Defusing the representation-hungry challenge

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The representation-hungry challenge is a popular challenge leveled against anti-representational approaches to the mind sciences. It contends that any *general* anti-representationalist conclusion is presently premature, as anti-representationalists have not yet offered a non-representational account of representation-hungry cognition; that is, cognition aimed at absent or abstract targets. Anti-representationalist tried to face this challenge in a number of different ways, but these attempts failed to convince representationalists. Hence, the need for an alternative way to handle the challenge. Here, I provide such an alternative: rather than facing the representation-hungry challenge, I will try to *defuse* it, showing that it does arise in any *meaningful* form. I'll do so by arguing that the challenge hinges on a presupposition that is factually false, and so that the challenge fails to arise. Additionally, I will argue that even if the challenge were to arise, it won't be a *serious* challenge to anti-representationalism. For, given certain, widespread representationalists assumptions, must concede that anti-representationalists have already met the challenge, and that no additional explanatory work is required on their part.

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1 - Introduction

Anti-representationalism is quite popular in the philosophy of cognitive science: enactivism (e.g. Hutto & Myin 2013; Di Paolo, *et al*. 2017), ecological psychology (e.g. Chemero 2009; Favela 2023), dynamic views of cognition (e.g. Van Gelder 1995) and some unorthodox views of predictive processing (Bruineberg & Rietveld 2014; Ramstead *et al*. 2020) all argue that cognition is best explained without positing representations. Inner content-bearing states are, on these views, not needed to explain cognition.

In a sense I will later (§2.1) qualify, these anti-representationalists are *global eliminativists* about representations - in two ways. First, they are global eliminativists in that they take *no* cognitive - indeed, often no *mental* - process to involve representations. Secondly, they are global eliminativists in that they are both *entity* and *discourse* eliminativists (Sprevak & Irvine 2020). Thus, they defend both the *negative existential claim* that there are no representations, and the explanatory claim that representations are *not* part of our best explanations of cognitive processes.

Despite their popularity many philosophers think these forms of anti-representationalism all suffer from a fatal problem, variously called the "scaling-up" problem (Clark 2013, ch. 6 and 7; Downey 2020; 2024), the challenge of "higher" (Kiverstein & Rietveld 2018) or "real" (De Oliveira et al. 2021) cognition, or - to use my preferred, original label - *the representation-hungry challenge* (Clark & Toribio 1994).

The challenge aims to undermine the justification for these eliminativistic claims, arguing that representations have been eliminated (if at all) only from a small class of cognitive processes. In particular, they have *not* yet been eliminated from so-called "representation-hungry" cognitive processes; that is, cognitive processes concerning absent or abstract targets. Thus, any global eliminativist claim is at least premature.

Anti-representationalists have tried to face this challenge calling upon novel explanatory resources, such as new types of environmental information (e.g. Bruineberg *et al*. 2019), hegelian dialectics (Di Paolo *et al*. 2018) or non-representational mechanism (Kohar 2025). To date, these attempts failed to convince representationalists that the challenge has been met. A different approach, then, is needed.

Here I articulate one such alternative. I won't try to face the challenge, but to *defuse* it: I will argue that the representation-hungry challenge *cannot meaningfully arise from the representationalist's own point of view*. As I shall show, the challenge hinges on a factually false presupposition, thereby failing to arise. And, even if such a presupposition were true, certain assumptions that are central to the representationalist make it such that the challenge has already been met *from the representationalist's own point of view* - and so no *extra* explanatory work is required from the anti-representationalists' part. Otherwise put: I shall argue that, from the representationalist's point of view, the representation-hungry challenge is not a *serious, pressing* challenge to anti-representationalism.

To claim so, I will first reconstruct the challenge (**§2.1**) and then make explicit the presupposition whereupon it hinges (**§2.2**). To anticipate, the representationalist's presupposition is that cognition generally takes place in conditions of *informational unavailability*, such that the information needed to carry out relevant representation-hungry

cognitive tasks is not directly available in the environment itself, and must thus be internally represented. I will then (**§3**) argue that this presupposition is factually false - and so the challenge does not arise. To illustrate the falsity of this presupposition, I will first sketch a vignette that illustrates it in an intuitive and unproblematic way (**§3.1**). I will then anticipate some objections representationalists and cognitivists would like to make (**§3.2**), and show, with appropriate examples, that my point is valid *in general*: *generally*, cognition does not take place in conditions of informational unavailability (**§3.3**). Having so argued, I will claim (**§4**) that even if the informational unavailability presupposition were correct, the challenge would not be a *serious*: given certain central assumptions the representationalist makes, they must concede that anti-representationalists have *already* met the challenge, and that no *extra* explanatory work is required from them. **§5** will then quickly conclude the paper.

A caveat: I am an anti-representationalist, but I won't *directly* defend anti-representationalism here. Hence, in this paper, I will *never* claim that anti-representationalism is right. My aim is different: I want *only* to defuse the representation hungry challenge. My claims is that the challenge does not arise, because it hinges on a false presupposition, and that, even if it were to arise, it won't be a *serious, meaningful* challenge to anti-representationalism (from the representationalist's own point of view). These are the *only* claims this paper seeks to establish.

2 - The representation-hungry challenge

Here, I reconstruct the representation-hungry challenge, showing, *contra* a popular reading (Degenaar & Myin 2014; Zahnoun 2021), that it is not a conceptual argument to the effect that representations are *necessary* to account for representation-hungry cognition. On the contrary, it is an empirical argument challenging anti-representationalism, showing that its global eliminativism is unjustified (**§2.1**). I will then clarify how the challenge hinges upon a presupposition, which I will call the *informational unavailability presupposition* (**§2.2**).

2.1 - Reconstructing the representation-hungry challenge.

One convenient way to introduce the representation-hungry challenge is by looking at the historical context wherein the challenge has been formulated. The challenge is situated in the intellectual climate of the early '90s (the paper itself was published in 1994), which saw a noticeable rise in the popularity of anti-representationalism. Importantly, these anti-representational views were not based exclusively on theoretical argument (e.g. Dreyfus 1990; van Gelder 1995), but also on empirical results, such Brook's (1991) mobots and Beer's (1990, Beer & Gallagher 1992; Beer *et al*. 1992) dynamical system theory analysis of simple robotic agents.

These empirical results are the *starting point* of the challenge. For, Clark and Toribio concede to the anti-representationalist that such result illustrate that representations can be eliminated in certain cognitive tasks, wherein the world can be used "as its own best model" and a worldly signal (or series of worldly signals) can directly drive an agent's behavior. This is what anti-representationalists have empirically demonstrated. But, Clark & Toribio argue, this neither shows nor entails that representations can be eliminated *in general* - even in tasks wherein there is no worldly signal driving the agent's behavior. Thus, any *global* anti-representational claim is unjustified:

> 'Our claim will be that the empirically driven anti-representationalist vastly overstates her case [...] The empirically driven anti-representationalist invokes superficially compelling case studies of complex but representation-free behavior. But these case studies, on closer examination, are compromised by a failure to address the right type of problem, viz. the range of cases in which ambient environmental information is (prima facie) insufficient to guide behavior.' (Clark & Toribio 1994, p. 402)

Anti-representationalists are thus over-generalizing: their models support the elimination of representations only in a limited set of cases - which crucially excludes cases of *representation-hungry* cognition:

> 'The basic trouble (with eliminativism [AN]) is one that afflicts all the case studies mentioned above. It is that the kinds of problem-domain invoked are just not sufficiently 'representation-hungry'. Instead they are, without exception, domains in which suitable ambient environmental stimuli exist and can be pressed into service in place of internal representations.' (Clark & Toribio 1994, p. 418, *references omitted*)

Where "representation-hungry" problem domains are defined in terms of the *absence* or *abstractness* of what I'll here call the relevant *cognitive target*; that is, what the cognizer is cognizing about (Clark & Toribio 1994, 419). I will also call cognitive processes dealing with these domains *representation-hungry cognitive processes* or *representation hungry cognition*.

Clark & Toribio call *absent* those targets that do not deliver a signal that the cognizer can rely on to execute the relevant cognitive processes and orchestrate their behavioral performance. Thus actress Catriona MacColl, the number 3 and tomorrow morning's coffee are all absent in this sense - none of them is sending me a signal enabling me to cognize about (or behaviorally coordinate with) them. For this reason, my *mentally picturing* Catriona MacColl, my *recalling* her scenes in *The Beyond*, my *imagining* how it would be to meet her, or my planning to write an academic paper investigating her role in horror movies are all representation-hungry cognitive tasks. Similarly, in my solving $x^2=9$ I am performing a representation-hungry cognitive task, which deals with an absent target (the number 3). Notice, however, that representation-hungry cognitive tasks need not be "intellectual" and decoupled as the ones just indicated. For example, my behavior concerning my coffee tomorrow morning may involve my *present coupling with a situation*, for example my current navigating a supermarket and buying my favorite coffee beans. Surely navigating a supermarket and buying coffee beans is not intellectual and decoupled in any relevant sense. And yet, insofar these behaviors (and the cognitive processing fueling them) are aimed at an absent target (my coffee tomorrow morning), they are representation-hungry.

Clark & Toribio call *abstract* those targets that, whilst providing *some* signal to the cognizer, provide signals that are "complex and unruly".[1] In such cases, then, the problem is that the

[1] Notice, then, that abstract entities and properties (in the ordinary sense of the term) are, in Clark & Toribio's terminology *absent*, rather than abstract (cf. Chemero 2009, 48-49). In fact, non-spatiotemporally located objects or properties *can't* yield any signal, and are thus absent rather than abstract (Clark & Toribio's sense). In this paper, I will always use "abstract" in Clark & Toribio's sense.

environment provides signals upon which the cognizer cannot *directly* rely to solve the cognitive task at hand. This is because the signals are complex, unruly, hard to parse, because they have different physical manifestations, because they are non-nomic (Clark 2013) or because they are "drowning" in a sea of different, task-irrelevant signals (and are thus noisy). In all these cases the "shape" (so to speak) of the environmental signal itself is insufficient to account for the agent cognitive activity and behavior, in a way that makes the appeal to representational resources natural. Consider, for example, the objects belonging to the pope. These objects are abstract, as they yield no *special, unique signal* singling them out as the pope's object. Hence agents cognizing about them can't rely on such a signal. They must instead rely on a variety of different signals (obviously, the visual signals of the pope's ring will be quite different from the signals emitted by the pope's robes, his mitra and his *ferula*[2]) non of which "reveals" the pope's objects as such. A system responding to the pope's object - or any abstract target - must then be:

> "subsuming a variety of superficially very different inputs under some common rubric, and then defining further processing events [...] over some inner item or pattern whose content corresponds to the more abstract property in question." (Clark & Toribio, p. 420)

Inner patterns that, carrying some specific *content*, seem to qualify as representations in the relevant sense of the term. Similar patterns are required, for example, to recognize something (or someone) through different sensory modalities, or to navigate a supermarket so as to buy the ingredient needed to cook one's favourite meal. In all these cases, the subject is cognizing and coordinating their behavior in response to something that is delivering some environmental signal, but such that the agent cannot rely directly on the *signal itself* to carry out the task at hand.

It should now be clear that representation-hungry cognition is a fairly dishomogeneous class, containing both very "detached" and intellectual cognitive processes, and more "interactive", pragmatic and sensorimotoric ones. This dishomogeneity shouldn't surprise us, however. For, the whole concept of representation-hungry cognition is *disjunctive*: a piece of cognition is representation-hungry just in case the cognitive target is absent *or* abstract.[3]

Why are absence and abstractness central to Clark & Toribio's challenge? To answer, consider the following quote:

> 'In combat situations, support from a high ranking female is often decisive. Monkeys who groom such females tend to receive such support. Hence, it is wise to avoid contests with macaques who have been seen grooming these females. Such avoidance behavior is indeed often found, and persists long after the visual stimulus (witnessing the grooming event) has ceased. Knowledge of the likely behavior of the high ranking female in combat situations that have not yet arisen thus

[2] Latin for the papal stick.

[3] This means, of course, that the representation-hungry challenge is bracketing away what (realistically) are relevant differences between various different types of cognitive processes. One may wonder whether this is warranted: perhaps certain types of processes pose *specific* challenges and problems to anti-representationalism which the representation-hungry challenge ignores. Perhaps - but such challenges would not be the representation-hungry challenge, upon which this paper focuses.

> seems essential to the social organization of the group. Yet a good explanation of such behaviors will prima *facie need* to acknowledge some kind of representations of positions in the social hierarchy, and storage in memory of knowledge concerning past grooming events' (Clark & Toribio 1994, p. 420, emphasis added and references omitted)

Agents, the quote suggests, *do successfully* perform representation-hungry cognitive processes (such as remembering which fights not to pick). And the environment does not *directly* provide them with the relevant information - *definitionally*, as the target is either absent or abstract (in the case at hand, the grooming behavior "flagging" fights not to be taken has ceased). However, agents do have the relevant information at their avail - else they wouldn't be able to successfully perform representation-hungry cognitive processes. And since this information cannot (definitionally) come directly from the environment, then it *seems* that it can only be made available thanks to some internal representation of the agent ("the *prima facie* need to acknowledge some kind of representation" above). *What else* could explain the execution of such cognitive tasks?

That's a question for the anti-representationalist to answer. To substantiate their global eliminativism, then, anti-representationalists should provide a non-representational answer to this question. But their answer is still missing. Hence Clark & Toribio's challenge (Clark & Toribio 1994, 419-421).

Note that Clark & Toribio are *not* claiming that representations are *necessary* to account for representation-hungry cognition: their necessity is only "*prima facie*"; and indeed Clark & Toribio take representations to be (in principle) *eliminable*:

> 'The point we wish to make, however, is *not* that it is simply inconceivable that object recognition, counterfactual reasoning and selective response to rather abstract kinds of features might all succumb to some unexpected, representation-free, kind of explanation.' (Clark & Toribio 1994, p. 421)

Their point is that they haven't been eliminated (*yet*):

> 'Rather, it is that *insofar* as the robot insect/governor style cases are meant to illustrate the tenability of general anti-representationalism, they seem to us to miss the mark. For the problem domains they negotiate are not (yet, at least) the ones on which the representationalist should rest her case.' (*ibidem*, see also Clark 2013, pp. 128-129, 152-153)

Thus the representation-hungry challenge is *not* a conceptual argument for the *necessity* of representations (cf. Degenaar & Myin 2014; Zahnoun 2021).[4] It's an *empirical* challenge to the effect that anti-representationalist haven't yet offered a way to deal with representation-hungry cognitive phenomena in non-representational terms (cf. Kohar 2025).

[4] Ramsey (2007, 238 and ff.) offers a second reading of the challenge as a conceptual (*a priori*) argument. Basically, he claims that insofar Clark & Toribio characterize representation-hungry cognitive processes in representational terms (such as thinking and reasoning), then representations are needed to account for them: unsurprisingly, representational processes *require* the involvement of representations. As (**§4**) will later show, however, not all representation-hungry cognitive processes and tasks are defined representationally.

To further focus and clarify the challenge, it is also important to clarify what Clark & Toribio mean by "representation". To do so, let me start distinguishing *cognitive* from *mental* representations (cf. Ramsey 2007, 46-66; Cummins 1989, Ch.1). By *cognitive* representations I mean the sub-personal and non-introspectable content bearing states upon which computational/representational cognitive science relies to account for cognitive phenomena (Ramsey 2017).[5] By mental representations, in contrast, I mean the personal level representational states we are introspectively familiar with, such as beliefs, desires, imaginings, and more. I also wish to distinguish *public* representations, such as utterances, painting and stop signs, and whose meaning is often thought to derive from our mental and/or cognitive representations (e.g. Searle 1984).

The reconstruction above makes clear that the representation-hungry challenge hinges around *cognitive* representations.[6] Indeed, the challenge consists in accounting for certain cognitive phenomena without calling upon representational explananda; that is, *cognitive* representations.[7] This also explains why Clark & Toribio make *no* appeal to introspection, which would presumably offer an extremely strong argument for *mental* representations. Additionally, no anti-representationalist has (to my knowledge) ever denied the existence of *public* representations - so clearly there is no representation-hungry challenge concerning those.

Can something more be said about cognitive representations (henceforth, just *representations*)? Yes, even if Clark & Toribio are significantly laconic on the matter. To characterize representation, they appeal to Haugeland's (1991) definition of a representational system, according to which a system is representational just in case:

> (i) it coordinates its behaviors with something not reliably present; &
> (ii) It performs (i) by having something "standing in" for the not-reliably present thing, &
> (iii) the stand-in mentioned in (ii) is part of a general representational scheme.

Sadly, they do not expand on what these stand-ins are, or how we should conceive of them.[8] Luckily, a *positive* characterization of representations will not matter for my argument below. The only thing to know is that representations are often thought either as *trackers* (e.g. Neander 2017; Artiga 2022)[9] or *structural analogs* of the things they represent (O'Brien &

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[5] Some philosophers may wish to talk about "neural" rather than "cognitive" representations, and insist that these are observables, and not just explanatory posits (e.g. Thomson & Piccinini 2018; Piccinini 2022). For my purposes here, it is sufficient to notice that cognitive representations (in my sense), include what these philosophers call neural representations. For more discussion on neural representations, see (Drayson 2025).

[6] Pace (Downey 2020, 2024)

[7] Of course, the global eliminativism defended by anti-representationalists must find a way to eliminate these mental representations. For some argument in this direction, see (Noe 2004; de Olivera *et al*. 2021; **anonymized for blind review**). Yet, since my aim is *not* to defend anti representationalism (**§1**), I won't deal with this issue here.

[8] Haugeland's passage is also problematic for other reasons: the appeal to a "representational scheme" makes this definition or clarification of representations circular.

[9] Sometimes they are also called "detectors" or "receptors" (e.g. Ramsey 2007).

Opie 2004; Mamak & Milkowski 2025). For the purposes of this paper, I'll take Clark & Toribio to accept this tradition, and to be neutral on which characterization is the best.[10]

Notice also that Clark & Toribio adopt a "reified" (Zahnoun 2021) notion of representations as *concrete stand-ins physically tokened in a system*. This is important to notice not just because further characterizes the relevant notion of representation, but also explains why *all* anti-representationalists are clumped together as global eliminativists: because they all want to eliminate representations *thusly conceived*. Of course, given a *different* notion of representation, not all anti-representationalists are global eliminativist in the sense described above (§1). Radical enactivists, for example, are entirely fine with there being cognitive processes involving representational contents (e.g. Hutto & Myin 2013; 2017), provided that they are *not* understood as strange "things" somehow carried around by physical particulars inside an agent (Myin 2021; Myin & Van den Herik 2021).

Let me now focus on a central, but often undiscussed, aspect of the representation-hungry challenge.

2.2 - The informational unavailability presupposition

Consider again the macaque case discussed by Clark & Toribio:

> 'In combat situations, support from a high ranking female is often decisive. Monkeys who groom such females tend to receive such support. Hence, it is wise to avoid contests with macaques who have been seen grooming these females. Such avoidance behavior is indeed often found, and persists long after the visual stimulus (witnessing the grooming event) has ceased. Knowledge of the likely behavior of the high ranking female in combat situations that have not yet arisen thus seems essential to the social organization of the group. Yet a good explanation of such behaviors will prima *facie need* to acknowledge some kind of representations of positions in the social hierarchy, and storage in memory of knowledge concerning past grooming events' (Clark & Toribio 1994, p. 420, emphasis added and references omitted)

In this case the relevant targets cannot provide the agent with the information they need to successfully carry out the cognitive process: the grooming events are over (and thus are absent) and the sensory manifestations of social hierarchy (if any) are presumably varied and multifaceted, and are thus abstract. So, no "suitable ambient environmental stimuli exist and can be pressed into service in place of internal representations" (Clark & Toribio 1994, p. 418). Hence the *prima facie* need of internal representations to make the relevant information available to the agent.

Why "hence"? The fact that the relevant target is absent - thus offering no signal the agent can use to organize their behavior - or abstract - thus offering signals that the agent cannot *directly* use to organize their behavior - neither *suggests* nor *entails* that the environment at

[10] if there even is a difference between trackers and structural analogs (see Nirshberg & Shapiro 2021; Facchin 2021a, 2024; Artiga 2023).

large does not make the relevant information available to the agent, directly or indirectly.[11] Even if the target is absent or abstract, there can be environmental sources of information that make the relevant information *available* to the agent. Hence the agent could rely on these *in lieu* of the information stored in inner representations. So, in order for representations to *really seem needed*, something like the following must be assumed:

> **Informational Unavailability Presupposition [IUP]**: In general, environments are informationally hostile to cognizers, such that, if a target T is absent or abstract, and thus does not make directly available the information an agent needs to cognize about T, then the environment does not make available that information either.

If one accepts IUP, then the fact that an agent carries out relevant information-hungry cognitive processes offers a (prima facie) reason to think that representations are necessary. More: IUP is *necessary* for the representation-hungry challenge to raise. For, if IUP weren't valid, then representation-hungry cognition would not stand apart from un-representation-hungry cognition, wherein "suitable ambient environmental stimuli exist and can be pressed into service in place of internal representations" (Clark & Toribio 1994, p.418). And if so, then anti-representationalists would be *justified* to generalize their eliminative treatment to these cases, since they would be relevantly similar to the un-representation-hungry cases they successfully modelled. Indeed - to anticipate a point I will touch upon in (**§4**) - IUP is necessary for representationalism *in general*. For, representations are posited precisely to explain cases wherein it is not possible to appeal to environmental signals (Clark 2013, pp. 128-129; Orlandi 2020).

But IUP, I shall now argue, is false. There are indeed many cases wherein representation-hungry cognitive processes are carried out by directly or indirectly exploiting various environmental sources of information, thereby defeating IUP. The environment *typically* offers the agent enough information to carry out relevant cognitive tasks.

3 - Against the informational unavailability presupposition

I start illustrating the falsity of IUP with a vignette (**§3.1**), which hopefully shows the point in an intuitive and unproblematic manner. I then anticipate three objections the cognitivist/representationalist is likely to make (**§3.2**), and then multiply the examples, showing that IUP does not *generally* hold (**§3.3**).

3.1 - A vignette

Consider the following intuitive vignette.

> It's Benedetta's first time in Milan, and she really can't wait to see the Cathedral. As soon as her plane lands at Malpensa Airport (some 60 Km north of Milan), she rushes to the airport train station. She jumps on the first train she finds, and jumps off in Milan Central Station. She walks along the platform towards the exit, and quickly finds her way into the subway. She takes the "yellow" M3 line and counts three stops. She jumps off the wagon in Duomo, takes the first ramp of stairs she finds and *voitlà*, the Cathedral is there, right in front of her.

[11] Of course, information made indirectly available to the agent need not require the mediation of representations. It may require only the mediation on non-representational causal steps.

This mundane vignette provides a realistic (check on Google Maps) illustration of an agent dealing with a representation-hungry cognitive process; namely, the process of orienting oneself so as to reach a target place - which is absent, given that a human cannot receive any signal from the Cathedral while in Malpensa (some 60 km north of Milan). Notice also that some of the means Benedetta deploys to reach the target location are abstract: there is no "special signal" that trains and metro wagons emit that Benedetta can *directly* utilize to understand which ones she has to take. And these signals are also "drowning" in a sea of other, task-irrelevant signals, which can interfere with Benedetta's activity.

How does Benedetta deal with such a task, then? Surely not by *representing* the location of the Cathedral and a path leading there - by stipulation, it is Benedetta's first time in Milan, so she still has to acquire the information needed to create a "cognitive map" and operate on it to plan her route. How, then, does Benedetta manage to reach the Cathedral?

By using the information the environment *makes available* (directly or indirectly, through manipulations) to her; information that's entirely unmysterious. This information can, for example, come via her phone, thanks to Google Maps app. Or she may ask an information desk (or to the locals) for help. Or she may rely on other sources of environmental information, such as signs indicating the whereabouts of the train station, and the maps of the metro lines and the city present in any subway station. Benedetta can also combine all these sources of information, and rely on them opportunistically, relying on the easiest to consult at every stage of her journey. Regardless of what Benedetta chooses to do, her environment is *ripe* with the information she needs to perform the representation-hungry cognitive task (i.e. physically reaching an absent target). The vignette is thus a (very mundane, entirely unmysterious) counterexample to IUP.

Of course, *a single* counterexample is not enough. IUP says that, *in general*, if a relevant cognitive target is absent or abstract, then the environment does not make available the relevant information the cognizer needs. So, I need to *multiply counterexamples*, to show that IUP is false *in general*. I'll do so in (**§3.3**). Before doing so, however, I wish to anticipate some objections.

3.2 - Three objections

Objection #1 - What about the agent's inner processing?

The first objection is this: the vignette is simply *silent* on Benedetta's neurocognitive mechanism. But looking at them would reveal various types of representations that contribute to various computational processes. So, even in the case at hand, representations *are* involved. And so it *can't* possibly be used to support any form of anti-representationalism.

This objection, I think, is based on a misunderstanding of my aims. I'm not arguing in favor of anti-representationalism. I'm arguing that the representation-hungry challenge does not arise, because IUP is (generally) false. And to claim so, it's sufficient to show that the relevant environment *does* make available the information the agent needs. I do not *also* have to show that there are no representations in the agent's head, so to speak.[12]

[12] Nor that is a conclusion one can reasonably *expect* from the argument. It would be indeed very weird to discover that dissolving an argument in favor of representationalism would entail that representations are

That's *not* to deny that I *would* need to show that there are no representations in the agent's head, *if I were arguing that anti-representationalism is true*. But I'm not. In fact, I am *not* facing the representation hungry challenge; I'm trying to "defuse" it, and show that (from the point of view of the cognitivist/representationalist) it does not meaningfully rise. And insofar I'm interested in *defusing* the challenge, rather than to face it, I'm not forced to provide any positive, non-representational explanation.[13]

Also, even if I were to provide such an explanation, I *wouldn't* be forced to cite (allegedly representational) neurocognitive mechanisms. Explanations of cognitive phenomena and processes can be dynamical (e.g. Thelen & Smith 1994), network-based (Sporns 2016), program-based (Cummins 1977), or evolutionary-biology-based (Cisek 2022) explanations. They need not be explanations in terms of mechanisms. Indeed, at times we *prefer* non mechanistic explanations of cognitive phenomena. Consider:

> (1) The priest to whom I confessed my sins knows the woman who saw the man who has fallen from the bike
> (1*) The man the woman the priest I confessed my sins to knows saw has fallen from the bike

To explain why people judge (1*) ungrammatical despite it being created by repeatedly applying the same grammatical rule[14] to (1), we would normally cite constraints on working memory and processing power, rather than the mechanistic functioning of neural areas. The first explanation seems indeed more concise, apt and clear.

And even if I was *somehow* forced to provide an explanation in terms of mechanisms, it is debatable whether such an explanation *could* be representational (see Facchin 2023; Kohar 2023, 2025; Mamark & Miłkowsky 2025 for discussion). It cannot simply be *assumed* that it will, at least if representationalism is an empirical hypothesis (Ramsey 2017). Indeed, assuming that cognitive mechanisms *must be* representational can hinder scientific progress (Freeman & Skarda 1990; Webb 1994) and force us to adopt an overly-permissive concept of representation (Ramsey 2007; Orlandi 2014).[15]

In sum: the first objection misconstrues my aims here, and does not really deflect my counterexample to IUP. Additionally, it hinges on a number of problematic assumptions that *should not* just be conceded to the objector.

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irrelevant to cognitive processing (which is presumably an empirical claim that can't be established from the armchair).

[13] Notice, incidentally, that this is also why *prima facie* cases extremely resistant to an anti-representational treatment (e.g. cases such as dreaming wherein an agent is not realistically gathering any environmental information and is performing a detached cognitive task entirely in the head) are not a problem. Additionally, the exceptional nature of such cases makes them unapt to defend IUP from my attack: we typically do *not* cognize neither in such a passive manner, nor in unscaffolded, informationally barren environments.

[14] Basically, the rule creates "bare" relative clauses. It transforms, for example "The priest to whom I confessed my sins knows the woman who has fallen from the bike" in "The priest I confessed my sins to knows the woman fallen from the bike".

[15] Largo (2025) makes an analog point in regard to intelligence.

Objection # 2 - The "rest" of representation-hunger, part I: abstractness and informational selection

The second and third objections (whose strongest forms I owe to one reviewer), stress that the scenario I painted above is at best a *partial* dissolution to the representation-hungry objection- in two important ways. I shall here focus on the first, leaving the second for the next subsection.

The first important way in which my scenario is partial is that it only deals with the *absence* of information, but it does not deal with its *abstractness* - the *highly problematic* way in which the information is available to Benedetta. In the example above Benedetta *makes use* of various environmental sources of information, such as public signs and other external representations. But do these signs *directly* provide her with the relevant information she needs, or must she internally (and presumably, representationally) manipulate the signals they provide to make use of them? And how does Benedetta select the relevant informational sources, and why does she select *those* sources of information over *other* sources of information? Why does she, for example, follow the signs to the metro, rather than to the bathroom? And how does she know that she must follow the signs to the metro, rather than to the bathroom (or any other of the signs she might follow)? In short: my scenario may offer a non-representational solution to the *absence* of information. But that's only a part of the representation-hungry problem: *the abstractness* of information is relevant too. And the scenario above does not assess it. Hence, it is at best a *partial* solution to the problem.

My answer is as follows. Recall that I aim to *defuse* the representation-hungry problem by calling IUP into question. Thus, the principle of charity dictates we interpret the objection above as a defense of IUP, rather than a description of Benedetta's cognitive mechanisms that select and make use of the relevant information. On this second reading, the objection would be a variant of objection #1, and miss the mark in the same way.

So, we must read the objection as an attempt to defend IUP. The problem is that the only way to do so seems to be that of reading the objection as suggesting that the relevant kinds of public representations I've mentioned in my scenario *do not make the relevant information available to the agent*. But this is simply false - of course public representations do make information available to the agent making use of them. What other purpose could they serve?

This isn't a rhetorical question - it may be possible to offer a theory of public representations wherein they are not characterized in terms of physical structures that make the information available to an agent. But, as far as I can see, representationalists have yet to offer such a view of public representations.[16] Thus, it's on *them* to make such a view intelligible, argue that such a view is preferable to the "standard" one, *and also* explain why *internal, cognitive* representations should still be characterized as the carriers of information the representation-hungry challenge makes *prima facie* necessary. This is a tall order. And it is the representationalist who has to show that it can be carried on.

[16] Perhaps Ramsey's (2025) content-deflationary characterization of (inner, cognitive) representations may be a step in this direction.

Absent such an alternative view of public representations, it seems perfectly legitimate to call upon public representations to challenge the IUP. Clark himself (2005; 2008, pp. 149-156) used to do so, emphasizing the way in which the information made available by external scaffolds (and sensorimotor engagements with them) makes the appeal to inner representations redundant - so much so that they turn the representation-hungry challenge (and similar challenges) "on their head" (Clark 2005, p. 234)! Sure, Clark stops short of claiming that appealing to these external scaffolds allow us to eliminate *all* internal representations. But *so do I*, at least insofar this paper is concerned. My aim here is to undermine the representation-hungry challenge by attacking IUP, *not* to argue that anti-representationalism is correct.

The representationalist might here retort that I'm evading the relevant question - *of course* external representations make information available to the agent; the relevant point to address is *how* they do that. External representations are in a sense *abstract*: they don't *directly* make information available to the user: they need to be *interpreted*. There is nothing, in the shape of an exit sign that *directly* conveys information about the location of exits. So, how can Benedetta make use of this information *without* resorting to some inner representation? And how can she know which external, public representation to trust, absent some external representation carrying the relevant knowledge she needs?

Fascinating and important as these questions are, *they are not objections to me*. In fact, they are asking for a non-representational explanation of certain phenomena, and so receive the same response I already provided for objection #1. In this regard, it is perhaps worth pointing out that insisting on the *abstractness* or the need to *select information* does not significantly alter my response - and the need to offer representational explanations. As Ramsey (2007, pp 219-220) has already argued at length, non-representational systems that respond to abstract (in Clark & Toribio's sense) targets are fairly common: he offers the case of a car's spark plug firing rate, which is responsive to an abstract, disjunctive set of physical inputs (various positions of the pedals and the control cruise). Later (§3.3) I'll offer a further detailed example of this too.[17] Analogous examples can be provided for informational selection. Clark himself (2013, ch.6; see also Barrett 2011, pp. 49-55) offers such an example by commenting on Webb's (1994) cricket robot. Famously, female crickets (and Webb's robotic model) perform phonotaxis: they localize (and approach) male crickets based on the "song" they emit. Surely female crickets (and Webb's robot) must carry out a sophisticated process of information selection, wherein they single out males' "songs" from the auditory background. How is such a process (non-representationally) carried out? The answer, put bluntly, is by *being deaf* to anything that's not a male cricket song: the very bodily shape of the cricket performs the process of informational selection, allowing *only* the relevant signals (e.g. males' songs) to be processed.

Are such non-representational strategies *generally* valid and available for *all* cognitive processes? Hopefully, it should now be clear that answering such a question - as important and fascinating as it is - falls beyond the scope of the current paper.[18]

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[17] See below my discussion of Gorman & Sejnowski's (1988 a,b) networks.

[18] Let me also add that the representationalist *should not* shun non-representational solutions to the problems of prioritizing, parsing, and selecting information. For, representations do not seem *fit* to solve these problems. Imagine a system relying upon representations to solve them. What tells the system *upon which* representations to rely (cf. Dennett 1990; Orlandi 2016)? Calling upon representations only reframes the

Objection # 3 - The "rest" of representation-hunger, part II: the representational pull

The second important way in which my example is incomplete is that it does not address what we may call - using an useful expression by Di Paolo *et al*. (2017) - the *representational pull*: the "perceived necessity" for representation in accounting for representation-hungry cognition. As Clark and Toribio say when talking of the macaque's fight behavior (see §§ 2.1 & 2.2 above), representations are *prima facie* needed: we have an *extremely hard time* understanding how that behavior can occur *without* supposing that macaques "consult" some sort of inner representation of the social hierarchy. We are also intuitively, extremely tempted to call "representation" whatever inner structure will turn out to uphold that behavior. A good attempt at defusing the representation-hungry challenge would reasonably quench our thirst for representations, so to speak.

A problem in answering this challenge is that it's not entirely clear what our "thirst" consists in, and thus whether the demand to quench it is *reasonable*. For, suppose that our need or preference had a sort of *psychological* or *cognitive* basis: simply put, our cognitive apparatus is unable to conceive of a non-representational explanation of representation-hungry cognition - just like it is unable to parse and understand a sentence with more than 4 or five relative clauses. Our psychological/cognitive apparatus is simply unable to carry out these tasks. Given such a reading of the representational pull, it would be inappropriate to ask my discussion to "quench" our thirst for representations. It is generally inappropriate to ask a philosophical argument to *modify our cognitive architecture* to a degree such that it gets "freed" from its limitations. It would be like objecting to eliminativism about phenomenal consciousness on the ground that reading papers defending eliminativism doesn't make one unconscious! Surely this isn't a fair remark against such an eliminativism; and indeed sophisticated eliminativists do emphasize the fact that, in a way, we can't but believe that we are phenomenally conscious (e.g. Dennett 1988, 1991; Frankish 2016; Kammerer 2021).

A different reading of the representational pull is thus in order. One such reading is *epistemic*: the *prima facie* need for representations refers to the fact that, at present, our evidence basis is insufficient to rationally persuade one to think that the challenge has really been defused. In the case at hand, since my strategy to defuse the challenge has to do with IUP, the objection would be that I've not provided enough evidence to reject IUP. This is surely correct: I've just provided a vignette. I will, however, multiply examples in **§3.3**, showing that IUP does not generally hold. Additionally, **§4** will argue that, even if IUP were to hold, anti-representationalists would be *trivially* able to meet the challenge, which would thus be no challenge at all. This reading of the objection, then, is addressed by the rest of the paper.

Perhaps, then, one could give a *methodological* reading of the representational pull (e.g. Dengsø 2025). The idea, roughly, is that insofar we adopt some form of methodological individualism and focus on individual cognizers "abstracted" from the environment, we are then forced to find a way to reconnect the agent to the environment, granting the former epistemic access to the latter. Representations are just the most obvious tool for this job (cf. Fodor 1980).

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problem at a *higher* level. A non representational solution seems thus needed, on the pain of an infinite regress.

This idea is highly influential - variations of it can be found in classic phenomenologists such as Heidegger (1927/2010), Enactivism (e.g. Stendera 2015) and ecological psychology (Anderson 2017; Anderson & Chemero 2019) - and to a degree is obviously correct. To make the point in terms of the scenario I painted above: if we were to abstract away from the information available in Benedetta's environment, we would seemingly have no way to explain her behavior, other than by positing inner representations. It is not clear, however, how noticing this could constitute an objection to my claims thus far.

Perhaps, then, the problem is that I'm not helping the methodological individualist to get rid of their *methodological* representational pull, as I am calling upon factors the methodological individualist prefers not to appeal to? This is a fair challenge - but one that can be easily met.

Notice that the methodological individualist assumes that representationalism is the *default* position, and asks the anti-representationalist to justify their deviation from the norm. But, as Ramsey (2007, p. 220), this gets the burden of proof backwards in an important way. For, both the methodological individualist and their opponent (here, the anti-representationalist) agree that cognitive processes depend (partially or fully) on the inner states and processes of an agent. In addition to that, the methodological individualist claims that such states and processes are best characterized in *representational* terms. But it's on the methodological individualist to defend this claim and justify its adoption.[19]

The point can be appreciated by looking at the macaque's case that Clark & Toribio (1994) use to illustrate the "*prima facie*" need for representations, what I've been here calling the representational pull. Recall that macaques avoid fighting with other macaques that groomed high-ranking females, and that this avoidance behavior persists even when grooming events are not observable, suggesting that macaques internally represent the social hierarchy of their troupe, as well as past grooming events (cf. Clark & Toribio 1994, p. 420; see also **§2.2** above). Is the methodological individualist free to *assume* that such representations are present?

The answer is squarely negative. The standard practice in comparative account of cognition is that of *not* positing representations unless it is *shown* that they are needed there is independent proof of their existence, and no non-representational, merely associative explanation can do the job (e.g. Wasserman & Zental, 2006, pp.4-5; Barrett 2011).[20] This is taken to be a straightforward application of Morgan's Canon (Morgan 1903), which is a methodological pillar upon which the study of comparative cognition is founded.

So, the standard practice (at least in comparative accounts of cognition) is that the methodological individualist (and representationalist more generally) must *argue for* the positing of representations. The burden of proof is *on them*. And it seems a hard burden to carry, given the fact that alternative, "merely associative" explanations exist. For, the affiliation of monkeys in groups and sub-groups has much to do *with how they are spread in*

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[19] Of course, by making a negative existential claim (i.e. that there are no representations) the anti-representationalist must also meet a substantial argumentative burden. Recall, however, that this is *not* a claim I'm making here. My aim here is just that of dissolving the representation-hungry challenge.

[20] Such a literature often takes the representational and the cognitive to be coextensive (cf. Buckner 2011), and contrapposes the cognitive to the "merely associative", which is exemplified by various forms of conditioning and reinforcement. It seems thus warranted to conclude that the associative is non representational.

space - for example, with how they divide in groups to forage, or how they occupy different "safe spaces" to sleep. Additionally, monkeys that are closely affiliated tend to occupy the same space, both because of grooming activity (which require proximity) and because they tolerate each other's company the best (Barrett *et al*. 2007). Additionally, social monkeys *do often* display dominance (and submission) cues which are highly salient, highly stereotyped (and thus, *not at all abstract*) and at times in so clear and unequivocal even non-trained human observers can pick them up and navigate the monkey's social hierarchy (Miranda 2014). Thus, dominance is often visible, and can be associated with non-dominant individuals in virtue of the fact that dominant and non-dominant individuals are often perceived together.

Notice that the above is no weird shift of the burden of proof due to the peculiar methodology adopted by comparative studies of cognition. The burden of proof remains squarely on the methodological individualist side even when accounting for *human* cognition. Even in the human case the positing of representations has to first *exclude* that non-representational, "purely associative" explanations are sufficient. For example, to reintroduce representation in the study of language, Chomsky (1959) had to argue that purely associative explanations based on operant conditioning were *insufficient* to explain how and why we follow linguistic rules, and how we learn them.[21]

Are these observations enough to escape the *methodological* representational pull? I think the answer is positive. For, they halt the methodological solipsist from making a *default* explanatory appeal to representations. Of course, these observations do in no way demonstrate that there are no representations, and so that anti-representationalism is correct. But, to repeat, that was never a point for this paper to establish. Time, then, to get back on track, and generalize the point my example (**§3.1**) illustrated: IUP does not generally hold.

3.3 - Generalizing the point

My vignette showed *one* case wherein IUP does not apply. IUP, however, claims that, when targets are absent or abstract, the environment does not *typically* contain the relevant information. This is entirely compatible with there being one (or few) counterexamples. So, to motivate a rejection of IUP, I need to multiply them. Luckily, that isn't a hard task.

Consider, first, our human (typically urban) environment. Many philosophers and cognitive scientists noticed that we compulsively restructure and reshape it, to make it *friendlier* to our cognitive processing. A huge part of that consists in *informationally enriching the environment*, forcing it to "carry" various pieces of information our brains find inconvenient to carry (Clark 1997, 2008; Sterelny 2010; Pezzulo & Nolfi 2019; Constant *et al*. 2022).[22]

One example is offered by the way expert sudoku solvers mark each cell on the grid so as to embed in the sudoku grid *itself* the relevant information on possible values for the cell and

[21] For a longer, more detailed exposition of these points see (Moro 2008, ch. 1). See also (Chemero 2009, pp. 6-7; Piantedosi 2023) for critical discussion of Chomsky's arguments.

[22] I will here remain neutral on (a) whether such external structures actually "extend" our mind (e.g. Clark 2008) and (b) whether they can also have a negative impact on our cognitive lives (Timms & Spurrett 2023; Coninx 2023).

value-dependencies between cells.[23] They are cognizing about targets that are surely absent (numbers presumably send us no signal), and yet they do so in informationally enriched environments, whose enrichment is specially tailored to accommodate their relevant cognitive processing and routines. Designers and artists, to give another example, decide how to modify their products by interacting with them or things substituting for them such as models, preparatory sketches, physical prototypes and the like (e.g. Gedenryd 1998; Van Leeuwen et al. 1999). Again, their thinking takes place in an environment hosting structures carrying the information the cognizer needs. In both cases, targets are absent and/or abstract, and yet the environment still contains relevant information about them.

Examples easily multiply. Expert bartenders line up cocktail glasses so as to mirror the sequence of drinks ordered, "offloading" the remembering to the glasses themselves (Beach 1988). Expert tetris players rotate the falling pieces on the screen multiple times to extract the information they need to decide where to place them (Maglio & Kirsh 1992). By physically separating, say, the washed from the unwashed mushrooms, one can easily distinguish the two and quickly determine whether each mushroom has been washed (Kirsh 1995).

Zooming out from the need of specific cognitive agents reveals the same pattern. Our cities are *littered* with signs telling us what's where and helping us reach our destination. We created and continuously maintain a complex public infrastructure enabling us to access (basically 24/7) potent, easy to carry computers able to retrieve tons of information we need during our day to day life - telephone numbers, appointments, birthdays, celebrations, and more. And, we are generally *decently* cooperative: in many cases, you can simply ask for help, and receive the relevant bits of information from some reasonably secure societal source.

It seems, then, that the spaces we create for ourselves often contain, and are engineered to contain, much of the information we need to solve the cognitive challenges we face. But if so, then IUP seems to be false: our environment will typically contain exactly the information we need to cognize.

What, however, about cognition in environments that have not been so informationally enriched? Maybe our informationally enriched environments are the exception, and IUP remains generally, typically true in spite of them. If that were the case, then, the bulk of animal (i.e. non-human-animal) cognition would confirm IUP.

And yet, many animals have ways to "squeeze" the information they need out of their environment, even when they are performing representation-hungry cognitive processes (and their environments are informationally impoverished, as it often happens in laboratory settings). Jumping spiders, for example, plan and select alternative routes to their play by enacting a "dance" which visually acquaints them with the most direct path to their goal (see Tarsitano 2006; Tarsitano & Andrew 1999; Tarsitano & Jackson 1997, 1994). Numerous species of wasps remember if they have already visited a location by chemically marking it, rather than by internally encoding a memory trace (e.g. Höller & Hörmann 1993; Sheelan et al. 1993; Bernstein & Driessen 1996; Nakashima et al. 2002; Ayasse & Jarau 2014). Strains of

[23] The youtube channel *Cracking the Cryptic* offers an ample sample of such techniques (https://www.youtube.com/@CrackingTheCryptic)

bacteria and yeasts - organism sometimes taken to be *definitionally* unable to represent (cf. Fodor 1986) - are able to anticipate and prepare for the presence of future environmental stressors relying on associated external cues (e.g. Tagkpoulus *et al*. 2008; Dahar *et al*. 2013).[24]

The informational richness of the environment is also underlined by the behavior of certain *robotic* agents, able to solve complex representation-hungry tasks even if "equipped" only with extremely simple cognitive architecture. Simple artificial agents can discriminate between items yielding largely overlapping signals by manipulating them (or, better, the visual signal they receive), without resorting to prior assumptions encoded in the visual system (see Nolfi 2002). Robotic agents with no memory storage can *learn* how to solve fairly complex T-mazes (and variants thereof) by "encoding" the information they need in their position in respect to the walls (Bovet 2007; Bovet & Pfeiffer 2005; Carvalho & Nolfi 2016).

It seems, then, that even "in the wild" the environment is often more rich in information than IUP credits it for. Indeed, at times the environment is *so* rich that even *abstract* signals can be sufficient to carry out a representation-hungry cognitive task - in absence of any "informational enrichment" of the environment or strategy to "squeeze" more information out of it.

Here's one example. Take the task of discriminating between rocks and mines using *only* the sound bouncing off of them. This cognitive process is a representation-hungry one: for, the signal given is abstract, as there is no discernible "signature" difference in the signal that tells apart rocks from mines. This is precisely why the task of classifying them is challenging and interesting to model, and why in fact it has been modeled.

Still, this signal provably carries *enough* information to allow for the task to be carried out. For, a simple (feed-forward, non recursive) artificial neural network with no middle layer *can* classify mines and rock correctly based on their sonogram alone with a high degree of accuracy (Gorman & Sejnowski 1988 a,b). Since the network has no hidden layer(s), we know it is using *no* inner representations to "supplement" the environmental signal, as representations in artificial neural networks consist in patterns of activity of the hidden layer(s) (Clark 1993; Shea 2007, 2018; Churchland 2012). Hence, the information it receives from the signal *must* be sufficient to carry out the task.

Aren't the network's *connections* representations too (e.g. Grush & Mandik 2002)? Only given an *overly liberal* definition of representation. Indeed, few philosophers interested in representations would count them as such (Ramsey 2007; Orlandi 2014, 2018). For, as anticipated in (**§2.1**) philosophers think about representations either as *trackers* (e.g. Neander 2017) or as *structural analogs* of the things represented (e.g. O'Brien & Opie 2004). Clearly connections are not trackers: when the network is operating, connections *are fixed*, and do not change in response to stimuli. They are not inner states that track the network's environmental contingencies. So, connections cannot satisfy the tracking conception of representation, no matter how its finer-grained details are specified. Also, connections are *not* structural analogs of the things they purportedly represent. For, no matter how this structural conception of representation is specified, it requires some sort of *stable*,

[24] For more such cases, see (Japassu & Laland 2017; Kiverstein & Sims 2022; Facchin & Leonetti 2024).

one-to-one (or roughly one-to-one) mapping from the representation to the represented item or items (see Artiga 2023; Facchin 2024). But if connections encode information, they do so in a *holistic* manner: each connection encodes information about *multiple* allegedly represented items, and each item is (allegedly) represented by multiple, if not all, connections (see McClelland & Rumhelart 1986, p. 176; Van Gelder 1991). It seems, then, that there is no relevant one-to-one (or roughly one-to-one) mapping from connections to represented items. So, no matter how the finer-grained details are specified, it seems that the connections *cannot* satisfy the relevant, structuralist notion of representation (Facchin 2021b).

In the case at hand, then, a network is dealing with a representation-hungry task, without relying upon internal representations and without enacting any strategy to informationally enrich the environment or "squeeze" more information out of it. I don't see how one *could* avoid the conclusion that - at least from appropriately attuned agents[25] - the environment is *not* informationally impoverished as IUP argues. And, the mass of examples provided above suggests that that is often the case - that is, environments are typically richer in information than IUP depicts them, and thus IUP is false.

A representationalist might complain that my analysis has thus far been *way* too glib. Why haven't I analyzed all the cases I have mentioned here to show that representations aren't involved (as I just did for the neural network case)? And, absent such an analysis, how can I exclude that (to repeat the sequence of examples above) designers, artists, bartenders, jumping spiders, wasps, bacteria, yeast, and a host of robots do not rely on representation when solving their relevant tasks? Am I simply *assuming* the anti-representationalism I wish to support? This challenge requires a thoughtful response - especially given how *easily* we can mistakenly deprive of representation and cognitive flexibility some, *prima facie* simpler, agents, such as insects (Keijzer 2013).

As I repeatedly explained above (**§3.2**), however, this remark gets both my aim and the burden of proof backwards. I am *not* arguing in favor of anti-representationalism, so I don't have to claim (and thus, to *defend*) the view that no representations are involved in the cases at hand. I only need to show that IUP does not generally hold. Indeed, it's the representationalist who must defend their claim that representations are involved. And they must do this both against the fact that some systems are explicitly characterized as not involving any representation (e.g. Carvalho & Nolfi 2016; Nolfi 2022), and the increasingly high number of papers analyzing *prima facie* representational systems and finding no representation in them (Ramsey 2007; Orlandi 2014; Hasson *et al*. 2020; Facchin 2021b, c, 2023; Anderson & Champion 2022; Davies-Barton *et al*. 2024).

For similar reasons, the representationalist cannot retort to my conclusion by offering some sort of counterexample to the wealth of empirical evidence exhibited above - not even if such a counterexample were to involve some highly detached, paradigmatic representation-hungry phenomenon like recalling an event in the absence of any external "trigger" for such a memory event. For, *I am not defending anti-representationalism*, so I do not need to commit to the claim that the environmental information is *always* enough to allow cognitive agents to throw away representations. I am trying to attack the

[25] For some - admittedly speculative - sketches of how our cognitive architecture could be so attuned, see (Hasson *et al*. 2020; Davies-Barton *et al*. 2024).

representation-hungry challenge by arguing that one of its crucial presuppositions is false. To properly defend the challenge, one should find a way to conclude that IUP is true; that is, that environments are *generally* informationally impoverished as IUP claims.

I must confess I don't see *how* the representationalist/cognitivist could argue for that conclusion. But even if they could, there would be an additional problem. Even if the representation-hungry challenge was able to arise in the desired form, cognitivists/representationalists cannot take it to be a *serious* challenge to anti-representationalism. For, given some widespread cognitivist/representationalist assumptions, anti-representationalist have *already* faced it - indeed, they have been facing it all along. Let me unpack.

4 - Representation hunger: trivially satiated

Assume, for the sake of argument, that IUP is true and that the representation-hungry challenge can arise in full force. Still, the cognitivist/representationalist is forced to concede that the challenge is not a *serious* challenge. For, given certain very widespread cognitivist/representationalist assumptions, anti-representationalists have done nothing *but to meet the challenge* this whole time. So, from the cognitivist/representationalist point of view the challenge has been met *trivially*, without requiring any additional work from the anti-representationalist part.

For, generally representationalists/cognitivists take perceptual targets to be *abstract* (Orlandi 2014). Cognitivist theories of vision, for example, assume that the visual input is informationally impoverished, as retinal images are ambiguous, and do not correspond in any 1:1, unambiguous fashion to the external objects we see (see Marr 1982; Rock 1997; Palmer 1999; Friston 2005; Rescorla 2015). For example, a circular retinal image of radius *R* may be protected by a sphere having radius *r* and being *d* meter away from the observer, or by a sphere having radius *2r* and being *2d* meters away - and, in general, by any sphere having any radius *xr* and standing *xd* meters away, as well as by appropriately placed cylindrical, conical and egg-shaped objects. Visual objects, then, offer no "signature" signal revealing us their nature, and are thus abstract in the relevant sense. A similar pattern of reasoning can be applied to other sensory modalities too.

Similarly, cognitivist/representationalists take motor control to be abstract. In fact, they take the problem of motor control to be formally analogue to perception, in that there is no 1:1 mapping between desired outcomes and movements bringing it about (see Todorov 2009a,b; Friston 2011; Botvinick & Toussaint 2012). Even worse than that, cognitivists take active, moving bodies to be *absent*. Of course, they know that our active bodies are physically there as we act. But the *reafferent* signal coming from them is not, for it is too slow to move from the sensory periphery to the brain in time to allow for online, closed loop action control. When it comes to controlling actions:

> 'We effectively live in the past, with the control systems only having access to out-of-date information about the world and our own bodies, and with the delays varying across different sources of information.' (Franklin & Wolpert 2011, pp. 425-426)

When it comes to motor control, then, our body is absent, as it offers us *no signal* able to drive the relevant cognitive processes. Hence the positing of "predictive models" for motor

control in cognitive theories of motor control (e.g. Flanagan & Wing 1997; Wolpert & Flanagan 2001; Grush 2004; Pickering & Clark 2014; Rescorla 2016; McNamee & Wolpert 2019).

These are widespread assumptions cognitivist/representationalists are happy to make. And these assumptions are *theoretically central* to cognitivism/representationalism, in that disputing them lands one with an ecological - that is, direct and non-representational - theory of vision (Gibson 2014; Orlandi 2016) and/or motor control (e.g. Feldman 2009; on this point see also Rescorla 2016). Indeed, these assumptions are precisely the assumptions that *differentiate* between cognitivist/representational theories and anti-representational, in particular ecological, ones (see Raja 2024).

But these assumptions entail that sensorimotor coordinations *are representation-hungry*, as they involve coordinating an absent and abstract body with some abstract perceptual target. But, as Clark & Toribio themselves concede(**§2.1**), anti-representationalists can deal with such cases in a non-representational way (e.g. Braitenberg 1986; Beer 1990; Brooks 1991; Bongard & Pfeifer 2007). Indeed, in an important sense, Clark & Toribio's point is that they have done only that.

So, *given the very assumptions that motivate cognitivism/representationalism*, cognitivist/representationalists must concede that anti-representationalists meet the challenge - and *trivially* so, in that they don't need to perform any *additional* explanatory work to meet the challenge. It follows that, from the representationalists' own point of view, the representation-hungry challenge is not a *serious* challenge against anti-representationalism.

The cognitivist/representationalist would at this point likely complain that I've been too attached to *the letter* of Clark & Toribio's original challenge, at the expense of its *spirit*. For, presumably Clark & Toribio meant to talk about *complex, high-level, off-line* or *enculturated cognition*. These types of cognition and cognitive processes pose a problem for anti-representationalist, not the representation-hungry ones as defined by Clark & Toribio.

I don't think the cognitivist/representationalist is entitled to this move. In general, it is not clear why we should assume that Clark & Toribio were unable to explicitly write what they had in mind. Surely if the problem were a problem concerning "high level", "off-line", or "enculturated" cognition Clark & Toribio would have simply *written* that. Additionally, Clark & Toribio (1994, p. 418-419) spend roughly two pages to clarify what kind of phenomena they had in mind. It would be very weird to think that they actually meant something else entirely. Add to this that Clark himself continues to use the "absent and abstract" nomenclature or similar ones (e.g. Clark & Thornton 1997; Clark 2013), and it becomes *very* hard to think that Clark & Toribio meant something else.[26]

But even if cognitivist/representationalists were entitled to these moves, the situation would not substantially change. Anti-representationalists have offered accounts for phenomena such as pretense (Rucinska 2016; Facchin & Rucinska 2024), mathematical cognition (Zahidi & Myin 2018; Pantsar 2022), imagination and decision making (van Rooij *et al*. 2002; 2013). *Prima facie*, these count as complex (or high-level, off-line or enculturated) cognitive

[26] For this reason, Grayot's (2025) analysis of the representation hungry challenge - whilst interesting - completely misses the mark.

processes. So, even focusing on the "spirit" - rather than the letter - of the representation-hungry challenge would not substantially alter the situation.

So, it seems that the IUP underlying the representation-hungry challenge is (as a matter of fact) generally false, and that even if it were true, anti-representationalists would (from the representationalist/cognitivist point of view) trivially been able to face the challenge. I think that this is sufficient to *defuse* the challenge - that is, to show that it does not seriously arise - from the very cognitivist/representationalist point of view levelling it.

5 - Conclusion

Anti-representationalism is a lively option in the philosophy of cognitive science. Many take it to be put under significant pressure by the *representation-hungry challenge*. In this paper, I tried to defuse that challenge. I argued that the challenge does not really arise, since one key presupposition the challenge hinges upon is false (**§3**). Additionally, I have argued that even if the challenge were to arise, it would not be a *serious* challenge to anti-representationalism. For, given assumptions made by representationalists, anti-representationalist can trivially (i.e. without having to do any additional work) meet it.

Importantly, my arguments were written from the point of view of the representationalist/cognitivists. I haven't called upon explanatory posits such as affordances (e.g. Gibson 2014), various types of ecological information (Bruineberg *et al*. 2019) or sensorimotor contingencies (Noe 2004) whose existence or utility cognitivists/representationalists might wish to dispute. All the theoretical resources I've called for come *from cognitivism/representationalism* itself, or are empirical results. That is essential for my strategy of *defusing* the challenge, showing that it cannot raise.

Does any of this mean that anti-representationalism is right? No, it does not. But my aim here was not to defend anti-representationalism and show that it is right. My aim was to defuse the challenge. And I must confess I don't see how representationalists may re-ignite it.

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