

Editors-in-chief feedback

Dear authors [...] based on the reviewers' comments, your paper requires major revision.

Thank you very much for considering this draft. We understand that a major revision is required, and detail how we take these reviewer comments here, using italic font.

Review #1 feedback by Ben Wright<dr.ben.j.wright@gmail.com>

Recommendation: Reject and resubmit

Detail Comments While not a full review as this is a resubmit, there are a few comments to be made here.

The paper's complexity does not require 5 Appendices and 95 footnotes. Both are excessive, especially the footnotes - which a number of them are *still* missing. There is (at least) one missing citation as well.

Thanks for this feedback:

- *We have now reduced to two appendices by canceling an application review, thus concentrating on the main message, and restructuring other appendices;*
- *This amount of footnotes was due to the fact we have made explicit the HTTP links, it is now changed, we also have canceled or reported in the acknowledgments all footnotes quoting collaborator's work.*
- *We have corrected the missing reference-s, sorry*
- *We have maintained only, as explained in the draft, demonstrations of statements given in footnotes with title, while only straightforward derivations are required here, to avoid heavy derivations in the text, in particular for readers not familiar with such elements.*

While I had initially said that the clarity of the paper could be improved, the clarity has not improved greatly and the narrative running through the whole article has become more unclear.

We have performed a deep rewriting, including lengthening some side remarks or non-essential statements, and we have rebuilt the presentation of the paper and of each section to make clearer the unfolding of the presentation.

In the future, do not call out reviewers by name (or at all) and the parts they asked to be added to a paper. A thank you to all reviewers in the acknowledgments is more than enough.

Apologies, this has been corrected; we note that some proposed add-ons in the previous review were particularly valuable.

Unfortunately, I believe this paper needs a serious rewrite that is more than cosmetic.

We understand and have done our best to improve it.

Review #2 feedback by Liar Morra<lia.morra@polito>

Recommendation: Minor revision

After carefully reviewing the revised manuscript, and taking into account reviewers' responses, I believe that the manuscript was substantially improved. Nonetheless, I suggest a further round of revisions to further strengthen readability. The revised paper is also quite long and, while I do not have any objections in principle, a strong organization and clear message become even more important, to make the essential concepts stand out also to the less attentive readers.

Thanks for this precious rereading, we have restructured the paper to improve its organization, enlighten important concepts, and entirely revised the introduction

- I would consider revising the introduction. It starts by defining the proposed approach as “unusual”, which I find a bizarre choice of wording. Then it defines the content of the paper section by section and then the contribution. My suggestion would be to write a more conventional introduction summarizing the main issue, the limitations of existing work and the main contribution, and optionally a paragraph illustrating how the rest of the paper is organized. Parallely, I would move the context subsections to a separate section (Context or Related work) and move the notation to Section 2 -

Thank you very much for sharing this precious restructuring proposal, entirely implemented in this version, following your advice.

I am still not convinced by the definitions of symbols, icons and index in semiotics (page 5) – nor whether this introduction is essential to the rest of the paper.

We found it interesting to link to the semiotic approach, often re-invented in various ways when considering symbols. But, indeed, the place was not in the introduction, especially in light of your next comments. It has now been reduced and placed as a discussion aspect, taking, of course, all your feedback into account.

To the best of my knowledge, an “index” is not a special case of “icon”, but rather a different class of sign altogether (cfr. “The type of representational relation the sign bears to its object, or more precisely, to its ground, determines whether a sign is an Icon, and Index, or a Symbol.” [1]). [1] Sánchez-Ovcharov, Carmen, and Mauricio Suárez. "Peirce's Pragmatism, Semiotics, and Physical Representation." *European Journal of Pragmatism and American Philosophy* 16.XVI-1 (2024).

Oh yes! This was just a formulation mistake, and it is now corrected, canceling the grammatical error at the origin of the misunderstanding, sorry. We have also added the reference, read the paper, and rewritten the paragraph.

In semiotics there is no notion of hierarchy, which as far as I understand is introduced by the authors in relation to the complexity mechanisms which, from computational neuro-science, could support the emergence of different types of signs as studied in semiotics. However, this argument is not made in the paper, and the correspondence between the indexical sign and the hippocampus is not

clear to me as object features are not necessarily the only type of index available. Another interesting point to clarify is the relationship between the concept of index, icon and symbol from Figure 3 and the data structure presented in Figure 4. -

You, indeed, are right again; this is only an assumption raised as a perspective of this work. This is now made explicit, and statements are corrected accordingly.

References to individual requests of the reviewers, including naming the reviewers, is highly unusual and I don't see the point. If the authors wish, generally thanking the reviewers in an Acknowledgment section is sufficient. The content of the paper is the authors' responsibility, not the reviewers'. I would also use Acknowledgments instead of footnotes for contributions that do not meet authorship requirements (e.g., footnote 52)

Sorry, this has been corrected; we would like to mention that some proposed add-ons of the previous review were really precious points to address.

In some sections of the paper, many paragraphs contain a single sentence. This happens in the introduction, but also Section 2.2, Section 2.4 and other. I suggest revising as it breaks the flow.

Thanks, this has been corrected following your advice.

In Section 4.3 it is not clear what is the goal or final objective of the agent in the reinforcement learning example, and why the symbolic approach should be better a priori.

Oh yes, this has now been well clarified, thanks.

Figure 15 is not referenced in the text. This example is quite useful and, while details can be found in the referenced report, the description of the task should remain here. It is also useful to report if the task is a standard benchmark from the literature and, in that case, how do the results compare against SOTA techniques.

Thanks for this feedback, we have now followed the recommendation and rewritten the whole sub-section.

I suggest a further round of revision for typos and minor stylistic adjustments. Minor and typos:

- At page 2 line 11, "The notion of extrapolation, allowing exploration and search mechanisms is also designed": what do you mean by designing extrapolation?

The sentence has been rewritten, avoiding the work extrapolation, thus avoiding the lack of clarity.

- At page 3 line 8 a priory instead of a priory *Corrected, thanks.*

- At page 3 line 46 In the [63] it is also equipped with a rather efficient algorithm.: While I would in general avoid the use of citations as subjects or objects, if used then I would not use "the". (In [63] it is also equipped with). *Corrected, thanks, avoiding the use of this citation as an object.*

- Page 5 lines 9-15: please check for flow and proper use of citation quotes *Corrected, thanks.*

- Page 6 line 41 broken reference *Corrected, thanks.*

- Page 6 "Concepts are represented as a hierarchical data structure, in the sense of [23], how made the distinction between associative, sequential and hierar-

chical cognitive memories”. Typo or grammar issue (probably who instead of how?) *Corrected, thanks, the sentence has been split and rewritten.*

- Several references are broken, e.g., Page 6 line 41, caption of Figure 4, Page 7 line 40 *Corrected, thanks, we have been victims of a BibTeX caveat and we carefully rechecked*
- Page 7 lines 40 41: “in compliance compliant with the author formalization proposal”. Repetition *Corrected, thanks*
 - also, it is not clear who the author refers to *Sorry, we have reformulated.*
- Page 12 line 40 Contrary should not be capitalized *Xorrected, thanks*
- Pay attention to the proper formatting of item list, e.g., see page 13 lines 1-3 *Corrected in the whole document, thanks*
- Section 2.6 starts with “Such a projector” but it is not clear to which projector it refers to *Corrected, thanks, the whole paragraph has been rewritten.*
- Page 14 L1-2: List and set can either be empty by default, or equal to a list or set with default value. -> Lists and sets can either be empty by default... *Corrected, thanks*
- Ensure that all titles are numbered (e.g. Page 17 Line 12 is not) *Corrected in the whole document, thanks*
- Page 17 Lines 16-19: probably itemization can be removed here *Corrected, thanks*
- Section 4 title could be rephrased as Illustrative examples or Application examples? *Oh yes, indeed, thanks, done*
- Page 20 line 19 pay attention to the URL embedded in the text, here and in the rest of the page, there are some issues with footnotes *Corrected, thanks*
- Section 5.1 rephrase title as “On the computational efficiency of the method”? *Oh yes, indeed, thanks, done*
- I would also move the references before the Appendix, and not after. *Corrected, thanks*