UNIVERSITÀ
DEGLI STUDI
DI GENOVA

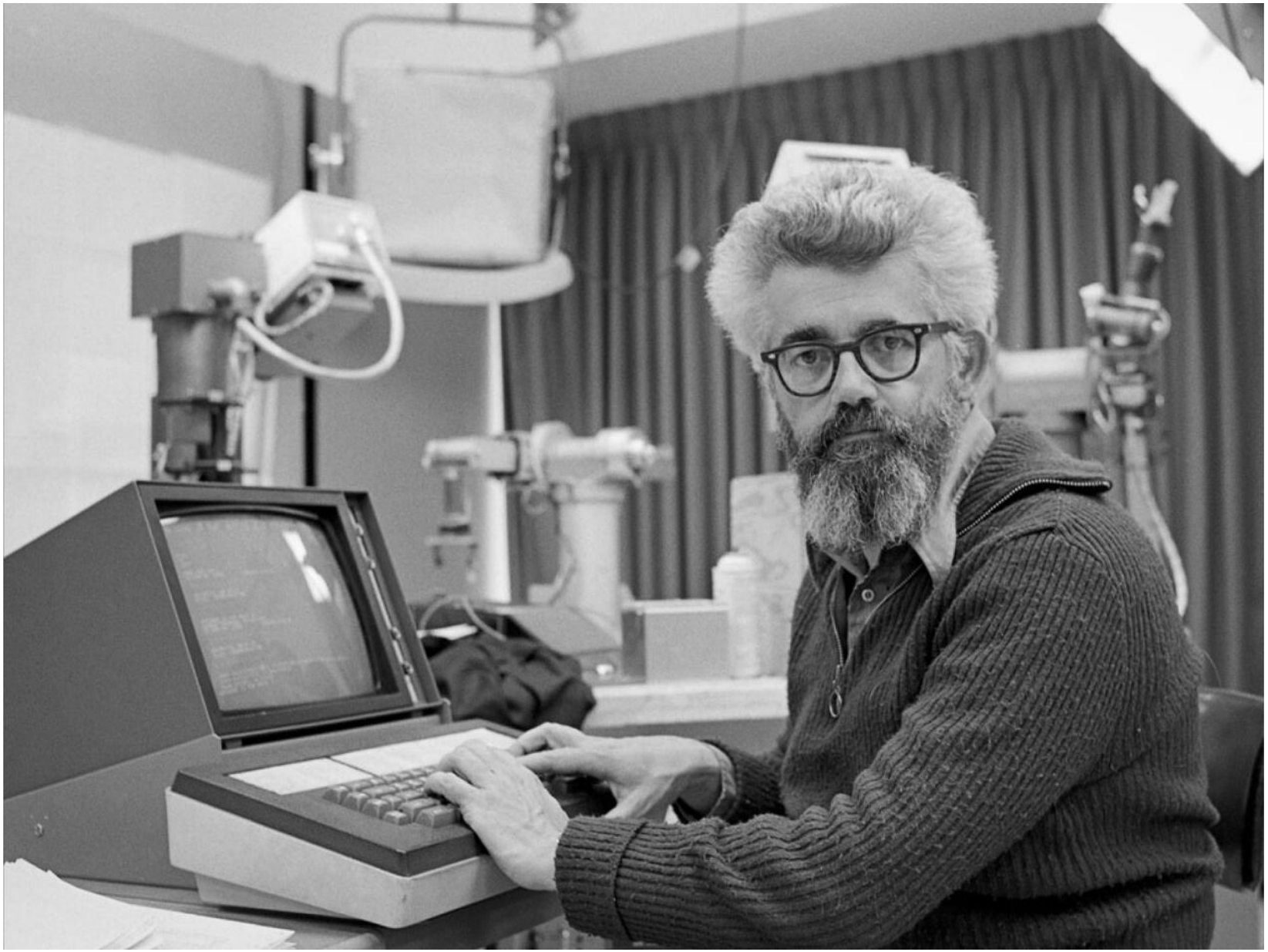
AI/ROBO VALLEY

Fulvio Mastrogiovanni

ARTIFICIAL INTELLIGENCE

VS

INTELLIGENCE AUGMENTATION



JOHN MCCARTHY HA CONIATO IL TERMINE INTELLIGENZA ARTIFICIALE NEL 1956

“LA SCIENZA È L’ATTIVITÀ INGEGNERISTICA DI CREARE MACCHINE INTELLIGENTI”

“AFFINCHÉ UN PROGRAMMA SIA CAPACE DI APPRENDERE QUALCOSA, DEVE PRIMA ESSERE CAPACE DI SENTIRSELO DIRE”

$$\frac{}{\Delta, B \longrightarrow B}\ initial^{\dagger} \qquad \frac{B, C, \Delta \longrightarrow G}{B \wedge C, \Delta \longrightarrow G}\ \wedge \mathrm{L}^{\dagger}$$

$$\frac{\Delta \longrightarrow B \qquad \Delta \longrightarrow C}{\Delta \longrightarrow B \wedge C}\ \wedge \mathrm{R}^{\dagger} \qquad \frac{B, \Delta \longrightarrow G \qquad C, \Delta \longrightarrow G}{B \vee C, \Delta \longrightarrow G}\ \vee \mathrm{L}^{\dagger}$$

$$\frac{\Delta \longrightarrow B}{\Delta \longrightarrow B \vee C}\ \vee \mathrm{R} \qquad \frac{\Delta \longrightarrow C}{\Delta \longrightarrow B \vee C}\ \vee \mathrm{R}$$

$$\frac{B, \Delta \longrightarrow C}{\Delta \longrightarrow B \supset C}\ \supset \mathrm{R}^{\dagger} \qquad \frac{C, B, \Delta \longrightarrow G}{B \supset C, B, \Delta \longrightarrow G}\ \supset \mathrm{L}_1$$

$$\frac{A \supset (B \supset C), \Delta \longrightarrow G}{(A \wedge B) \supset C, \Delta \longrightarrow G}\ \supset \mathrm{L}_2^{\dagger} \qquad \frac{A \supset C, B \supset C, \Delta \longrightarrow G}{(A \vee B) \supset C, \Delta \longrightarrow G}\ \supset \mathrm{L}_3^{\dagger}$$

$$\frac{B \supset C, \Delta \longrightarrow A \supset B \qquad C, \Delta \longrightarrow G}{(A \supset B) \supset C, \Delta \longrightarrow G}\ \supset \mathrm{L}_4$$

ASSUNZIONI:

1/ SISTEMI BASATI SULLA RAPPRESENTAZIONE DELLA CONOSCENZA

2/ CAPACITÀ DI APPRENDERE DALL'ESPERIENZA

3/ CAPACITÀ DI COMUNICARE

VOL. LIX. No. 236.] [October, 1950

MIND

A QUARTERLY REVIEW

OF

PSYCHOLOGY AND PHILOSOPHY

I.—COMPUTING MACHINERY AND INTELLIGENCE

BY A. M. TURING

1. *The Imitation Game.*

I PROPOSE to consider the question, 'Can machines think?' This should begin with definitions of the meaning of the terms 'machine' and 'think'. The definitions might be framed so as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words 'machine' and 'think' are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, 'Can machines think?' is to be sought in a statistical survey such as a Gallup poll. But this is absurd. Instead of attempting such a definition I shall replace the question by another, which is closely related to it and is expressed in relatively unambiguous words.

The new form of the problem can be described in terms of a game which we call the 'imitation game'. It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex. The interrogator stays in a room apart from the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is

The rise of Robotics and AI

Fueled by advances in computing power and connectivity, the fields of robotics and artificial intelligence have grown rapidly

1921
The term **robot** is first used by Czech writer Karel Capek

1939
Elektro, a humanoid robot, debuts at the World's Fair, smoking cigarettes and blowing up balloons

1941
Isaac Asimov formulates the **Three Laws of Robotics:**

A robot may not injure a human being or, through inaction, allow a human being to be harmed

A robot must obey orders given it by human beings except where such orders would conflict with the First Law

A robot must protect its own existence as long as such protection does not conflict with the First or Second Law

1948
William Grey Walter creates **the first autonomous robot with complex behavior**

1950
Alan Turing publishes paper about the possibility of machines that think, develops idea known as the **Turing's Test.**

It tests a machine's ability to "think" by answering a series of questions. **In essence, the tester must think the machine's answers are coming from a human**

1951
Marvin Minsky builds the first neurocomputer, **SNARC**

1954
George Devol invents the first digitally operated and programmable robot

1956
Field of AI **research** founded at a conference at Dartmouth

1960
Frank Rosenblatt constructs **Mark I Perceptron**, a computer that learned new skills by trial and error

1961
GM installs Unimate robot to lift and stack hot pieces of metal

1968
Mobile robot "Shakey" is introduced. It's controlled by a computer the size of a room

1972
Stanford researcher develops PARRY, designed to simulate a paranoid schizophrenic.

1974
Intel produces its second-generation 8080 general-purpose chips

1979
SCARA, an articulated robot arm, is developed for assembly lines

1984
Doug Lenat and his team start **Cyc**, to codify millions of pieces knowledge that compose human common sense

1984
The RB5X, developed by General Robotics Corp., includes software enabling it to learn from its environment

1985
Jaron Lanier's VPL Research, Inc., sells first VR glasses and gloves; Lanier coins the phrase **virtual reality**

1986
Honda creates the E0, the first of a series of humanoid robots that walk on two feet

1988 Nope, I'm human.
Researchers launch Jabberwacky, an AI chatbot designed to learn through conversation

1988
The first HelpMate service robot begins work at Danbury Hospital

How are you feeling today?

I have had enough of this.

1956
IBM 305, the first hard disk drive
5MB

1970
IBM 1330
100MB
per pack

1985
IBM 0665, a 5.25" disk with
20-40MB

Minimize and maximize
Shrinking disk sizes and exponentially growing capacity help fuel robotics and AI

Robotics and AI
charging forward

With technologies advancing at breakneck speeds, robotics and artificial intelligence are finding new applications in factories, businesses, and homes

1990
Tom Caudell coins the phrase
augmented reality

1990
iRobot® Corporation is founded, producing domestic and military robots

1997
Deep Blue defeats Garry Kasparov in a game of chess

1997
NASA's Pathfinder lands on Mars

1998
Dr. Cynthia Breazeal creates Kismet, a robot that interacts emotionally with humans

2000
The UN estimates there are 742,500 industrial robots in use worldwide

2005
Stanford robot Stanley drives autonomously for 131 miles

2006
IBM introduces Watson, a question-answering computer system that later defeated a Jeopardy! champion

2007
Fanuc develops an industrial robot arm that can grab 120 items per minute

2010
Google launches a 3D version of its Street View

2011
Siri is introduced

2012
Google introduces its Siri response: **Google Now**, which already has been rendered obsolete by Google Assistant

2012
Baxter, created by Rodney Brooks, can do light repetitive tasks

2012
An estimated 8.7 billion devices are connected to the internet

2013
Google launches **Google Glass**, augmented reality glasses

2015
Amazon launches **Alexa**, a "virtual assistant" that helps communicate with connected devices in the home

2016
Amazon makes first drone delivery in UK

2016
Sony PlayStation launches **PlayStation VR**

2016
Uber begins testing driverless cars in California and Arizona

2016
Companies utilize an estimated 1.8 million industrial robots

2020
By 2020, the drone industry could be worth **$127 billion**

The FAA expects 7 million drones to ship in the US, including 2.7 million commercial drones

2004 Seagate ST1, 1" disk — 2.5-5GB
2015 Seagate Thin HDD, 2.5", 7mm thick — 2 TB
2025 Even smaller — 100+ TB?

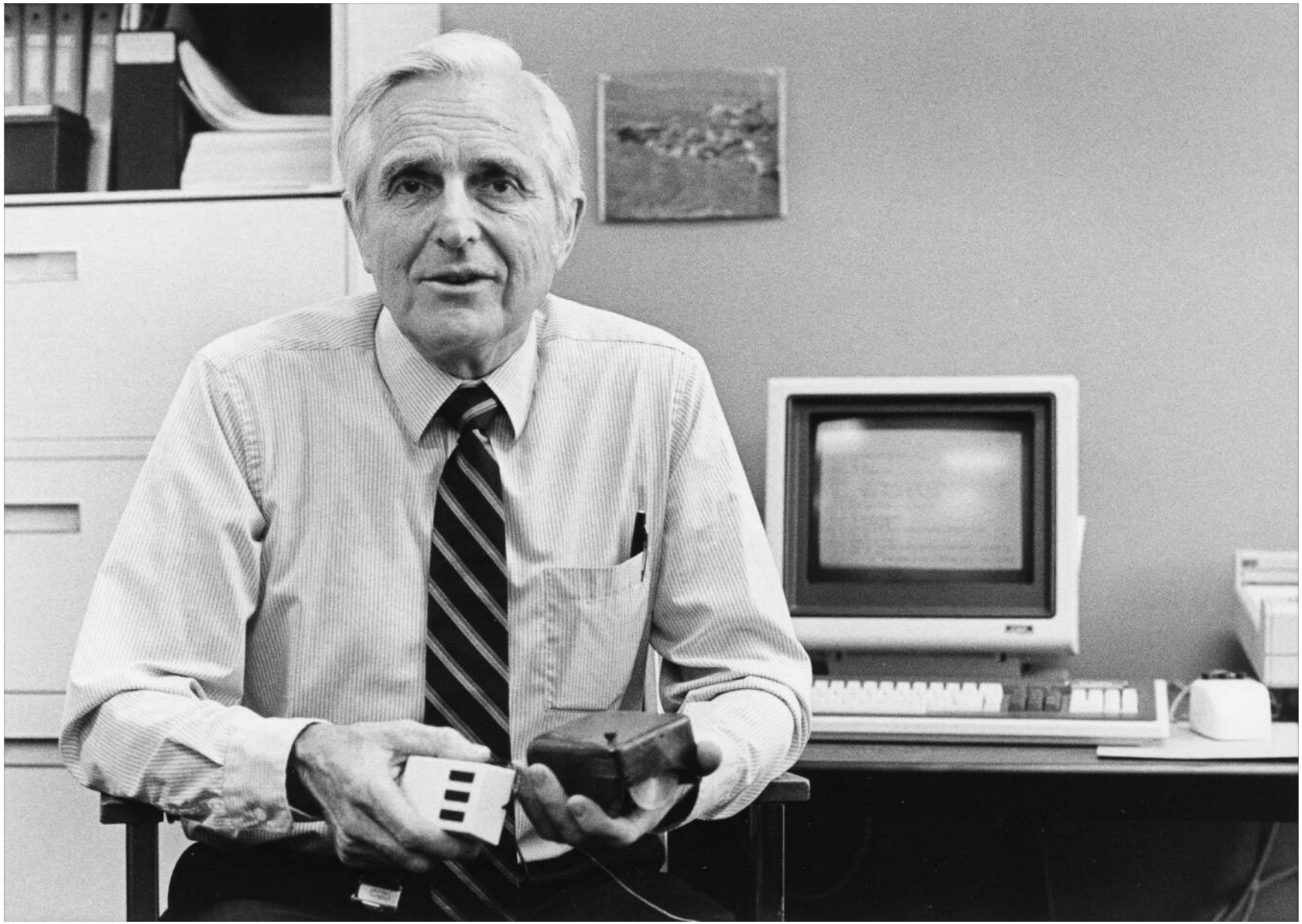
Growing capacities
As disk size has shrunk, capacity has grown exponentially since 2000

Industrial robots: looking forward
A common fixture in the factory, the industrial robot has reshaped the manufacturing landscape through the years by performing duties unsuitable for humans

2005: Fewer than 1 million
2016: 1.8 million
2019: 2.6 million

Robotics and other computerization could replace **47 percent of U.S. jobs**, according to a 2013 University of Oxford study

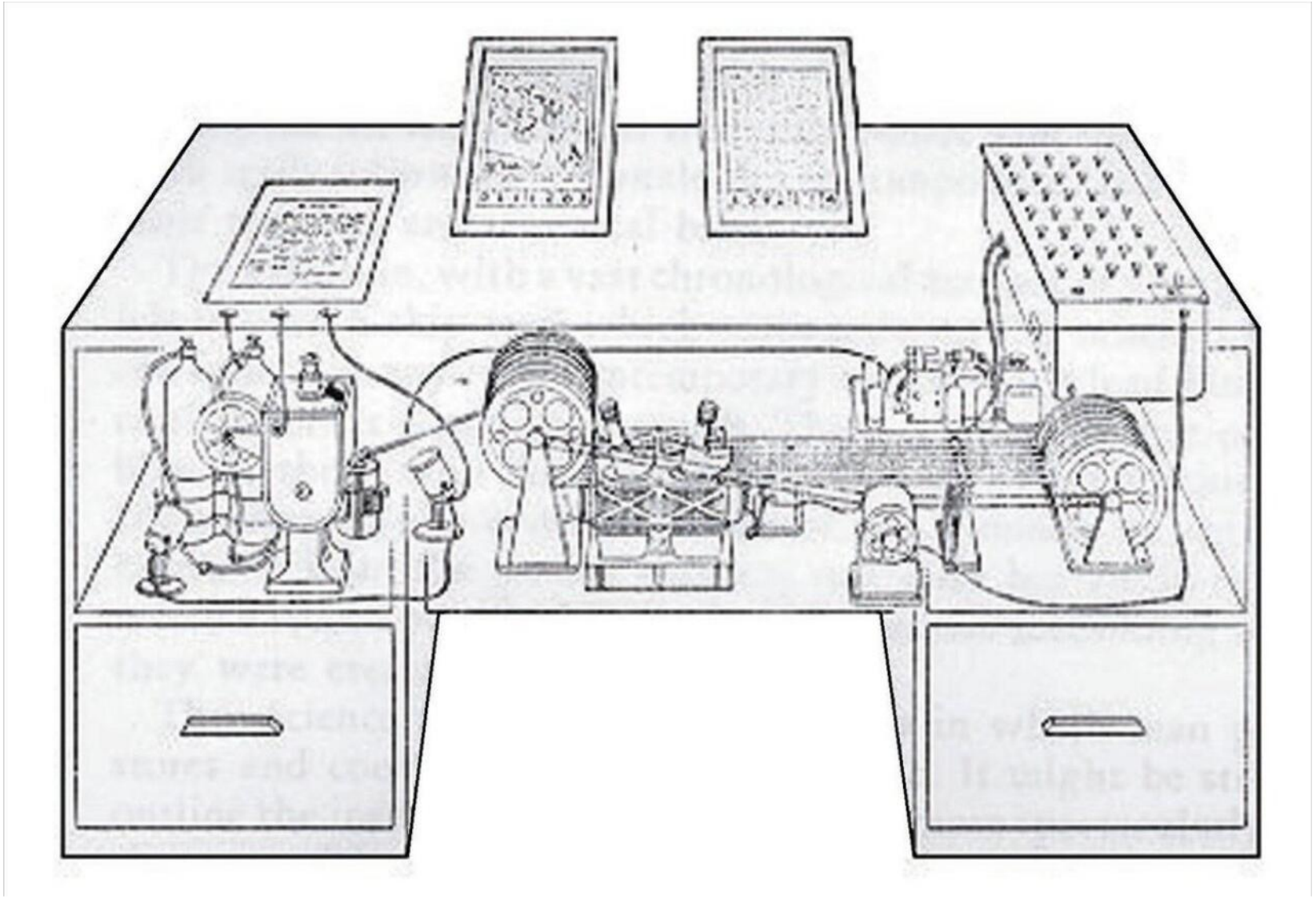
2034

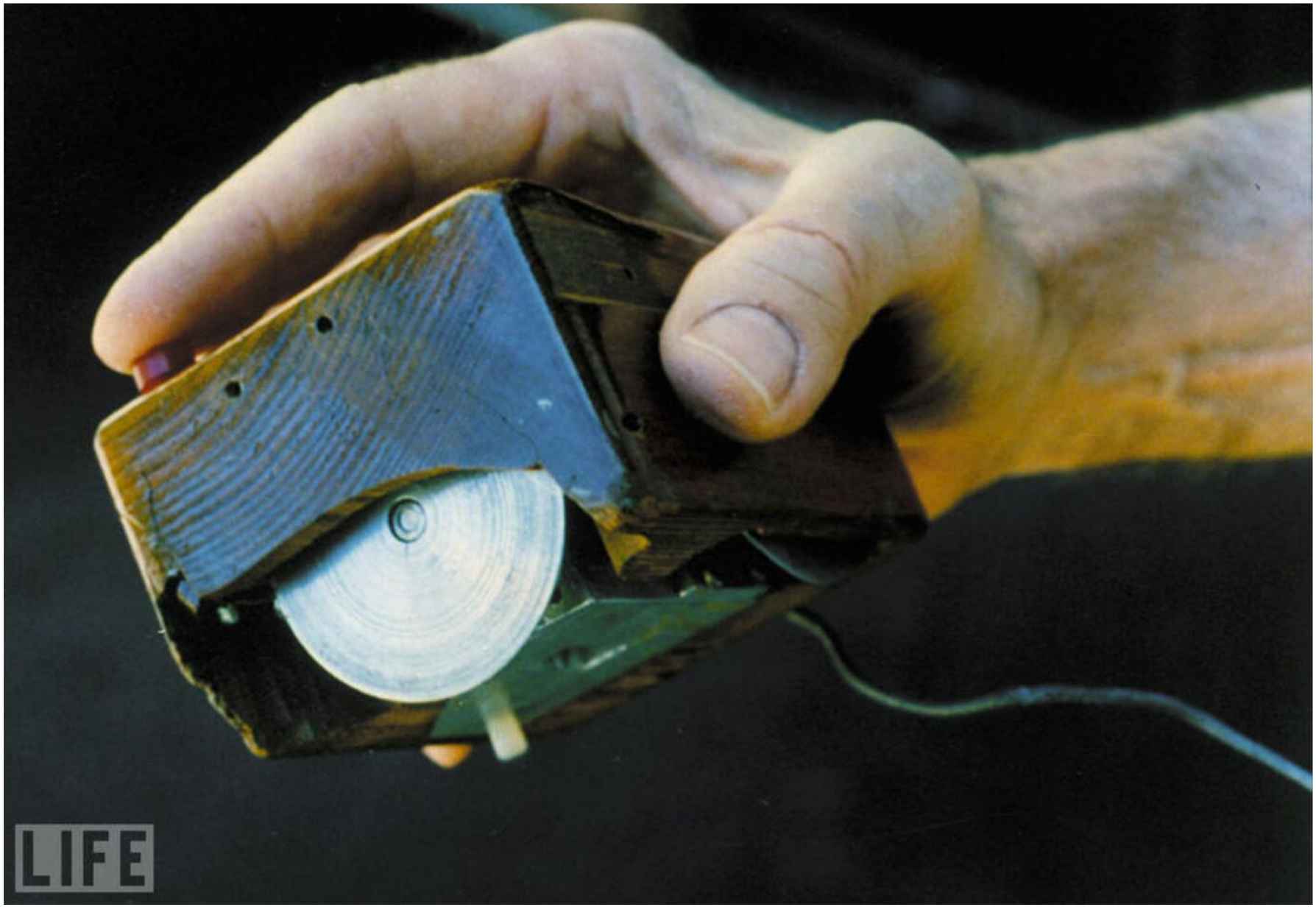


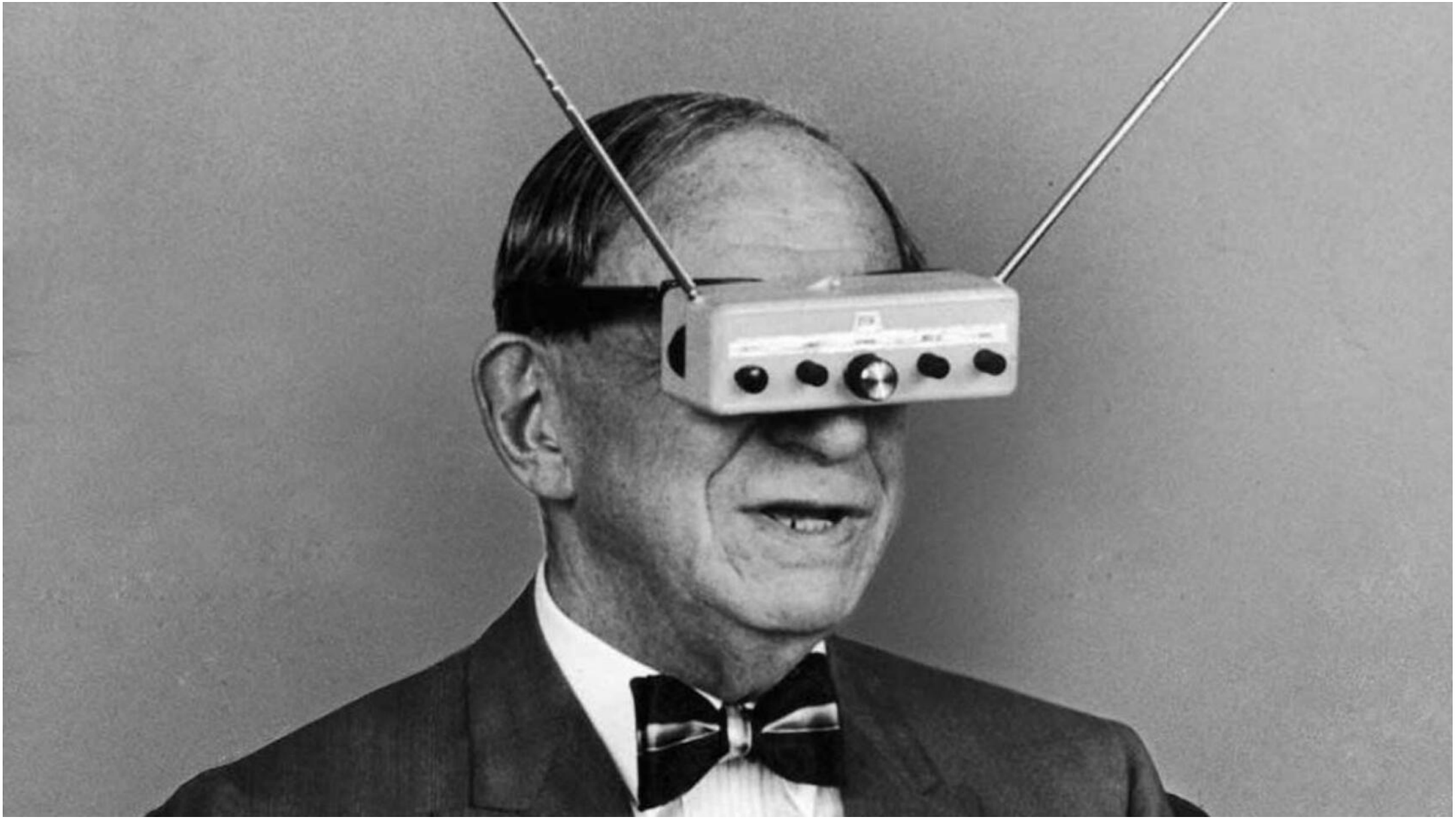
DOUG ENGELBART HA CONIATO IL TERMINE INTELLIGENCE AUGMENTATION (ESPANSIONE DELL'INTELLIGENZA) NEL 1962

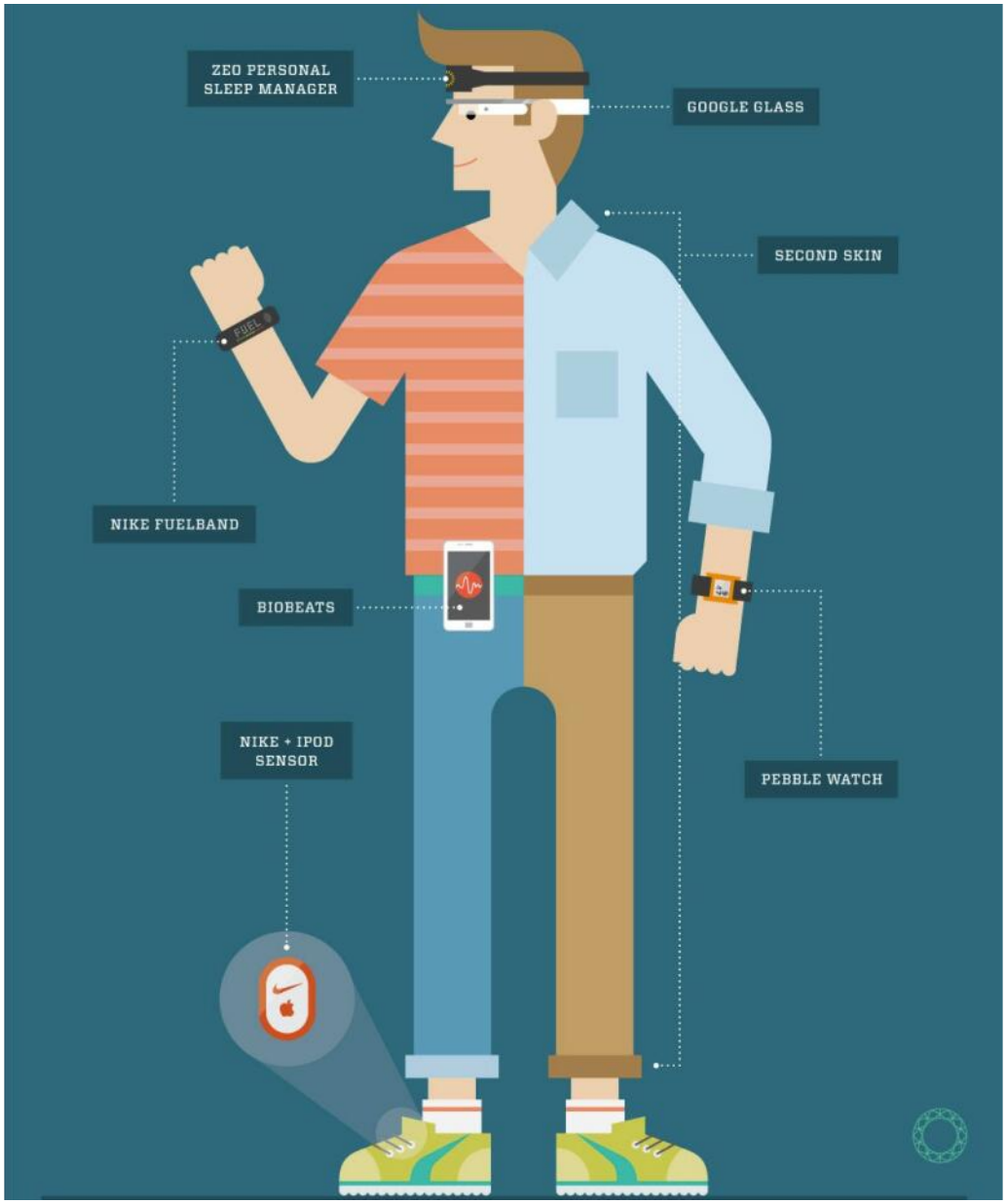
"INCREMENTARE LA CAPACITÀ DI UNA PERSONA DI APPROCCIARE UN PROBLEMA COMPLESSO, COMPRENDERE COME RISOLVERLO PER I PROPRI BISOGNI PERSONALI, E DERIVARE SOLUZIONI A PROBLEMI"

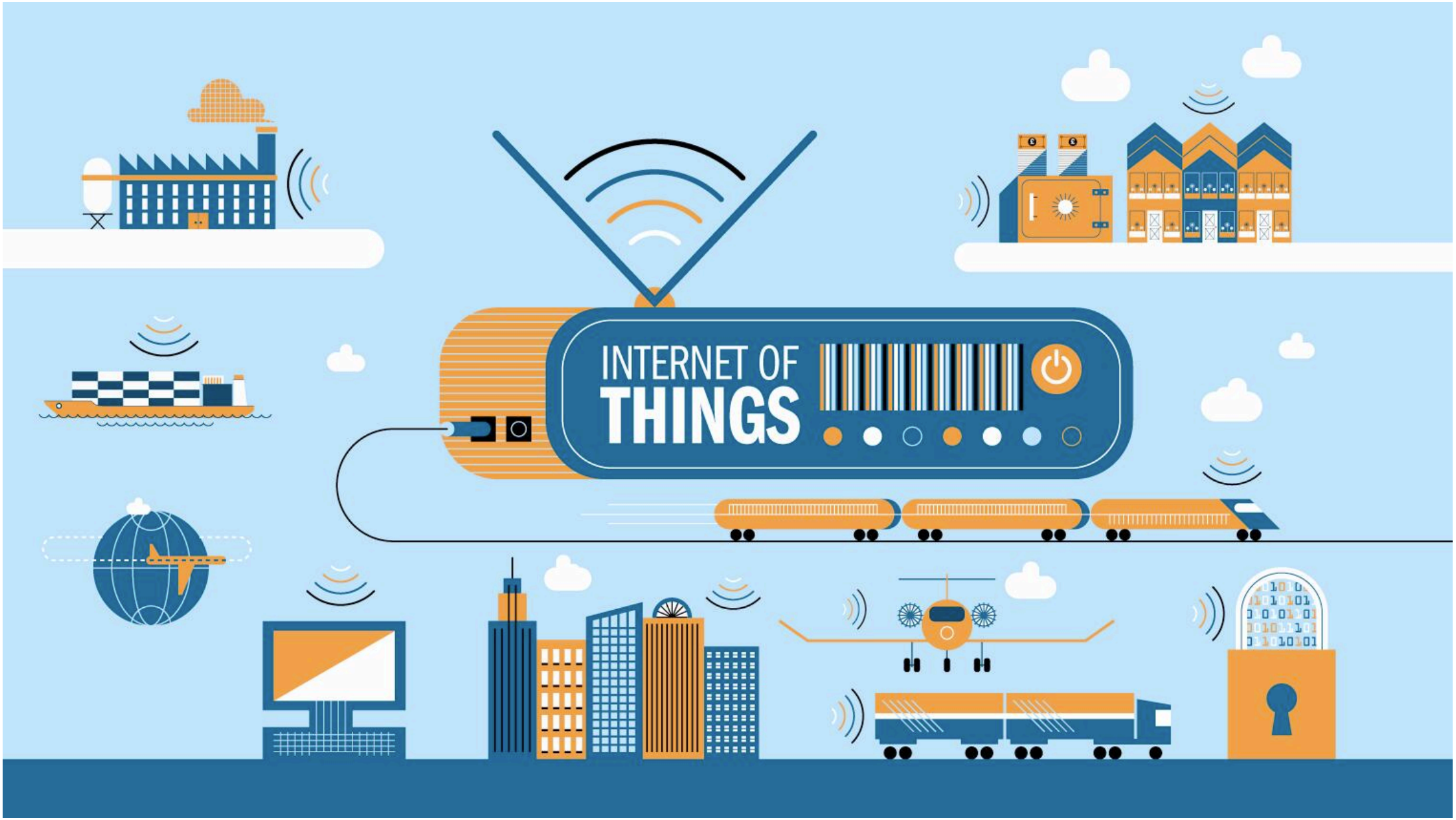
"UNA MIGLIORE CAPACITÀ DI APPROCCIARE PROBLEMI SIGNIFICA: COMPRENSIONE PIÙ RAPIDA, COMPRENSIONE MIGLIORE, LA POSSIBILITÀ DI COMPRENDERE UNA SITUAZIONE PRIMA TROPPO COMPLESSA, OTTENERE SOLUZIONI PIÙ VELOCI, OTTENERE SOLUZIONI MIGLIORI, E LA POSSIBILITÀ DI TROVARE SOLUZIONI A PROBLEMI PRIMA NON RISOLVIBILI"




LIFE




ZEO PERSONAL SLEEP MANAGER
GOOGLE GLASS
SECOND SKIN
FUEL
NIKE FUELBAND
BIOBEATS
NIKE + IPOD SENSOR
PEBBLE WATCH


INTERNET OF
THINGS

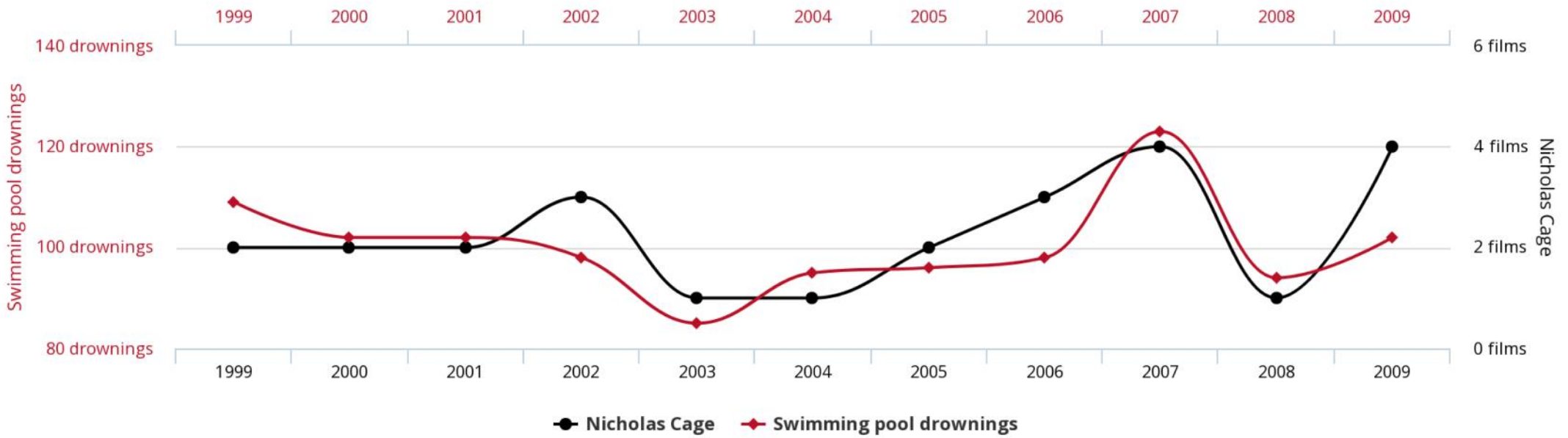

05.06.40
PERSONAL
NUTRITION
ANALYSIS
3:33 PM
24°
15°C


FORECASTING
1,2,3,4 ...
5

Number of people who drowned by falling into a pool

correlates with

Films Nicolas Cage appeared in



tylervigen.com

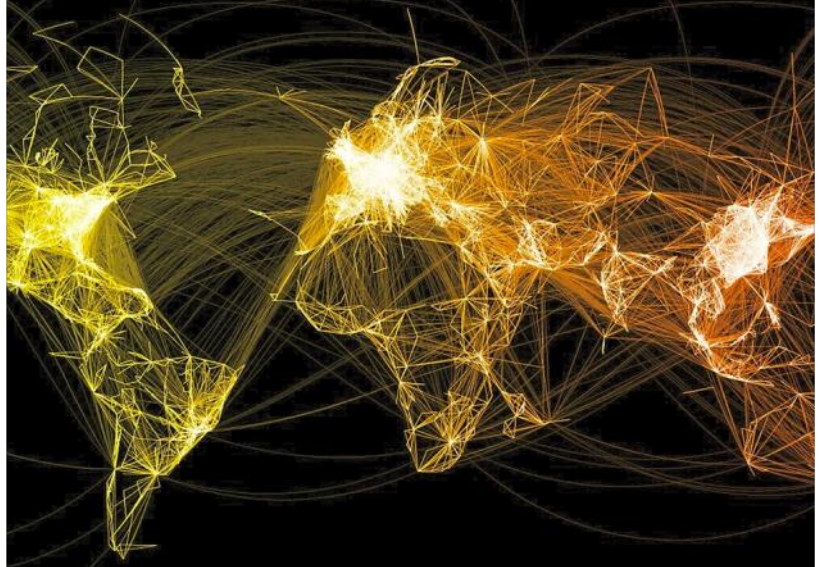
LA TECNOLOGIA È BASATA SUI VALORI CULTURALI
DEI LORO INVENTORI

FROM STUDENTS TO STARTUPS

(AND POSSIBLY BEYOND)

CONNECTOGRAPHY

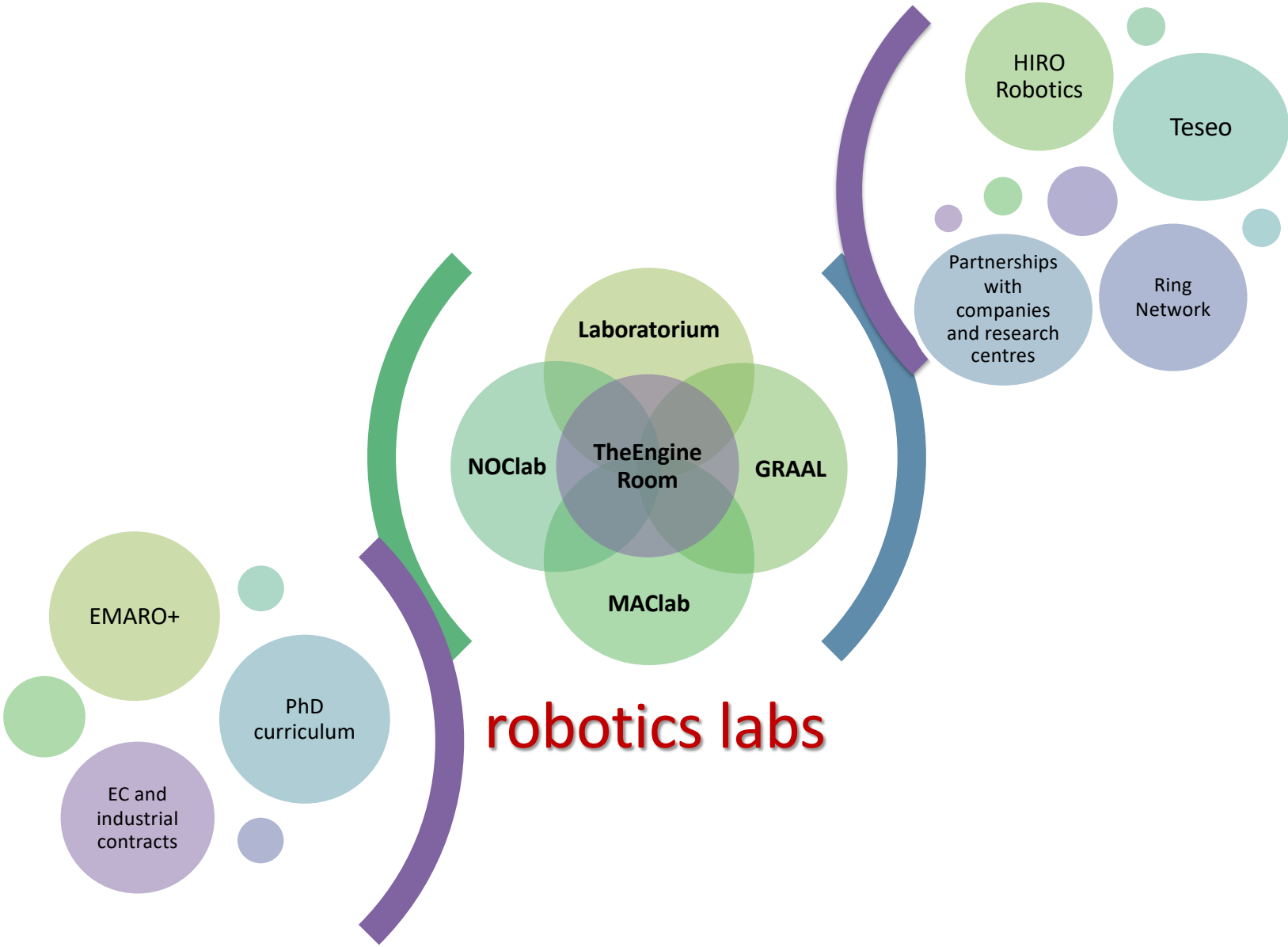
MAPPING THE FUTURE *of* GLOBAL CIVILIZATION



"Lorem ipsum dolor sit amet, consectetur adipiscing elit,
sed do eiusmod tempor incididunt ut labore et dolore magna aliqua."
—AUTHOR NAME, greek text attribute

PARAG KHANNA

UN MODELLO POSSIBILE: UNA SUPPLY CHAIN PER LA CONOSCENZA


HIRO Robotics
Teseo
Partnerships with companies and research centres
Ring Network
Laboratorium
NOClab
TheEngine Room
GRAAL
MAClab
EMARO+
PhD curriculum
EC and industrial contracts
robotics labs

EMARO

- EMARO+: EUROPEAN MASTER ON ADVANCED ROBOTICS *PLUS*
- PROGRAMMA DI DOPPIO TITOLO ATTIVO DAL 2008
- 4 UNIVERSITÀ EU + 2 ASIATICHE (KEIO UNIVERSITY IN TOKYO E JIAO TONG UNIVERSITY IN SHANGHAI)
- INSEGNAMENTO IN INGLESE
- ALCUNI CORSI INSEGNATI DA DOCENTI INTERNAZIONALI – CALL PERIODICHE
- PROGRAMMA DI STUDIO:
  - Y1: UGUALE IN TUTTE LE UNIVERSITÀ
  - Y2: DIVERSO, DIPENDE DALLE SPECIFICITÀ DELL'UNIVERSITÀ
- 850 DOMANDE NEL 2017

EMARO


Centrale Nantes
WARSAW UNIVERSITY OF TECHNOLOGY
Università degli Studi di Genova
UNIVERSITAT JAUME·I
Ecole Centrale de Nantes (France)
Warsaw University of Technology (Poland)
University of Genova (Italy)
Universitat Jaume I de Castelló (Spain)
www.ec-nantes.fr
www.pw.edu.pl
www.unige.it/
http://ujiapps.uji.es/


Keio University
1858
CALAMVS GLADIO FORTIOR
SHANGHAI JIAO TONG UNIVERSITY
1896
IRT JULES VERNE
AIRBUS GROUP
BA SYSTEMES
Robotnik
Siit

IL CURRICULUM PHD IN ROBOTICS AND AUTONOMOUS SYSTEMS DI UNIGE È PARTE DEL PROGRAMMA PHD IN BIOENGINEERING AND ROBOTICS GESTITO CONGIUNTAMENTE CON L'ISTITUTO ITALIANO DI TECHNOLOGIA E L'UNIVERSITÀ OF CAGLIARI

IL PROGRAMMA PHD IN BIOENGINEERING AND ROBOTICS È STATO ACCREDITATO COME PROGRAMMA PHD INNOVATIVO DAL MINISTERO DELL'UNIVERSITÀ E RICERCA

ISME: CENTRE FOR INTEGRATED SYSTEMS FOR THE MARINE ENVIRONMENT

MEMX: BIO-INSPIRED BEHAVIORS DEVELOPMENT FOR ROBOTS

RASES: ROBOTICS AND AUTONOMOUS SYSTEMS IN EMERGENCY SCENARIOS

Centre for Research and Technology Hellas (Greece)
CNR-IEIIT (Italy)
CNR-ISSIA (Italy)
Ceske Vysoke Uceni Technicke V Praze (Czech Rep.)
Ecole Centrale de Nantes (France)
EPFL (Switzerland)
Hanyang University (South Korea)
Heriot-Watt University (UK)
Istituto Superior Tecnico (Portugal)
Karlsruhe Institute of Technology (Germany)
Katholieke Universiteit Leuven (Belgium)
Keio University (Japan)
Korea Aerospace University (South Korea)
CMRE (Italy)
Monterey Bay Acquarium Research Institute (USA)
Oceanic Platform for the Canary Islands (Spain)
Shanghai Jiao Tong University (China)
Universitat Jaume I de Castellon (Spain)
University of Cassino and Lazio Meridionale (Italy)
University of Bologna (Italy)
University of Cagliari (Italy)
University of Girona (Spain)
University of Glasgow (UK)
University of Hawaii (USA)
University of Hertsfordshire (UK)
University of Parma (Italy)
University of Pisa (Italy)
University of Salento (Italy)
University of Wales at Newport (UK)
Warsaw University of Technology (Poland)
Westfalische Wilhems-University Munster (Germany)
Tokyo National Institute of Informatics (Japan)
ATR (Japan)
Goldsmiths University London (UK)
University of Oxford (UK)

Aker Solutions Norway (Norway)

SIIT (Italy)

Dot Vocal SRL (Italy)

Fincantieri SpA (Italy)

Genova Robot SRL (Italy)

Graal Tech SRL (Italy)

Impara AI (Italy)

Rulex Inc. (USA)

Magneti Marelli SpA (Italy)

Neovision SRO

Piaggio Aero (Italy)

Selex ES (Italy)

Softarea SRL (Italy)

Telerobot SRL (Italy)

Thales Alenia Space (Italy)

TLS Europe

Husqvarna (Sweden)

Generation Robotics (France)

Rethink Robotics (USA)

ATS Applied Tech Systems SRL (Italy)

Robox SRL (Italy)

NTT Data Italia SpA (Italy)

TESEO

IoT tech to keep your loved ones independent and safe

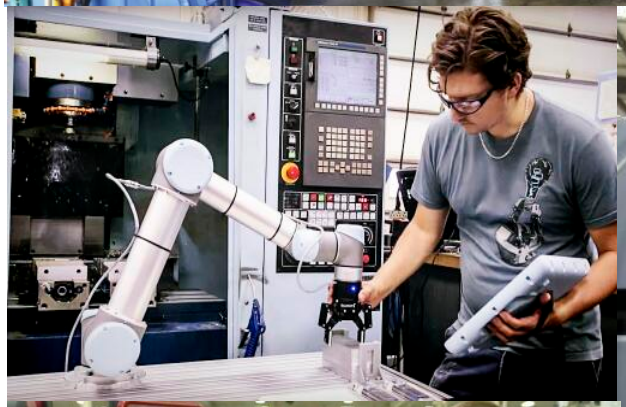
Fulvio Mastrogiovanni

www.teseotech.com


dotvocal
STMicro
Teseo
DeepIt
UniGe
Casa di riposo San Camillo
Estimote


KUKA

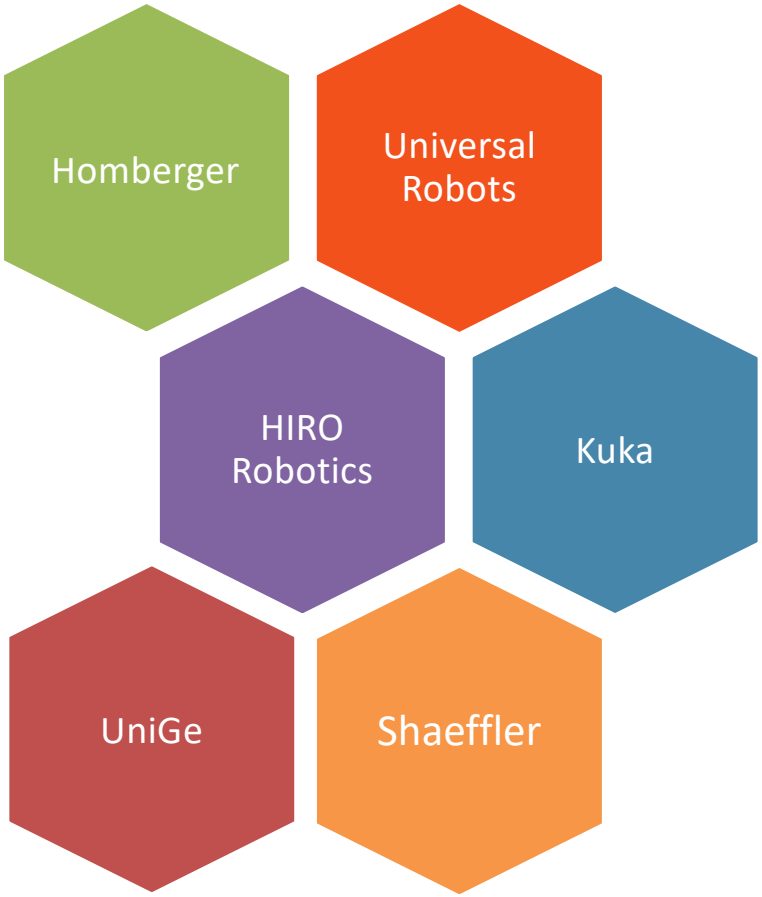

www.faude.de



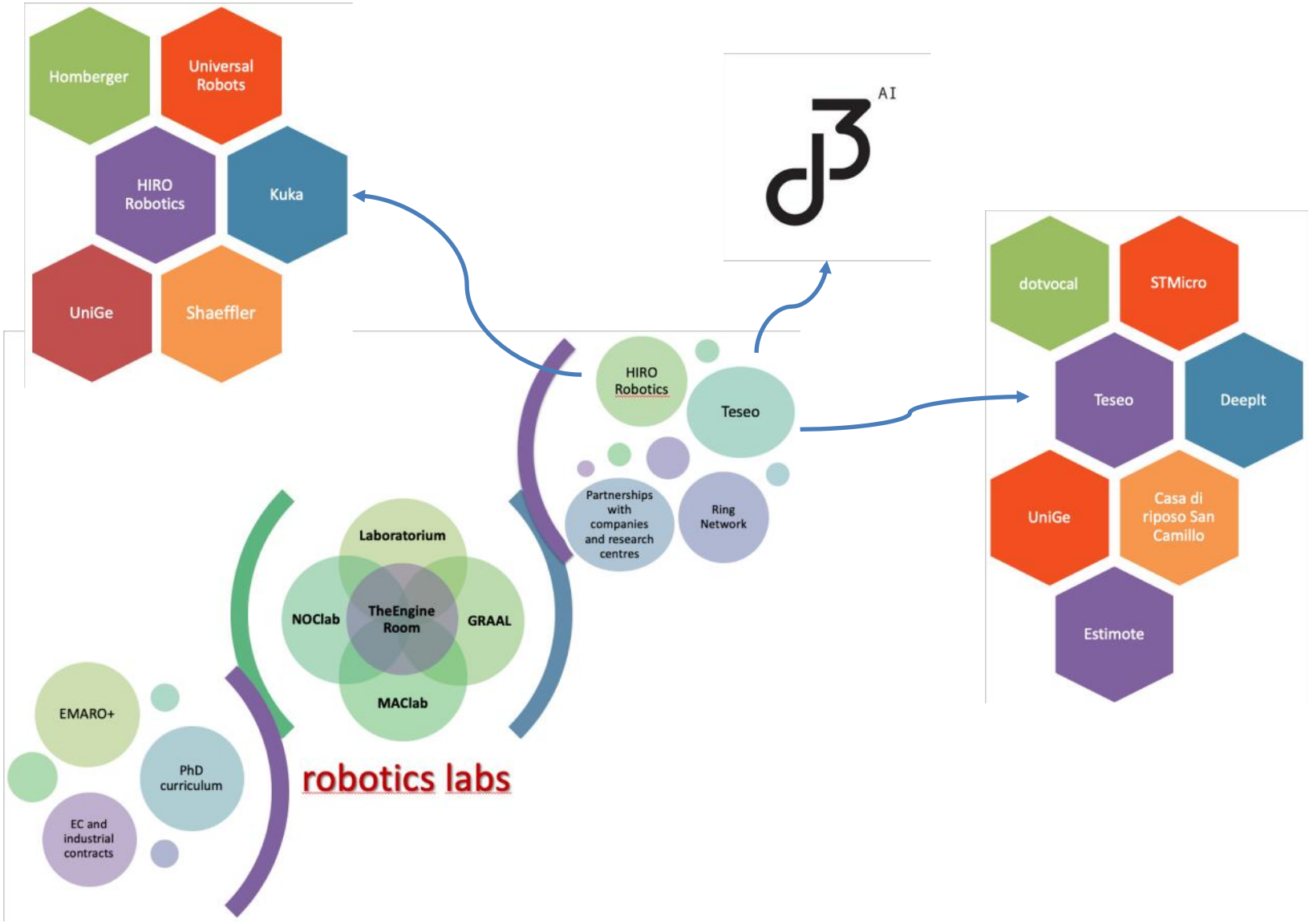

DANGER
KEEP HANDS
DAMAGE
DANADOS

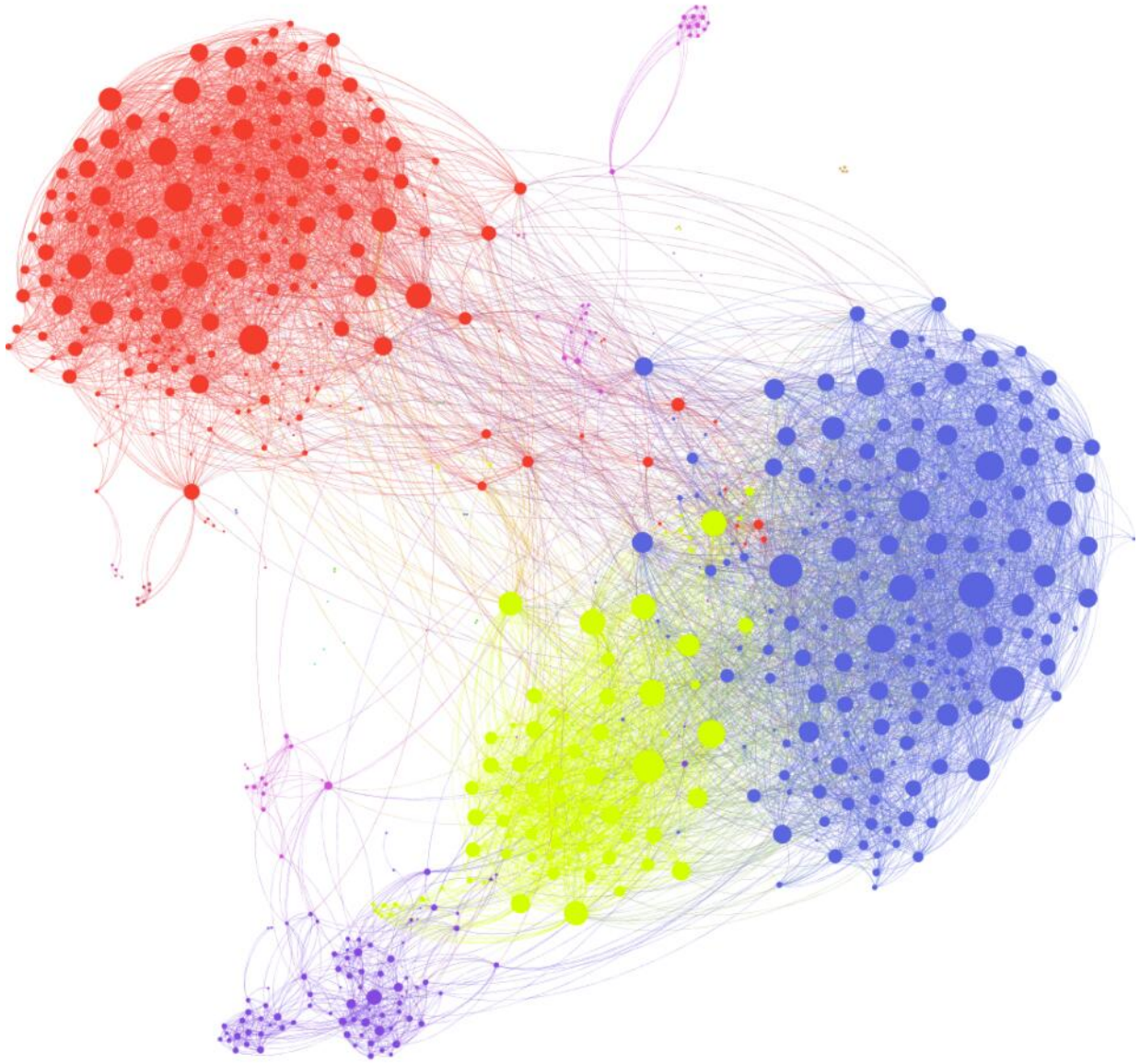
www.hirorobotics.com

- Screwing & Drilling
- Tool Following
- Assembling
- Pick & Place of Static and Moving Objects
- Tracing
- Operator Assistance

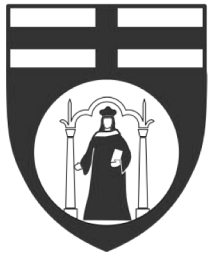

Homberger
Universal Robots
HIRO Robotics
Kuka
UniGe
Shaeffler

SCALABILITÀ


Homberger
Universal Robots
HIRO Robotics
Kuka
UniGe
Shaeffler
AI
HIRO Robotics
Teseo
Partnerships with companies and research centres
Ring Network
dotvocal
STMicro
Teseo
DeepIt
UniGe
Casa di riposo San Camillo
Estimote
Laboratorium
NOClab
TheEngine Room
GRAAL
MAClab
EMARO+
PhD curriculum
EC and industrial contracts
robotics labs



AI/ROBO VALLEY



UNIVERSITÀ
DEGLI STUDI
DI GENOVA

fulvio.mastrogiovanni@unige.it