Tabla de Contenidos

Models and Simulations 7

ms7 18 de mayo de 2016

Roman Frigg. How models represent

a. denotacion vs representacion a territory-representation isnot necesarily a representation of a territory if the territory is nonexistent. a territory-represesentation could be a representation of some national sentiment using a map as a way of charting.

b.exemplification ejemplo: un pantone.

Exemplification of properties. But converse does not hold: not every property instantiated is also exemplified. (un pantone noejemplifica lapropiedad de la rectangularidad sino solo el color).

¿Which properties are instantiated and which are exemplifies& This is not told by the object itself. Exemplars provide epistemological access to properties. Ejemplo: “Teaches as a boxer” (picture) denotes NT, EXEMPLIFIES aggresivity/brutaliti, so IMPUTES this to MT.

A representation DENOTES, EXEMPLIFIES and IMPUTES.

El paso de una representacion para que se convierta en modelo es una INTERPRETACION.

Video Youtube=economia (de guatemala)como un system of pipes. Phillips-Newlyn machine. Is an OBJECT WITH PROPERTIES. Propiedades es todo lo que podemos atribuirle: el material del que está hecho, laépoca, y tambien la ubterpretacion MODEL =-representation where X has been chosen by the scientist to be a model. MODEL is a Z-representacion but not neccesarily a representation of Z. SPECIFICATION (la metafora usada) → TARGET DOMAIN (el mundo real) EXEMPLIFICATION = INSTANTIATION + REFERENCE The Instantiation is associated to an Interpretation because the object doesnotconvey autimatically the representationofthe world. IMPUTATION. In science rarely models and objects share exactly the same properties.

To take from properties exemplified to properties imputed there is a KEY (K) that transform properties to get what is imputed to reality. K is a blank to be filled. Toward a general account DEKI Denotation, Exemplification, Keying, Imputation

Z-Representation (exemplifies) Properties (keys provide) Q1,Q1 (qualities?) (imputes) T and Representation (denotes) T

and:Object (with an O-Z Interpretation I) (becomes) a Representation Open questions

DENOTATION,which theory? Philosophy of Language? Kripke-Putnam “bare-type”reference KEYS. No hay estudios sistemáticos sobre est Son idealizaciones, analogias?

(How) Do models provide undertanding-why?

models employ idealizations. Many idealizations: simplification, distortion, abstraction, omission idealizations (intuition says) have explanatory value BUT idealizations are falsehoods WHY FALSEHOODS HAVE EXPLANATORY VALUE? Do we have to relax truth requirements when based on models? Aim: succesful model-based explanations are true A. “possibly” explanations Models can provide modal knowledge about possibilities : Giere 1988 Lipton 2009 Basic idea: We get explanations in the form POSSIBLY (p because q) Introduce the POSSIBILITY OPERATOR See van Riel 2015

B. “according-to-the-moel explanations! Modeling is similar to fiction (van Riel 2015) We get exlpanations in the form “According tothemodel (p because q)

C. Succesful model-based explanations are correct - WITH model-based laws to explain phenomena (Ley de Boyle para los gases). Reduces to simplifications = Ceteris Paribus.(Ojo, lasleyes requieren CETERIS PARIBUS, por loq que hay que modificar el explanans para hacerlo cierto. - OF model-based laws. Modificamos el explanandum. why the law approximately holds. Based on veridical explanations we gain understanding-why. - IF model-based laws.

Scientists make educated guesses about what to idealize.Tsting themodel they test if idealizations are good.

highly idealized models do not provide explanations, the aim is to get insight into the phenomena we observe. Idealizations have an auxiliary epistemic value. - provide images - enable computational tractability (Cartwright 1989) -informatinal value

A cathegory theoretic approach to models and simulations in biological systems.

Aziz Zambak (Laboratory for Computational Ontology) http://lco.modsimmer.metu.edu.tr/en

Concept: knowledge representation: makup language for biological systems Cathegory Theoretic Markup Language

Knowledge representation (KR) as a substitute of Domain of Knowledge (DOK) Identity and fidelity are important. KR: 5 different roles (Davis et al 1993) KR is an AI concept The Systems Biology Markup Language (SBML) eases modeling specially ehen simulators ceases to exist. A markup language is independent. Marcadores XML (ver foto) Living systems = non-linear systems. Their structure in Cathegory Theory derives from their relations. Cathegory Theory Is a high level of abstraction in mathematics: real numbers, matrices, operations (inverses are unique, important). A deductive inference system Group: algebraic structure, elements equipped with operations. Properties of a system unified and presented with arrows diagrams Categories Morphisms Cathegory Theory better than Set Theory: no mention of entities. Foundations for Cathegory Theory Markup Language (foto) Data is phenotype

Computer can establish the relations by recognizing patterns, we do not impose the relations from the outside. The computer should make the inferences. (Is this AI related?) Estructuras de datos no separadas entre si, sino relacionadas, y la relacion la hace el ordenador.

Concrete biological models

What is the “real thing” in biological research? Are biological models surrogates for human beings? In animal tests X led to Y. The prediction: X will lead to Y in humans also. Nicole C. Nelson Modelling mouse

Model > Tarhet is so simple… dyadic Reality is: S uses X to represent W for R van Fraassen 2008: “Z uses X to depict Y as F” “measuring locates the target in a theoretical constructed logical space” (Van Fraaseen 2008 p. 2) Por ejemplo, en un termometro. Epistemological grid: what are the transformations from one logical space to another? (one experimental system into another: in-vitro vs. mice experiments) Interconnected models: a locus for investigation. Often they are “implicit”but should be explicit how do scientists interconnect models.

Darwinizing culture

Eva Boon

Many things evolve Evolutionary models for culture change Gray & Jordan Nature 405, 105: many parallels between biological & linguistic and the mehods used to analyze them

Family-tree model: phylogenetic tree, phylogenetic methods applicable Reticulate evolution. Phylogenetic methods apply?

Evolution has proccesses: selection, etc units: genes, organisms Testing evo hypothesis by statistical analysis Phylogenetic tree method: a visual representation of a evolutionary hypotheses EVO STUDIES NEED A MODEL TESTED BY HYPOTHESES

Evo models for cultural change

Greenhill “Does horizontal transmission invalidate cultural phylogenies?”

When is a transfer succesful

What bio models useful to analyze cultural data? dificult.

Modeling and Realism, scientific and perpetual

Paul Teller

———- JUEVES ————-

Models and Simulations MS7, 19/5/2016

What distinguish data from models?

what counts as data? what counts asmodels? what count as data models?

data as a representation of the world which is mind-independent. documenting the world. scientific method guarantee theirreliability as means to test theories Data is visualized/analysed/interpreted through models/theories

Problems: defining the representational power of data (whats is represented, does dataset changes depending on questionsasked?) defining the relationship between data and models

Also we deed some middle ground theories of… (Suppes) linear response models models of experiment models of data experimental design ceteris paribus condicions

Suppes: We need three kind of models. models of theory models of experiment models of data

Harris (2003) “data referred to as raw data is in fact a data model”, “data acquisition cannot be separated from data modelling”

Proposes a shift to a relational definition of both data and models, and functional understanding of the distinction between the two.

datastudies.eu is a project to tracking Data Journeys. nalyses data processing practices.

Yo Sushi experiments Youtube: Sci fi plant centre animation

Ver fotos stages of data processing

analysis

a. what counts as data changs at every step b.beyond representation assole or primary research goal c. the role of data processing in identifying phenomena

Implications:distinguish modelling from data processing

when does modelling starts? (ver foto)

representational value for data is important here.

Data/model distinction is not fixed absolutely (foto)

Analysis 3: Choice of data management strategies & visualization tools goes hand in hand with identification of phenomenon: iterative process. (foto)

Therole of data models in identifying phenomena: Data models are where evidential and representational considerations meet. Conclusion: a relational view of relational components Ver fotos

Book: Data Centric Biolog Sabina Leonelliy

Scientists adopt repertories. Data modelling is the source of those repertories.

Explanatory mechanistic models

The mechanistic account: explanations via models. Background: the problem of relevance. Real world is complicatedm models are abstractions. What include as relevant ox exclude as irrelevant? RELEVANCE is a network of concepts Ps, Qs interconnected by some property P or many Ps in a certain way Z Examples of properties: utility efficiency semantic fut causality Craver (ver foto) ayuda a establecer de forma experimental qué aspectos son relevantes Sirtes “which information is relevant dependson context, a conversational context” (foto) Relevance depends os pragmatic grounds! (foto)

Pragmatic relevance subjective, depend on user's estimation objective, depend on fulfilling a certain task

The 9 dots puzzle: the size of the dots is regarded as irrelevant but is crucial. This is not dependent on aget's estimation but dependent on the propierties of the problem.

The problem of Subjective Relevance: ver foto. Contradicts the mechanistic manifesto (model states which is relevant)

Objective Relevance relevance depends on something that increases the likelyhood of accomplish the task purposed. relevance depends on the properties of the task

Conclusions

The choice of a model is pragmatic but not subjective The task-based view avoids the problems on subjective factors while sving the intuition on the relevance of pragmatics

We often find which aspects are objectively relevant a posteriori, after testig if they help in fulfilling the task

The functions of idealization in mechanistic models NO

Justifying serious possibilities with unrealistic models

UM: rely on contrary to fact assumptions seriuousky possible if consistent with background knowledge

Using models assumptions, input, values of external variables run, analytical solution result, values of internal variables

Models as a procedure for obtaining an if-then-clause for the target system

The DDI Account

Denotation demonstration Ibterpretation DDi modifies the standard account for speaking of statements DDi as an abstract argument schema adds an implicit premise

Weakening premisesasa way of justifying possibilities Possibiistic weakeniing of DDI schema:it's possible that…

Inconsistent idealizations and the structure of scientific models

en la vida real tenemos posibilidad de juzgar si un cuadro se parece a una persona, si lo representa fielmente. en los mecanica cuantica no hemos contemplado (ni podremosa) la realidad, no tenemos una ontologia de la mecanica cuantica, asi que todas las visualizaciones son ficticias, no sabemos si son reales, solo si describen apropiadamente fenomenos que observamos.

De-idealized models

—- viernes —-

Performative representations with computer simulations

simulaciones del cambio climatico son “performativas”, por tanto utilizables por el método científico.

CS computer simulations as SR scientific representations

Three notions of CS (Eric Weinsberg) 1. Narrow view. Computer for non analytically solvable problems. Accessible systems. Scientist no relevant 2. Whole Process: model + algorithm + calculate. Inaccessible systems. Scientist relevant. Some degree of subjectivity. Ej astrophysics. 3. Simulation/similarity. One system used to study the other. Dynamical vs. structural similarity. No ontological correspondence between systems. Ex. Climate models.

JHP> en linea con una de las preguntas posteriores, la nocion 3 y la 2 están muy relacionadas, una describe el sistema construido (2) y la otra el uso que se le da (3).

How CS represent 1. narrow sense: mirroring 2. broad sense: deflationary views (van Fraasen, Suarez) 3. performative view

CS as SR

CS as SR In a narrow sense represent real system Aim to mirror dynamics of a system conclusionsare attributed to the simulated system I CS as SR In a broad sense, involving model choice, algorithm implementation, visualization of output data do not mirror the system anymore Central role of scientist Relevant notions: perspective, purpose

CS as SR (alternative notion) dynamical similarity emphasis oh relations between the systen's processes instead of on the actual system”s elements epistemological relativity: both systems are interchangeable This demands a shift of perspective!

Performative SR

Origins: Hertz (1894) Hertz”s diagrams are commutative (systems ↔ representations) Hertz doesn't ake into account objects, but relations. Commutativity express logical preservation between domains. Empirucal-theoretical distinction becomes thus relative!

Duhem (1906) on SR Representation as correspondence between “practical facts” and “theoretical facts” Puralism of representations for a given fornuka Example: CCM Climate chamge models

How GCMC represent CCM require much parametrisation. Complex equations with no analytical solution Different parametrisations give rise to a full range of models energent (andunexpected) large scale phenomena Uncertainties

Verification and validation verification vs. validation dichotomy collapses when considering emergent (unexpected) phenomena The CS simoultaneously validates and verifies, no separation here.. Empirical-theoretical distinction here is also relative.

To sum-up CCM displays relativity (epistemic relativity) and multi-value relation

An ontological approach to simulations and computer simulations

Aspects invstigated by philosophy of science Ethical (Bynum 2015, Brey 2008) Epistemological & Ontological: (Friggs & Reiss 2009, Weisberg 2013, 2015, Humpreys 2009). Ontological: a ship with all it's parts replaced is the same ship?

Ontological status of simulations

“Simulation” is not an action noun (AN). AN are plysemous.

The term “simulation” intentional act of simulation (X is simulating). Intentional act of representing. E.g.. people simulating an evacuation out of a burning fire. intentional relation of simulation (X simulates Y) is an intentional relation of dynamical representation.The sentence“Newton'scraddle in motion simulates conservation of momentum” means that NC in motion has been intended to enter into a dynamical representational relation of conservation of momentum.

Notions involved ACT, experimentig, CS studies as human activity RELATION (representational relation between model and target), experimenting on what? what is a representational relation?

Simuation is spoken of as an entity which designates dynamical vehicle (simulation type) dynamical device/medium target/result

Simulation type (process) and token (device). Schelling (1978). Simulated entity is a target represented by a process (simulation type). Doesnot have to have a dynamic nature.

Relata Simulation type as a computational model simulans simulating structure (internal) dynamic object (or target) simulation model (model simulating target) simulacrum

Simulation token as a simulans simulating structure dynamical model description (model tout court) concrete model core simulatiom

Simulated entity simulandum (external) target simulacrum

Ontological status of CS

CS refers to running a computational model on a computer relation model-target (kind of simulation-as-a-relation) computation (kind of simulation type) running hardware (kind of simulation token) target (kind of simulation-as-simulated-entity)

Conclusions differences between simulations, CSs and other kinds of models lie in ontological differences rather that epistemological or methodological differences. (Frigg & Reoss 2009) are indirect representarions (Weinsberg 2013)

Topic models as an example of computer modeling in the humanities

Widely used in computational literary analysis and history

Useful for philosophy?

Why haven't philosophers used these approaches to textual abalisys?

Which kind of knwledge produces?

Features of topic modeling text considered a bag of words unit of analisys is s chunk of text topics are probabilitiey distributions on word types based on observed word co-occurrence within chunks E.g. “vote,people,constitution,free,rights,election,representative” could be interpreted as a topic labeled “democracy” Does not try to model the mental processes that produce the original. Only intended to generate the word frequency distribution. (no se trata de averiguar el sentido mediante una reconstruccion semantica/gramatical sino solo de averiguar la red de topics que el texto contiene) This model is not obviously false. initially word types are assigned to topics randomly most common model: Latent Dirichlet Allocation (LDA) Different from: a portion of the text is used to train the model, the rest to test the model (supervised modeling). Topic modeling is UNSUPERVISED, the inference algorithms are applied to the whole set of documents

Process remove indexes, TOC, etc remove all punctuation split in chunks remove stopwords what is left is a list of words set the number of topics run LDA algorithm N times until equilibrium Parameters: cs (chunk size) t, (number of topics) i (number of iteractions)

Su proyecto consiste en usar este algoritmo para analizar obras filosóficas.

Lo suyo sería comparar los resultados de usar este algoritmo con los resultados de usar una red neuronal entrenada.

conclusions fotos importante aclarar esta diferencia de sus conclusiones: “Topics are not subconceptual representations as used in the semantics of neural nets” paper “symbolic, conceptual and subconceptual representations” de P. Gärdenfords parece muy importante. Computational modelling in educational research: do we need such an approach?

Is possible to conceptualize educational problems?

how do students acquire knowledge how students make progresses how students develop abilities how social interavtions affects/affected by changes in student's abilities related problems how discoveries are made? how researches explore new ideas? developmen of skills in learning/training role of social learning in opinion formation

ALL THOSE PROBLEMS HAVE COMPUTATIONAL MODELS

Can we model learning in educational settings? YES Bordogna et al 2001,2003 Reactions: harmful! Brumfield 2001

Agent based model for modeling sociodynamics of learning target nnodel description agent description social dynamics description

D1. Three tiered system of explanatory schemes Koponen (2013) Complexity 19, 27-37 Koponen & Kokkonen (2014) Frontline Learning Research 4, 149-166 They build an epistemic landscape

D2. Utility based probabilistic selection of explanatory scheme Pott's model of statistical physics

D2+D3 Social learning and scheme selection social based + utility based

D3 Proficiency development on basis social comparisons appraisa based comparisonsl memory

Comparison with empirical results? Interpretations

Conclusions Do we need computational modelling in educatioal research? No if isolated research paradigms Yes if integrated research is of interest

Realist interpretation of the Standard Model