8 Days at ICA 4 First session in Paris

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Introduction

The Intercontinental Academia (ICA) creates a global network of future res which some of the very best young academics work together on paradigm disciplinary research, mentored by eminent researchers from across the globe [

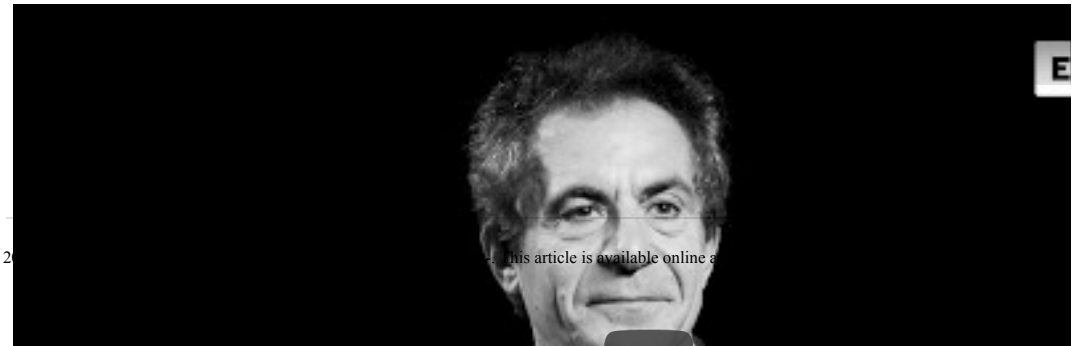
The ICA was established in 2016 through the University-Based Institutes for (UBIAS) coalition, (@cordelois_how_2020) which has 44 member institutes ar

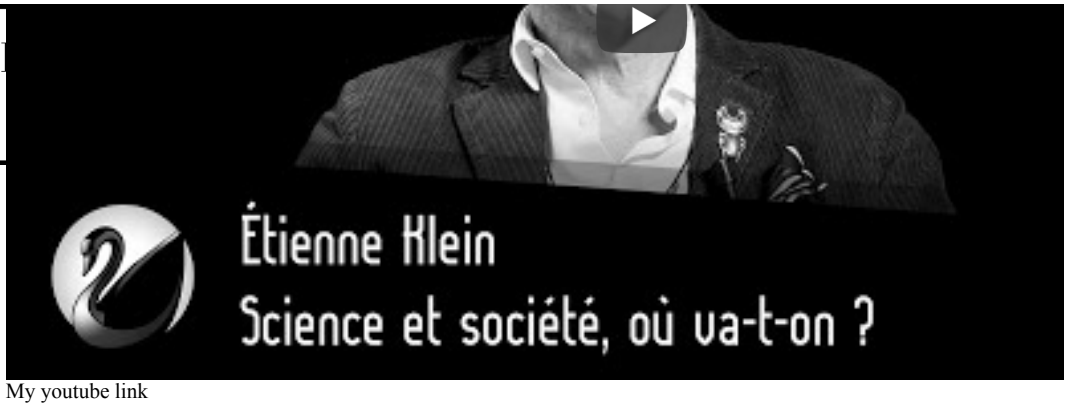
During each edition of Intercontinental Academia, participants get together i over the course of one year.

Previous editions of ICA have focused on "Time", "Human Dignity" and "Lav Dynamics".

The 4th edition of the ICA explores the complementarities between artificial neuro/cognitive-science and the tremendous challenges and opportunities humanity. Fellows and mentors initially met online and in cyberspace, and nov Paris, from October 18 to 27. They shall meet again in cyberspace in the next then finally, in Belo Horizonte in Brazil next June.

The first session, hosted by Paris Institute for Advanced Study (Paris IAS), inc 10-days of scientific sessions, discussion forums as well as scientific excha Paris Saclay, Sorbonne Center for Artificial Intelligence and Ecole Normale Su





My youtube link

Each day at the Paris IAS, ICA4 Fellows meet with their Mentors for a closed during which two mentors launch the discussion with a presentation. Upon cc seminar, the Fellows then meet for 45 minutes to list the key takeaways and emerged from the discussion, followed by a collective brainstorming sessior that the output of collective intelligence is collected, formatted and capitalised.

The other half of the day is left free for participants to reflect on the scientifi small groups. Such discussions are occasionally complemented by lectures fron

Day 1: "The future needs wisdom!"

The very first lecture of ICA4 - Session 1 came from *Robert Zatorre* who t fascinating world of music while explaining the relationship between percept and pleasure!

This was followed by another lecture that introduced a rather different perspe was presented by *Eliezer Rabinovici*. The lecture mostly explored the complexi enquiries and methods in the context of AI.

Before leaving for cocktails and welcome speeches in the chambers of Pa lecture was given by*Helga Nowotny*, who emphasised an urgent need fo context-sensitive AI control system.

Perception, prediction, and pleasure: What can music te about neurocognition/intelligence?

Presented by ***Robert Zatorre***

It was stated during the seminar that the brain represents the properties of and guides behaviour through evaluation and reward. Aesthetic pleasure can b phylogenetically older system that is centred on the striatum.

Moreover, results of the relation between connectivity of the auditory cortex v and several behavioural results were presented (e.g. related to amusia, anhedonia). Dynamic causal modelling and predictive coding frameworks have as possible explanations of the relationship between learning and reward in m make the rewards evolve from a biological event to the expectation of the ever

Through the post-seminar collective discussions, the relevance of affec (pleasure and fear) in learning was emphasised. Discussions concluded with ended question, leaving ICA4 Fellows wondering about whether or not AI similar system for learning, and how should the reward and punishment be Maybe AI does not need to understand or experience human emotions; it just like a human by capturing the features of a dataset that correctly describes the

High Energy Physics: Successes, Challenges and Magi

Presented by ***Eliezer Rabinovici***

It was discussed that observing natural phenomena can motivate scientific er us to understand the unknown. Moreover, equations are a way to increas However, a single, compact and reductionist explanation for all phenomena may not necessarily exist. The scientific method requires that results are re correspondence principle requires that new theories can explain all phenome preceding theory was valid. To understand a phenomenon, one has to ident players and determine the correct explanation scale.

In AI We Trust: Power, illusion and control of predictiv algorithms

Presented by ***Helga Nowotny***

The session began with introducing the concept of singularity and defining point: a change of state that can lead to the collapse of a system. In an at Ethical AI, examples such as Transhumanism (ideas of transcending the limitat body through information sharing) were discussed. Furthermore, the illusion humans better than humans know themselves was elaborated, ultimately mentioning the existence of a possibility for human beings to both profit or su system depending on how it is applied.

"The future needs wisdom": an urgent need to institutionalise context-sensiti creating a standardised system to control AI, was discussed and collectively lead to further debates regarding the concentration of technology advan deteriorating impact on inequality. Thus, a global agreement is necessary although it is currently almost impossible to obtain! Therefore, we should e child of humanity that can grow to contribute to society. AI research is under massive scale that it requires global efforts which go beyond a single countr paid by society, and their curiosity-led work should return to society as a whol

Day 2: "In AI we trust"...or not!**

The ICA4 continued onto the second day, through which three seminars t mentors who had joined the first session in Paris from around the world!

The first lecture was by *Robert Aumann*, a Nobel prize laureate, who convoluted concept of consciousness and its counterparts.

This was followed by a lecture from *Karen Yeung*, who offered a rather critic on the prevalence of AI, as well as some of its surrounding myths and misc then went on to explain how responsibility should be re-defined to consider impact(s) of AI in human societies.

Finally, Raouf Boucekkine took the fellows for an exploration into the wor and finance, using the concept of equilibrium as an example to illustrate between disciplines: mainstream economics VS. statistical physics!

- Why Consciousness?

Presented byRobert Aumann

Essentially, the seminar was focused on the purpose which consci Consciousness was defined as the ability to do the following:

- Perceive
- Feel (emotions)
- Think/intend
- Carry out intentions (volition)

Of all the above, perceiving, thinking/intending, and carrying out intentions r machines. However, feelings and emotions belong exclusively to human be context, it may be argued that the evolutionary function of consciousness i operation of emotions. This being said, we currently have no idea al consciousness work. Although considerable progress has been made in AI, Art (AE) has remained rather untouched.

Myths and misunderstandings about responsibility for t unintended impact of AI

Presented byKaren Yeung

The talk mostly focused on responsibility for the unintended impact of Artifi based on the presenter's Council of Europe study. It was argued that Machine capacity to enable task automation and machine "autonomy" raise important responsibility. Thus, responsibility-relevant attributes of ML were identifiec

illustration is the data-driven profiling of individuals, and other ML applicati hold adverse impacts on human rights, on both individual and collective levels.

While responsibility is important for human beings, who are considered as r maintain peaceful social co-operation within the community, only a few studi on tackling the fundamental role of responsibility for individuals, as well as the

The impacts produced by complex socio-technical systems using ML tec generated a range of concerns that fall under the heading of "algorithmic While existing laws have an important role to play in ensuring the ac algorithmic systems, the implications of these technologies for their interfere rights need to be studied further. This has been the primary focus of Karen Yeu

In a nutshell, two dimensions of responsibility are required:

- Historic or retrospective responsibility: responsibility for conduct and events that occurred in the past
- Prospective responsibility: roles and tasks that look to the future

Finally, five common myths and misunderstandings concerning respons unintended adverse impacts of AI were identified:

- Need for effective and legitimate mechanisms to protect human rights from AI applications.
- Identifications of the appropriate responsibility model for allocating, distributing and preventing the various threats and risks.
- Responsibility of states to ensure that these policy choices are made in a transparent and democratic manner, in order to effectively pro
- Need for more interdisciplinary research
- Application of the fundamental principle of reciprocity so as not to allow those who develop and run our advanced digital technologies and exercise their power without responsibility.

Data science and deep learning vs theory: two example economics and finance

Presented by ***Raouf Boucekkine***

The session included discussions on Data Science, Machine Learning (ML), an theories in the field of economics and finance that share common disc examples from macroeconomics, in which characteristics of the underlying complex systems are of great interest, were then discussed in more detail. In misunderstanding between different disciplines was highlighted: the concept o of great significance in mainstream macroeconomics, whereas this is not the ca physics (e.g., the "equilibrium" bias outside the econ area, discussed b Boucekkine (2020)). Finally, the use of various methods and approaches, (Dynamic Stochastic General Equilibrium), ABM (Agent-Based Modelin Network-Based methods, in the field of macroeconomics were discussed.

Day 3: "What you do FOR people, you do ' people, so do it WITH people!"

Day 3 of the first session of ICA4 continued in Paris IAS, where the Fell three more scientific seminars, followed by discussions and brainstorming sessi

The day kicked off by a framework proposed by *Saadi Lahlou*, called "Insta which enables scientists to analyse and regulate human behaviour. This was c a new technique to capture the subjective perception of action, ultir psychological and behavioural sciences one step closer to what was onc technically impossible task: introspection!

William Hopkins then joined the discussions with some stimulating videos fro on apes, while exploring self-recognition and social cognition in animals.

Finally, Toshio Fukuda revealed the Moonshot project: a society where humans together in 2050 !

Distributed Intelligence & Distributed Agency

Presented by ***Saadi Lahlou***

We want intelligence to perform relevantly adapted actions that change the si we are for the better. To design intelligence, we must first understand the natu activity. In this sense, the behaviour was defined as what people do, seen fron other words, behaviour remains an external description of objective phenomen activity is how people subjectively perceive their action and how they see it perspective.

Installations consist of components that simultaneously support and control. they are specific, local, and societal settings where humans are expected to bel e.g., airport, metro, cash machine, etc. Installations consist of three layers: af physical environment, embodied competencies and social regulations. Inte distributed over these three layers.

The question now is: why do we have these installations? Because installatior of our behaviours and consequently make us very efficient, although our sh cognitive processing are very limited compared to animals. Installations are redundancy produces resilience and learning.

Moreover, certain questions on designing trade-off issues were raised: wh whom? AI agent? what kind of competence for the AI? What affordances? W degree of awareness? To whom does the agent report? How is it evaluated? H "privacy dilemma." In other words, for better service, one must disclose infor

an “agency dilemma”? Can we make it explicit? Because the agency is dis responsibility is shared. It means that we now have the “many hands" credentials for AI were suggested, which include values (what does it tr ownership (who takes responsibility for its actions), principles of action (ru domain of awareness and action), track record (list of transactions executed, training).

To conclude, ICA4 Fellows were left with some questions as food for th activity, do we want to augment existing agents with more agency? If s Humans? Material objects? Social system? New agents? Who learns what? Wh want to foster? What do we want AI for must be addressed for each activity, s activity and discussed?

Perspective on Artificial Intelligence research from stu Agency, self-recognition and social cognition in anima

Presented by ***William Hopkins***

The session began by discussing humans constructed concepts to reflect intelle various domains of cognitive functions. In this sense, we use tests like the W Binet to quantify and scale performance to standards for specific age classes. heavily on language. There are many approaches to developing fair tests of co species with different sensory and motor capabilities. It began with Darwin anc George Romanes (1884) focused on animal intelligence and later on, Kohler (learning. Within the same field, Robert Yerkes (1916) worked on “The mental and apes: a study of ideational behavior”. Yerkes later developed the IQ test u in WW1 (army alpha test).

Upon drawing on some of the literature, several videos were played, in which various tasks including retrieving a peanut in the bottom of a tube followed l an ape imitating a human, and so on. Several animals passed the mark test. E.g a yellow stick in their neck can identify it and try to remove using the parcellation of chimpanzee brain - compared to humans, the ones that passe differences in some cortices. Grey matter differences between MSR+ vs. M analysed the anterior cingulate since such neurones are rather long and conn cingulate with the insula.

Moreover, results from studies that showed that human children outperform social, but not physical, cognition tasks were presented and discussed. Much l in AI, Most early comparative studies of cognition and intelligence were str associative learning theory. However, associative or operant theories of learni notoriously anti-cognitive. In the 1960s, there were attempts to reach communication systems. The goal of the ape language studies was to det language is uniquely human. The answer depends on how we define language.

However, is it language? There is very little evidence for declarative productio the TV, give me an onion) in communication signals by primates and other an

question is: are social stimuli rewarding? For chimpanzees, yes. Experiment: t to see other chimpanzees or another button to see random animals. The chim the button to see other chimps. Thus, the role of reward guides the learning a animals. Although animal cognition is often used to explain animal behavio explained by an associative learning mechanism.

AI and Robots for Future: The Moon Shot Project

Presented by ***Toshio Fukuda***

Robots are avatars that pop up to help when humans need them. There is an physical interaction between robots and humans. Toshio showed several mu e.g., monkey-type robots, multi-locomotion, intelligent cane, etc. One of the Brachiator I-III. Brachiation is a form of long-armed ape locomotion. It uses pendulum, under-actuated mechanical system, variable constraint system, m AI, reinforce learning, soft computing (fuzzy, genetic algorithm). Regarding n types, in many cases, one creature has multiple types of locomotion in orde mobility. The motivation of their study is to develop a robot mechanism architecture that can achieve multiple locomotions. Hybrid computational inte and brain interface were also commented upon by the speaker while show related videos. An example of such videos illustrated the Boston dynamics a three robots dancing and jumping which was quite impressive!

Moreover, AI+Robot+IoT (Internet of Things), the use of robots in meg urbanisation, food, ageing, global warming, robot, and AI) were discussed. Th by further discussions on autonomous cars, which may be safer than humar reality, the Eve project (a transparent body that simulates the human body), cy (fusion of robot and animal), and multiple robots (communication among robot

Day 4: A visit to The University of Paris-S

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(https://lh6.googleusercontent.com/NlgQpGHaBLRystLQsRXAbmAklsdIPADYc

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The Fellows embarked on their first scientific trip for ICA4 and were h **Normale Superieure de Paris-Saclay** throughout Day 4. The sessions at Sacl thought-provoking talks by *Xiao-Jing Wang* and ***Jay McClelland***, both of whi the principles underlying cognitive behaviours, as well as the difference betw machine intelligence. These were followed by a symposium on AI at Univers The symposium was followed by a half-day event with multiple workshops mentors discussed major advances and issues surrounding AI with ot researchers such as ***Stanislas Dehaene***. Finally, the intellectually intense day with a talk in which ***Zaven Paré*** raised important questions regarding how with AI algorithms and intelligent robotics in the decades to come…

Efforts to understand the computational principles unde cognition

Presented by ***Xiao-Jing Wang***

Deep neural networks, despite their recent success, differ from human cogniti have no internal mental life - instead, they act as complex, nonlinear input-outp humans, the prefrontal cortex (PFC) is known to be crucial for cognitive fu working memory, decision making, and executive function. An early avenue involved understanding how persistent neural activity may underlie worki sustaining stimulus information in the brain after the sensory cue has dis persistence is linked to recurrent connectivity, which is lacking in most deep described his previous research using spiking networks and tools from dynar understand the attractor dynamics behind this form of memory. In the second he showcased his more recent work which uses recurrent neural networks (R of a model organism to probe how the PFC may perform multiple simultaneously. These RNNs can then be used to address questions such as v encodes cognitive building blocks in a compositional manner, similar to th concepts of schema.

A different distinction between human intelligence and

Presented by ***James McClelland***

While the latter (in particular machine learning algorithms) learns from statistic input data, humans learn to learn from explanations structured by culturally in Indeed, humans fail to perform in systematic ways, which we would expect were built into our cognitive functionality. But, McClelland points out that sir

structure, as proposed by the pioneers of GOFAI, limits flexibility. This struct argued, is built by culture. For example, he described a classic study by Scrib 1973 which showed that non-Western cultures often lack a concept of absol tend to classify objects based on concrete situations rather than abstract categ These authors proposed that Western education creates a context in which relational concepts are learned, consistent with McClelland's later work cor puzzle performance to mathematical education level. McClelland closed by re learns by examples but humans learn by explanations and that his explanatio (rather than built-in structure) may underlie our propensity for one-shot learnin

Upon completion of the talks by ICA4 Mentors, Paris-Saclay hosted a half multiple workshops in which ICA4 mentors and Paris-Saclay researchers advances and issues surrounding AI. *Stanislas Dehaene* presented a series of fl behavioural evidence that humans use symbolic and recursive strategies on with complex sequences, as compared with monkeys which seem to use strategy. In a session focusing on AI and ethics, *Paola Tubaro* revealed the workers who provide the hand-labelled training data for products such as Siri companies and corporations needing a cheap workforce in the same langu reproducing historic colonial patterns.

Finally, the intellectually intense day came to an end with a talk in whi discussed his artistic works based on electronic marionettes and his coll robotics specialists in Japan. Paré's conception of automaton-centred th audiences while challenging our tendency towards anthropomorphisation. This questions regarding how we will interact with AI algorithms and intelligent decades to come...

[^1]: This is the first footnote.