Adaptive conditions for being informed

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— CONTEXT —

An ‘information first’ approach to epistemology

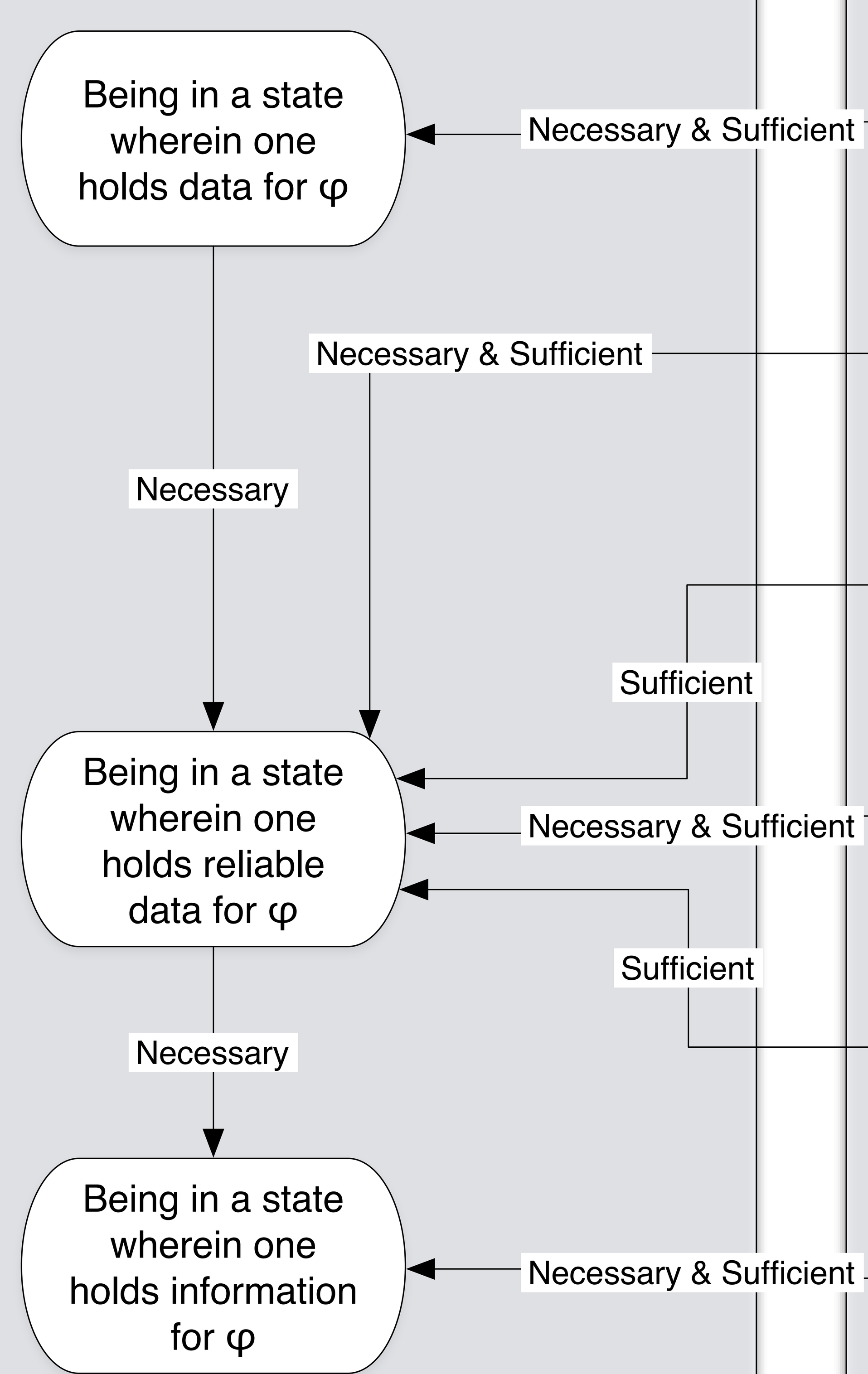
- Explaining knowledge in terms of information
- Adopting the non-doxastic relation of ‘being informed’ as a starting point
- Either providing a definition of knowing as the conjunction of being informed and something else, or presenting being informed as a generalisation of knowing.

— ISSUES —

Information as a state and as a commodity

- Viability of a reductive analysis of strongly semantic information (information as truthful, meaningful well-formed data)
- Insufficiency of holding strongly semantic information as a condition for being informed
- Modelling being informed as a prime state
- Tension between reductive analysis of information as a commodity, and primeness of the condition of being informed

Necessary and sufficient conditions



Turning information-structures into models for ‘being informed’

Extended semantics / **Semantics**

$i \Vdash \langle \mathsf{P} \rangle \varphi$ iff for some j $j \preceq i$ & $j \Vdash \varphi$

$i \Vvdash [\mathsf{P}]\varphi$ iff $i \Vdash \langle \mathsf{P} \rangle \varphi$ but $i \nVdash \langle \mathsf{P} \rangle \neg\varphi$

$i \Vvdash [\mathsf{A}]\varphi$ iff $i \Vdash \langle \mathsf{A} \rangle \varphi$ but $i \nVdash \langle \mathsf{A} \rangle \neg\varphi$

$i \Vvdash [\mathsf{A^{ar}}]\varphi$ iff $i \Vdash \langle \mathsf{A^{ar}} \rangle \varphi$ but $i \nVdash \langle \mathsf{A^{ar}} \rangle \neg\varphi$

$i \Vvdash [\mathsf{A^{cr}}]\varphi$ iff $i \Vdash \langle \mathsf{A^{cr}} \rangle \varphi$ but $i \nVdash \langle \mathsf{A^{cr}} \rangle \neg\varphi$

$i \Vvdash [\mathsf{A^{vr}}]\varphi$ iff $i \Vdash \langle \mathsf{A^{vr}} \rangle \varphi$ but $i \nVdash \langle \mathsf{A^{vr}} \rangle \neg\varphi$

Admissible combined structure

$$\langle \mathfrak{I}, \mathsf{INF-STAT_g} \rangle$$
$$\mathfrak{I} = (W, \preceq, \sqsubseteq, *, \rho_g, \lambda)$$
$$\rho_g \subseteq \lambda \qquad \preceq \ \subseteq \ \sqsubseteq$$

Adaptive generated submodels

A sub-model $\mathfrak{M}_i$ of Γ^R is just fine iff $Ab(\mathfrak{M}, i) = Ab(\Gamma_i^R)$, that is

$$\{\varphi \in \mathsf{PROP} : \mathfrak{M}, i \Vdash \langle\cdot\rangle\varphi \wedge \langle\cdot\rangle\neg\varphi\} = \{\varphi \in \mathsf{PROP} : \Gamma, i \models \langle\cdot\rangle\varphi \wedge \langle\cdot\rangle\neg\varphi\}$$

where Γ_i^R is a point-generated premise-subset of Γ^R and contains the same information as the set

$$\Gamma_i^{R,\langle\cdot\rangle} := \{\langle\cdot\rangle\varphi \ : \ (w, \varphi) \in \rho_g \ \& \ iRw\}$$

Information structure $(W, \sqsubseteq, *, \lambda)$

Veridical states $\mathsf{INF-STAT}$

Veridical input $\mathsf{INF-STAT_g}$

Declarative, objective and semantic information

Semantic information as *veridical* wellformed meaningful data

Data input tree-structure and structured premise-set

$$\Gamma^{\preceq} = (W, \preceq, \rho_g)$$

Point-generated submodels

$$(W', R', V') \rightarrowtail (W, R, V)$$
$$\forall w \in W'(Rwv \Rightarrow v \in W')$$
smallest submodel such that $\{x\} \in W'$

Adaptive selection of models

A model $\mathfrak{M}$ of Γ is just fine iff $Ab(\mathfrak{M}) = Ab(\Gamma)$

A-restricted accessibility

$i \leq_a j$ iff for all $k \in S$ such that $i \preceq k \preceq j$, and for all $\varphi \in \{\varphi : i \Vvdash [\mathsf{P}]\varphi\}, k \nVdash \neg\varphi$

C-restricted accessibility

$i \leq_c j$ iff for all $k \in S$ such that $i \preceq k \preceq j$, and for all $\varphi \in \{\varphi : i \Vdash \langle\mathsf{P}\rangle\varphi\}, k \nVdash \neg\varphi$ when $\{\varphi : i \Vdash \langle\mathsf{P}\rangle\varphi\}$ is consistent, and $i \leq_c j$ iff $i \preceq j$ otherwise

V-restricted accessibility

$i \leq_v j$ iff for all $k \in S$ such that $i \preceq k \preceq j$, and for all $\varphi \in \{\varphi : i \Vdash \langle\mathsf{P}\rangle\varphi\}, k \nVdash \neg\varphi$ when $i \in \mathsf{INF-STAT}$ and $i \leq_v j$ iff $i \preceq j$ otherwise

Properties

At all states

$$\langle\mathsf{P}\rangle\varphi \Longrightarrow [\mathsf{P}]\varphi \vee (\langle\mathsf{P}\rangle\varphi \wedge \langle\mathsf{P}\rangle\neg\varphi)$$
$$[\mathsf{P}]\varphi \Leftrightarrow [\mathsf{A^{ar}}]\varphi$$
$$[\mathsf{A^{ar}}]\varphi \not\Longrightarrow [\mathsf{A^{ar}}][\mathsf{A^{ar}}]\varphi$$
$$\{\varphi : i \Vvdash \langle\mathsf{P}\rangle\varphi\} = \lambda(i)$$
$$\{\varphi : i \Vvdash [\mathsf{A^{ar}}]\varphi\} \subseteq \lambda(i)$$

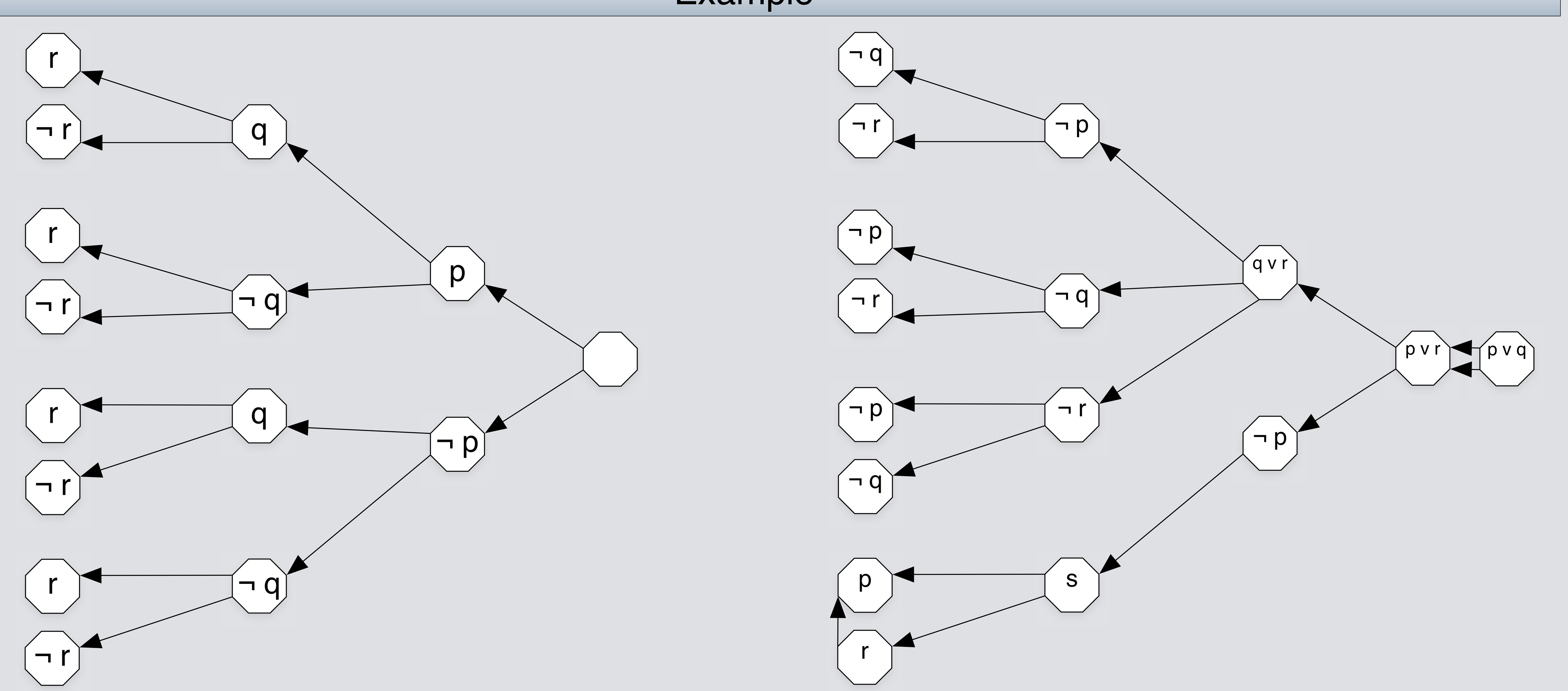
At consistent states

$$\langle\mathsf{P}\rangle\varphi \Leftrightarrow [\mathsf{P}]\varphi \Leftrightarrow [\mathsf{A^{cr}}]\varphi$$
$$\{\varphi : i \Vvdash [\mathsf{A^{cr}}]\varphi\} = \lambda(i)$$

At veridical states

$$\langle\mathsf{P}\rangle\varphi \Leftrightarrow [\mathsf{P}]\varphi \Leftrightarrow [\mathsf{A^{vr}}]\varphi$$
$$\{\varphi : i \Vvdash [\mathsf{A^{vr}}]\varphi\} = \lambda(i)$$

Example



What is explained?

Holding a piece of information for φ, but failing to be informed that φ

while holding reliable information for φ

$\exists i, j \in S$ such that $i \Vvdash [\mathsf{A^{ar}}]\varphi$, and $i \nVvdash [\mathsf{A^{vr}}]\varphi$ but $j \Vvdash [\mathsf{A^{ar}}]\varphi$, and $j \Vvdash [\mathsf{A^{vr}}]\varphi$

but not holding reliable data for φ

$\exists i, j \in S$ such that $i \nVvdash [\mathsf{A^{ar}}]\varphi$, and $i \nVvdash [\mathsf{A^{vr}}]\varphi$ but $j \Vvdash [\mathsf{A^{ar}}]\varphi$, and $j \Vvdash [\mathsf{A^{vr}}]\varphi$

Being informed that φ is sufficient for robustly holding persistently reliable data for φ

$\forall i \in \mathsf{INF-STAT}$ if $i \Vvdash [\mathsf{A^{ar}}]\varphi$ then for all j such that $i \leq_v j$ it holds that $j \Vvdash [\mathsf{A^{ar}}]\varphi$

Holding reliable data for φ is a strong necessary, but purely internal condition for being informed

$i \Vvdash [\mathsf{A^{ar}}]\varphi$ as well as $i \Vvdash [\mathsf{A^{cr}}]\varphi$ can be derived from $\{\psi : i \Vdash \psi\}$ while $i \Vvdash [\mathsf{A^{vr}}]\varphi$ cannot

Benefits

- Translates insights drawn from information-structures into a modal language and thereby generalises the S4 embedding of intuitionistic logic to structures with inconsistent points
- Formalises the defeasible inference from holding consistent data to expecting that data not to be contradicted at future states
- Formalises strong internal necessary conditions for being informed without a reference to doxastic states