



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Selective Laser Melting and Direct Energy Depositions: research activities and industrial applications at the University of Bologna

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Gruppo Laser: staff



Prof. Luca Tomesani
Professor and manufacturing
group coordinator



Prof. Alessandro Fortunato
Associate professor and laser
group coordinator



Ph.D ing. Alessandro Ascari
Senior assistant professor
Main research topic: laser welding



Ph.D ing. Erica Liverani
Research fellow.
Main research topic: PBF additive
manufacturing



Ph.D ing. Antonio Candido
Research fellow.
Main research topic: data analysis, modeling,
machine learning for manufacturing



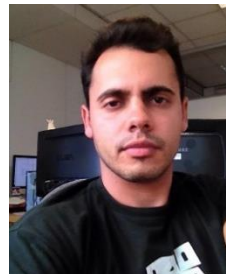
M.Sc Giuseppe Valli
Ph.D student.
Main research topic: PBF additive manufacturing



M.Sc Flavia Lerra
Ph.D student.
Main research topic: grinding processes modeling
and optimization



M.Sc Vincenzo Dimatteo
Ph.D student.
Main research topic: laser welding of highly reflective
materials for automotive applications



M.Sc Eriel Pérez Zapico
Research fellow.
Main research topic: laser welding of highly reflective
materials for automotive applications

Gruppo Laser: equipment and main research topics

- 3 kW CW Laserline diode laser (1000 μm delivery fiber core diameter)
- 3 kW CW nLight Yb:fiber laser (50 μm delivery fiber core diameter)
- 1 kW CW Trumpf Nd:YAG laser (300 μm delivery fiber core diameter)
- 300-3000 W Q-CW long pulse Yb:fiber IPG laser (50 μm delivery fiber core diameter)
- 200 W long pulse Nd:YAG Trumpf laser (400 μm delivery fiber core diameter)
- 100 W short pulse Yb:fiber SPI laser
- 20 W short pulse Yb:fiber IPG laser
- 7 W ultra-short pulse Ti:Sapphire Light Conversion laser
- GTV 2 hoppers powder feeder + GTV 6-ways powder nozzle
- 6 axes anthropomorphic robot + 1 axis rotary positioner
- Several fixed focal and galvo focusing heads
- **Sisma Mysint 100 SLM PBF 3D printing machine**

- Laser surface hardening of carbon steels and cast irons
- Laser welding of high reflectivity and dissimilar materials
- Laser welding and cutting of thin plastic films for packaging applications
- Laser engraving and marking
- Powder Bed Fusion additive manufacturing
- Direct Energy Deposition additive manufacturing
- Laser surface modification and coating

Industrial partners and collaborators



Gearboxes and
gears
manufacturer



Packaging
machines
manufacturer



a coesia company
Packaging
machines
manufacturer



Ice cream
machines
manufacturer

<https://firma.unibo.it>



Grinding machines and
tools manufacturer



Beverage packaging and
packaging machines
manufacturer



Cams and motion
generators manufacturer



Packaging
machines
manufacturer

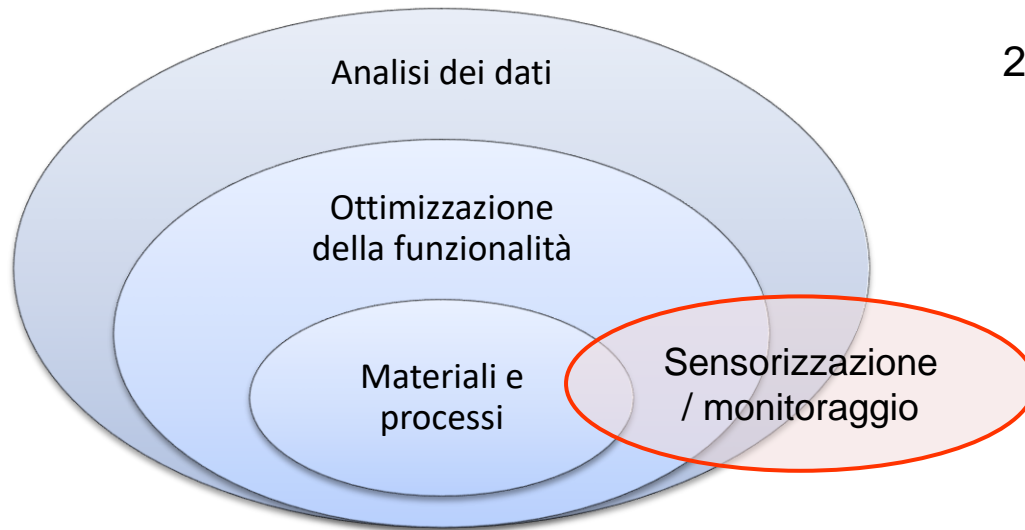


Leader of automatic
bar feeders

Tecnologia AM nella sensorizzazione degli impianti

OBIETTIVI

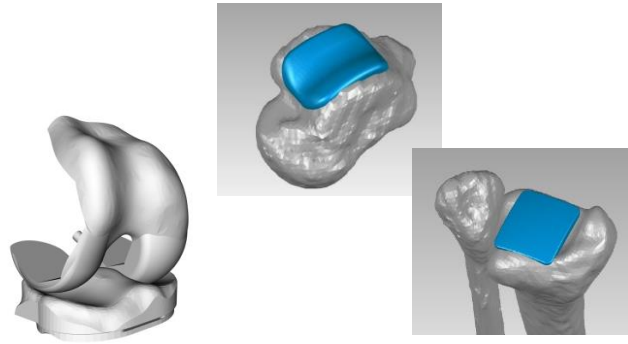
1. Ottimizzazione di **strutture reticolari** → possibilità di ottimizzare le rigidità delle strutture metalliche, anche con strutture a rigidità variabile



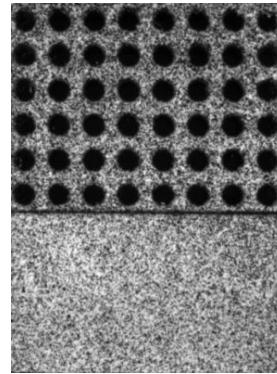
2. Possibilità di sensorizzare e **monitorare l'impianto** finale per verificare la corretta distribuzione dei carichi durante il movimento → realizzare delle protesi intelligenti "sensorizzate" in grado di fornire dati real time

Metodo

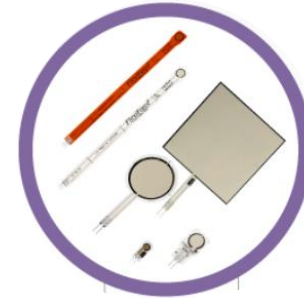
Progettazione dell'impianto personalizzato



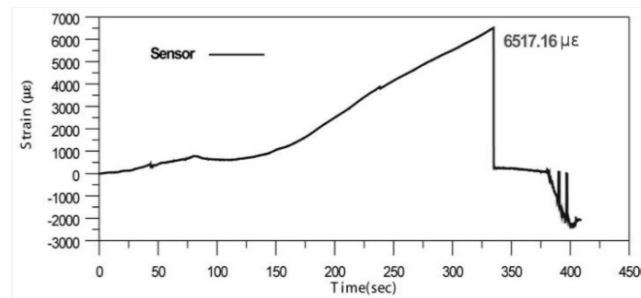
Ottimizzazione struttura reticolare



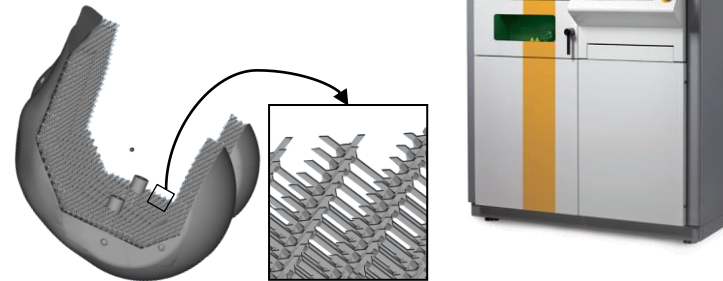
Progettazione della sensorizzazione



TEST E VALIDAZIONE

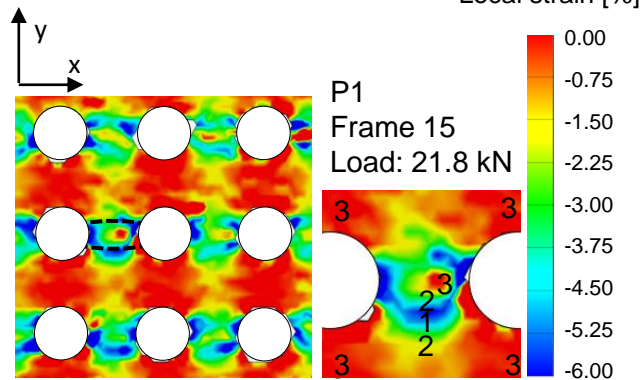
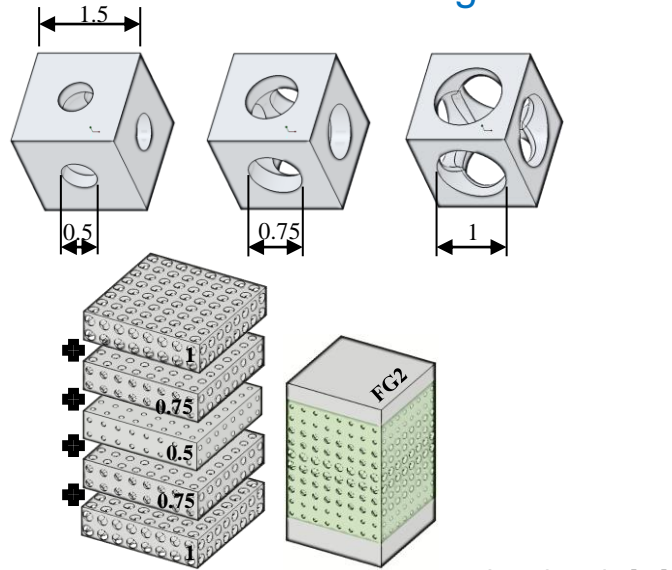


PRODUZIONE DELL'IMPIANTO



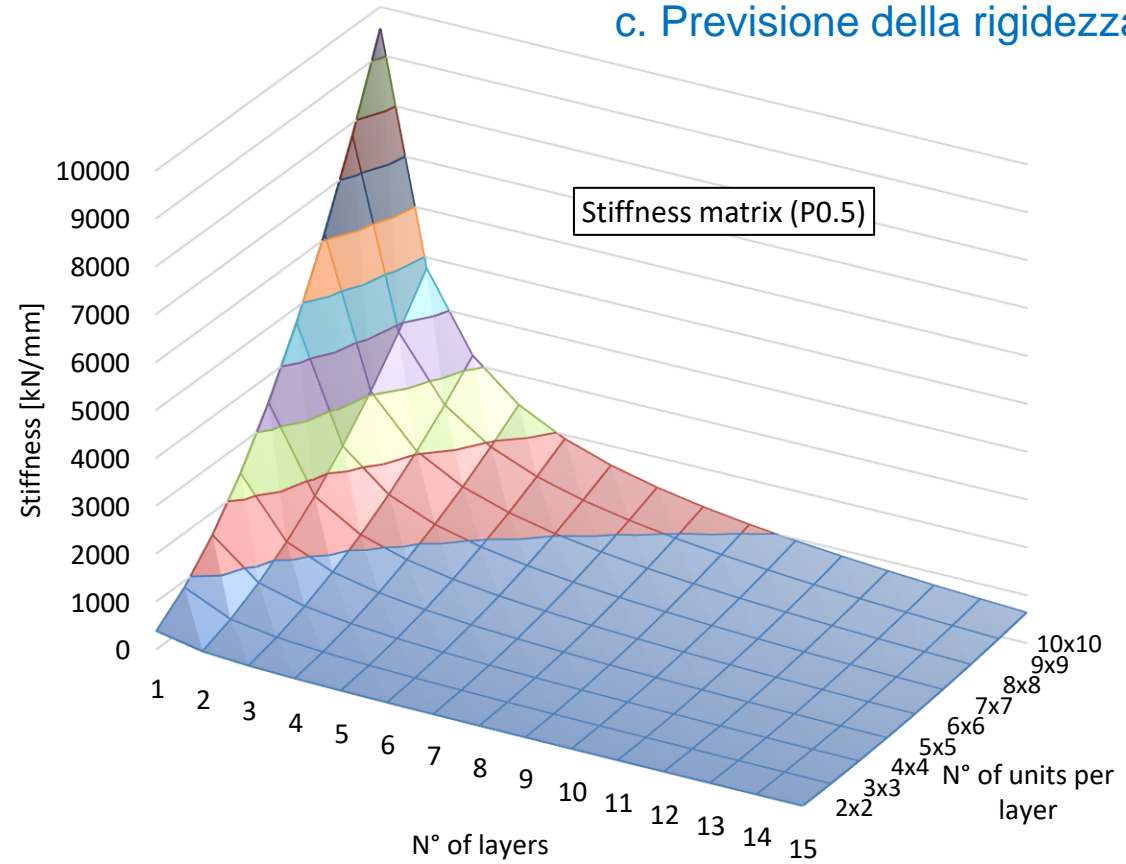
Fase 1: studio di strutture reticolari periodiche e FG

a. Progettazione della struttura



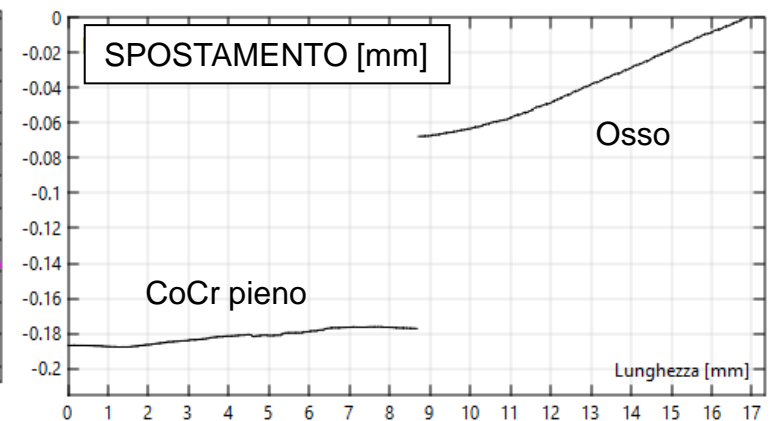
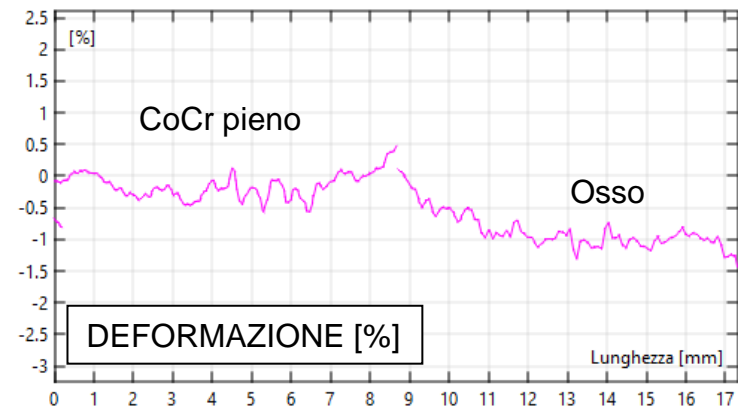
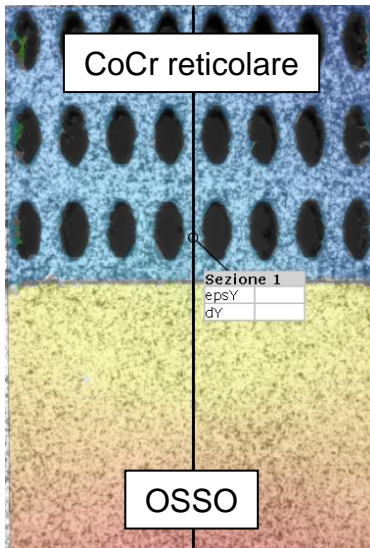
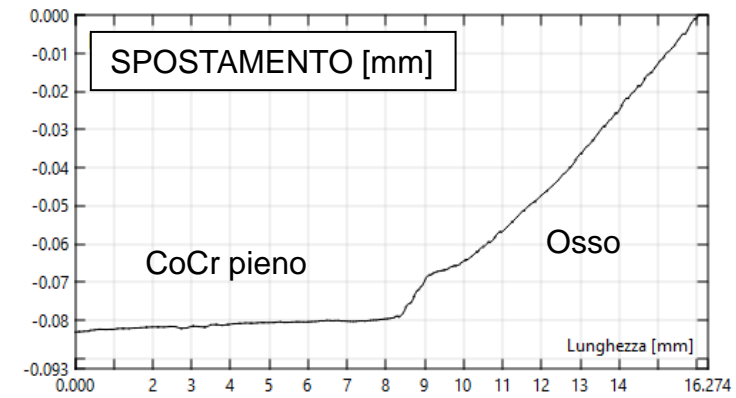
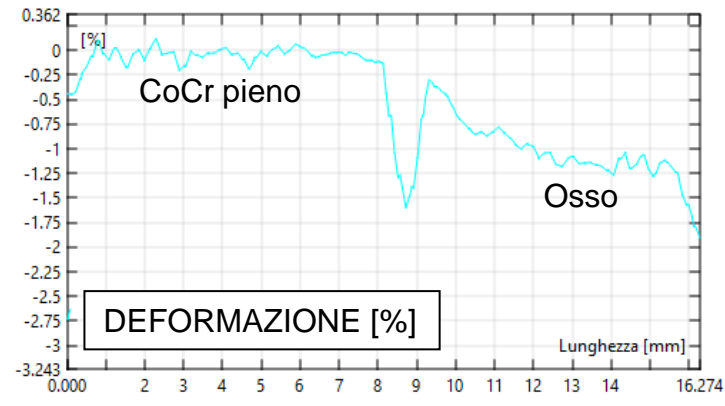
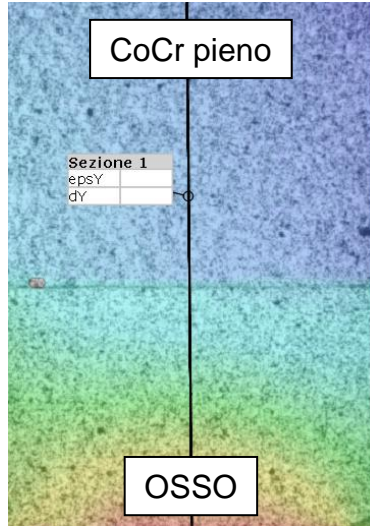
b. Studio delle modalità di deformazione

c. Previsione della rigidezza



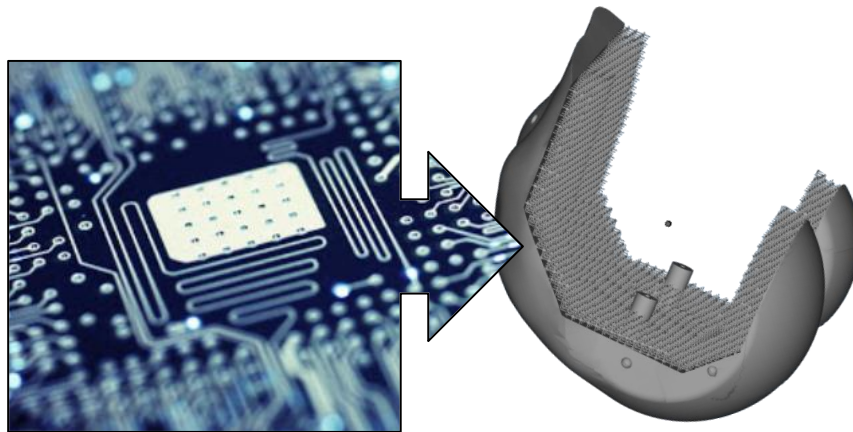
Fase 2: studio di strutture reticolari a contatto con l'osso

In collaborazione con IOR
Laboratorio di analisi del movimento



Fase 3: sensorizzazione e monitoraggio

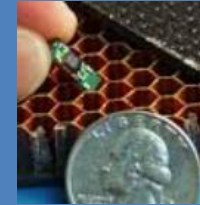
Progettazione del Sistema di sensorizzazione



Batteria



Micro-sensori wireless



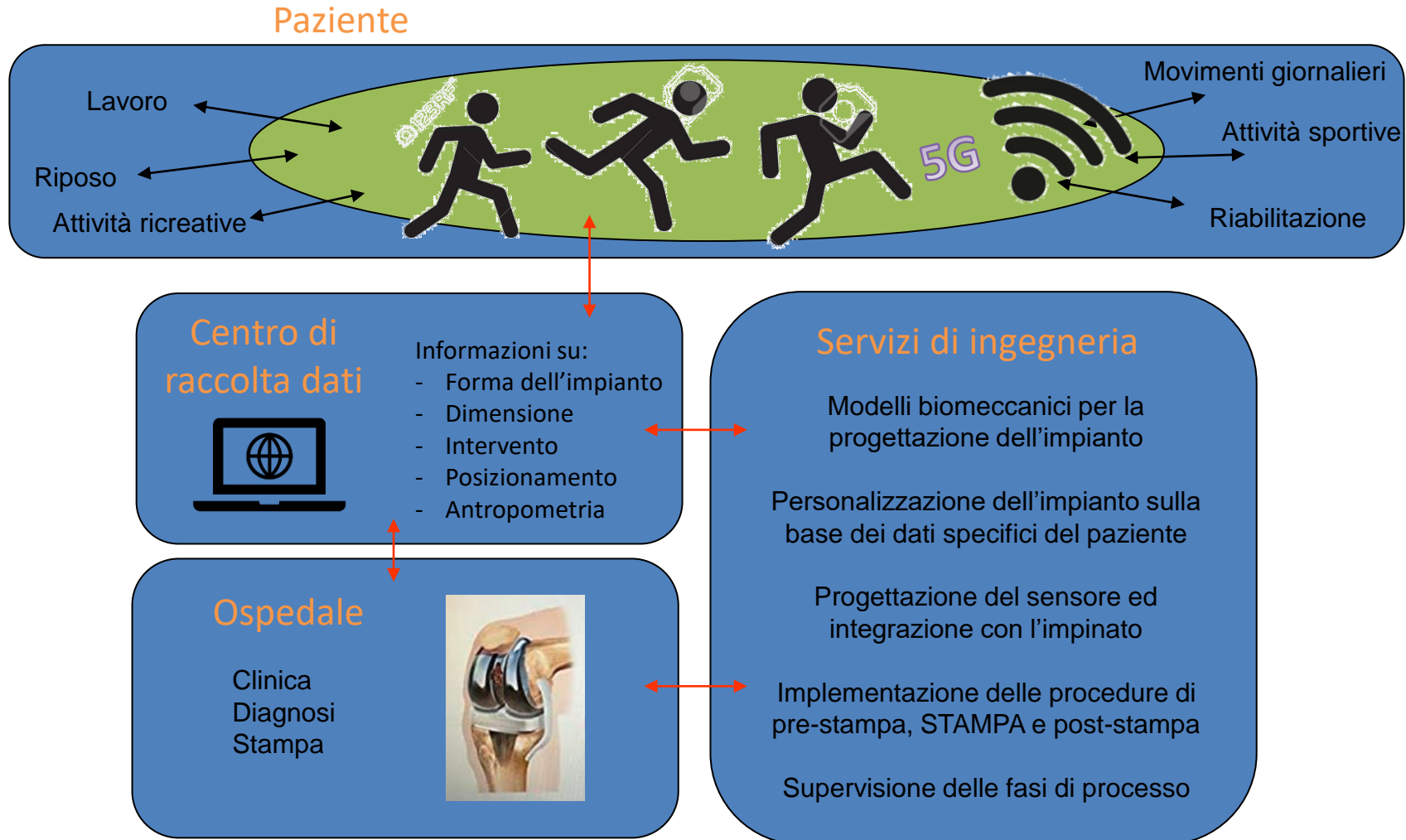
GPS
Bluetooth
WIFI



Sistema di controllo



Roadmap





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