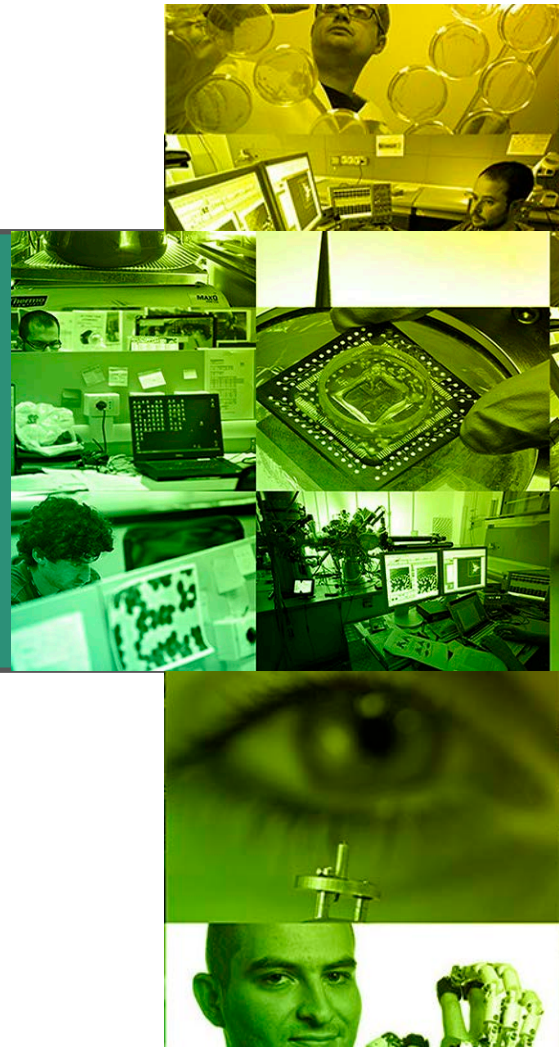
Istituto Italiano di Tecnologia

Evaluation exercises of an international research institute



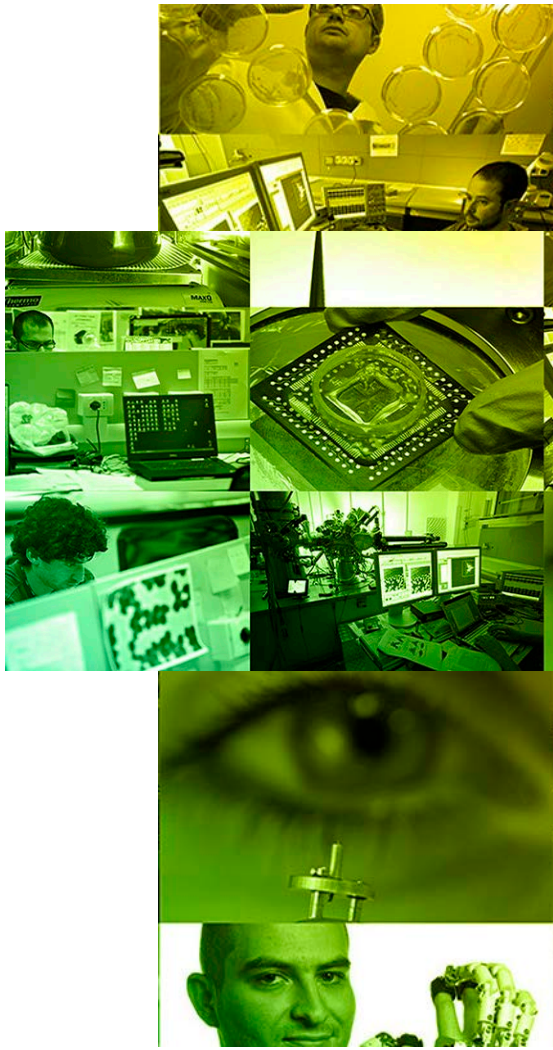
Eleonora Palmaro

October 7, 2015

Technology with human touch

In this presentation

- Background on Istituto Italiano di Tecnologia (IIT)
- Output, Impact and Collaboration
- Deep dive into Robotics



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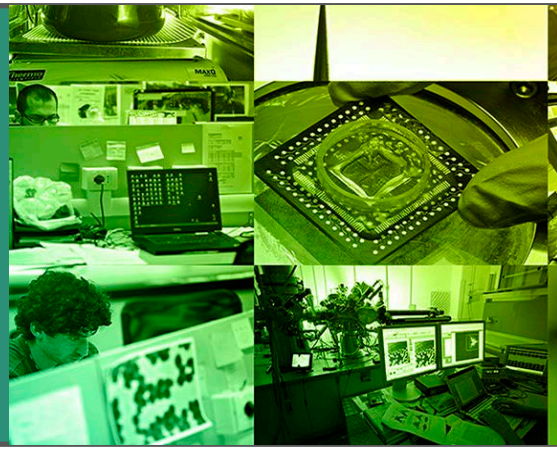


Technology with human touch

Who

- A scientific research institute

When

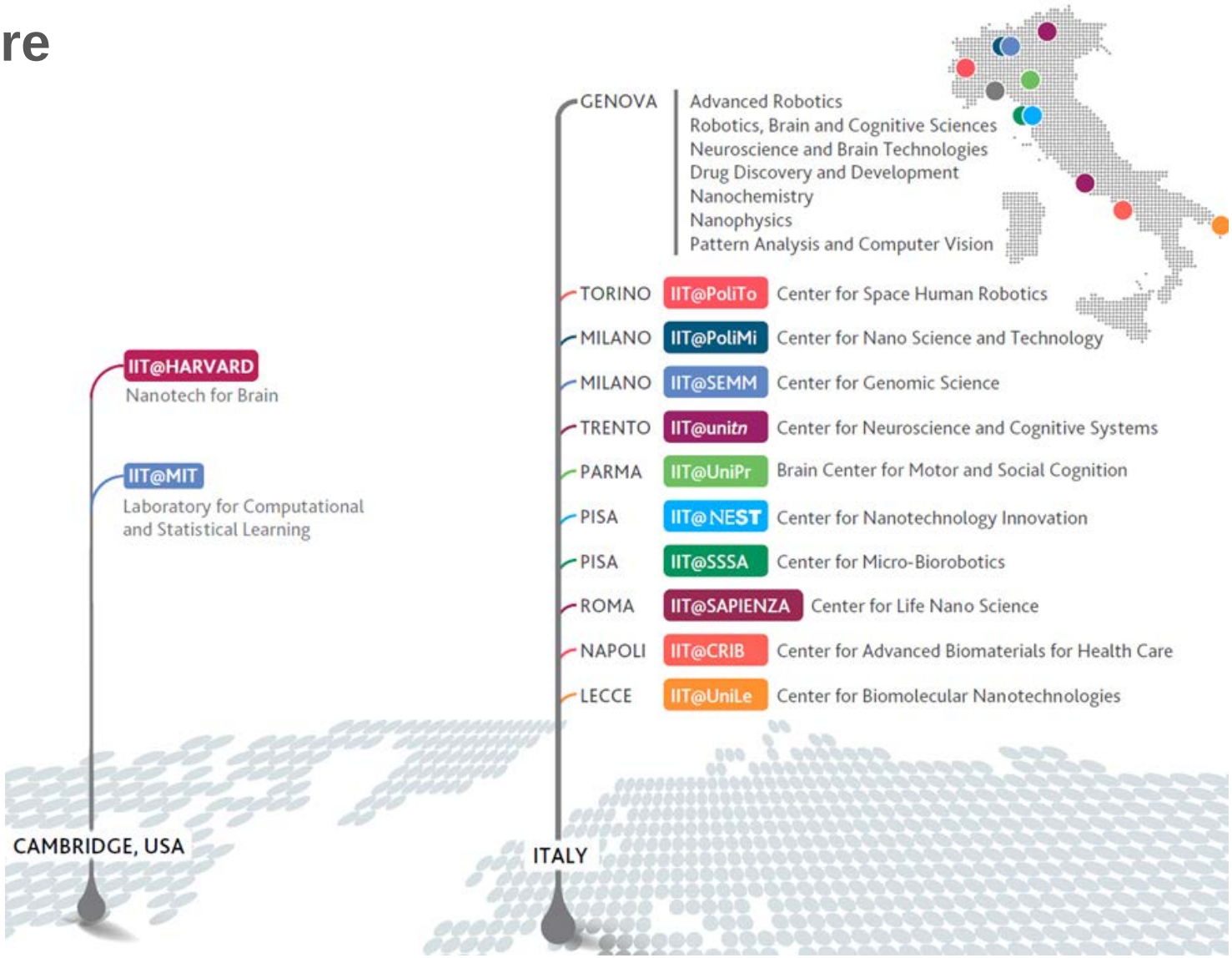
- Established in 2003
- Scientific activity started in 2006

What

Twofold mission:

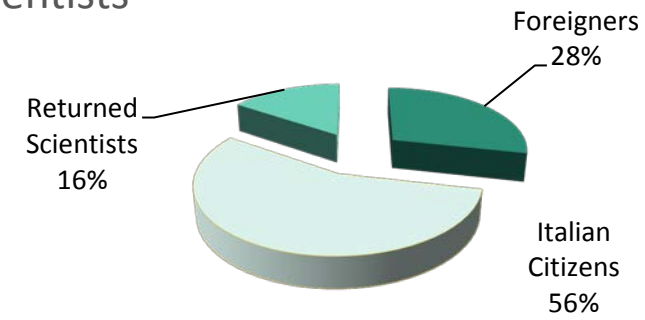
- Performing cutting edge research
- Transferring technology to the industrial system

Where


GENOVA
Advanced Robotics
Robotics, Brain and Cognitive Sciences
Neuroscience and Brain Technologies
Drug Discovery and Development
Nanochemistry
Nanophysics
Pattern Analysis and Computer Vision
TORINO IIT@PoliTo Center for Space Human Robotics
MILANO IIT@PoliMi Center for Nano Science and Technology
MILANO IIT@SEMM Center for Genomic Science
TRENTO IIT@unitn Center for Neuroscience and Cognitive Systems
PARMA IIT@UniPr Brain Center for Motor and Social Cognition
PISA IIT@NEST Center for Nanotechnology Innovation
PISA IIT@SSSA Center for Micro-Biorobotics
ROMA IIT@SAPIENZA Center for Life Nano Science
NAPOLI IIT@CRIB Center for Advanced Biomaterials for Health Care
LECCE IIT@UniLe Center for Biomolecular Nanotechnologies
IIT@HARVARD
Nanotech for Brain
IIT@MIT
Laboratory for Computational and Statistical Learning
CAMBRIDGE, USA
ITALY

Why international

Scientists



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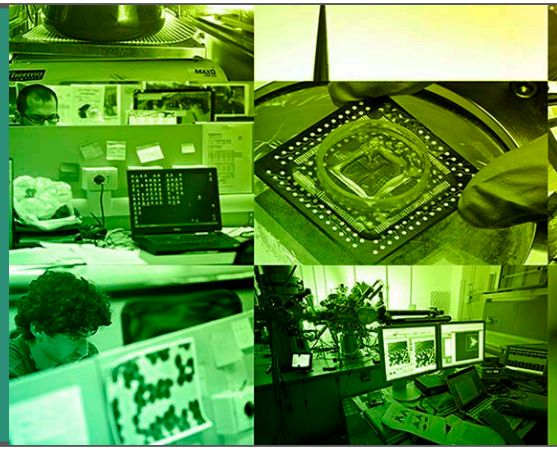
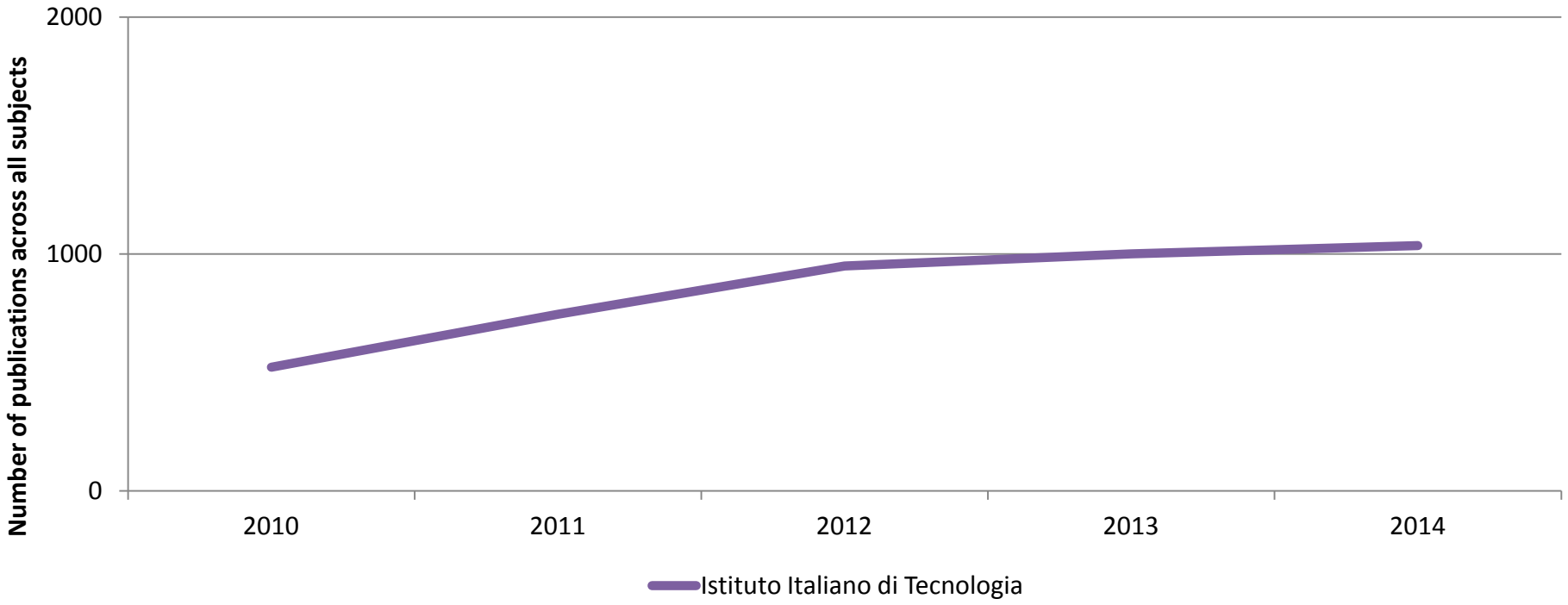
Output, Impact and Collaboration



Technology with human touch

Research output



It is advisable to introduce peer institutes as benchmarks

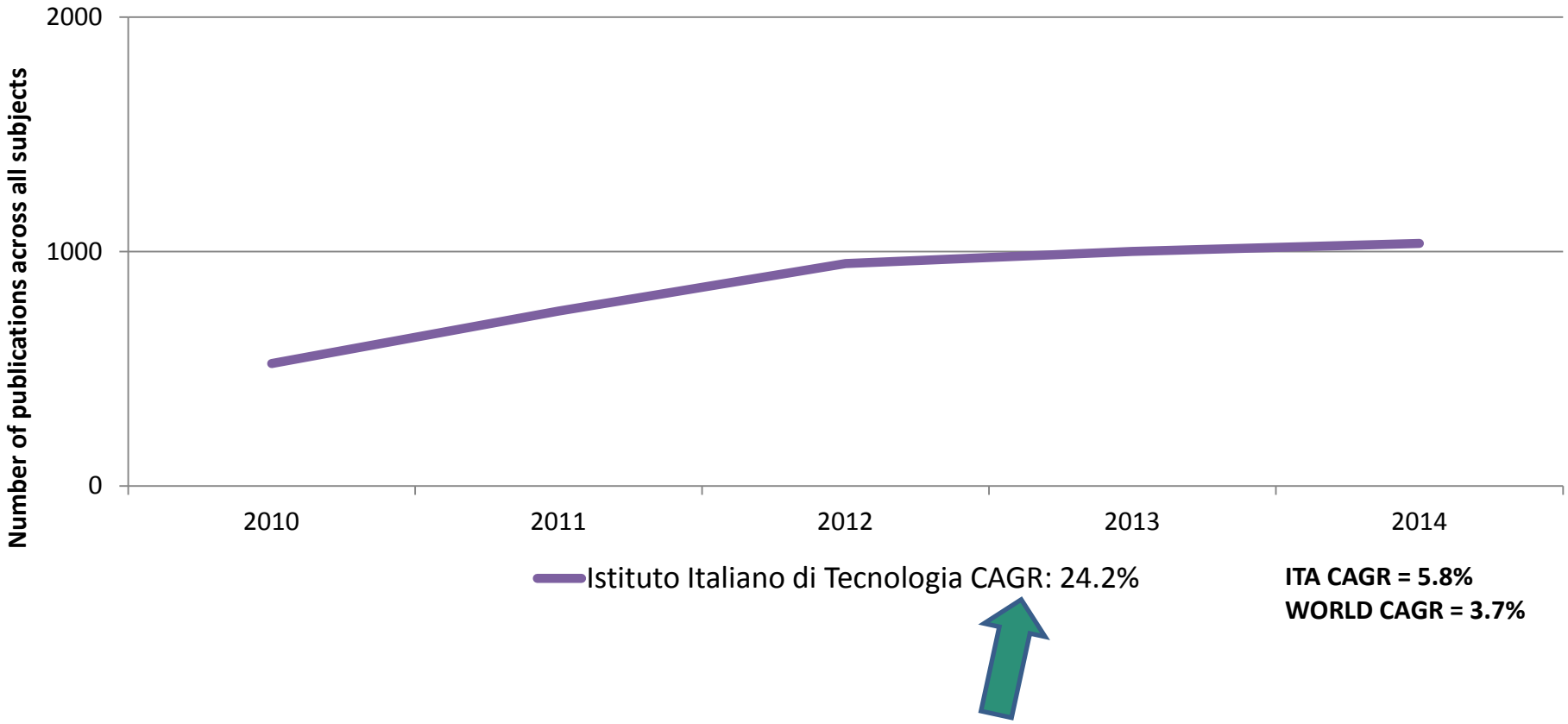
Compound Annual Growth Rate, CAGR

The year-over-year constant growth rate over a specified period of time. Starting with the first value in any series and applying this rate for each of the time intervals yields the amount in the final value of the series

$$\text{CAGR} = \left(\frac{Ending\ Value}{Beginning\ Value}\right)^{\frac{1}{\#\ of\ years}} - 1$$

The report analyses Istituto Italiano di Tecnologia's research output, growth, impact, and excellence for the period 2010-2014. 2014 data are about 5% incomplete at the time of writing, due to standard publication delays and indexation timelines. Therefore output growth is calculated for 2010-2013 rather than 2010-2014. This slight incompleteness does not affect shares or impact indicators

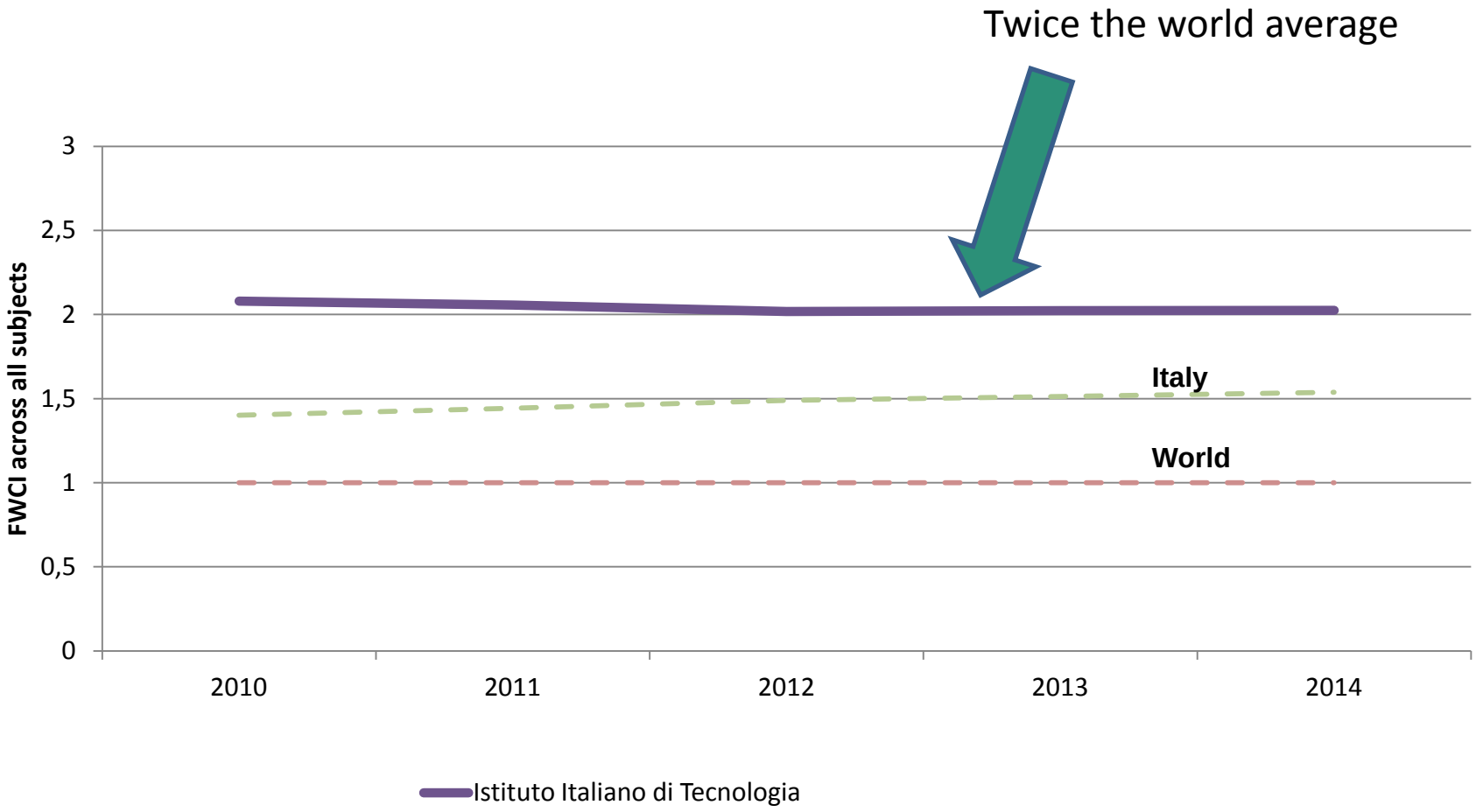
Research output



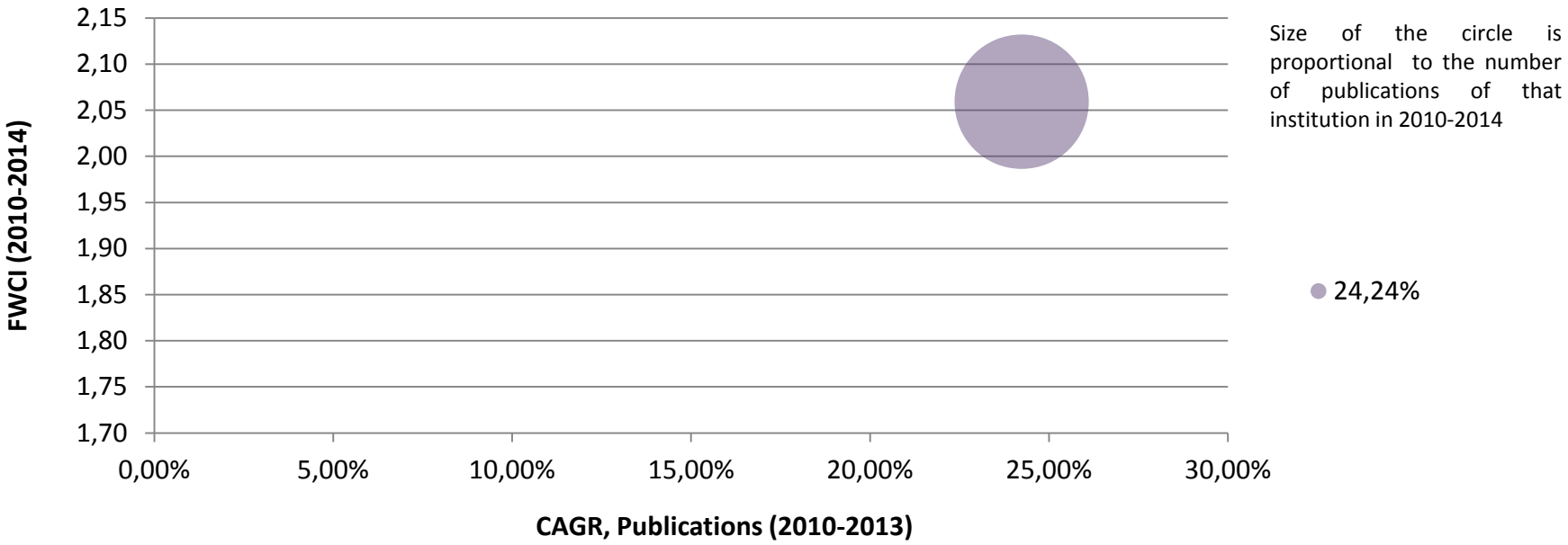
High growth in research output

It is advisable to introduce peer institutes as benchmarks

Citation Impact



Output growth and impact



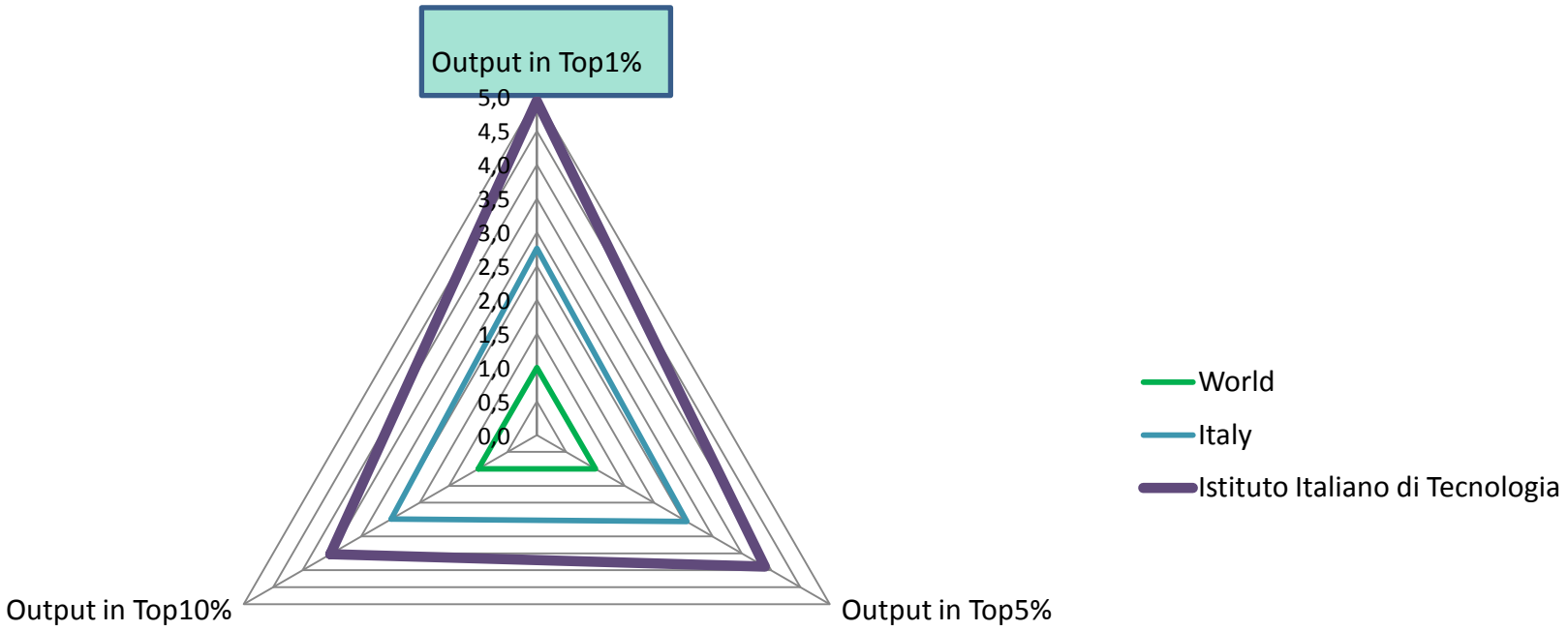
World CAGR: 4%

It is advisable to introduce peer institutes as benchmarks

Excellence

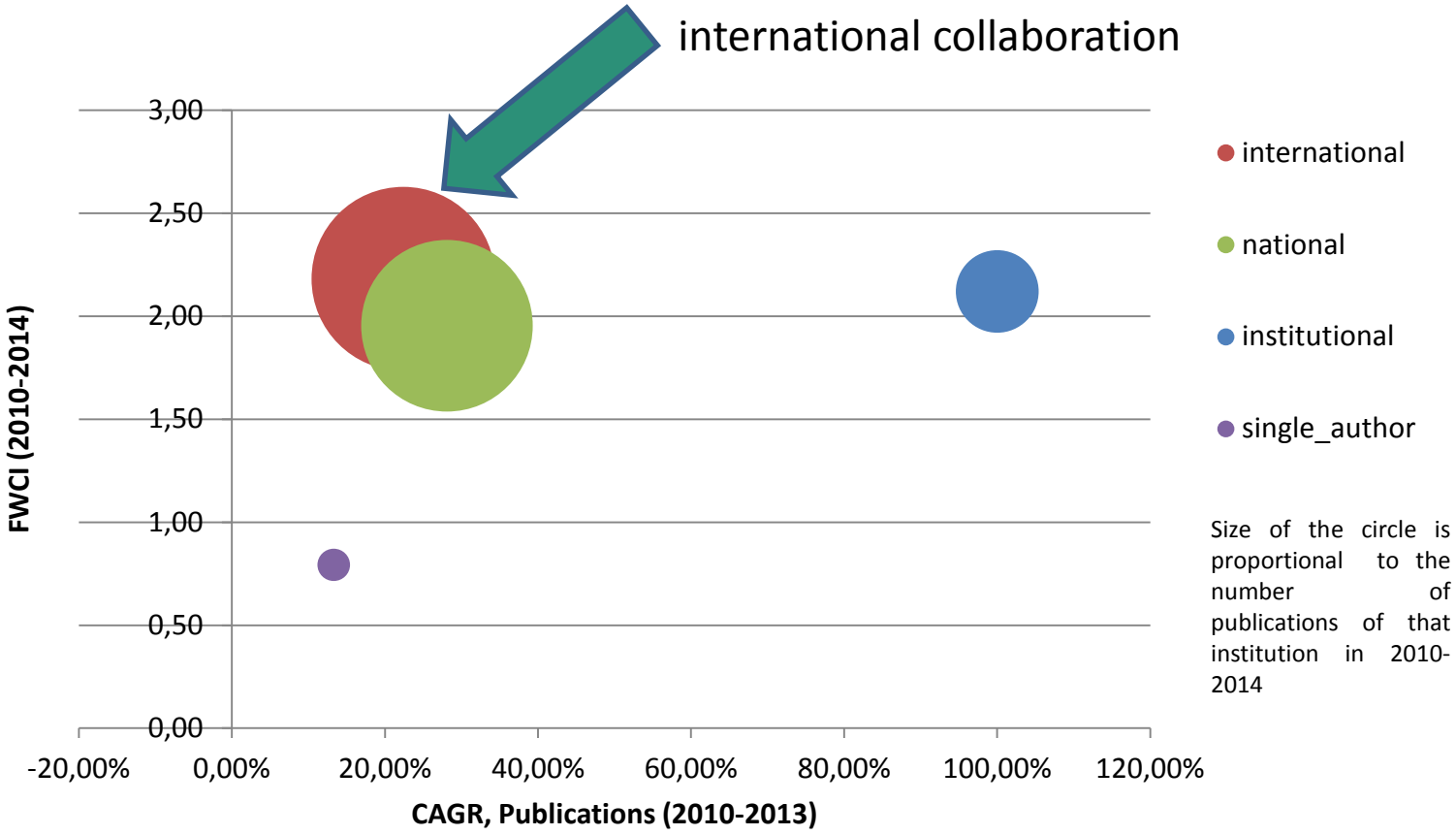
Istituto Italiano di Tecnologia

excellence in the highly cited spectrum of the publications



Collaboration

The highest impact is associated with the international collaboration



Size of the circle is proportional to the number of publications of that institution in 2010-2014

Key findings

PRODUCTIVITY

Volumes of outputs:
articles, reviews,
conference papers

IMPACT

FWCI,
an indicator
of mean citation impact

EXCELLENCE

Percentiles ,
highly cited articles
(top 1%, 5%, 10%)

EXCHANGE

Collaboration ,
international, national,
institutional,
single_author

Importance of benchmarking

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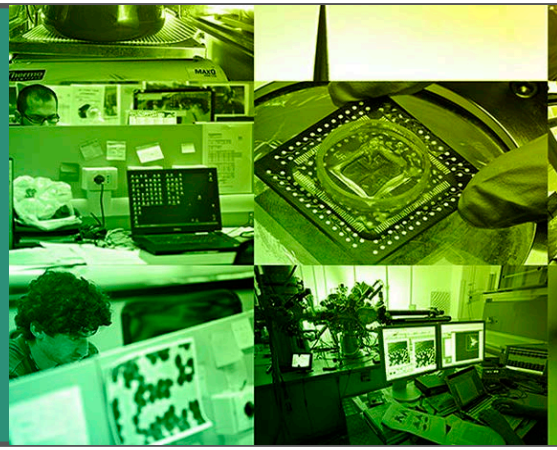
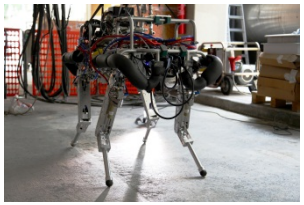
Deep dive into Robotics



Technology with human touch

Matrix organization



Plantoids

Commercial Domain

Perception Ability

Interaction Ability

Animaloids

Biomechanics

Humanoids

Robotics

Civil Domain

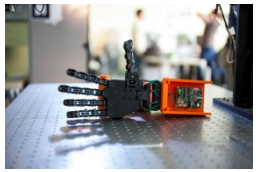
Cognition

Artificial Intelligence

Healthcare

Mechatronics

Material Science



Nanocomponents

Decisional Autonomy

Adaptability

Cognitive ability

Human robot interaction

Subject classification

CUN areas, aree Consorzio Universitario Nazionale

UOA, Units of Assessment

FOR, Fields of Research

FOS, Field of Science and Technology

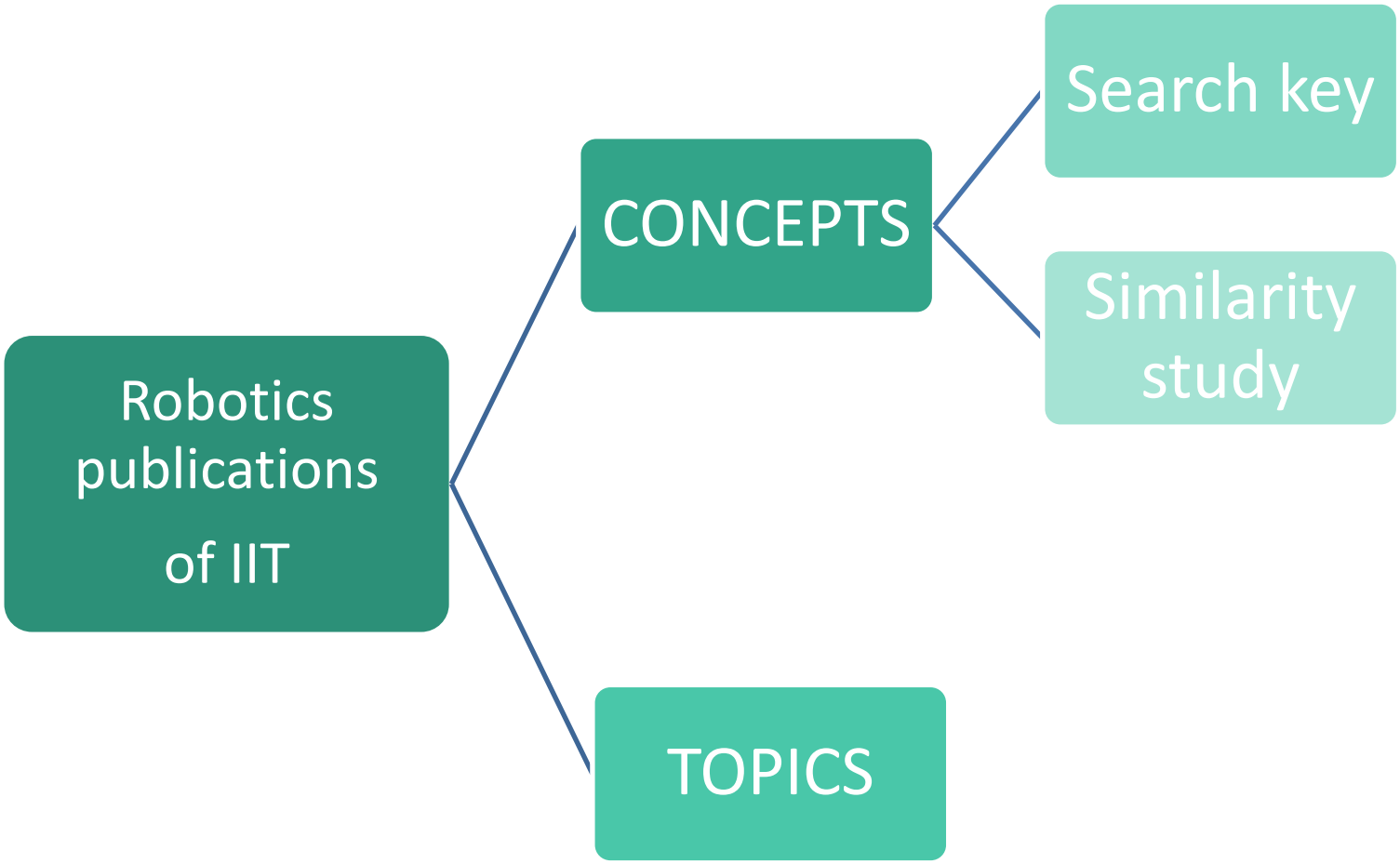
ASJC, All Science Journal Classification

The rigidness of classification systems does not allow to capture

new developments of areas of research and

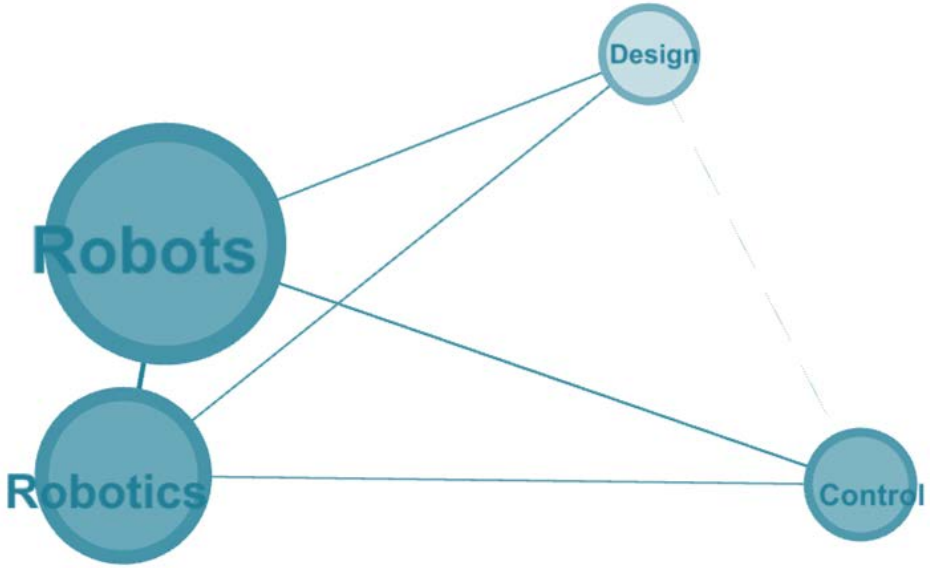
the inderdisciplinarity

Content


Robotics publications of IIT
CONCEPTS
Search key
Similarity study
TOPICS

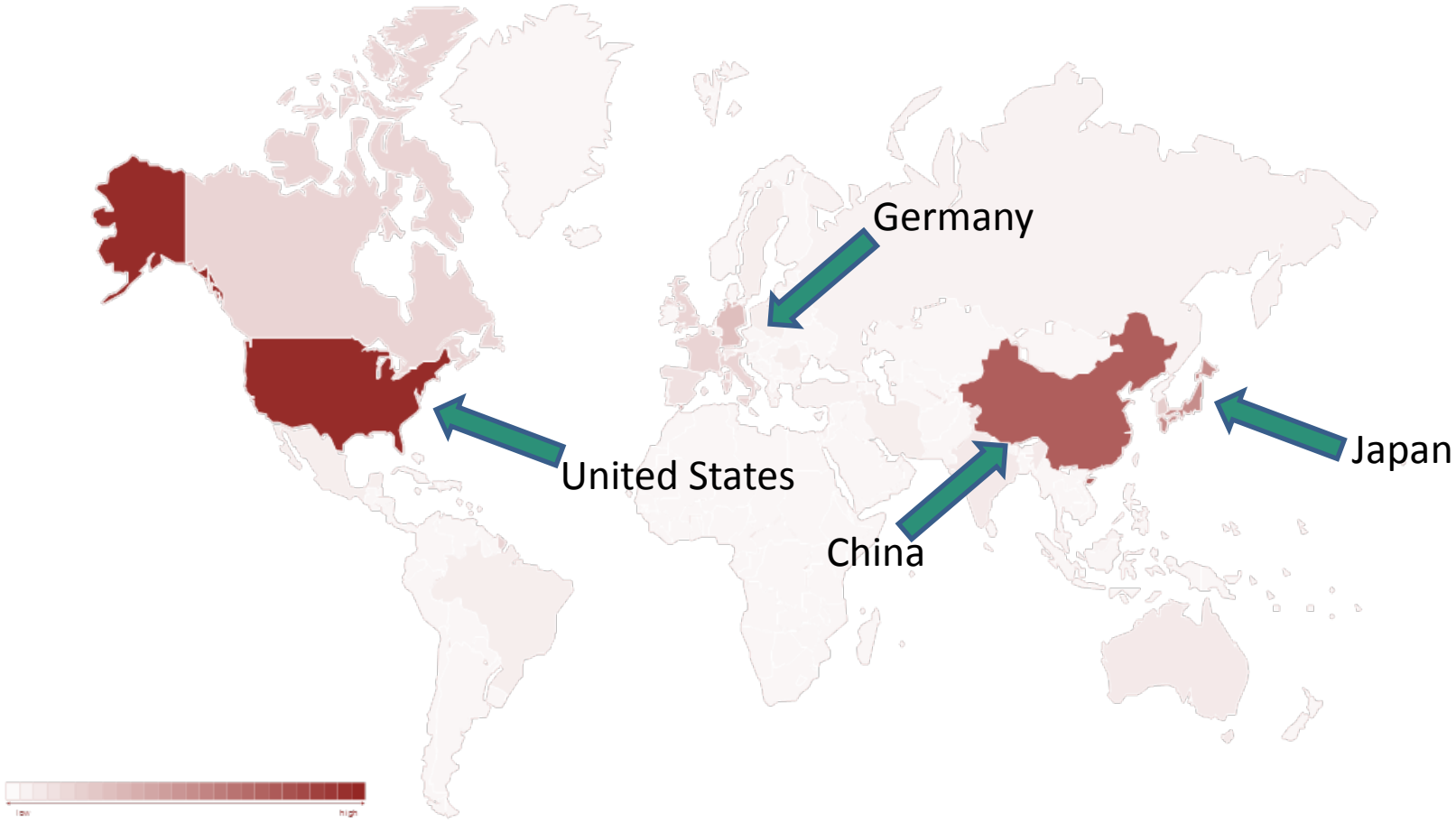
Concepts

COMPENDEX
Engineering literature database
with over 17 million records
from 73 countries across 190 engineering disciplines



Search key in Solr-> robot* AND (design OR control)

Country distribution of robotics' publications



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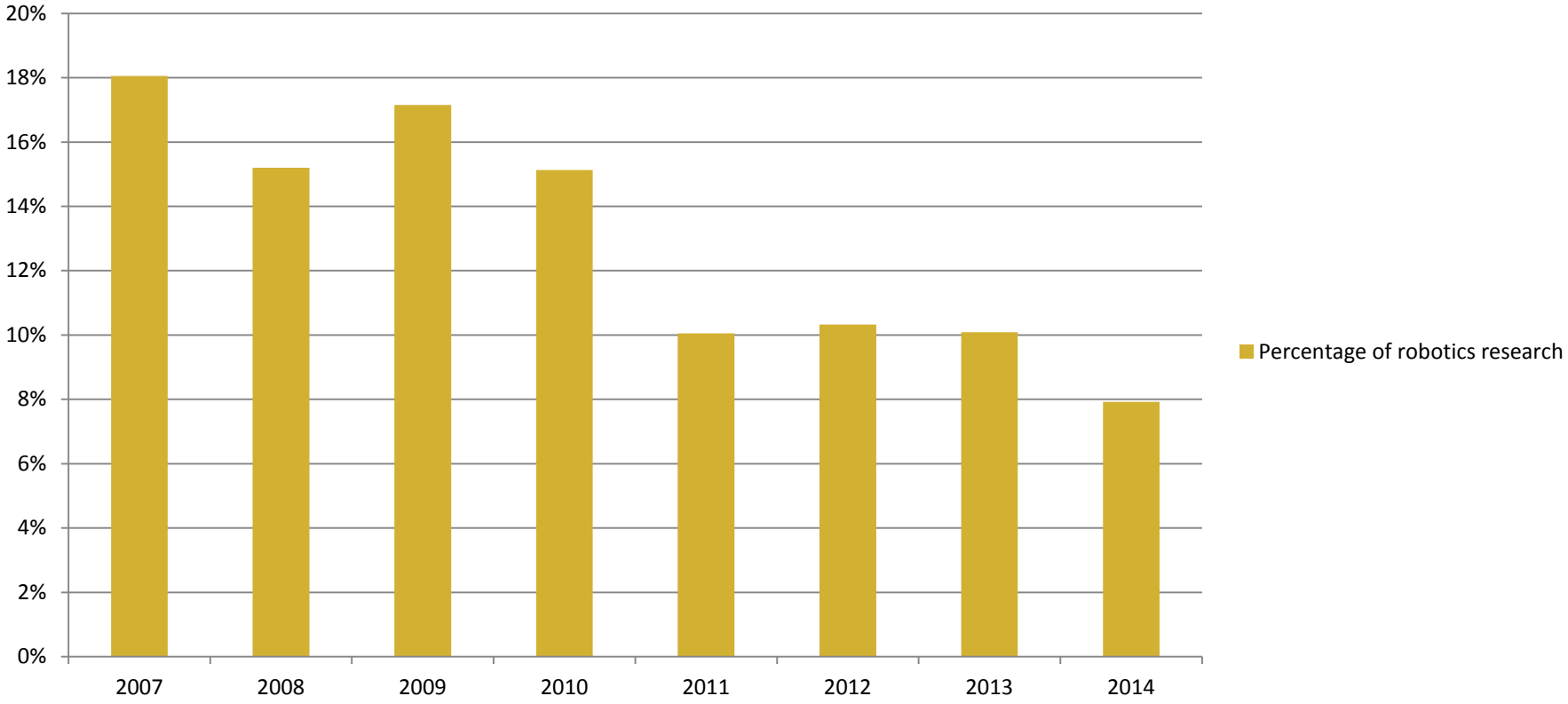


The trend shows the increase of the number of the research programs

Similarity study

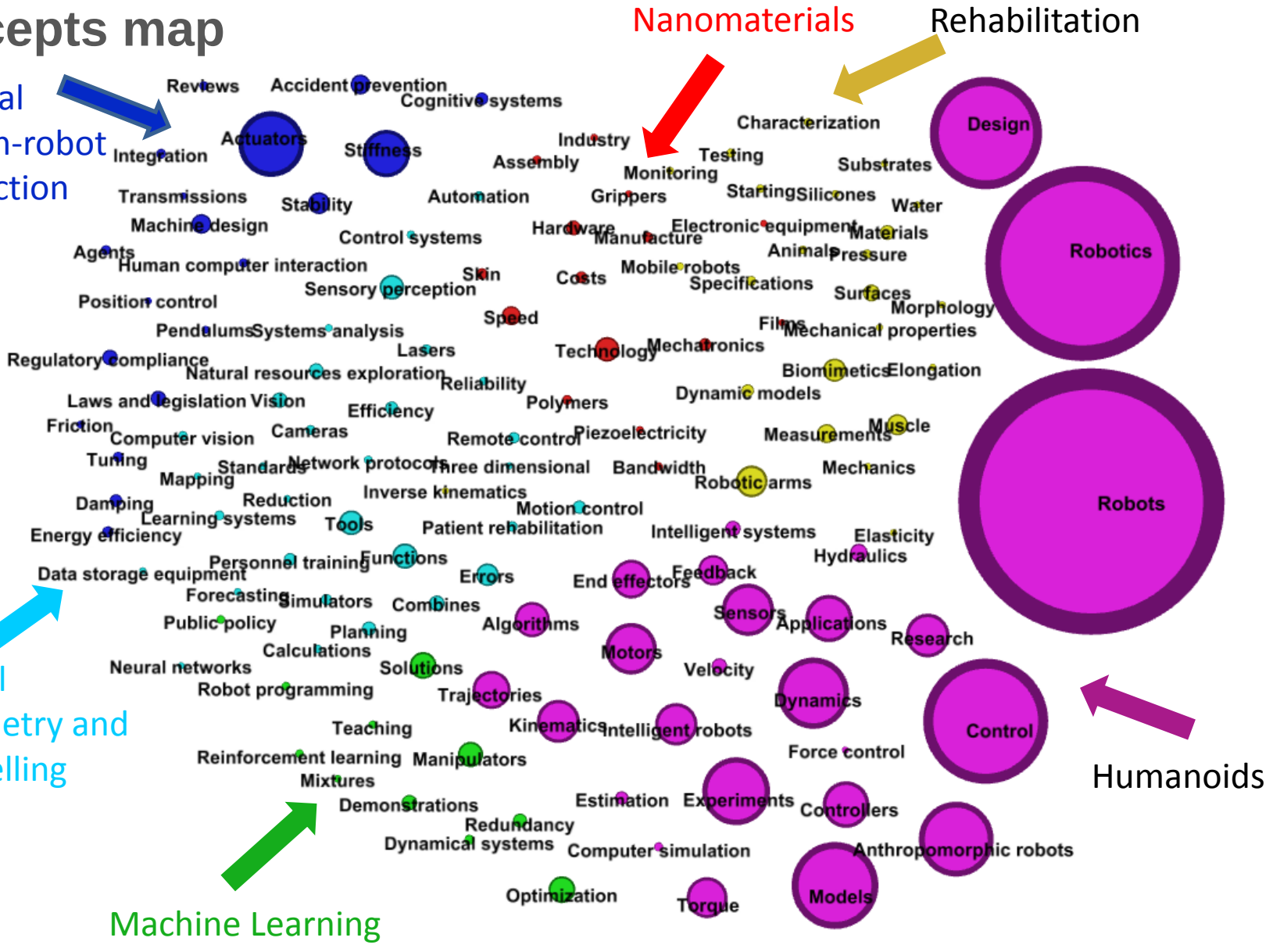
The Jaccard coefficient measures similarity between finite sample sets, and is defined as the size of the intersection divided by the size of the union of the sample sets:

$$J(A,B)=\frac{|A\cap B|}{|A\cup B|}$$

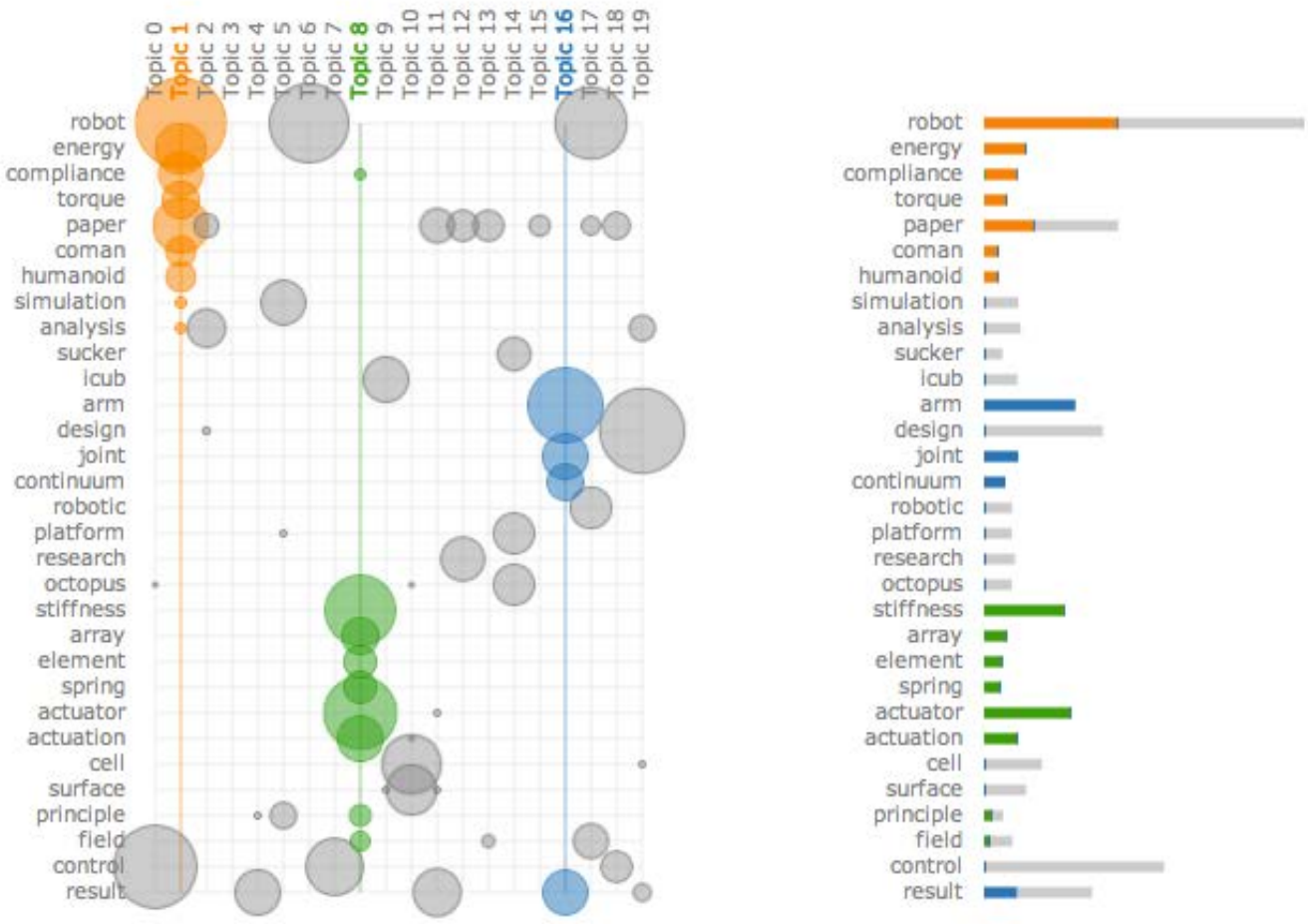
Clusters

Gephi is an interactive visualization and exploration platform for all kinds of networks and complex systems

Concepts map



Topics



MALLET, MAchine Learning for LanguagE Toolkit

Roncone, A., Hoffmann, M., Pattacini, U., Metta, G. **Automatic kinematic chain calibration using artificial skin: Self-touch in the iCub humanoid robot** (2014) Proceedings - IEEE International Conference on Robotics and Automation, art. no. 6907178, pp. 2305-2312.

Li, Z., Vanderborght, B., Tsagarakis, N.G., Caldwell, D.G. **Human-like walking with straightened knees, toe-off and heel-strike for the humanoid robot iCub** (2010) IET Seminar Digest, 2010 (4), art. no. 0356, pp. 638-643.

Medrano-Cerda, G.A., Dallali, H., Brown, M., Tsagarakis, N.G., Caldwell, D.G. **Modelling and simulation of the locomotion of humanoid robots** (2010) IET Seminar Digest, 2010 (4), art. no. 0367, pp. 704-709.

Content

Advantages

Objective start point

Flexibility

More retrieval information

Limits

Absence of a standard methodology to define the research areas

Definition of the thresholds

Need of expert feedback

Next steps

Look at the concepts of the publications of each Principal Investigator to compare their performance with the other researchers of the field in the world

Explore more the topics methodology

Involve the researchers to check the results

Combine the content information with the bibliometric indicators

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Thank you