

AI&Big Data @ DIITET

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Source: White Papers of DIITET Projectual Areas

AI&BigData– DIITET Projectual Areas



Trust

CYBER-SECURITY

Cyber-Physical Privacy
Insurance Network
Access Control
Intelligence

HEALTH CARE & WELL-BEING

Healthy Aging
Personalized
e-Health
In-Silico

Transport
Communities

SMART CITY

Energy
Building

Data Science
Deep Learning Knowledge
Social
Semantic Reasoning Big Data
DATA, CONTENT AND MEDIA
Network Science Fuzzy Logic
Machine Learning Analytics
Retrieval Multimedia
Vision

Perception

AUTOMATIC & ROBOTICS

Interaction Cognitive
Control Decision
Adaptability
Safety

Biological data

BIOTECHNOLOGY

Bio-inspired

Personalised

INDUSTRY 4.0

Sustainability
Evolutionary

IoT Cloud
FUTURE INTERNET
HPC Edge



Institutes Involved



Scienza e Tecnologie dell'Informazione "Alessandro Faedo"



Calcolo e Reti ad Alte prestazioni



Elettronica e di Ingegneria dell'Informazione e delle



Telecomunicazioni



Informatica e Telematica



Istituto di analisi dei sistemi ed informatica "Antonio Ruberti"

imati

Fisica Applicata "Nello Carrara"

STIIMA

Matematica Applicata e Tecnologie Informatiche "Enrico Ma



Sistemi e Tecnologie Industriali Intelligenti per il Manifatturi

Avanzato



Rilevamento Elettromagnetico dell'Ambiente

Applicazioni del Calcolo "Mauro Picone"

> Dip. di Scienze Fisiche e Tecnologie della Materia (DSFTM)



Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello"

Sistemi Complessi



Resources:

>200 FT Researchers

>300 PhD Stud &
Post Docs

Research Topics

- Big data Sensing and Management
- **Knowledge** Representation, Reasoning and Engineering: **REASONING**
- Knowledge Extraction and **Semantic** enrichment
- **Data Mining** and Machine Learning theory and algorithms: **LEARNING**
- **Neural Networks** and Deep Learning methods: **LEARNING**
- Network science and **Social Network** analysis: **LEARNING**
- **Fuzzy** and Computational Intelligence: **LEARNING**
- Behavior Analysis and Cognitive Computing: **COGNITION**
- **Perception Interaction and Cognitive** ability of robotic systems: **COGNITION**
- **Adaptability, Configurability, Decisional Autonomy** of robotic systems: **INTERACTION**
- Acquisition, modelling, retrieval and analysis of images, videos, 3D and multidimensional data
- Data **Ethics** : **ETHICS**

Ongoing Projects

- EU projects
 - H2020 **Social Mining** & Big Data Ecosystem (SoBigData)
 - FET- H2020 **Bringing Citizen, Models and Data together** in Participatory, Interactive Social Exploratories (CIMPLEX)
 - H2020 **Big Data for Mobility** Tracking Knowledge Extraction in Urban Areas (Track and Know)
 - Wireless Autonomous, Reliable and Resilient Production Operation **ARchitecture for Cognitive Manufacturing**
 - **Enhanced Human Robot** cooperation in Cabin Assembly tasks (EURECA)
 - H2020 FORTISSIMO2 – LIGA Pilot “**Large-scale Indie Gaming Analytics**”
 - H2020 AI4EU - A European AI On-Demand Platform and Ecosystem
 - H2020 **BigData & Wine**
 - H2020 MASTER

Ongoing Projects

- National & regional
 - Servizi Ict iNTEgrati per il **bEnessere di Soggetti frAgili** (INTESA)
 - SCIADRO (SCLame di DROni - swarm of drones)
 - REINForce REsearch to INspire the Future
 - **CORYL ROBOT**
 - Social Sensing for **Braking News (Smart News)**
 - Ambienti di Personalizzazione per applicazioni di Internet delle cose nel settore (APIC)
 - Sviluppo di una linea intelligente per il **converting della carta tissue**: le tecnologie ICT al servizio dell'Advanced Automation (IRIDE)
 - CompTo NM
 - **ADditive Manufacturing** & INdustry 4.0 as innovation Driver (ADMIN 4D)
 - Automatic Data and documents Analysis to enhance human-based processes (ADA)
 - **Smart Cities & Communities** (eg., Liguria Region, Genova Municipalities)
 - CAMPANIA ONCO TERAPIE: Sistemi di intelligenza artificiale per la validazione statistica ed epidemiologica dei dati e la creazione di modelli predittivi.
 - EMORFORAD: per **la diagnosi, la prognosi e la personalizzazione** della terapia dei tumori
 - AMICO: **Robot che si pone come mediatore/master tra la persona**, l'ambiente circostante e l'ambiente esterno.
 - Centro di Ricerca per l'Analisi delle Informazioni Multimediali (CRAIM)
 - Mobilità Intelligente Ecosostenibile (MIE)
- Industrial
 - FCA-HPC Lab Research Collaboration

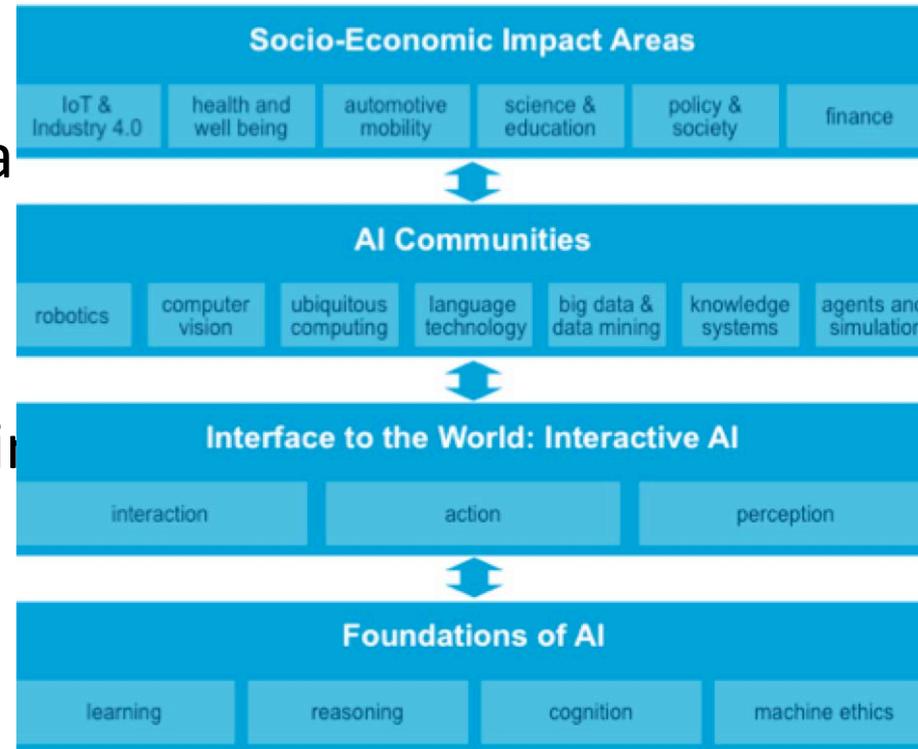
AI&BigData@ DIITET towards Competence centers

- **AI& Big Data for Society:**
 - **Data Science Hub** (CNR, Univ. Pisa, S. Normale, S. S. Anna, S. IMT Lucca) (since 2013, more than 100 researchers)
 - Master BigData Analytics (2015), Data Science PhD (2017), RI-SoBigData, Competence Center AI&DataScience for society and industry (proposal)
- **AI& Big Data for Robotics:**
 - **Competence Center** on “Advanced Robotics and Enabling Digital Tech. & Systems 4.0” (ARTES) (coord. S.S. Anna) (bando Mise 2018)
- **AI& Big Data for Precision Medicine:**
 - **Centro di Sperimentazione di Tecnologie di Intelligenza Artificiale a supporto della Medicina di Precisione (Proposal)** IRCSS “Istituto Nazionale per lo studio e la cura dei tumori - Fondazione G. Pascale”, con sede in Napoli, Dipartimento DIITET del Consiglio Nazionale delle Ricerche, IBM Italia s.p.a
- **AI& Big Data for Security & Resilience:**
 - **START 4.0 Competence Centre for “Security and Optimization of Strategic Infrastructures”:**
 - Coordinated by CNR

Wrap-up

The research activities carried on in AI&BigData@ DIITET are aimed at

- advancing the methods and technology within the entire data science pipeline
- discovering piece of knowledge needed to build intelligent and autonomous systems in challenging domains
- Excellent critical mass
- We need a shared vision!!!!



 Consiglio Nazionale delle Ricerche
Osservatorio Interdipartimentale sull'Intelligenza Artificiale

Intelligenza Artificiale

Report sulle attività in corso nel CNR

2018

(vers 0.26 del 28 novembre 2018)

Informazioni relative a:

- 3 Dipartimenti
- 15 Istituti
- 55 Gruppi di Ricerca
- 230 Ricercatori Strutturati
- 120 Ricercatori non Strutturati
- 150 Progetti

<http://bit.ly/CNRAI>

What outside CNR?

What outside CNR

- DARPA launched in 2016 “Explainable AI”
- EU Report on Strategy for AI (50 Experts have appointed) 2017
- France: national plan (see the Cedric Villani Report)
 - Expected funding around 3 Mld of Euro PP
- Germany National Plan (see Katharina presentation)
- **G7 Academy**
 - **2017, 2018 and 2019 statement** on Data Science, DiGital Future and AI
- MISE: just appointed a group of experts on AI (this week)
- MIUR: just appointed a group of experts on AI (this week)
- IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems
- Claire initiative for a CERN of AI

The CINI National Lab AIIS

Un unico laboratorio aggregante a reti di sedi nei temi di Intelligenza Artificiale e Sistemi intelligenti

TODAY: 50 NODI DI RICERCA

- 46 nodi da Università italiane
- 4 nodes da centri di ricerca (CNR; IIT; FBK)
- **830** Italian professors/researchers

- *Rafforzare l'eccellenza scientifica italiana in AI*
- *Rafforzare il ruolo strategico dell'Italia nell'AI a livello europeo e mondiale*
- *Supportare stakeholder industriali italiani anche non IT nell'adozione di tecnologie AI*
- *Supportare la società Italiana nel comprendere opportunità e rischi nell'adozione di tecnologie AI*
- *Monitorare le risorse italiane per sviluppare la tecnologia*



- We need to develop Artificial Intelligence Technologies that
 - synergically work with humans
 - seamlessly fit in with our complex social settings and
 - dynamically adapt to changes in our environment
- **These technologies will empower humans with AI, allowing humans and human society to reach new potentials and more effectively deal with the complexity of a networked globalized world.**

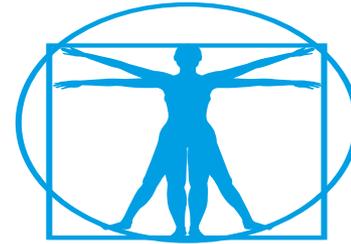


- **AI for enhancing human cognitive capabilities** and channeling human **creativity, inventiveness** and **intuition**.
- **AI to allow seamless, productive interaction among humans, intelligent machines and complex, dynamic, environments**
- **Explainable, transparent, validated and thus trustworthy AI**
- **Values, ethics, privacy and security as design considerations**
- **AI for solving social problems rather than creating new problems** through added complexity and lack of transparency.

Vision the scientific challenges

- **Distributed AI** running on (human) users' **personal devices**, behaving as proxies of their users in the BigData world
- **the explainability/accountability of Machine Learning Models** to support automated decision, guarantee the reliability of ML methods against training bias, and embed ethical values into autonomous systems;
- **the protection of digital citizens from misinformation in on-line debates**, through semantic dissonance detection between headlines and contents in published news, integration of effective fact-checking methods from knowledge bases/crowdsourcing;
- **the development of interactive systems that are mobile and** interactive, support additional senses (voice, gestures, virtual/augmented visualization, vibrotactile-feedback, eye tracking), have a higher accuracy and quality experiences, incorporate bio or environmental sensors.
- **Decentralized user centric model for personal data based on block chain and digital identity**, where individuals track, recollect, and provide access to their own data to external actors only on request for specific tasks

HUMANE



AI

- **New Ethical, Trustworthy, Interactive AI Technologies to Enhance Human Capabilities and Empower European Citizens and Society**
- “Preparatory Actions for New FET Flagships (FETFLAG-01-2018)” : 100 Mil x 10 anni
- 35 partners

1	DEUTSCHES FORSCHUNGSZENTRUM FÜR KUNSTLICHE INTELLIGENZ GMBH (<u>coordinator</u>)	DFK
2	AALTO KORKEAKOULUSAATIO SR	AALTO
3	ALBERT-LUDWIGS-UNIVERSITÄT FREIBURG	ALBERT-LUDWIGS-UNIVERSITÄT FREIBURG
4	ATHINA-EREVNITIKO KENTRO KAINOTOMIAS STIS TECHNOLOGIES TIS PLIROFORIAS, TON EPIKOINONION KAI TIS GNOSIS	ATHINA-EREVNITIKO KENTRO KAINOTOMIAS STIS TECHNOLOGIES TIS PLIROFORIAS, TON EPIKOINONION KAI TIS GNOSIS
5	KOZEP-EUROPAI EGYETEM	KOZEP-EUROPAI EGYETEM
6	CONSIGLIO NAZIONALE DELLE RICERCHE	CONSIGLIO NAZIONALE DELLE RICERCHE
7	AGENCIA ESTADAL CONSELHO SUPERIOR DE PESQUISAS CIENTÍFICAS	AGENCIA ESTADAL CONSELHO SUPERIOR DE PESQUISAS CIENTÍFICAS

INTERFACE TO THE WORLD

FOUNDATIONS OF AI

RESPONSIBLE AI & ETHICS

SOCIO-ECONOMIC IMPACT
AI COMMUNITIES