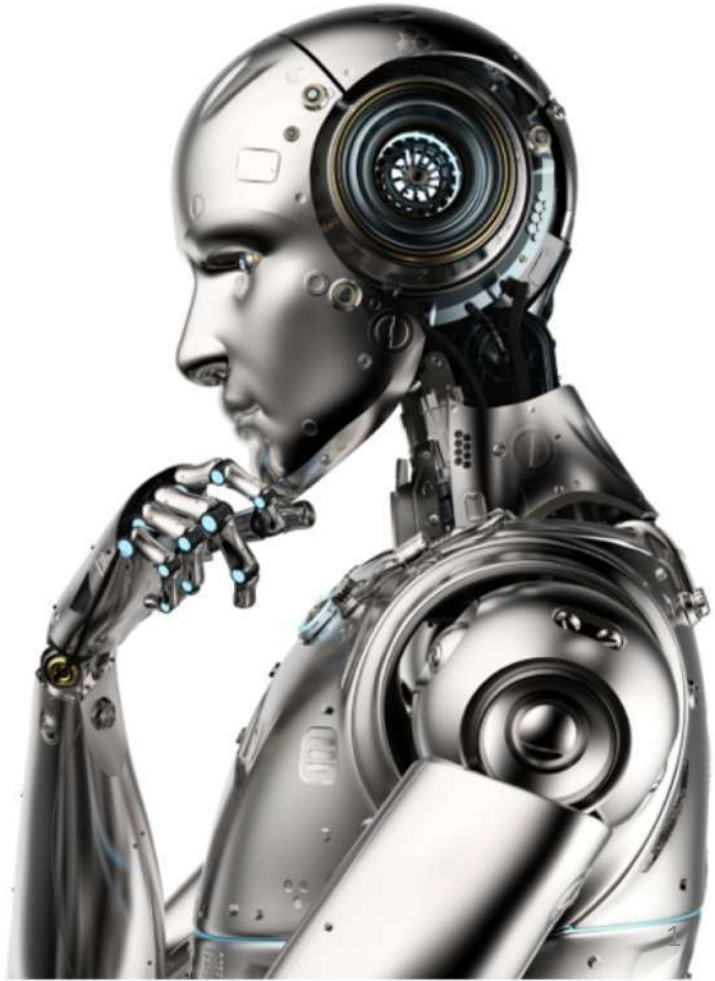
# Artificial Intelligence for Humanities & Social Sciences

Με τη χρηματοδότηση της Ευρωπαϊκής Ένωσης

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ
UNIVERSITY OF CRETE

**TALOS Launching event**
University of Crete - Rethymno
March, 14 - 2023

> *"The question of whether computers can think is just like the question of whether submarines can swim."*
>
> — EDSGER W. DIJKSTRA



1) **Homo Digitalis**
2) **Artificial Intelligence**
3) **Applications**
4) **AI for SSH**

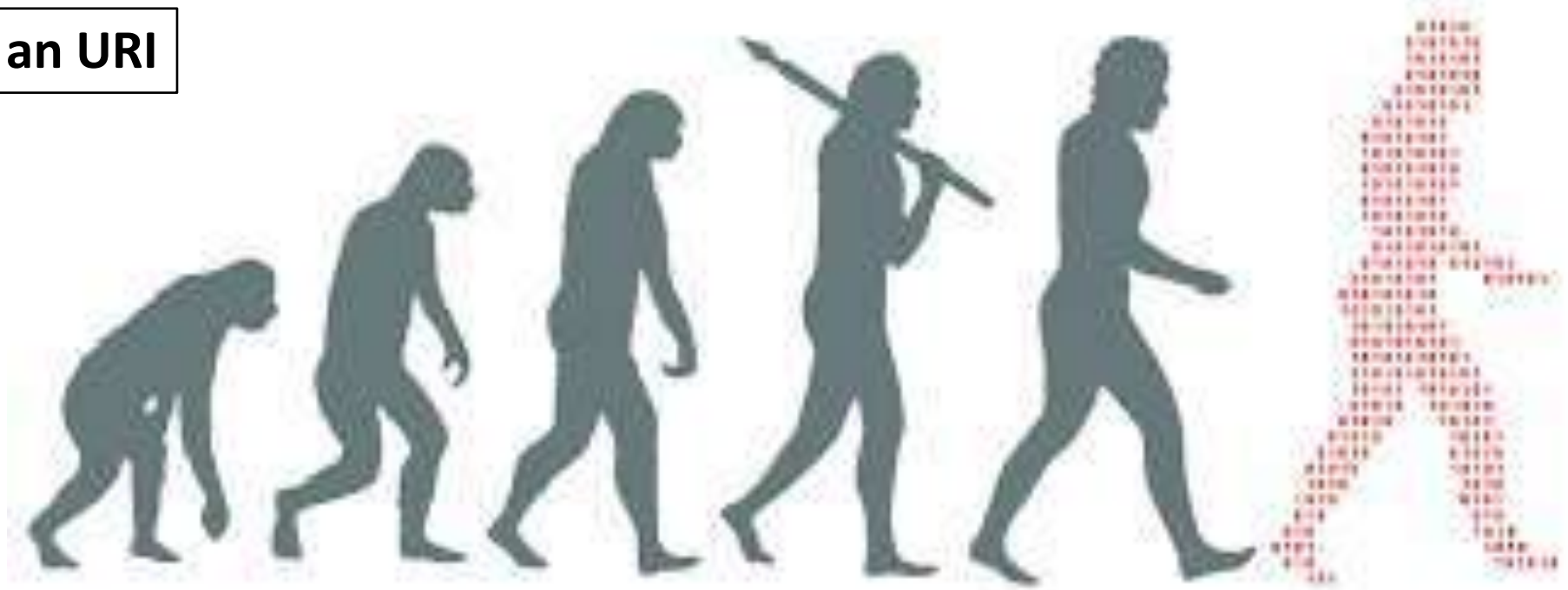
Prof Christophe Roche

University of Crete (Greece) - ERA Chair Holder
University Savoie Mont Blanc (France)

http://christophe-roche.fr/

# 1) Homo Digitalis

**To be is to be an URI**



Set of digits: digital identity
social networks
bank transactions, surfing on the web…

# 1) Homo Digitalis

## Big Data Network

- ✓ Organize
- ✓ Classify
- ✓ Exploit

**Digital Intelligence**

# 2) Artificial Intelligence

## Is a chess computer intelligent?

**It is able to**:

- Represent (the world)
- Reason (on the representation of the world)
- Act (on the representation of the world)
- Learn (on the representation of the world)

## Is ChatGPT intelligent?

As an artificial intelligence language model, I am designed to process and analyze large amounts of data, understand natural language, and generate text that mimics human-like responses.

…it is important to note that I am still a machine and do not have consciousness or emotions like humans.

# 2) Artificial Intelligence

## What is human intelligence?

"The ability to acquire and apply knowledge and skills" Oxford Dictionary

"the ability to learn or understand or to deal with new or trying situations" Merriam-Webster

"the ability to learn, understand, and make judgments or have opinions that are based on reason" Cambridge

Rodin Thinker
Paris (France)

**ChatGPT**

Human intelligence is a complex and multifaceted concept that refers to the cognitive abilities and mental capacity of human beings.

It involves the ability to reason, think abstractly, solve problems, learn from experience, understand complex ideas, communicate effectively, and adapt to new situations.

# 2) Artificial Intelligence

Artificial Intelligence is back in fashion. It has become efficient thanks to the **technical progress** made in **computing power** and **storage capacity**, and on the availability of a **large amount of data**.

"**Artificial Intelligence** (AI) is the part of **computer science** concerned with designing intelligence computer systems, that is, systems that exhibit the **characteristics we associate with intelligence in human behavior** – understanding language, learning, reasoning, solving problems, and so on" *"The Handbook of AI "*

**Strong AI**
Computer is a model of brain.
AI system can think as human does

**Weak AI**
AI System whose behaviour can be said intelligent

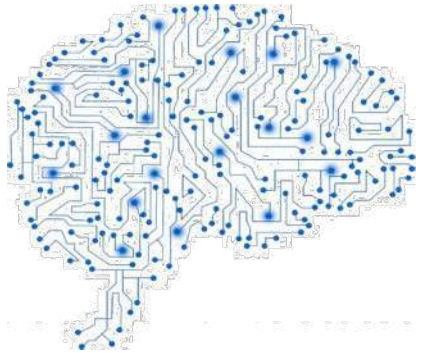
**ChatGPT**

Artificial Intelligence (AI) is the **simulation** of human intelligence processes by computer systems.

These processes include **learning**, **reasoning**, **problem-solving**, **perception**, and **decision-making**.

AI technologies enable machines to perform tasks that normally require human-like cognition, such as understanding natural language, recognizing objects, making decisions, and adapting to new situations.

# Connectionist A.I.



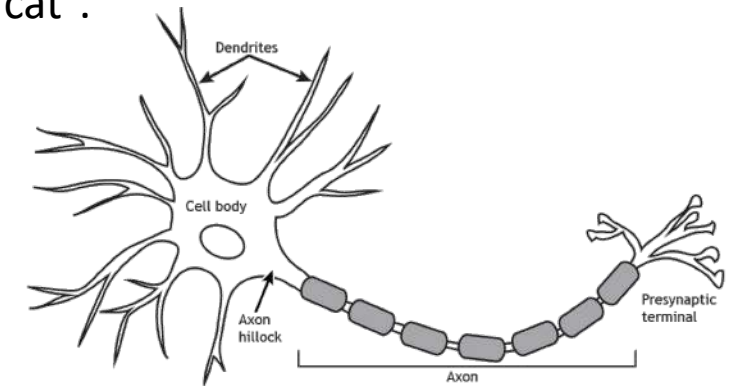
**Connectionist A.I.** is the branch of artificial intelligence which aims to understand how the human brain works at the neural level and, in particular, how people learn and remember.

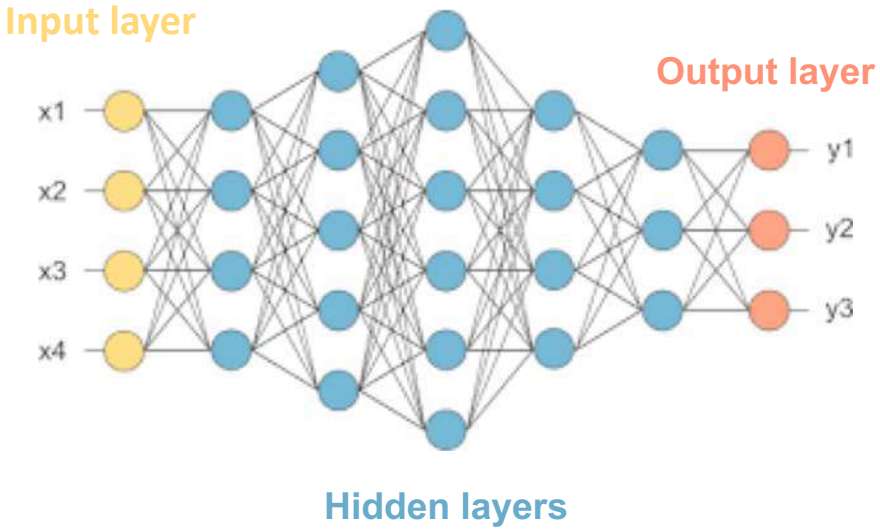
AI is nowadays most often associated with Deep Learning based on neural networks.

## Deep Learning - Neural Network

Artificial Neural Networks are computing systems inspired by biological neural networks.

Such systems "**learn**" to perform tasks by considering **examples**. For example, in image recognition, they might learn to identify images that contain cats by analyzing example images that have been **manually labeled** as "cat".



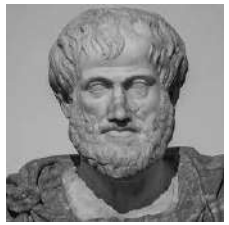




**Finding correlations between inputs and outputs**

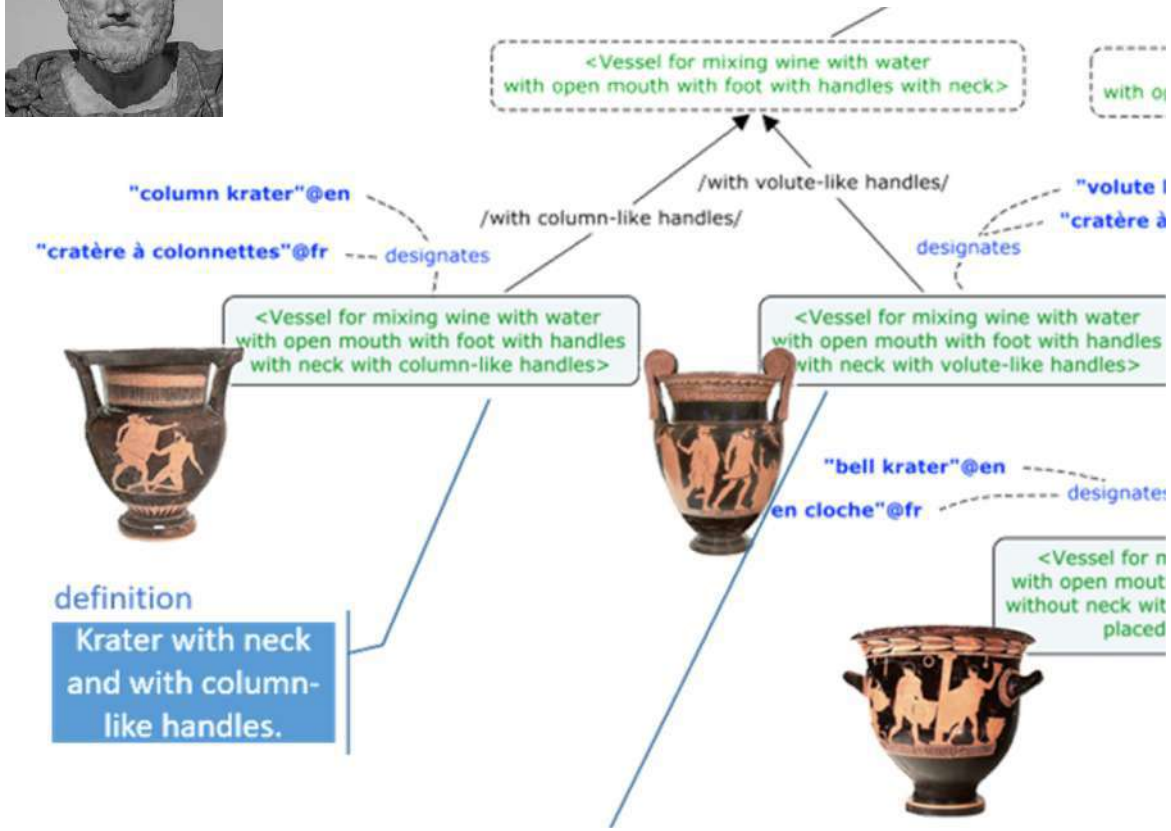
# Symbolic A.I.

**Symbolic AI** (or Classical AI) is the branch of artificial intelligence which aims to explicitly **represent human knowledge** (e.g. facts and rules) in a **declarative form** (i.e. understandable both by human and computer)

Aristotle



## Ontology - Terminology

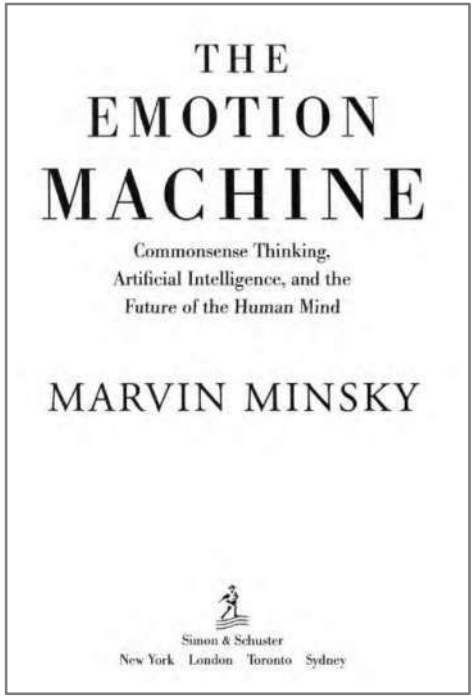


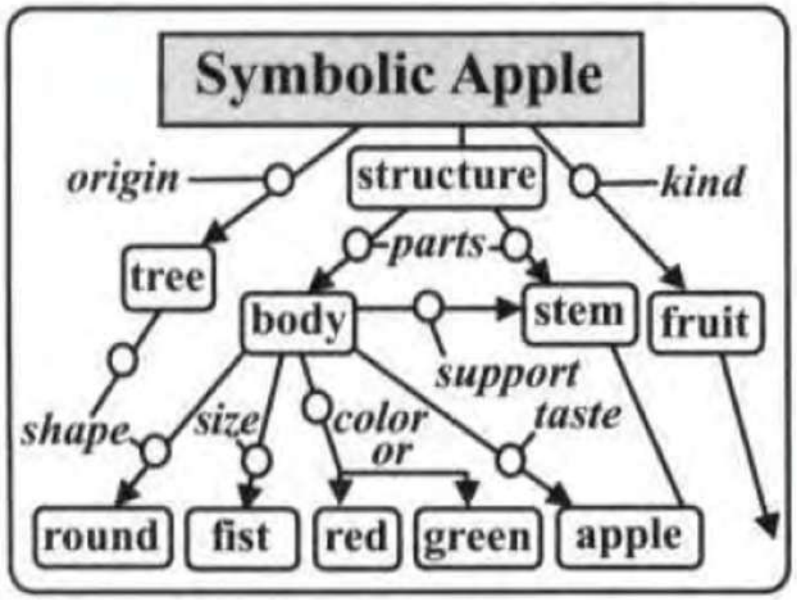

## Expert Systems (reasoning)

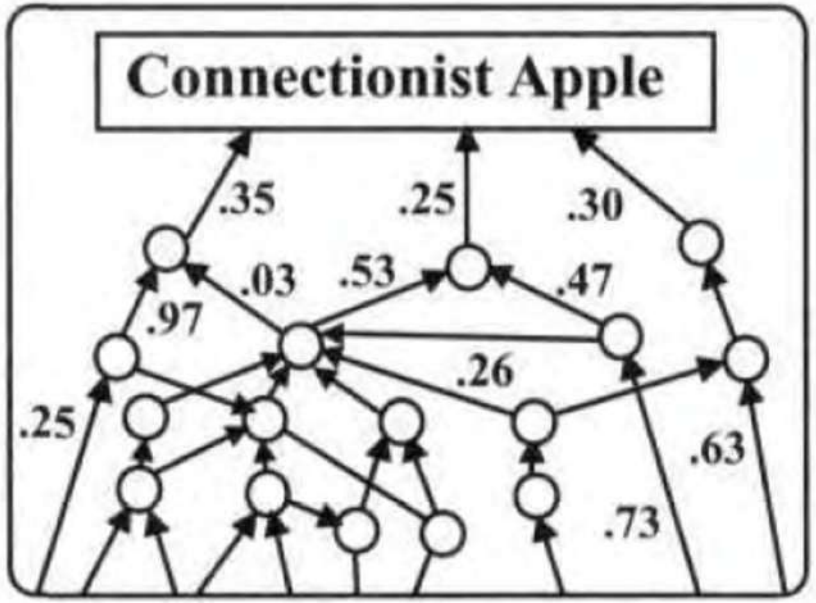
**If** the soil pH *is less than* 6.0
**and**
the soil *has a high level of* aluminum,
**then** it is not suitable for growing most crops.

**If** the stock price of a company *has been rising*
for three consecutive quarters
**then** it is likely to be a *good investment*.

# Symbolic A.I. *versus* Connectionist A.I.




The diagram on the left shows a Semantic Network that describes various features and relationships between various aspects or parts of an apple. The diagram on the right shows an example of what is called a *"Connectionist Network,"* which also displays some aspects of an apple, but does not have any simple way to distinguish between different relationships; it only shows numbers that represent how closely those features are "associated." It would take too long here to explain how such networks

# Symbolic A.I. *versus* Connectionist A.I.

https://www.cyc.com/

**Machine learning is one powerful form of Artificial Intelligence**.

Popular consumer applications such as Google Maps, Facebook's news feed, and Tesla's autopilot have been very successful at harnessing the power of machine learning to **recognize patterns in massive amounts of data**.

But **human intelligence is much more than just pattern recognition**, and **Artificial Intelligence is much more than just Machine Learning**. To earn the trust of decision makers, ML needs to **operate transparently**, to **explain** its conclusions.

**As useful as ML can be, it identifies correlation, not causation;**

**it requires a large volume of training data; and it can't explain its results.**

**AI**
**Black Box**

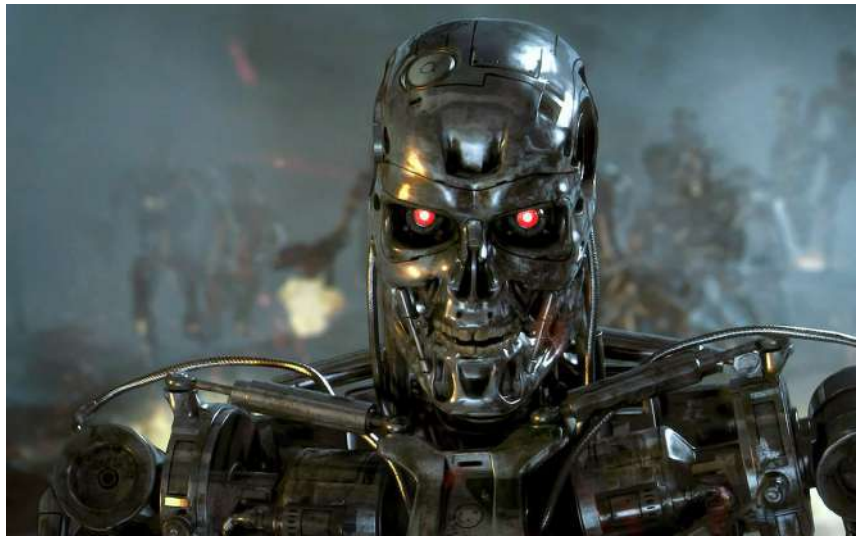
## Hybrid A.I. : Combining Symbolic AI and ML/DL

Brings together the best aspects of neural networks and symbolic AI.

# 3) Applications

## AI is everywhere

# Should we be afraid of A.I.?



**Military robots** are autonomous robots or remote-controlled mobile robots designed for military applications, from transport to search & rescue and attack.

**Autonomous weapons** select and engage targets without human intervention.

*Autonomous weapons have been described as the third revolution in warfare, after gunpowder and nuclear arms.*

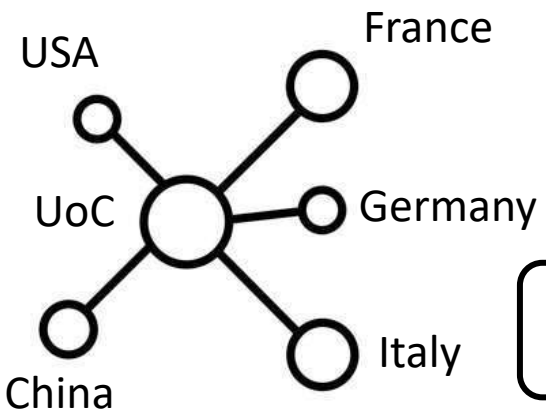
## Facial recognition

Protection?

Surveillance?

https://en.unesco.org/artificial-intelligence/ethics/cases

# 4) Social Sciences & Humanities




**TALOS ERA Chair in AI for SSH**

**A new Research Centre of excellence in Hybrid AI for SSH**

**Faculty of Philosophy at UoC Rethymnon**

- Philology
- History and Archaeology
- Philosophy and Social Sciences

**Research**

**Training**

# 4) TALOS: AI for Social Sciences & Humanities

Valia Aggelaki

Kostas Petrakis

**4 PhDs**

**4 Post-Docs**

Eleni Tamiolaki

Maria Papadopoulou

Christophe Roche

**18 people**

Artemis Karnava

Anastasia Natsina

Stergios Chatzikyriakidis

Stavroula Tsinorema

Eleni Katsarou

# 4) TALOS: AI for Social Sciences & Humanities

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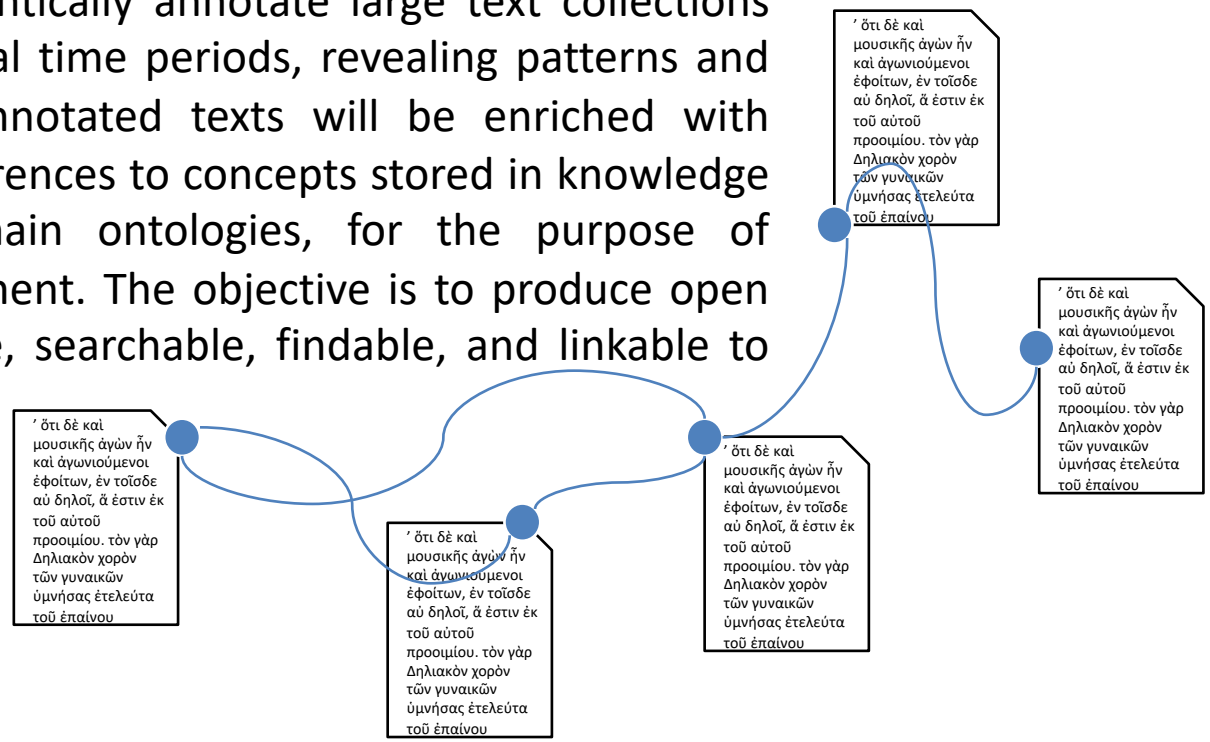
**RT1: Semantic Annotation of Texts**

Eleni Tamiolaki

Maria Papadopoulou

Use Hybrid AI to semantically annotate large text collections that cover vast historical time periods, revealing patterns and biases. Semantically annotated texts will be enriched with metadata, i.e. with references to concepts stored in knowledge graphs, including domain ontologies, for the purpose of effective data management. The objective is to produce open data that are shareable, searchable, findable, and linkable to external resources.




**RT5:**

**HAI**

**SAI**

**ML**

**NLP**

**RT6:**

**Standards**

# 4) TALOS: AI for Social Sciences & Humanities

Valia Aggelaki

Kostas Petrakis

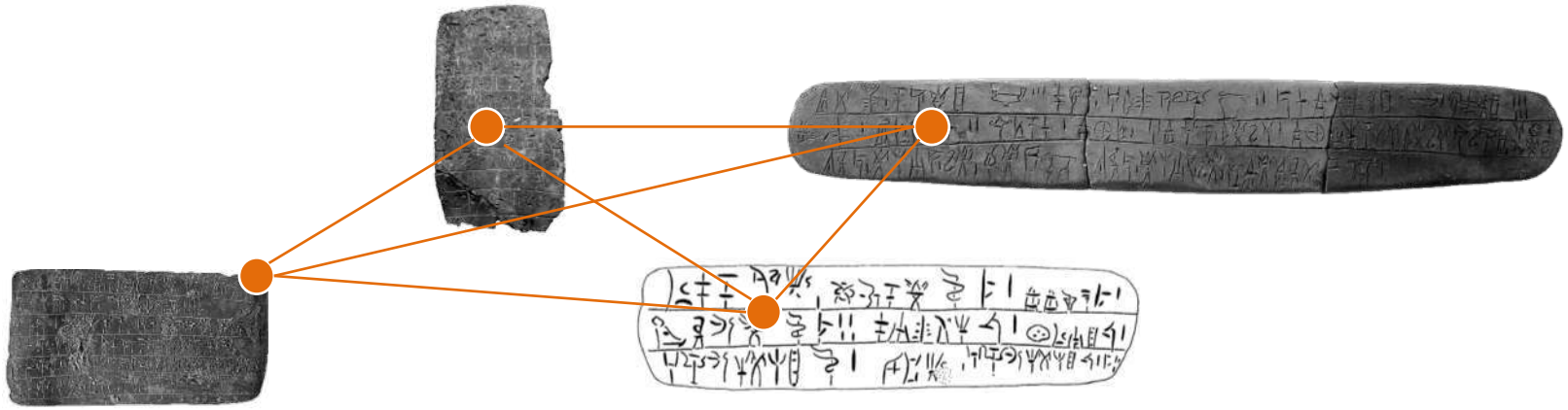
**4 PhDs** **4 Post-Docs**

The objective is to preserve and open cultural items in such a way they can be shareable, linkable and findable. Particular attention will be paid to scarce resources such as linear B inscriptions.

**RT2: Preservation & Dissemination of Cultural Heritage**

Artemis Karnava

DL will be used to complete inscriptions as well as terminology, ontology and knowledge graphs for their representation.



**RT5:**

**HAI**

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**Standards**

# 4) TALOS: AI for Social Sciences & Humanities

Valia Aggelaki

Kostas Petrakis

**4 PhDs** **4 Post-Docs**

Using NLP, Knowledge Representation (KR) and Deep Neural Networks for pattern detection in order to detect linguistic and semantic patterns in a large corpus. The detection of patterns and correlation with metadata in corpora that cover a long historical period and/or different genres is cardinal for an approach to modern literature as historical evidence as well as for the history of literature, history of genres, and the history of concepts and ideas

**RT3: Corpora Analysis**

Anastasia Natsina

Stergios Chatzikyriakidis

**RT5:**

**HAI**

**SAI**

**ML**

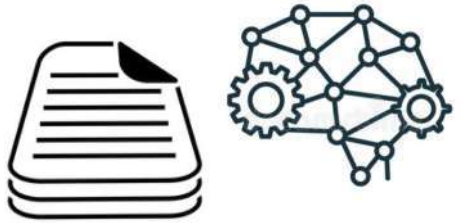
**NLP**

**RT6:**

**Standards**

ISO

WWW



# 4) TALOS: AI for Social Sciences & Humanities

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**4 PhDs** **4 Post-Docs**

"Ontologies are used with great success in education because they allow to formulate the representation of a learning domain by specifying all concepts involved, relations between concepts and all properties and conditions that exist."

"Ontologies in education – state of the art", Stancin, K., Poscic, P. & Jaksic, D. https://doi.org/10.1007/s10639-020-10226-z

Ontologies for:

- ✓ describing learning domains
- ✓ curriculum modelling and management
- ✓ describing learner data
- ✓ describing e-learning services

Applications for Education: Expert Systems

**RT4: Digitalisation of Education**

Eleni Katsarou

**RT5:**

**HAI**

**SAI**

**ML**

**NLP**

**RT6:**

**Standards**

# 4) TALOS: AI for Social Sciences & Humanities

Valia Aggelaki

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**4 PhDs**

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**RT1: Semantic Annotation of Texts**

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**RT2: Preservation & Dissemination of Cultural Heritage**

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**RT3: Corpora Analysis**

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**RT4: Digitalisation of Education**

Eleni Katsarou

**RT5:**

**HAI**

**SAI**

**ML**

**NLP**

**RT6:**

**Standards**

# 4) TALOS: AI for Social Sciences & Humanities

## 1) Enhancing the knowledge of the next generation of students in Digital and AI

- **Opening the University to children and teens**
- **New Curricula in Digital Humanities**

## 2) Dissemination

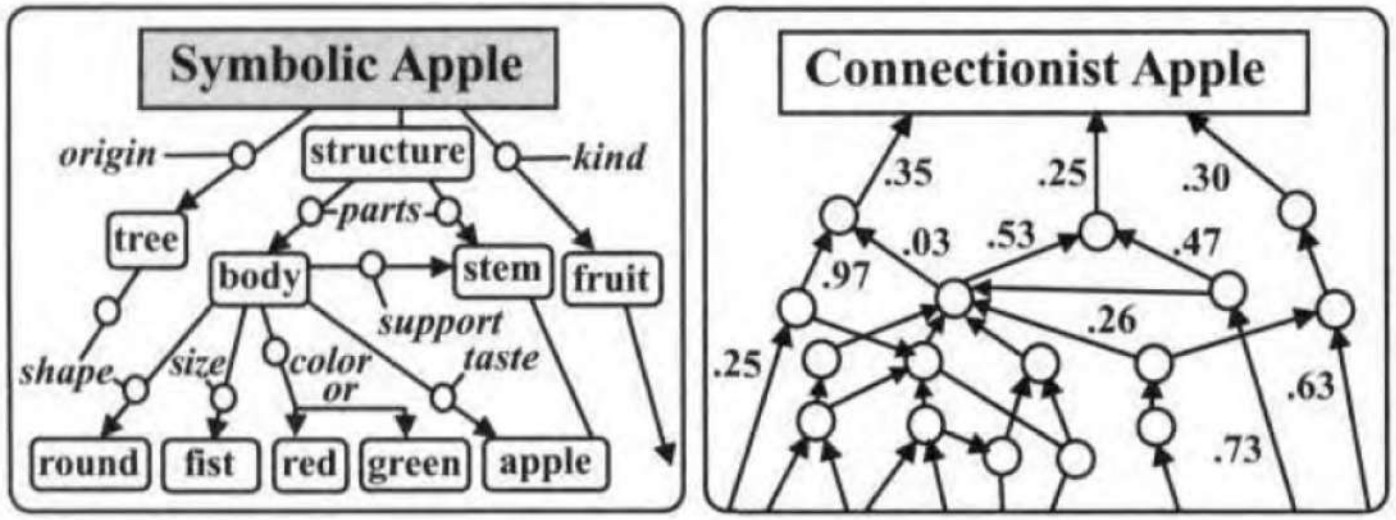
- **MOOCs (Ethics, AI, DH…)**

## 3) International training (on site & online)

**TALOS Virtual Academy**

- **Credits in AI for SSH**
- **PhD Courses**
- **Summer Schools**

# To Conclude: Digital Intelligence



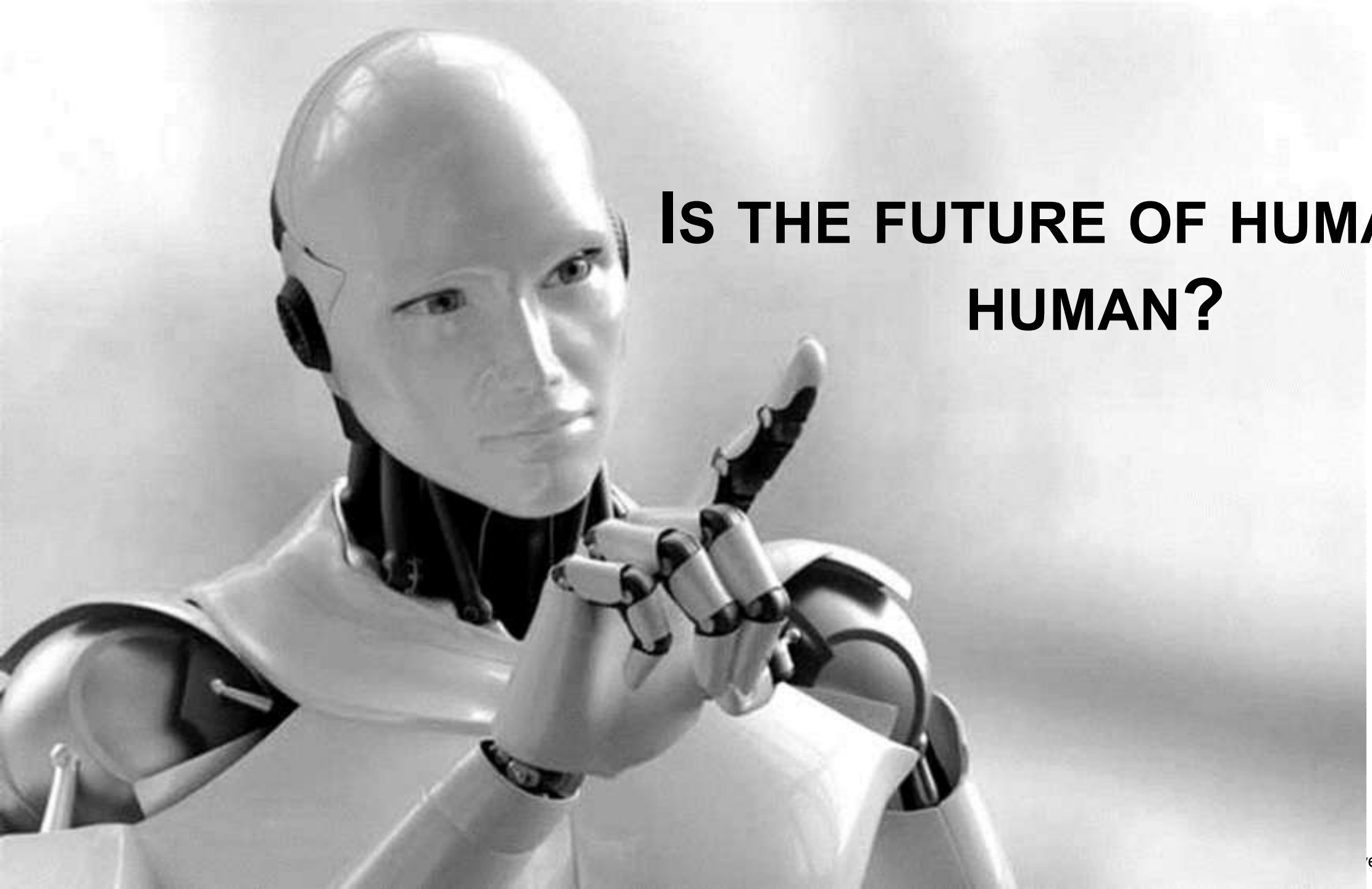

In ChatGPT, **knowledge** is represented through a set of parameters or **weights** that are learned during the model's training process.

These weights represent the **connections** and patterns between different **words** and **phrases** in the text data that ChatGPT was trained on.

**Understanding** in ChatGPT is represented through the model's internal representations and **mathematical computations**.

**New kind of knowledge**
**New kind of reasoning**

**Does it matter to Digital Intelligence to be understandable by humans?**



# IS THE FUTURE OF HUMANITY HUMAN?