Lecture 6: Knowledge detection and the nature of knowledge
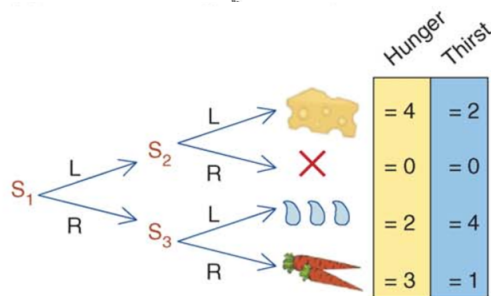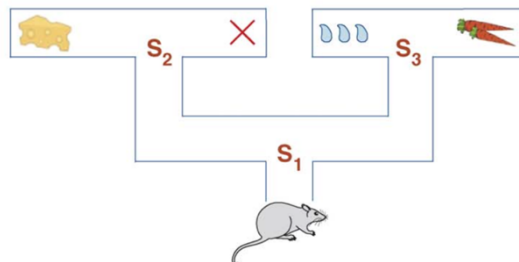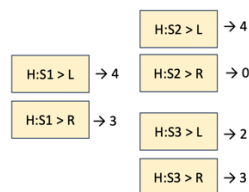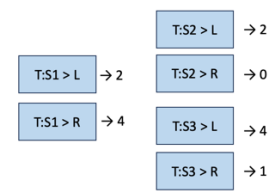
1. Model-based and model-free cognition revisited

What you do instinctively depends not only on outer circumstances, but also on inner conditions. You can have different sets of instincts for the same physical space.

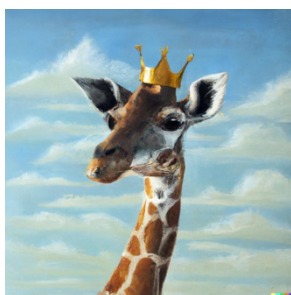Model-based control (goal-directed action)　　　Model-free hungry animal　　　Model-free thirsty animal

Image source, with modifications: (Niv, Joel et al. 2006, p.376)

2. Mapping epistemic territory

Source: Dall-E 2, June 2023, verbal prompt: "A man looking directly at a clay pot, in a room brightly illuminated by an oil lamp"

Source: Dall-E 2, June 2023, verbal prompt: "Photorealist painting of a giraffe wearing a crown, in the style of Alex Colville"

Our sharp sense of what people are looking at is not formed simply by passively scanning many instances of people identified as looking at things (the way Dall-E2's very sharp sense of what a giraffe looks like, or of Alex Colville's art, is formed by scanning many images identified as giraffes, and many paintings of Colville's). We have a hypersensitivity to gaze direction that is enabled by a history of interacting with others in contexts where gaze direction matters for action.

In most conditions (especially those similar to conditions where we have trained), we can be not only right but safely right about whether a person can see a given object or point, given the way our mapping of sight-range space is structured by the ongoing regularities in seeing agents and environments we have encountered.

For each agent, there is a set of points inside that agent's epistemic territory (the known points) and a set of points outside that agent's epistemic territory (the unknown points). For any given <agent, point> pairing, you will register the point as known if you can swiftly locate it as closer to some known point than to any unknown point, for that agent, where the relevant closeness is in epistemic space. Points in epistemic space are propositions; these can be specified directly, with that-clauses, or obliquely, as embedded questions. Epistemic space is a high-dimensional abstract structure (like face-space) which governs all our maps of epistemic territory.

"Outside of very specialized contexts such as psychoanalysis, the thoughts, experiences, hopes, and expectations of individuals are treated as theirs to know and describe. Persons are also generally treated as knowing more about their relatives, friends, pets, jobs, and hobbies than others." (Heritage 2012, 6).

Mapping epistemic territory is hard, but one thing that makes it not completely intractable for us is that facts are generally not learned in isolation: in humans, expertise is somewhat systematic.

3. Epistemic mapping in conversation

According to John Heritage, "real-world epistemic status will evidently take precedence over the significance of declarative syntax in determining whether a turn of talk is delivering, or asking for, information" (Heritage 2012, 12).

TABLE 1
Epistemics and Action Formation

Turn Design Feature	K+ Epistemic Status (Within Speaker's Epistemic Domain)	K− Epistemic Status (Not Within Speaker's Epistemic Domain)
	Action Interpretation (Given the "known in common" epistemic status of speaker and recipient relative to the targeted state of affairs)	
Declarative Syntax	Informing (5)	Declarative/B-event question (6), (7), (8), (9), (10), (11)
Declarative Syntax with Final Rising Intonation	Continuing (13)	Questioning (14)
Tag Questions	Mobilizing support for an assertion (18), (19)	Seeking confirmation (15), (16), (17)
Negative Interrogative Syntax	Assertion (cf. Bolinger's [1957] "Blinds up") (20), (21), (22)	Request for information (cf. Bolinger's [1957] "Blinds down") (23), (24)
Interrogative Syntax	Preinforming question (26) Known answer question (27) Rhetorical question (28), (29), (30)	Request for information (25)

Pomerantz contrasts direct ('type 1') knowledge of the sort you have for your immediate feelings, and for events in which you are the 'subject-actor', and indirect ('type 2') knowledge of the sort gained through inference, testimony, or witnessing the actions of others at a distance. Fishers make a declarative statement of their type 2 knowledge to an addressee who has type 1 knowledge of the same point. Example: Mark says to Bob, "She said that uh you guys were having a party Friday." Despite the declarative syntax, Mark is not informing Bob that he is having a party; he is fishing for confirmation. Bob appropriately treats this as an act of asking and responds, "that's correct" (Pomerantz 1980, 190).

In American English, only about a quarter of questions are marked with "wh-" question words, and polar (yes/no) questions mainly have declarative syntax (63%); (31% have interrogative syntax, 6% are tag questions). Only half of declarative questions have strongly rising intonation, and many have falling intonation (Stivers 2010).

Heritage (italics in original): "*Since any and all aspects of clausal morphosyntax are overwhelmed in their significance for action formation by epistemic status, interactants must at all times be cognizant of what they take to be the real-world distribution of knowledge and of rights to knowledge between them as a condition of correctly understanding how clausal utterances are to be interpreted as social actions.* This consideration must operate for every single turn at talk that embodies clausal elements, with the exception of imperatively framed utterances. For every clause will implement some form of declarative or interrogative morphosyntax, but the interpretation of the clause cannot correctly be effectuated without a fine-grained grasp of epistemic domains and relative epistemic status within them. This knowledge must definitely be consulted to grasp the sense of an utterance as an action. Epistemic status is thus a key element of the background knowledge (Garfinkel 1967) that is continually invokable and massively invoked as a means of grasping the actions executed in turns at talk. It is, in short, a primary and unavoidable element of action formation.' (Heritage 2012, 24)

First, speakers can position themselves in a relatively unknowing (or K-) position relative to others concerning the matter at hand, thereby initiating sequences by inviting or eliciting information from a projectedly more knowing (or K+) recipient. Alternatively, knowing (K+) speakers can simply initiate talk concerning the matter at hand, thus launching a sequence, finding a warrant for this conduct by projecting their recipients to be in a relatively unknowing. (K-) position. (Heritage 2012, 33)

Corpora of natural conversations suggest that fewer than 5% of conversational questions go unanswered (Stivers 2010), and fewer still if we include not only direct but also 'transformative' answers, which for example correct a mistaken presupposition (Stivers and Hayashi 2010).

Q: Who has greater epistemic authority on Burmese cats: Abe, who has very recently acquired a Burmese cat, or Ben, whose neighbour has owned a Burmese cat for some time? (Heritage and Raymond 2005).

Whether they are accepted or contested, disparities in epistemic stance serve as the 'hydraulic' engine of conversation: 'any turn that formulates a K+/K- imbalance between participants will warrant the production of talk that redresses the imbalance'; Heritage maintains that either type of gradient will start 'an epistemic seesaw motion that will tend to drive interactional sequences until a claim of equilibrium-for-all-practical-purposes is registered by the person who had previously assumed (or was assumed to be) the K- position' (Heritage 2012, 49). This satisfaction can be registered in various ways, down to a simple nod or, 'oh, ok'. In the end, 'giving and receiving information are normative warrants for talking, are monitored accordingly, and are kept track of minutely and publicly. It could, in principle, be different, but it is not' (Heritage 2012, 49).

The contrast between generic continuers like "uh-huh" and epistemic change-of-state markers like "oh" works to enhance knowledge delivery: speakers who are narrating tend to carry forward to the next chronological event on hearing a continuer, and elaborate on hearing an "oh" (Tolins and Tree 2014). Meanwhile, even eavesdroppers make use of backchannel markings in understanding dialogue, anticipating those elaborations after "oh" but not "uh-huh" (Tolins and Fox Tree 2016).

Backchannel is designed to stay into the background: because of its functional role, it needs to work as an exception to the general rule against simultaneous production and comprehension of speech. It has a distinct phonology; e.g.in English the click sound exists only in backchannel (Ward 2006, Ogden 2020). On the simplicity of backchannel markings, see (Knudsen, Creemers et al. 2020). T

Humans spend perhaps a fifth to a third of waking hours in conversation, with an average of 16,000 words per day, most of it on topics with no immediate instrumental value (Dessalles 2020). In my view, this is curiosity-motivated, and has the result that we end up building a model of epistemic territory, just as the curiously exploring rat ends up building a model of spatial territory.

The rat with a model of spatial territory can think strategically about how to navigate, and engage in vicarious trial and error (VTE) at tough maze junctions, simulating the experience of each branch. Rats seem to be quite efficient at managing the choice between epistemic actions (like VTE) and pragmatic actions (Pezzulo, Cartoni et al. 2016).

The human with a model of epistemic territory can also think strategically, using the model to generate simulated experience. However, it is open to us to think strategically instead, using model-based reasoning to explore the question of whether this content is known or only believed by the speaker, or indeed whether the speaker has an interest in deceiving us.

Our capacity to step up to strategic thinking is a valuable resource in complex circumstances, but it comes with costs. One of the costs is that we can imagine looking down on the subject from a position of epistemic superiority, even if the subject we are considering possesses knowledge.

We can allocate epistemic territory to agents in a model-based strategic way: if someone's epistemic status on a point is in doubt, we can challenge them for reasons. This is getting back to the idea that argumentation evolved as a way of enabling communication of knowledge beyond the zones where others have our instinctive trust, roughly the idea of (Mercier and Sperber 2011).

4. Common knowledge
Radford: "if conditions for the transmission of information in face-to-face situations are fairly normal or standard, participants do not require explicit responses to their remarks to believe or to justify their belief that their remarks have not only been understood but, when of the sort found in our examples, accepted. Moreover, participants in most conversations do set out and are entitled to set out on their conversations with the presumption that conditions are normal." (Radford 1969, 329-30)

"Any adequate account of what is learned and known in the most simple of conversations requires a complex description involving many iterated "know(s) that's". And this in turn leaves us with a major problem – namely, how can conversations and indeed language itself ever have got going?" (Radford 1969, 336)

Following up on earlier work on the ways in which backchannel feedback guides speakers (Bavelas, Coates et al. 2000), Janet Bavelas and colleagues have argued that oral conversations naturally feature an active three-step calibration process, with new information (initiation) overtly acknowledged by the addressee (response), and the acknowledgement recognized (follow-up) by the original speaker; in a study of face-to-face "get acquainted" conversations, they observed this 3-step calibration process for 97% of new information introductions (Bavelas, Gerwing et al. 2017).

"The proponents of common knowledge and its relatives suppose that when two people meet, their beliefs create a hall of mirrors: each person's beliefs reflect the world, but also the other's beliefs, which in turn reflect the first person's beliefs, and so on, in an infinite sequence of reflections of reflections. They imagine that certain objects and events are so positioned in this hall of mirrors that these objects and events are recognizably represented in each of the reflections in this infinite sequence. They propose that people will coordinate successfully only if they manage to position their actions in this exact way in the marvellous hall of mirrors created by their minds. But our minds often reflect the world imperfectly. I have argued that the presence of slight aberrations on the surface of each mirror has the consequence that as we move further and further along this sequence of reflections, the original image becomes blurred and ultimately unrecognizable." (Lederman 2018, 1095)

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