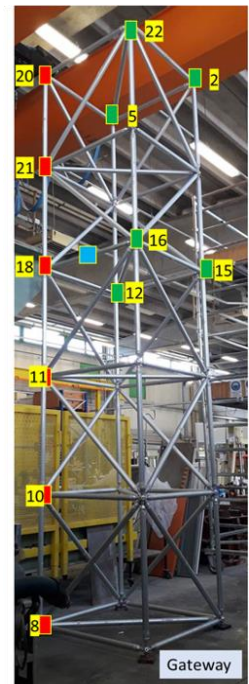
The diagram illustrates the JOINT STRUCTURAL HEALTH MONITORING + POWER CONTROL (ARTEMIS Arrowhead Tools) system architecture. It shows a central "WoT Arrowhead Drawbridge" connected to "Accelerometers", "Cluster Head", "MODRON", "WoT Translation/Thing Directory", "Server", "Power control sub-system", and "Zigbee gateway". The system also includes a "Dashboard" and "Arrowhead local cloud". The bottom of the slide features the text "JOINT STRUCTURAL HEALTH MONITORING + POWER CONTROL (ARTEMIS Arrowhead Tools)" and the Arrowhead logo.

Ricerca interdisciplinare su sistemi SHM

MAC4PRO: BRIC **INAIL** 2019 - 2022

DS2: BRIC **INAIL** 2021 - 2023

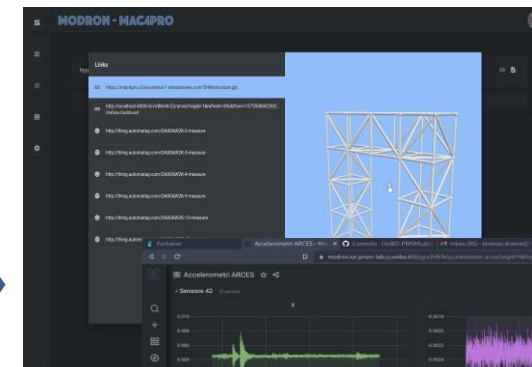
MANutenzione intelligente di impianti industriali e opere **Civili** mediante tecnologie di monitoraggio 4.0 e approcci **PRO**gnostici



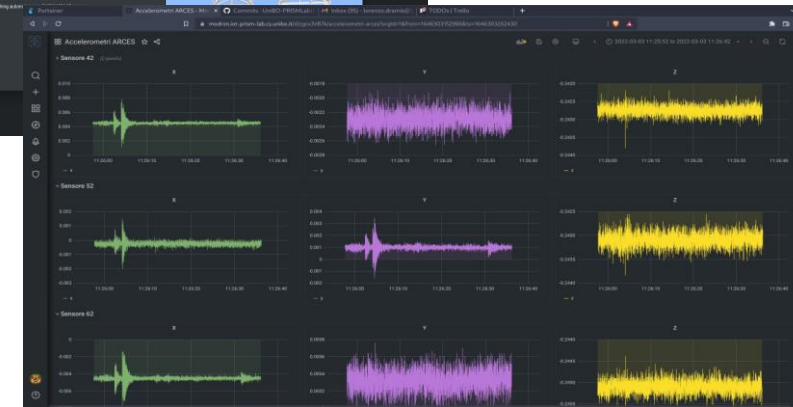
MODELLAZIONE
(DICAM)



SENSORISTICA
(DEI)



MODRON
SOFTWARE



PIATTAFORMA IOT
(DISI)



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Progetti di ricerca sul tema dell'AI

- [2022 - on going][**FIORIRE**] *Failure Identification with On-board prediction by aRtificial intelligence*: finanziato da European Space Agency (ESA) con UNIBO come principal investigator e Thales Alenia Space Italia, Leonardo Lab, Politecnico di Torino, ALTEC S.p.A come sub-contractors.

Stor**Alge**

- [2021 - on going][**StorAlge**] *Embedded storage elements on next MCU generation ready for AI on the edge*: Progetto europeo nella call ECSEL Joint Undertaking (JU) con un consorzio di 40 partners da 8 stati EU.



Partner di ricerca & ricerca commissionata

INAIL

ISTITUTO NAZIONALE PER L'ASSICURAZIONE
CONTRO GLI INFORTUNI SUL LAVORO

ThalesAlenia
a Thales / Leonardo company **Space**

**RFI**
RETE FERROVIARIA ITALIANA
GRUPPO FERROVIE DELLO STATO ITALIANE


SALCEF GROUP

HPE GROUP



Dottorato e Terza Missione



Spin-off UNIBO (dal 2020)

Piattaforme software di IoT data fusion/aggregation/analytics



PHD PROGRAMME
ENGINEERING AND INFORMATION TECHNOLOGY FOR
STRUCTURAL AND ENVIRONMENTAL MONITORING AND
RISK MANAGEMENT - EIT4SEMM



**CRISTIANO
AGUZZI (XXXIV CICLO)**



**LEONARDO
MONTECCHIARI (XXXV)**

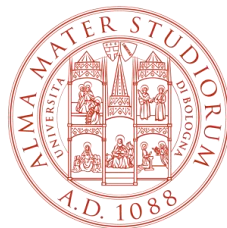


**IVAN DIMITRY
ZYRIANOFF (XXXVI)**



**LORENZO GIGLI
(XXXVII)**





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