

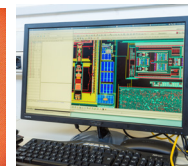
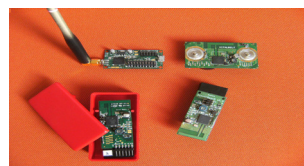
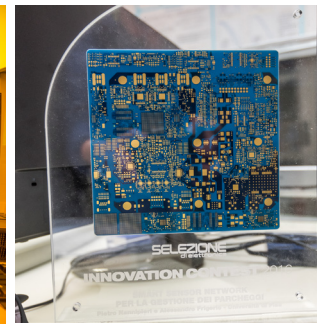
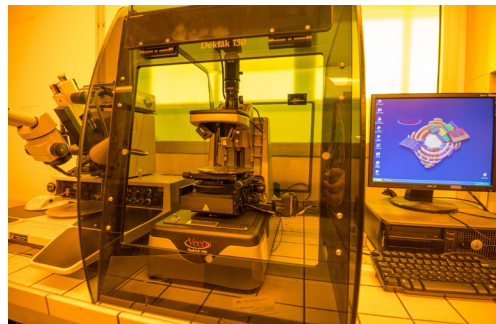
**Dipartimento di Ingegneria
dell'Informazione**

An Excellence Center in the University of Pisa for Research and Higher Education in the field of Information and Communication Technology (ICT)



RESEARCH FIELDS

- Electronics
- Applied Electromagnetics
- Telecommunication Systems
- Computer Engineering
- Automation & Robotics
- Bio-medical Engineering



HIGHER EDUCATION

**B.Sc. Degrees
(Lauree)**

- Electronics
- Telecommunications
- Computer Engineering
- Biomedical Engineering

Ph.D. Programs

- Information Engineering
- Smart Computing

Summer School

- Enabling Technologies for the IoT

M.Sc. Degrees

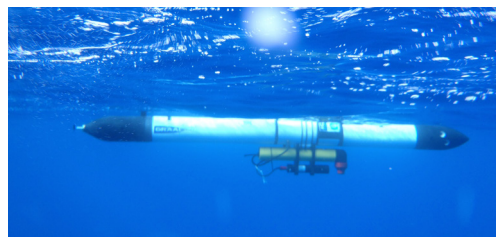
(Lauree Magistrali)

- Electronics
- Telecommunications
- Biomedical Engineering
- Robotics & Automation

Nanoscale Electron Devices

**Post-graduate Advanced
Courses (Master)**

- Cyber-security
- Under-water Acoustics & Sonar Applications



DII IN NUMBERS

35 European Projects

132 Projects commissioned by Companies (since 2013)

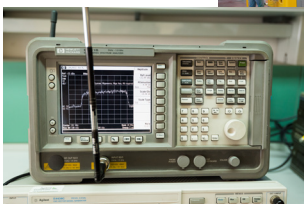
630 Collaborations with Companies

150 Professors and Researchers

90 PhD Students

4000 Undergraduate and Master Students

- Computer Engineering
(in English)
- Embedded Computing
(in English)
- Bionics Engineering
(in English)





The Department of Information Engineering (DII) at University of Pisa is an International Center of Excellence for Research and Higher Education in the field of Information and Communication Technology (ICT) and Robotics.

DII has promoted six spin-off projects, and it cooperates with private and public institutions to provide innovative solutions to key issues in different ICT sectors, and to bridge the gap between academic and industrial research.

The Department is involved in about 35 European, National and Regional research projects. It runs an intense activity in Higher Education for about 4000 students and 90 PhD students, it organizes the Master in Cyber-security and Under-water Acoustics and Sonar Applications, and the Summer School on Enabling Technologies for the Internet of Things.

www.dii.unipi.it
info@dii.unipi.it

Advanced Manufacturing Solutions



COOPERATIVE AUTONOMOUS ROBOTS FOR PRODUCTION AND LOGISTICS

Human-aware AGV fleets:
legible motion planning,
mutual communication of intent,
human detection and tracking

Safety and efficiency by
long-term learning and
prediction of patterns



Integrated Factory – Internal and External Logistics

- Laser Guided Vehicles (LGVs), Autonomous Guided Vehicles (AGVs) Fleets
- Loading/Unloading
- Drones for Internal logistics
- Misbehavior detection of autonomous agents (aerial and terrestrial – drones, LGVs, AGVs)

Easy deployment with
semantic mapping



Relevant recent EU projects

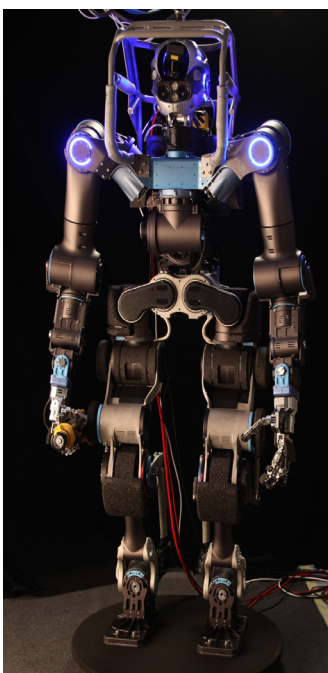


Control of Heterogeneous Automation Systems: Technologies for Scalability, Reconfigurability and Security



Intra-Logistics with Integrated Automatic Deployment. Safe and Scalable Fleets in Share Spaces

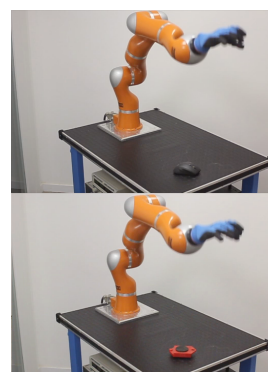
COBOTs AND SOFT ROBOTICS



Safe Physical Human-robot
Interaction

Robotic Manipulation for
Industry

Remote-guided robots for
security



Relevant recent EU projects



Safe and Autonomous Physical Human-Aware Robot Interaction

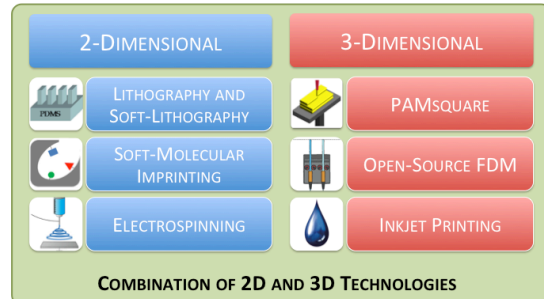
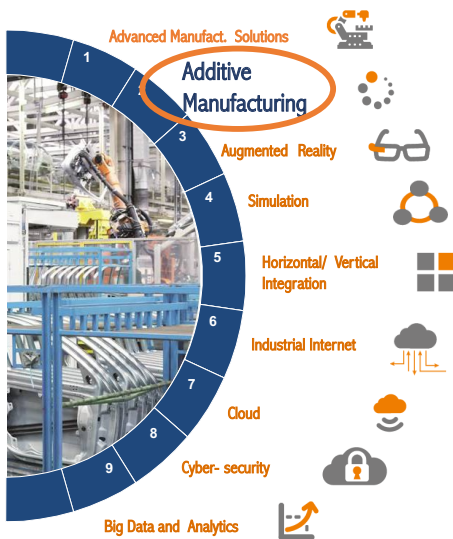


Physical Human-Robot Interaction: Dependability and Safety



Additive Manufacturing

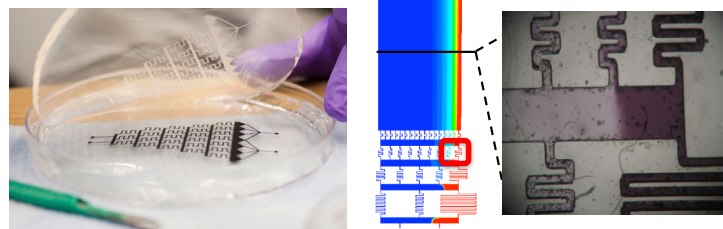
MULTIMATERIAL AND MULTISCALE FABRICATION



Fabrication techniques

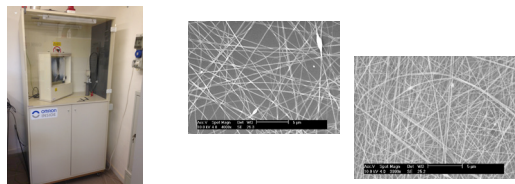
- Production of scaffolds for in vitro models and Tissue Engineering
- Advanced fabrication technologies for smart and (bio-)materials
- Experience in processing biopolymers extracted from waste material

Soft-lithography



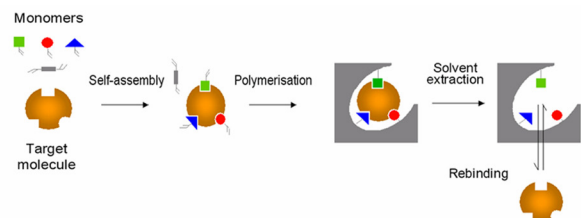
Example: **microfluidic** for the creation of stable gradients of chemical species

Electrospinning



Example: **nanofibers matrices** (nonwoven fabrics, filters, packaging)

Soft - Molecular Imprinting

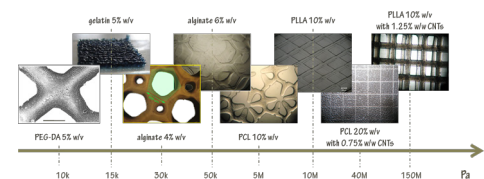
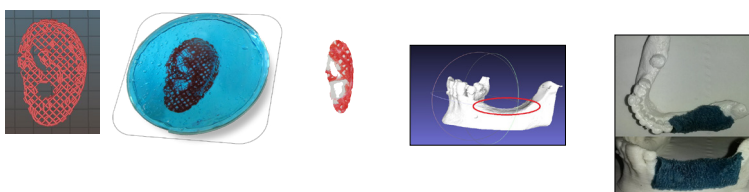


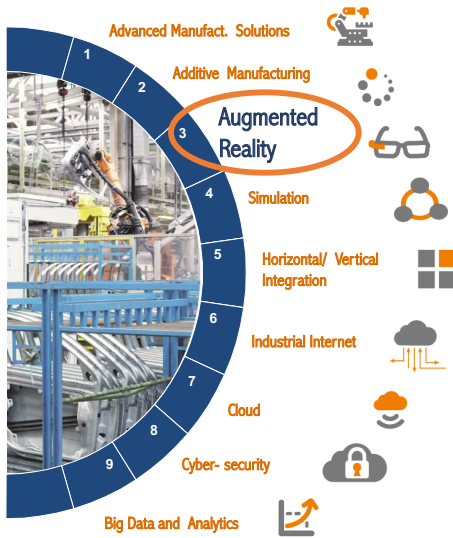
Example: selectively **scavenging of molecules** dispersed into a solution



Additive manufacturing

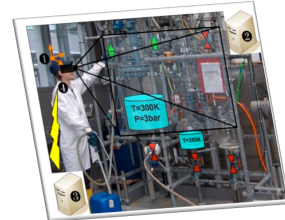
- Fused deposition modelling from filament and pellets)
- 3D printing of paste and gel materials
- Stereolithography
- Inkjet printing of nanoparticles and sensors





Augmented reality

WEARABLE TECHNOLOGIES — HEAD MOUNTED DISPLAYS



Augmented reality and wearable HMDs to support manufacturing and security

- Select the commercial HMD
- Study and implement the AR visualization modalities (to maximize user's perception)
- Study and implement real to virtual registration/alignment techniques
- Modify/improve existing HMDs or, when needed, develop HMDs ex novo

Relevant recent EU Projects



Video Optical See-Through Augmented Reality Surgical system (Horizon 2020;)

WEARABLE TECHNOLOGIES — HUMAN-MACHINE INTERFACES

Human robot interaction

Human motion capture

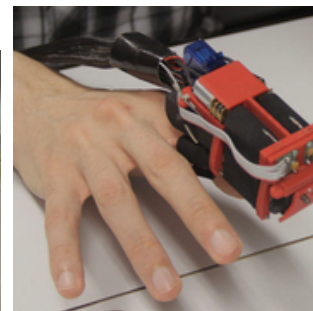
Physiological monitoring

User safety and health

Physiological sensing



Haptic Interfaces



Motion capture



Virtual reality



Relevant recent EU projects



Neurobehavioural predictive and personalised Modelling of depressive symptoms during primary somatic diseases with ICT-enabled self-management procedures



The Collective Experience of Empathic Data Systems



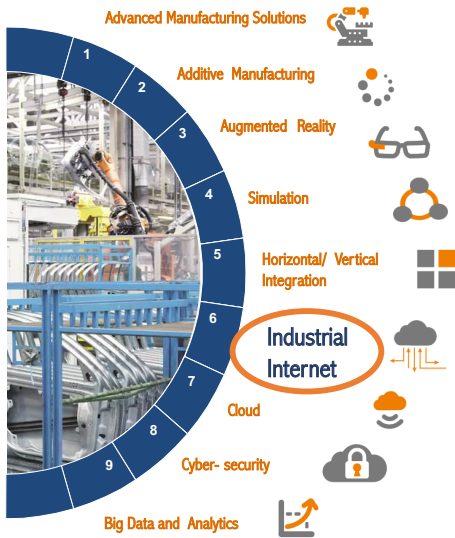
Personalised Monitoring Systems for Care in Mental Health



Expressive Agents for Synthetic Education and Learning
Expressive agents for symbiotic education and learning

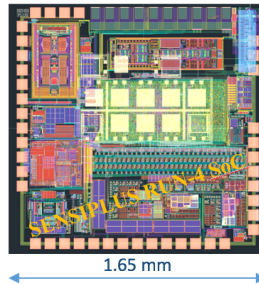


Training and monitoring of daily-life physical INTERACTION with the environment after stroke

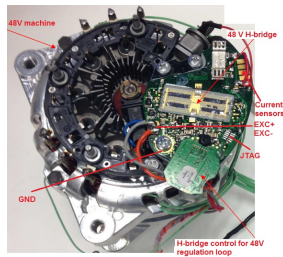


Industrial Internet

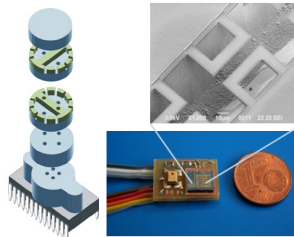
ADVANCED SENSOR PLATFORMS



SENSIPLUS Sensor platform
 In partnership with Sensichip srl
 Temperature, radiation, humidity, pollutant gases + communication



Sensors for mechatronics and predictive diagnostics
 In Partnership with VALEO, AMS CEG, GE



MEMS Smart sensors
 Acoustic, thermal, flow sensors
 In partnership with STM and CNR

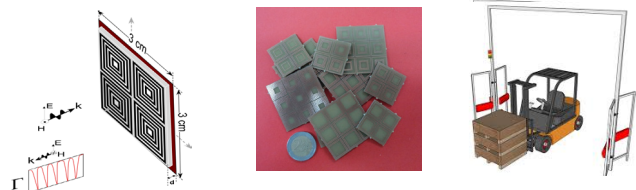
NEW FRONTIERS OF RFID TECHNOLOGY



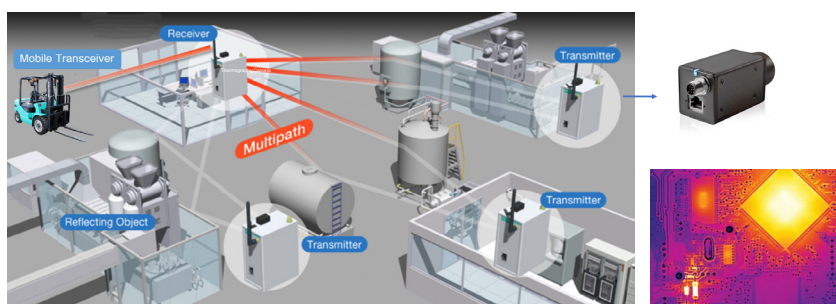
Adding secure «localization» to radio frequency identificator systems



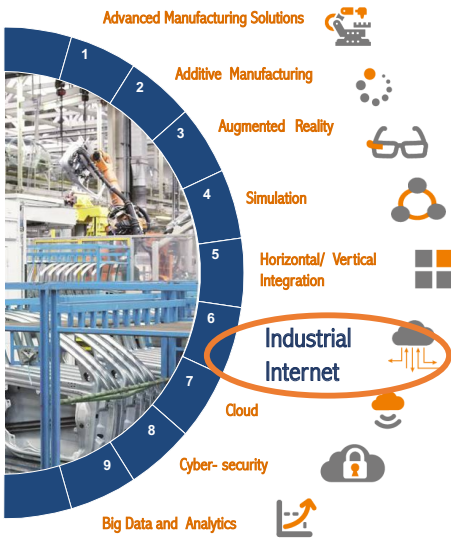
Low-cost solutions for challenging problems in Wireless Sensor Networks



MM-WAVE COMMUNICATIONS AS A PERFORMANCE BOOST FOR INDUSTRIAL WIRELESS NETWORKS



Time-slotted channel hopping & frequency-diversity can provide support for a large number of high bit rate channels

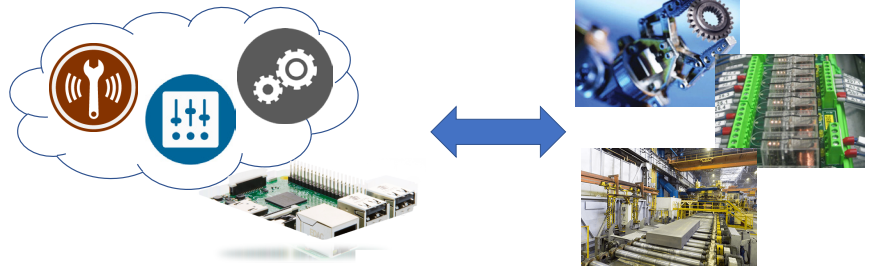


Industrial Internet

PLATFORMS FOR THE INDUSTRIAL IOT

Support application logic execution at the edge of the network through the Fog/Edge Computing paradigm

Reduce network latency and improve data security



Relevant recent Projects



BETaaS: Building the Environment for Things as a Service



E2SG: Energy to Smart Grid



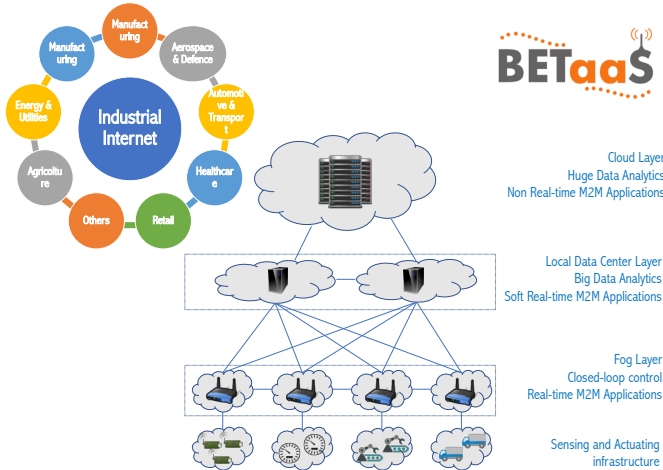
Applications

Data analytics for predictive maintenance

Autonomous control

Localized Management

INDUSTRIAL IOT SOFTWARE PLATFORMS



Cloud Layer
Huge Data Analytics
Non Real-time M2M Applications

Local Data Center Layer
Big Data Analytics
Soft Real-time M2M Applications

Fog Layer
Closed-loop control
Real-time M2M Applications

Sensing and Actuating infrastructure

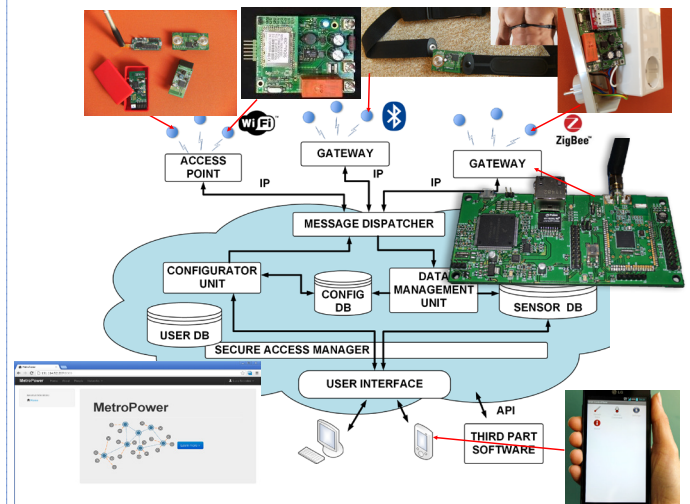
Design of distributed IoT systems to integrate existing vertical solutions into a single horizontal platform. Design of software platforms to ease the development of IoT applications.



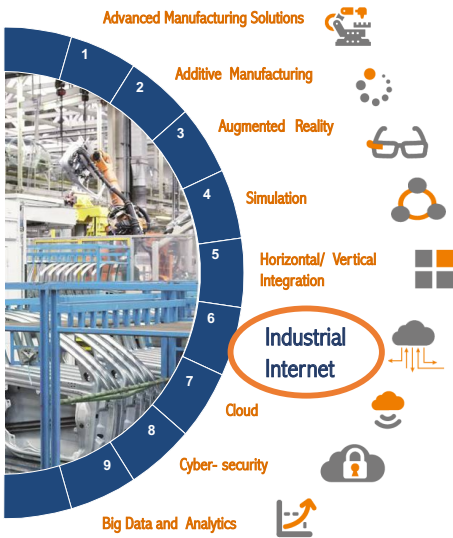
Evaluation and analysis of existing software platforms for IoT.



IoT GATEWAYS



Development of gateways for the Industrial IoT to interconnect different sensors based on different existing protocols. Design of integrated circuits exploiting energy scavenging.



Industrial Internet

INDUSTRIAL WIRELESS NETWORKS

Enable reliable and interoperable wireless communication for industrial applications

Guarantee reliable and timed data delivery



Relevant recent projects

Adamo Project: Aerodinamica Digitale Adattiva per Motocicli
POR FESR 2014-2020 Regione Toscana



Low cost and rapid industrial deployments

Guarantee flexibility and scalability

Motivation

Handle mobility

INDUSTRIAL WIRELESS SENSORS/ACTUATORS NETWORKS

Industrial IPv6-based wireless multi-hop networks

- 6TiSCH, 6LoWPAN, 6lo
- CoAP-based applications

Low-Power Wide Area Networks

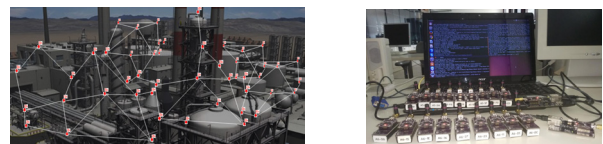
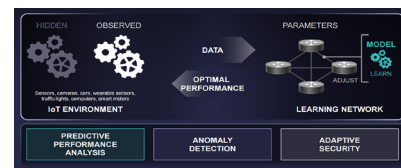
- LoRaWAN

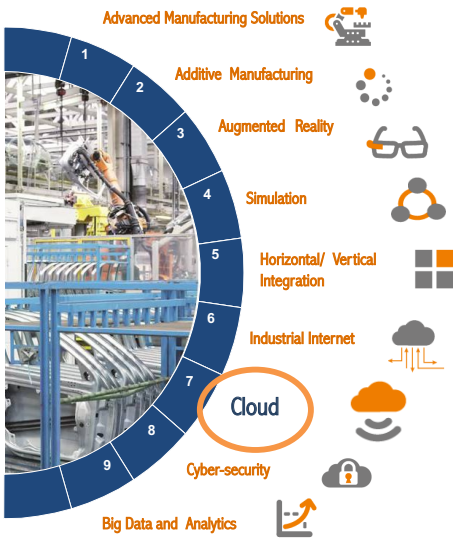


Design, development and performance evaluation of new architectures and protocols

Improving reliability and efficiency of Industrial wireless systems

INDUSTRIAL SOFTWARE DEFINED DETERMINISTIC NETWORKING





Cloud Computing and Networking

SOFTWARE ARCHITECTURES FOR HIGH-PERFORMANCE NETWORKING

Main industrial applications and funding:

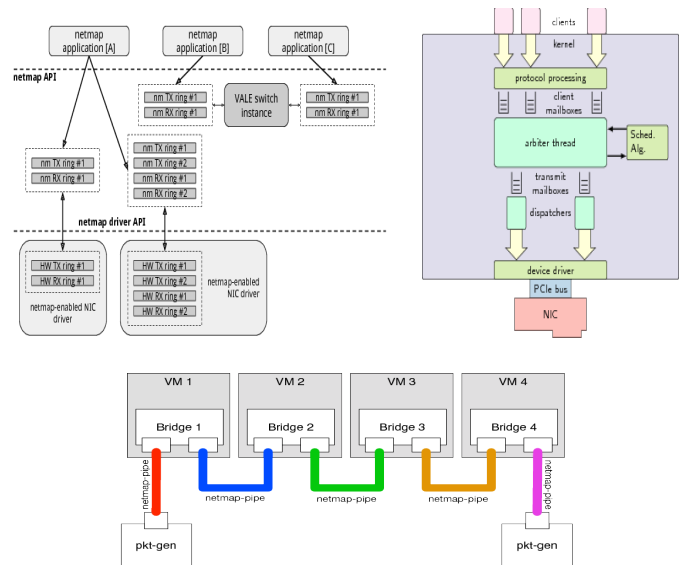
- Intrusion detection (**Corelight**)
- DoS prevention (**Solarflare**)
- Link emulation (**East Cost Datacom, TLEM**)
- Fast network stacks (**NetApp**)
- Inter VM networking (**Verisign, Cisco, NEC**)
- Fast packet I/O (**Netmap, VALE, PTNET**)
- Fast packet scheduling (**PSPAT**)

CONTRIBUTIONS TO EUROPEAN PROJECTS AND OPEN SOURCE

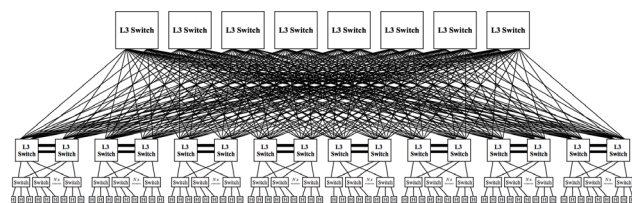
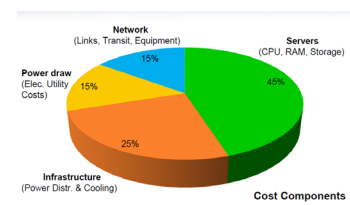
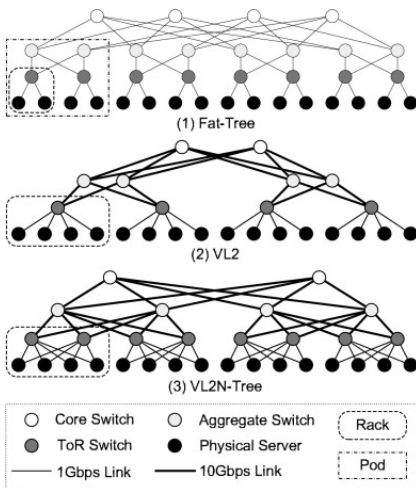
KVM Linux **FP7: CHANGE**

FreeBSD The Power To Serve **FP7: Planetlab**

SSICLOPS – Scalable and Secure Infrastructures for Cloud Computing



DATA CENTER NETWORKING



Cybersecurity

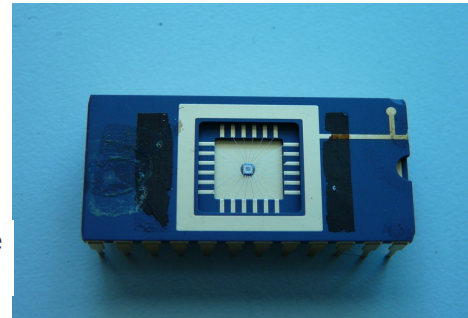


HARDWARE SECURITY

CMOS-Based PUF

Authentication

Resistant to 10^{25} brute-force attack



MALWARE DETECTION

Android malware

Behaviour-based

96% detection-rate

1.4% performance overhead

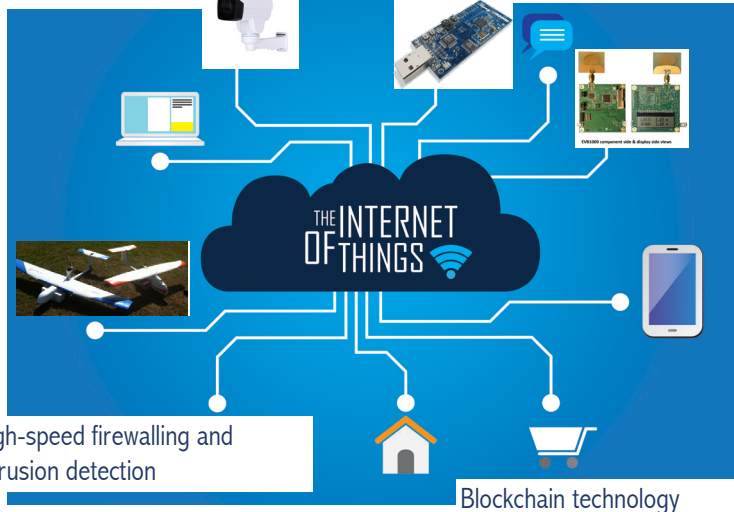
4% battery overhead



NETWORK AND SYSTEM SECURITY IN IIoT

Large-scale, fine-grain access control

Secure communication & Localization



Relevant recent Projects

TRACE THEM
Transparent localisation and identification through heterogeneous metasensor correlation

Reconfigurable ubiquitous networked embedded systems
RUNES

PLANET
PLAtform for the deployment and operation of heterogeneous NETworked cooperating objects

UAN
Underwater Acoustic Network

CHAT
Control of Heterogeneous Automation Systems: Technologies for Scalability, Reconfigurability and Security

PITAGORA
Innovative technologies and processes for airport management

COOPERATING OBJECTS NETWORK OF EXCELLENCE
Protecting National Critical Infrastructures from Cyber Threats
TENACE

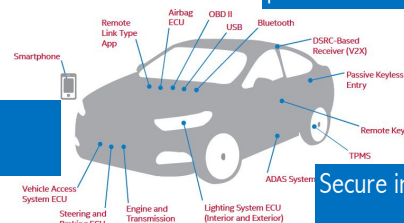
SAPIENT
Satcom and Terrestrial Architectures Improving Performance, Security And Safety In ATM

SOFTWARE SECURITY

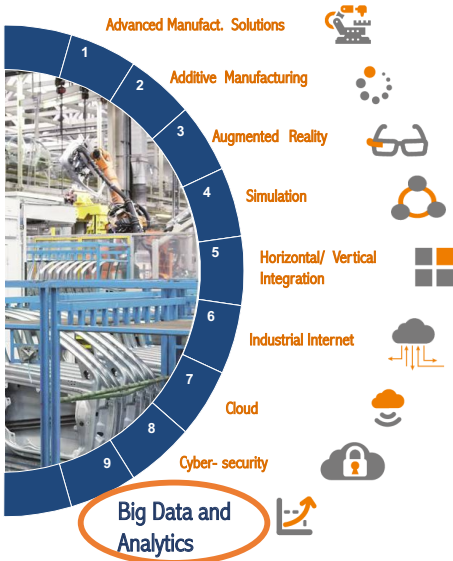
Secure SW modelling

Secure SW architectures & patterns

Secure SW analysis & synthesis



Secure information flow



Big Data and Analytics

Big Data Mining



Learning algorithms for fault detection, business intelligence applications, customer satisfaction

Frequent pattern analysis for customer analysis, event detection, fraud detection, web mining

Multi-objective evolutionary algorithms for industrial multi-objective optimization problems

Condition-based Maintenance

Fault Prediction



Diagnosis of the causes of efficiency loss in photovoltaic energy systems



Profiling

Recommender systems

Electronic Recruitment

Energy Management: low-cost system to monitor the use of electrical energy



Social Sensing

I just bought a new camera yesterday. It was a bit expensive, but the battery life is good.

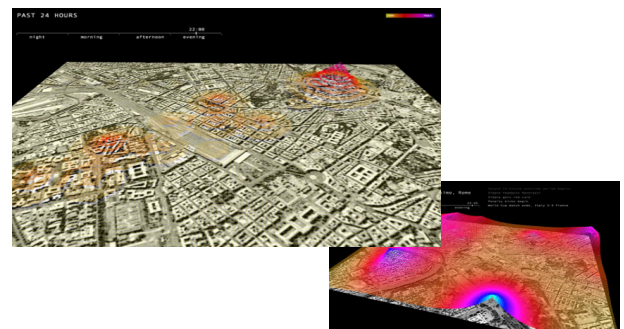
Opinion Mining

The camera comes with a free case but I don't like the colour much

Sentiment analysis

Event detection by social sensing analysis

Scalable tools for inferring social communities

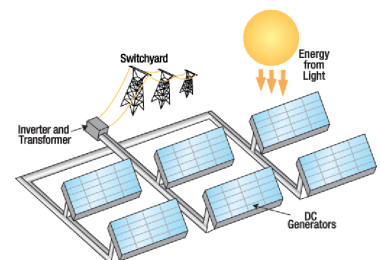


Forecasting

Forecasting of energy consumption due to electric lighting in office buildings



Forecasting of solar photovoltaic energy production





MASTER UNIVERSITARIO DI II LIVELLO IN ELETTROACUSTICA SUBACQUEA E SUE APPLICAZIONI

OBIETTIVI FORMATIVI

Il Master ha lo scopo di formare una figura professionale dotata di una cultura tecnico-scientifica ad ampio spettro nel settore delle applicazioni Sonar, che sia in grado di svolgere compiti di pianificazione, esercizio e gestione di sistemi ed impianti elettroacustici subacquei.

Formano oggetto del Master le problematiche, le tecniche ed i sistemi inerenti la generazione, la propagazione, la ricezione e l'elaborazione di segnali elettroacustici subacquei, ed il loro impiego per la realizzazione di apparati ed impianti idonei al controllo dell'ambiente e delle risorse naturali, alle bonifiche ambientali, alle attività subacquee connesse all'installazione e manutenzione di condotte per idrocarburi e portanti per telecomunicazioni, allo sviluppo di apparati di rilevamento e localizzazione per la sorveglianza e la difesa delle acque.

ARGOMENTI

Fondamenti di Elettroacustica Subacquea
Tecniche di Elaborazione del Segnale Sonar
Filtraggi ai Minimi Quadrati e Analisi del Moto di un Semovente Marino
Analisi e Progettazione di Sensori e Sistemi Acustici Attivi e Passivi
Elementi di Oceanografia e Modelli di Propagazione
Sistemi Autonomi per l'Esplorazione e le Misure Subacquee
Comunicazioni Subacquee su Portante Acustico
Tecniche di Monitoraggio del Fondo Marino
Misure Elettroacustiche

QUANDO

Lezioni: 480 ore, Novembre 2016 – Giugno 2017
Tirocinio: 200 ore, Giugno-Settembre 2017
Discussione Tesi: Dicembre 2017

REQUISITI

Laurea Magistrale, Specialistica
oppure Vecchio Ordinamento
in qualsiasi disciplina



IN COLLABORAZIONE CON



MARINA MILITARE



CALZONI



LEONARDO
SISTEMI DI DIFESA



KONGSBERG

Logicka

INFO

<http://master-eas.dii.unipi.it/>

CYBERSECURITY: SI PREVEDONO ENTRO TRE ANNI 6 MILIONI DI POSTI DI LAVORO

Cristiano Radaelli, presidente ANITEC

Analisi delle principali minacce "cyber" alla sicurezza dei sistemi informatici a livello sia infrastrutturale sia applicativo;

Acquisizione di conoscenze, metodologie e tecnologie necessarie al progetto e alla realizzazione di adeguate contromisure.

Crittografia applicata
Sicurezza nelle reti e nei sistemi operativi
Data, Web and Social Intelligence
Sicurezza nel Cloud
Applicazioni mobili sicure
Computer Forensics
Aspetti legali della cybersecurity
Esercitazioni pratiche in laboratorio



analisi della sicurezza di applicazioni e sistemi informatici;
progettazione e realizzazione di applicazioni e sistemi informatici sicuri;
analisi di attacchi informatici;
consulente tecnico di parte (CTP) e d'ufficio (CTU).

REQUISITI

Laurea Magistrale, Specialistica oppure Vecchio Ordinamento in qualsiasi disciplina

INFO

<http://cybersecuritymaster.it/>



EDIZIONE 2017-18

Lezioni: 340 ore, Febbraio – Ottobre 2018
Tirocinio: 400 ore, Novembre 2018 – Febbraio 2019
Conseguimento titolo: Febbraio 2019

Edizione 2016 -17: 25 partecipanti

IN COLLABORAZIONE CON

CON IL PATROCINIO DI

SPONSORS & PARTNERS