

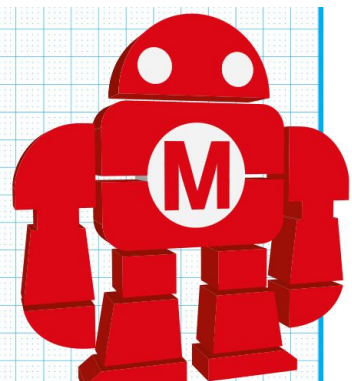


Future
Artificial
Intelligence
Research



UNIVERSITY
OF TRENTO

Integrative AI



Maker Faire - Rome (20 October 2023)

Integrative AI: The Starting Hypotheses

AI can overcome the barrier of complexity with an **overarching interdisciplinary approach** oriented to theories and techniques that **integrate different scientific methods, technologies, disciplines, and competences.**



Integration of different:

- **AI models and techniques** (e.g., neuro-symbolic, model based + data driven inference, ...)
- **AI areas** (e.g., perception, action, interaction, reasoning, ...)
- **AI with other fields** (e.g., formal methods, cognitive science, social sciences...)

Scientific Questions

How does Integrative-AI advance state of the art in:

(Q1) modeling, learning, and inference capabilities?

(Q2) interaction with the environment and humans ?

(Q3) cooperation among multiple artificial and human agents?



(Q1) Modeling, Learning, and Inference

- **Definition of Integrative Models**, e.g. the integration of Neural Networks, Logic, Probabilities, Automata, ...
- **Learning of Integrative Models**, e.g. by (pre-)training with constraints / by interaction with humans and the environment, by planning to train neural networks ...
- **Inference with Integrative Models**, e.g. constraint-based NN inference, symbolic planning from continuous observations, ...



(Q2) Interaction with humans and the environment



- **Perception and Action in the Environment** by exploiting the Integrative Models and the algorithms for learning and inference
- **Interaction with humans** through inclusive, unbiased, trustworthy, sustainable language models
- **Affect-aware mixed initiative interaction**, digital tools that interacts with individuals respecting human's cognitive capacities and social practices

(Q3) Cooperation among multiple artificial and human agents



- How **social rules / conventions affect** the interactions in multi agent systems and how the **rules emerge from the behavior** of interacting agents
- Social and cooperative AI systems leveraging **social learning, social influence, counterfactual learning**
- Cooperation frameworks of AI and human agents to **develop networks of AI and human agents** achieving fairness and social well-being

Integrative AI: Impact



Theories

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

Scientific & Technological Assets



Impact on Market and Society



Digital health



Digital industry



Digital Society

(Q1) modeling, learning, inference

(Q2) interaction with the environment and humans

(Q3) cooperation

WP1
Verification, Synthesis,
and Autonomy

WP2
Models
for Integrative AI

WP3
Multiperspective
Knowledge

WP4
Multimodal
Perceptions

WP5
Natural
Language
Understanding

WP6
Human
Computer
Interaction

WP7
Embodied
Systems

WP8
Cooperative and hybrid human-machine intelligence

WP9
Applications in digital industry, digital health, and digital society

