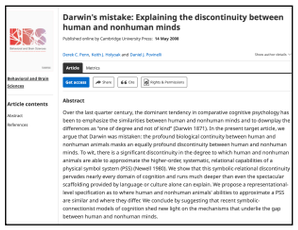
Darwin's Dumb Idea; Pure Predicate Calculus = $\mathscr{L}_0$; *Toward* Quantification

Selmer Bringsjord

Rensselaer AI & Reasoning (RAIR) Lab
Department of Cognitive Science
Department of Computer Science
Lally School of Management & Technology
Rensselaer Polytechnic Institute (RPI)
Troy, New York 12180 USA

Intro to Logic
2/6/2025


Darwin's mistake: Explaining the discontinuity between human and nonhuman minds

Published online by Cambridge University Press: 14 May 2008

Derek C. Penn, Keith J. Holyoak and Daniel J. Povinelli

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Behavioral and Brain Sciences

Article contents

Abstract

Over the last quarter century, the dominant tendency in comparative cognitive psychology has been to emphasize the similarities between human and nonhuman minds and to downplay the differences as "one of degree and not of kind" (Darwin 1871). In the present target article, we argue that Darwin was mistaken: the profound biological continuity between human and nonhuman animals masks an equally profound discontinuity between human and nonhuman minds. To wit, there is a significant discontinuity in the degree to which human and nonhuman animals are able to approximate the higher-order, systematic, relational capabilities of a physical symbol system (PSS) (Newell 1980). We show that this symbolic-relational discontinuity pervades nearly every domain of cognition and runs much deeper than even the spectacular scaffolding provided by language or culture alone can explain. We propose a representational-level specification as to where human and nonhuman animals' abilities to approximate a PSS are similar and where they differ. We conclude by suggesting that recent symbolic-connectionist models of cognition shed new light on the mechanisms that underlie the gap between human and nonhuman minds.

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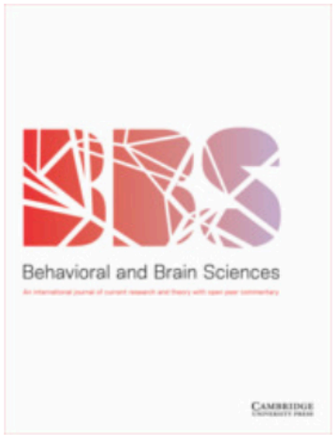

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Google Follows Microsoft in Unveiling AI Search Features

Alphabet unit's artificial-intelligence rivalry with Microsoft heats up

TECH + Follow

By Sam Schechner + Follow *and Miles Kruppa* + Follow

Updated February 08, 2023 05:15 p.m. EST

Google has said it would release a new ChatGPT-like AI service called Bard to a select set of testers, with a broader public launc...

PARIS—Google unveiled new artificial intelligence-powered search and map features, capping a flurry of competing announcements by the search giant and rival Microsoft Corp. as they race to bring a new generation of the technology to users.

The back-to-back announcements from two of the tech industry's fiercest competitors are the latest signs of how companies are scrambling to roll out tools that use a type of artificial intelligence that can generate content—from haikus to computer code—and capitalize on a wave of renewed excitement about the potential of AI among businesses and consumers.

At an event in the French capital Wednesday, the Alphabet Inc. GOOGL -1.31% ▼ unit showed a series of AI enhancements for its search engine, including plans to start generating lengthy textual responses to complex queries with no single correct answer—such as what are the best constellations to look for when stargazing. That came after Google offered a glimpse, Monday, of a homegrown rival to the popular ChatGPT chatbot that it calls Bard—and inadvertently demonstrated the trickiness of such tools when a screen capture of a Bard answer included an apparent factual error.

In between the Google announcements, Microsoft on Tuesday showed off its plans to incorporate the generative AI technology behind ChatGPT into its Bing search engine. It demonstrated how it can process natural-language queries to generate answers and suggestions using information like news stories, train schedules and product pricing.

"We're grounded in the fact that Google dominates this space," Microsoft Chief Executive Satya Nadella said in an interview with The Wall Street Journal, referring to a business where Google has more than 90% market share and generated $162 billion in revenue last year, more than half of Alphabet's total. "All I need is a few more users, and someone else that I'm competing [with] has to keep all of their users and all of their gross margin," Mr. Nadella added.

Alphabet's stock closed Wednesday down 7.7%, while Microsoft slipped 0.3%. The S&P 500 index fell 1.1%.

"Google has a lot more to lose than gain from rushing Gen-AI out the door," wrote Colin Sebastian, a senior research analyst at Baird Equity Research. "Microsoft is taking a big leap, integrating OpenAI technology with Bing, a smart move for a search engine with limited share—how could Bing not gain search share?"

Google emphasized Wednesday, as it has in the past, that it already bakes AI into its search results, for instance by helping the search engine understand natural-language queries to give better results. It also said it would be releasing more new AI products as soon as it was satisfied they would meet its standards for accuracy and quality.

"We have a lot of hard and exciting work ahead to build these technologies into our products and continue bringing the best of Google AI to improve people's lives," Alphabet Chief Executive Sundar Pichai said Monday in an internal company email that was viewed by the Journal.

The tit-for-tat developments are the part of fast-spreading AI war over the commercial potential of generative AI, which can create content in response to short user inputs, since OpenAI moved to release ChatGPT publicly late last year. Microsoft has promised to integrate capabilities from generative AI tools from OpenAI across all of its products quickly, as well as making them available to outside developers.

Others are jumping into the fray as well. China's Baidu Inc. is developing an AI-powered chatbot similar to ChatGPT called "Ernie bot," which it plans to launch next month.

The race is forcing Google—by far the most widely used search engine—into an unusual position of playing catch-up to a company whose search engine is an also-ran in traffic terms.

Google gave an additional glimpse Wednesday of its experimental conversational AI chatbot, Bard, which it made available earlier this week to a set of outside testers. The company showed a brief demonstration of how a user could use Bard to suggest criteria to consider when trying to buy a new car, or places to visit for a scenic road trip.

The company also gave more detail about how it plans to integrate generative AI into search results by focusing on what it calls "no one right answer" queries, which the company refers to as NORA. In a demonstration, the company showed how such a query might generate a bullet-point list, and below it some preformatted questions to elicit further information.

Another feature Google announced Wednesday will expand users' ability to query the search engine based on images and videos they are looking at on their phones if they use Google's Android operating system, allowing a user to identify, say, a local landmark.

The company also said it is now rolling out a feature that allows Google Maps users to explore

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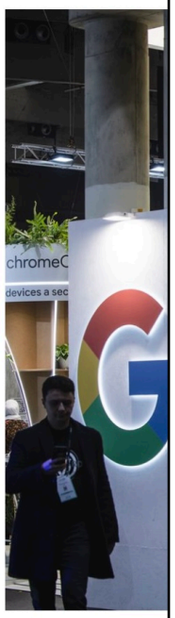

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9:33 AM Thu Feb 9

Back

TECH

three-dimensional representations of destinations —like the inside of a restaurant—extrapolated by AI from ordinary two-dimensional photos. And it said it is broadening the availability of a feature that lets users search maps for local businesses by pointing their phone at the nearby area.

Technology investors and analysts, as well as some company staffers, have complained that Google hasn’t released more AI products despite its research being at the core of some of the new technologies now generating public excitement.

In part, according to Google executives, that is because the company has been reluctant to roll out tools that, like ChatGPT, can sometimes spout false information or nonsense in response to user queries. The company also has been under scrutiny by researchers, regulators and its own staffers to police its own use of AI.

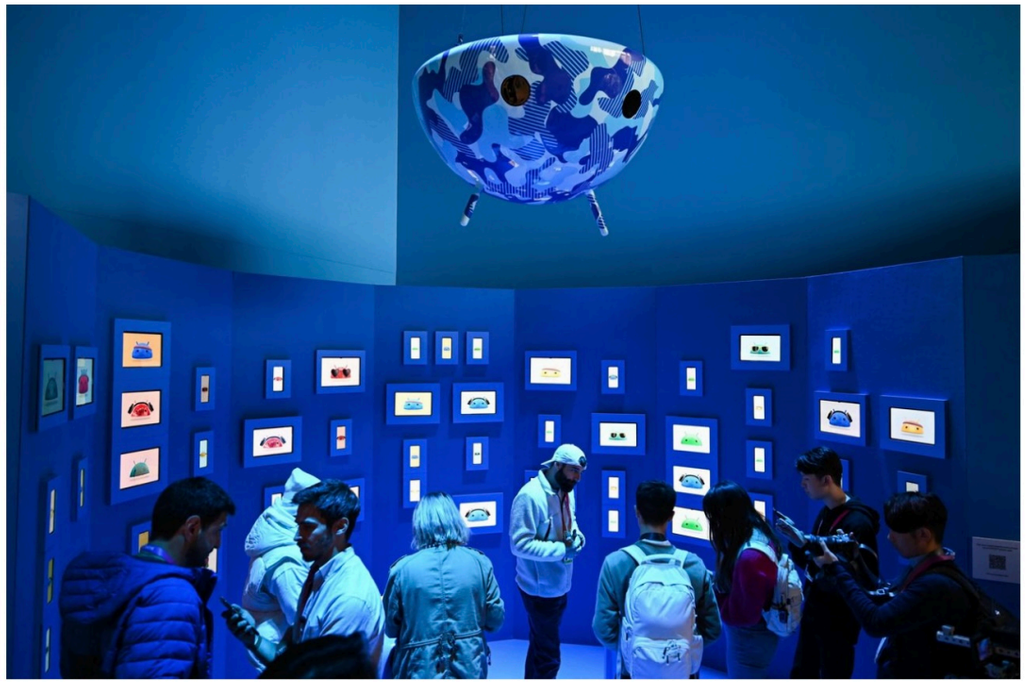
Google’s new Bard system appeared to fall victim to that pitfall on Monday when an example the company posted of its responses claimed that the James Webb Space Telescope took “the very first pictures” of an exoplanet outside the solar system. The National Aeronautics and Space Administration says on its website that the first images of an exoplanet were taken as early as 2004 by a different telescope.

“It’s a good example [of] the need for rigorous testing,” Elizabeth Reid, Google’s vice president and general manager of search, said Wednesday, adding that the example was nuanced.

The company declined to give a precise date for Bard’s public launch, or the new chat-based responses to NORA search queries, but said it is conducting tests to make sure they deliver accurate information. “The real bottleneck for us is to get to a place where we can get the quality where we want it to be,” said Prabhakar Raghavan, a Google senior vice president.

In 2018, Google created a series of AI principles that it said it would apply to its work going forward. Those rules include requirements that the AI tools should be socially beneficial, that they should avoid reinforcing biases and that they should be built and tested for safety in constrained environments.

Researchers cite many examples of the potential dangers. AI technology known as deepfakes, for instance, can create video that appears to be of real people saying or doing things they never said or did.



Google said it intends to launch more new AI products once it is satisfied they meet its standards for accuracy and quality.

“We’ve been focusing on responsible AI since the very beginning,” Mr. Raghavan said at the event, adding that the company is “committed to setting the highest standard on how to bring it to people in a way that’s both bold and responsible.”

Write to Sam Schechner at Sam.Schechner@wsj.com and Miles Kruppa at miles.kruppa@wsj.com

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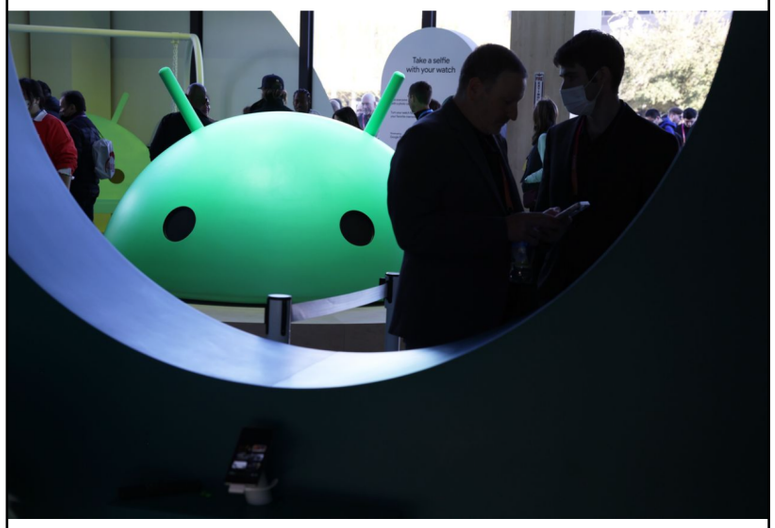
Google Matches ChatGPT With New Chatbot Subscription

Offering follows version from Microsoft for users of its work software



The Gemini chatbot will be available as a stand-alone app for phones running Android software. (Photo: Alex Wong/Getty Images)

By Miles Kruppa + Follow

Feb 08, 2024 08:00 a.m. ET

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Google is jumping into the tech industry’s latest craze: subscription chatbots.

The search giant will begin charging $19.99 a month for its most powerful chatbot, Gemini Advanced, as part of a subscription plan that

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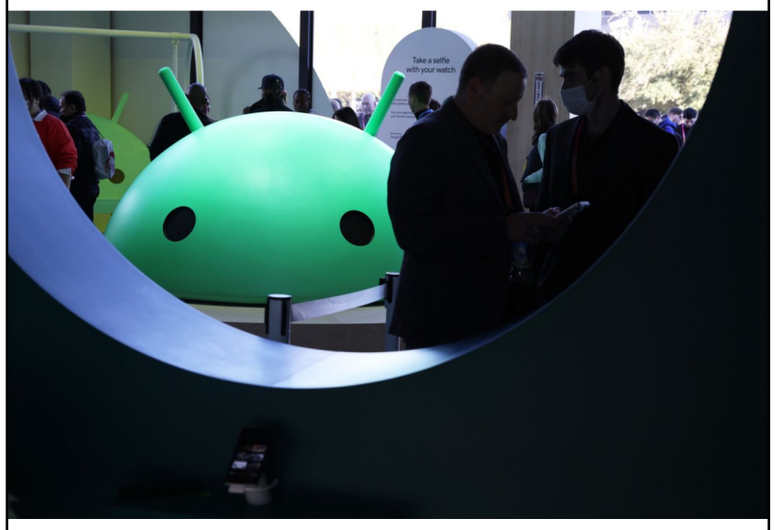

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Alphabet GOOGL +1.00% ▲, Google’s parent company, makes the vast majority of its revenue from advertising but has tried to diversify into areas such as cloud storage and online cable packages as growth in its core business has slowed.

Pichai said last month the company’s annual subscription revenue reached $15 billion, an increase of five times in the same number of years. Google brought in $307 billion of revenue last year, mostly from ads placed next to search results.

Tech giants are still figuring out how to turn recent advances in AI into steady profits. Generative AI, the technology behind chatbots, is particularly costly to develop and deliver to large volumes of users.

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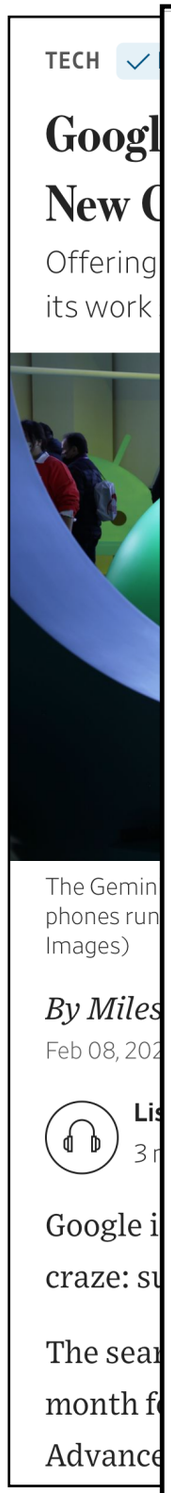

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By Miles
Feb 08, 202

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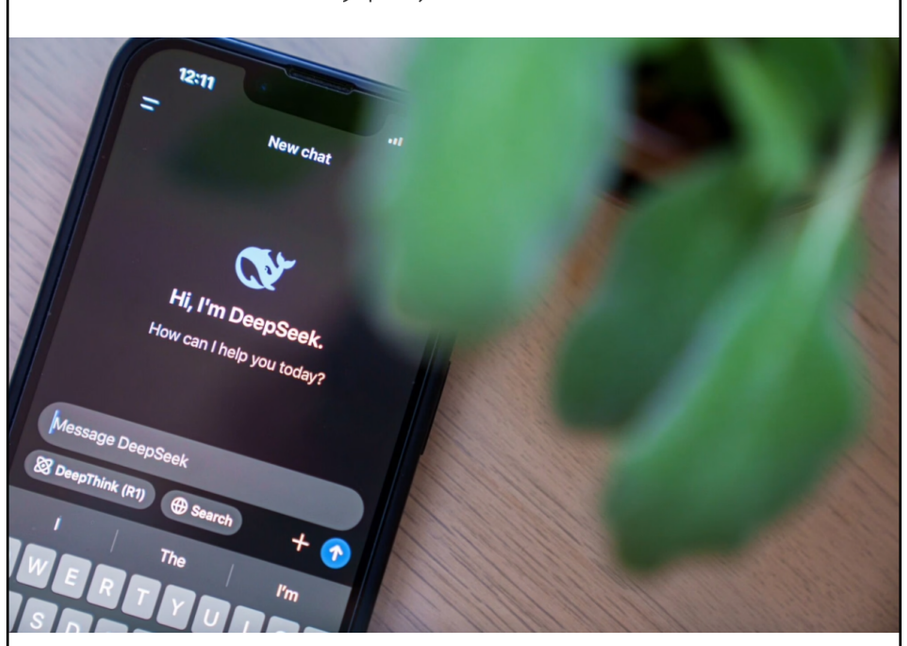
Power Stocks Had Been on an AI Tear. Then Came DeepSeek.

The efficiency gains of DeepSeek's AI models startled the power industry, which is set to invest billions in electricity projects



DeepSeek recently launched its latest AI model, which it calls R1. (PHOTO: LAM YIK/BLOOMBERG NEWS)

By Katherine Blunt Follow *and Jennifer Hiller*

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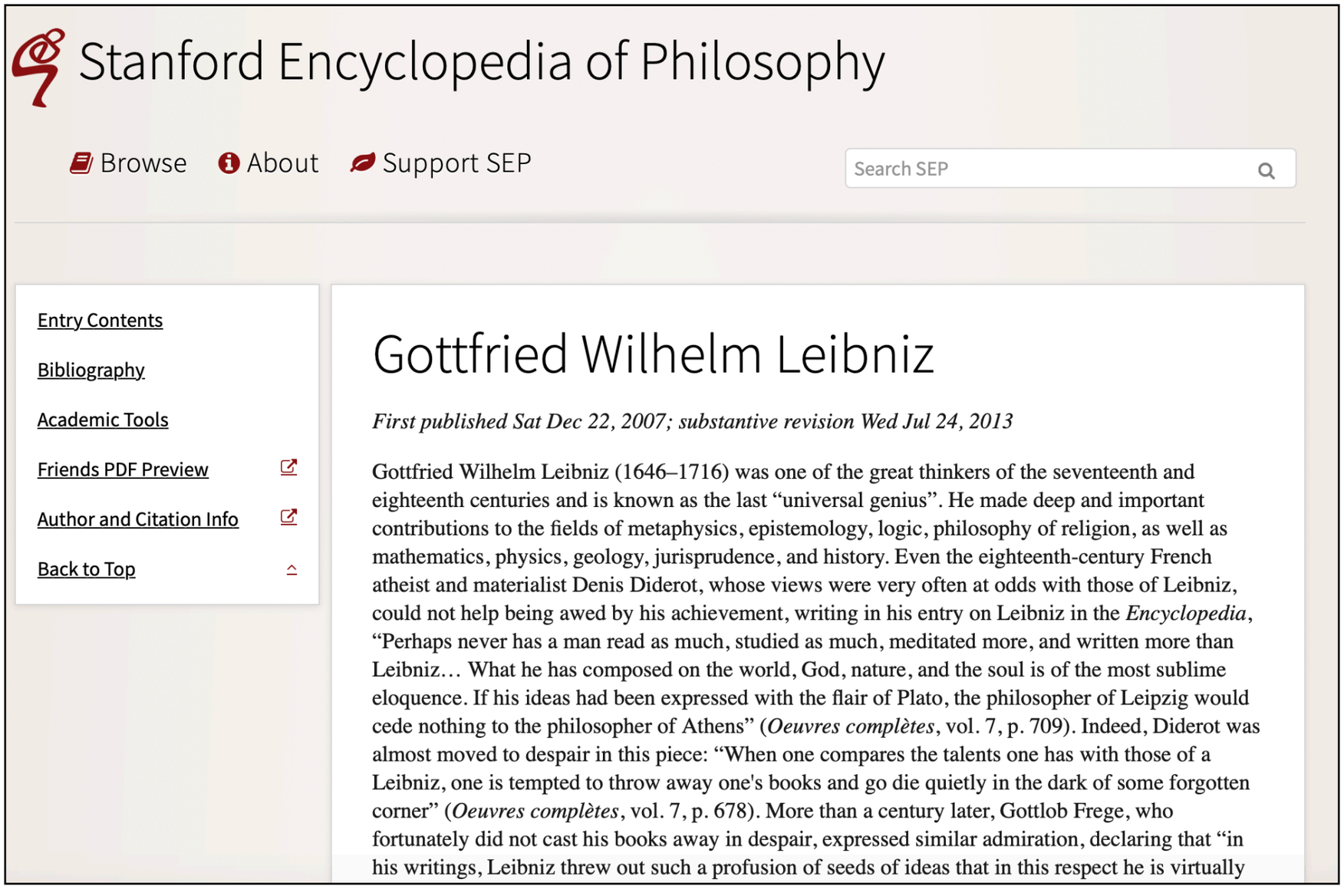
> Chinese AI startup DeepSeek has laid bare one of the power sector’s greatest fears: The AI boom might not need nearly as much electricity as anticipated.
>
> DeepSeek, a generative-AI model trained using substantially less energy than its American competitors, routed tech and power company shares last week, eroding stock gains spurred by data center growth projections. Now, the companies planning to power those data centers are grappling with the prospect that AI may become much more energy efficient, and fast.
>
> Executives and analysts say DeepSeek’s launch is unlikely to have a near-term effect on data-center investment plans as tech companies lock down contracts with utilities and power producers for huge amounts of electricity. Longer term, however, they say such efficiency gains call into question the need for massive investments in new power plants built to run for decades.

“Leibnizian Learning”
(The Ultimate Autodidact)



See: https://writings.stephenwolfram.com/2013/05/dropping-in-on-gottfried-leibniz/

"Leibnizian Learning"
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1. Life

Leibniz was born in Leipzig on July 1, 1646, two years prior to the end of the Thirty Years War, which had ravaged central Europe. His family was Lutheran and belonged to the educated elite on both sides: his father, Friedrich Leibniz, was a jurist and professor of Moral Philosophy at the University of Leipzig, and his mother, Catharina Schmuck, the daughter of a professor of Law. Leibniz's father died in 1652, and his subsequent education was directed by his mother, uncle, and according to his own reports, himself. He was given access to his father's extensive library at a young age and proceeded to pore over its contents, particularly the volumes of ancient history and the Church Fathers.

eloquence. If his ideas had been expressed with the flair of Plato, the philosopher of Leipzig would cede nothing to the philosopher of Athens" (*Oeuvres complètes*, vol. 7, p. 709). Indeed, Diderot was almost moved to despair in this piece: "When one compares the talents one has with those of a Leibniz, one is tempted to throw away one's books and go die quietly in the dark of some forgotten corner" (*Oeuvres complètes*, vol. 7, p. 678). More than a century later, Gottlob Frege, who fortunately did not cast his books away in despair, expressed similar admiration, declaring that "in his writings, Leibniz threw out such a profusion of seeds of ideas that in this respect he is virtually

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Part II: We rock and rule — in part because we can master $\mathscr{L}_0$.

Part I: *Slutten.*

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Part II: Hands-on Q&A & Review …

What *is* Logic?

- The key to becoming rational.
- "The science of reasoning." — so the not-unreasonable slogan goes.
- The only invincible subject there is.
- The basis for the formal sciences (from mathematics to game theory to decision theory to probability calculi to axiomatic physics ….) — and hence the basis for disciplines based on the formal sciences (e.g., engineering, computer science).
- The way of escape from shallow content and context to pure, immaterial, and immortal form and structure (which is why the exotic, imaginary, and seemingly non-sensical is so pedagogically useful).
- The most challenging subject there is.
- One of the chief differentiators between dogs and monkeys versus you (let alone bears and you); and mindless machines (like Deep Blue & Watson) versus you.
- A key to riches.
- The key to divining the meaning of life (and other such big questions).
- The better way to program computers; and fundamentally the *only* way to *reliably* program computers.
- One of two fundamental approaches to studying minds, and replicating/simulating minds in machines…
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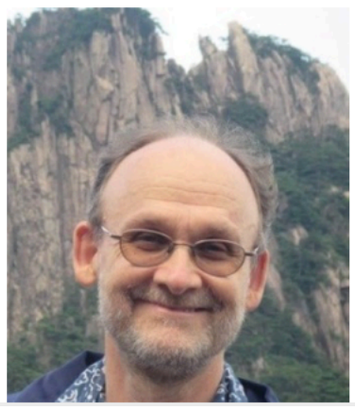
Watch brainy zoo animals figure out a box puzzle to get at food

(https://www.newscientist.com/article/2075151-watch-brainy-zoo-animals-figure-out-a-box-puzzle-to-get-at-food/)

ANIMAL SENTIENCE

AN INTERDISCIPLINARY JOURNAL ON ANIMAL FEELING

Chapman, Colin A. and Huffman, Michael A. (2018) Why do we want to think humans are different?. *Animal Sentience* 23(1)



AUTHOR WEBSITE

http://chapmancolin.com/

https://www.pri.kyoto-u.ac.jp/sections/social_systems_evolution/huffman/index-j.html

ABSTRACT

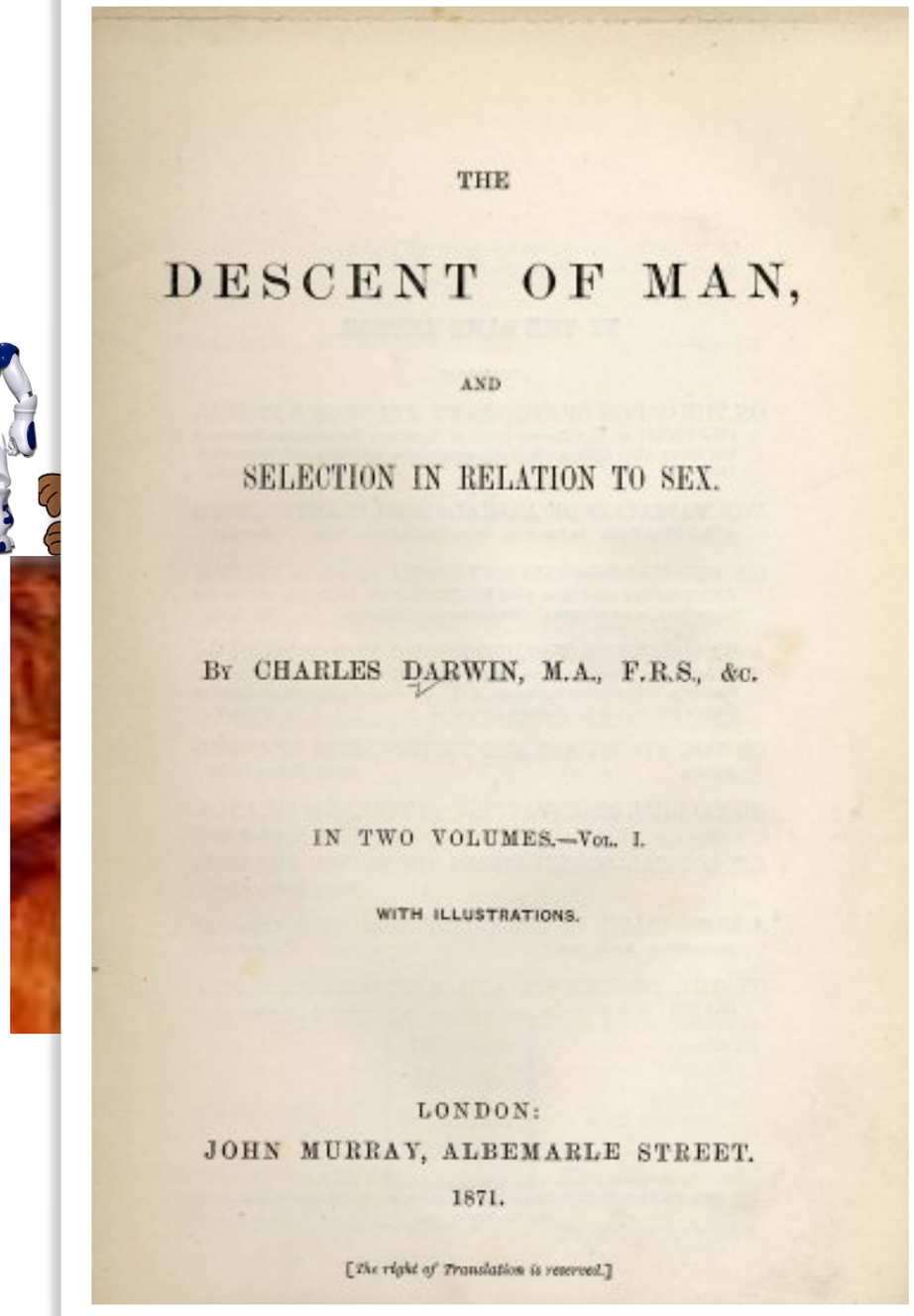
One harmful consequence of creating categories where one group is unique and superior to others is that it justifies committing negative, often atrocious, acts on the members of the inferior group. Correcting divisive human categorizations (racial superiority, gender superiority) has bettered society. Scholars have often claimed that humans are unique and superior to nonhuman animals. These claims need to be reevaluated. Many have already been refuted. Animals have been shown to outperform humans in many tasks, including cognitive ones. Here we raise the question: Has the false sense of superiority been used to justify human cruelty to animals?

AUTHOR BIOGRAPHY

Colin A. Chapman has conducted research in Kibale National Park in Uganda for 30

https://animalstudiesrepository.org/animsent/vol3/iss23/1/

The Canyon of Discontinuity (or Darwin's Dread)



THE

DESCENT OF MAN,

AND

SELECTION IN RELATION TO SEX.

By CHARLES DARWIN, M.A., F.R.S., &c.

IN TWO VOLUMES.—Vol. I.

WITH ILLUSTRATIONS.

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JOHN MURRAY, ALBEMARLE STREET.
1871.

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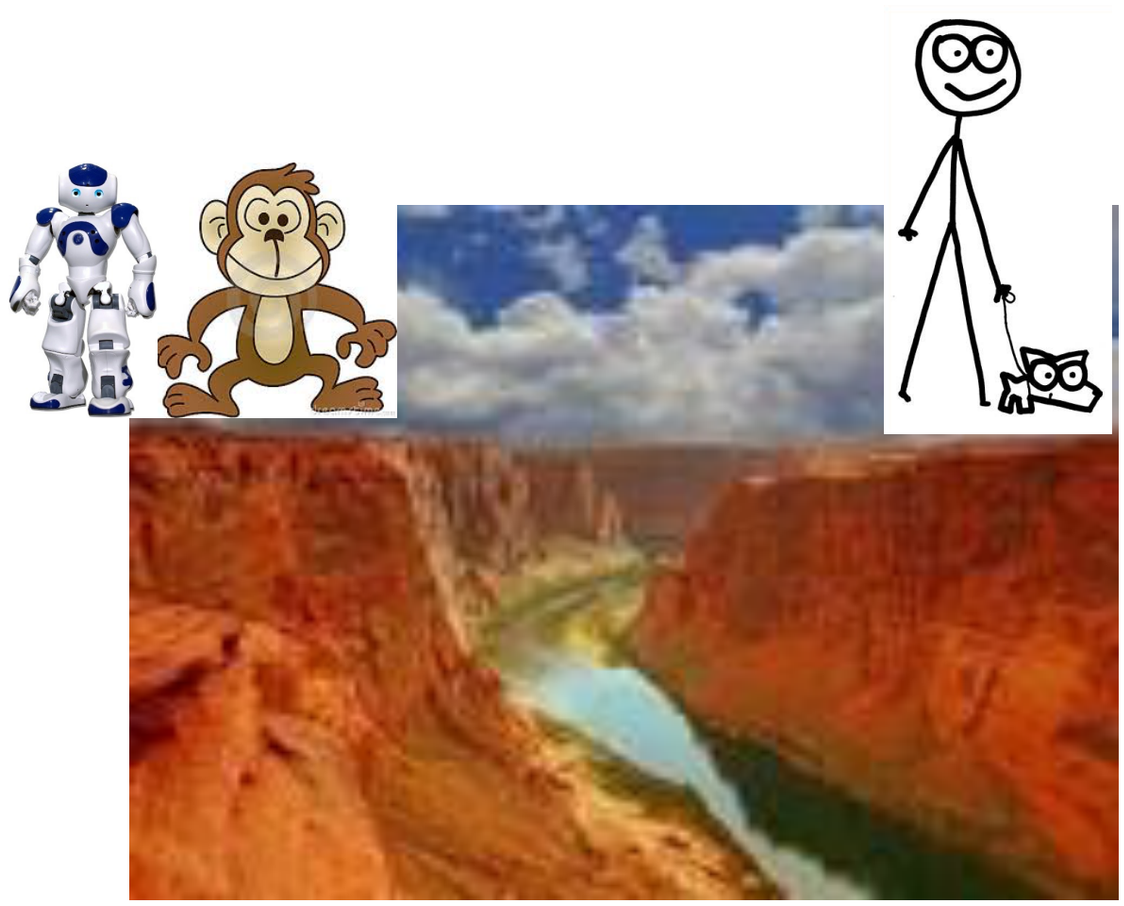
The Canyon of Discontinuity (or Darwin's Dread)



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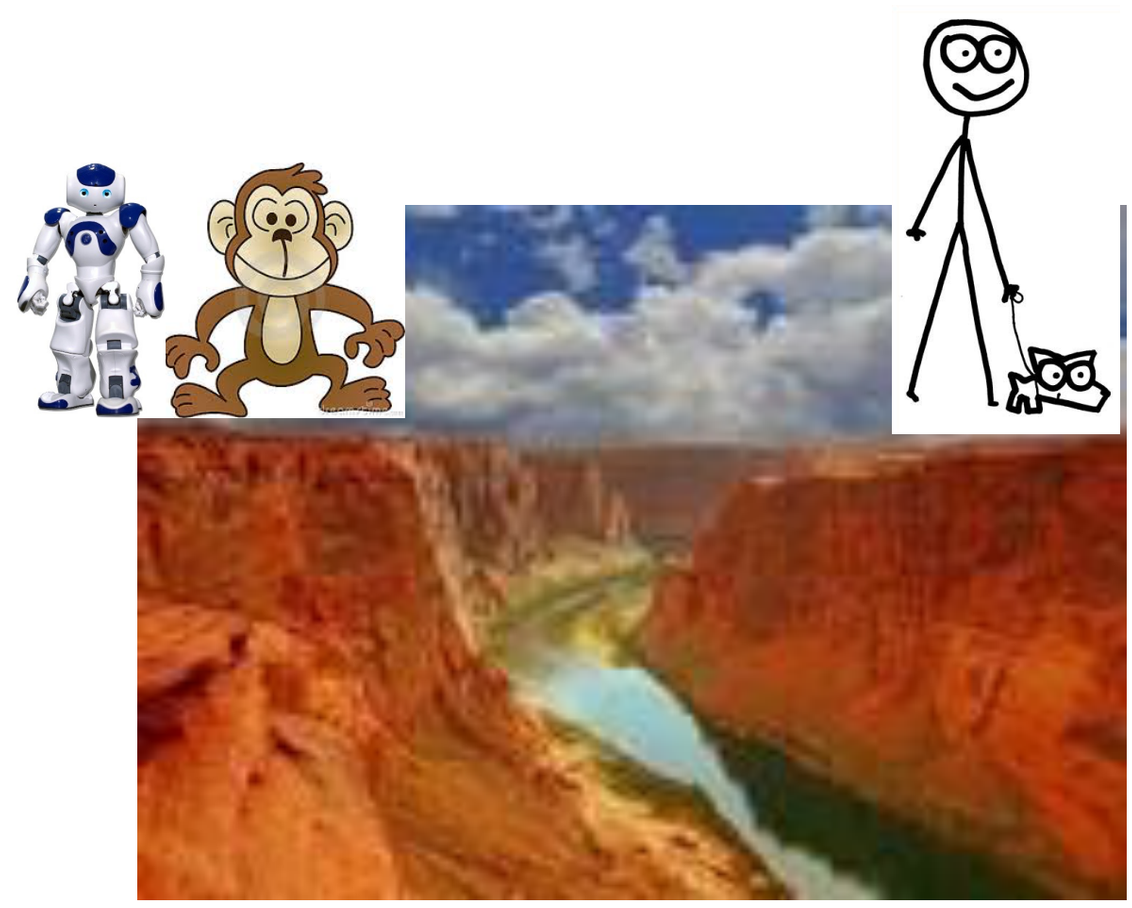

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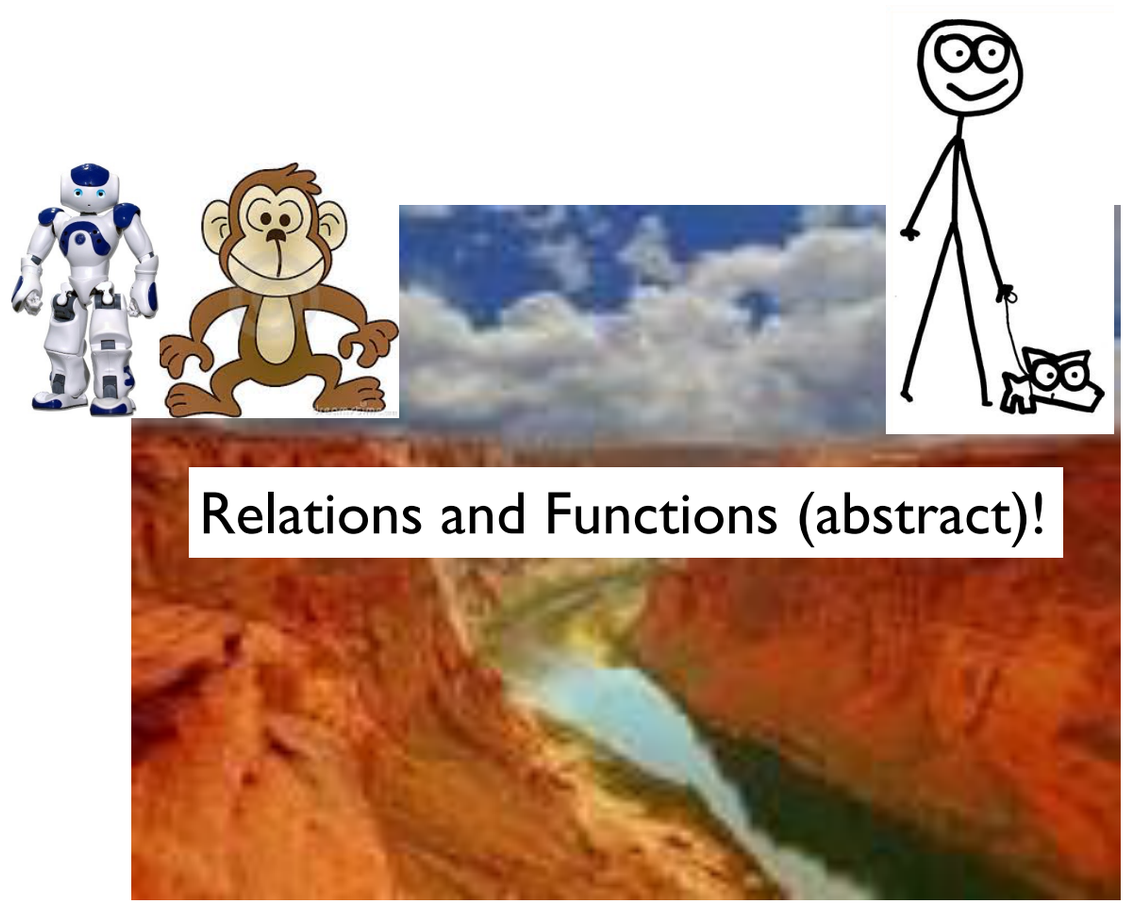

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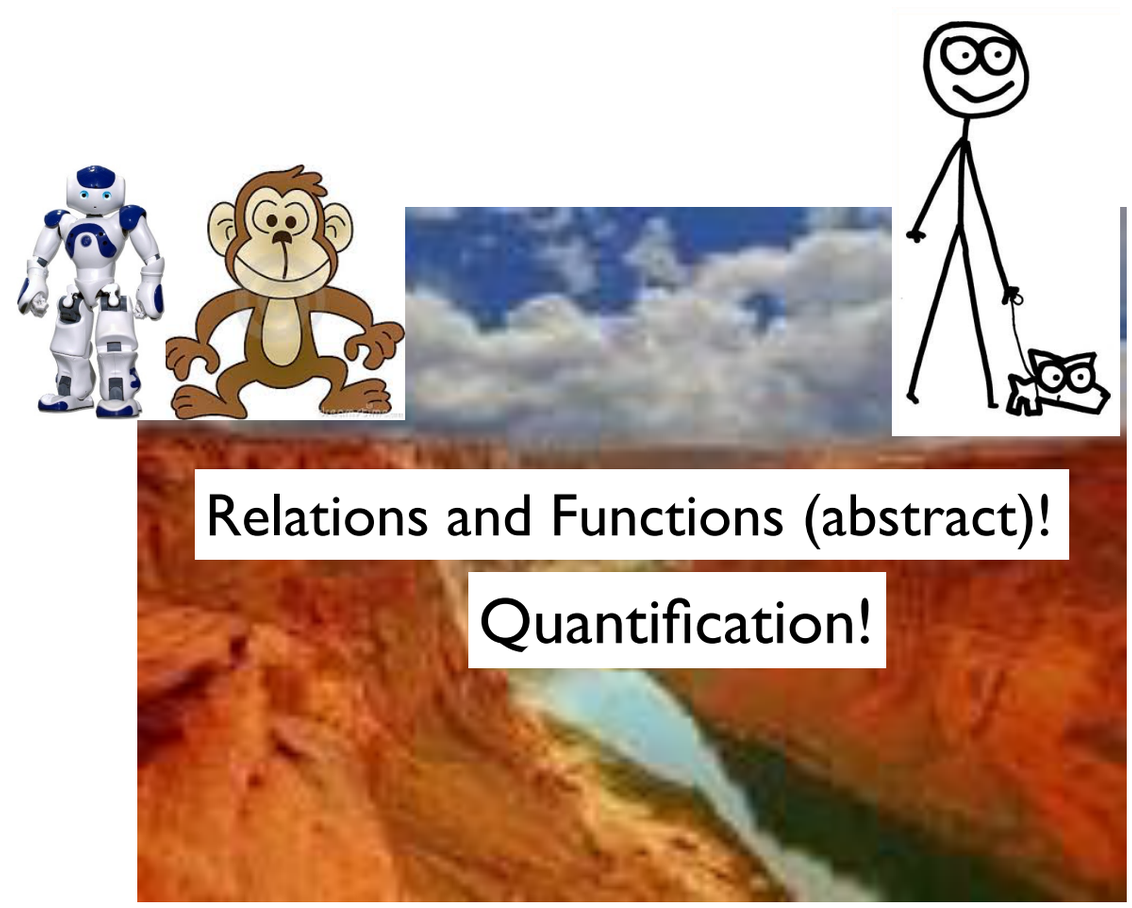

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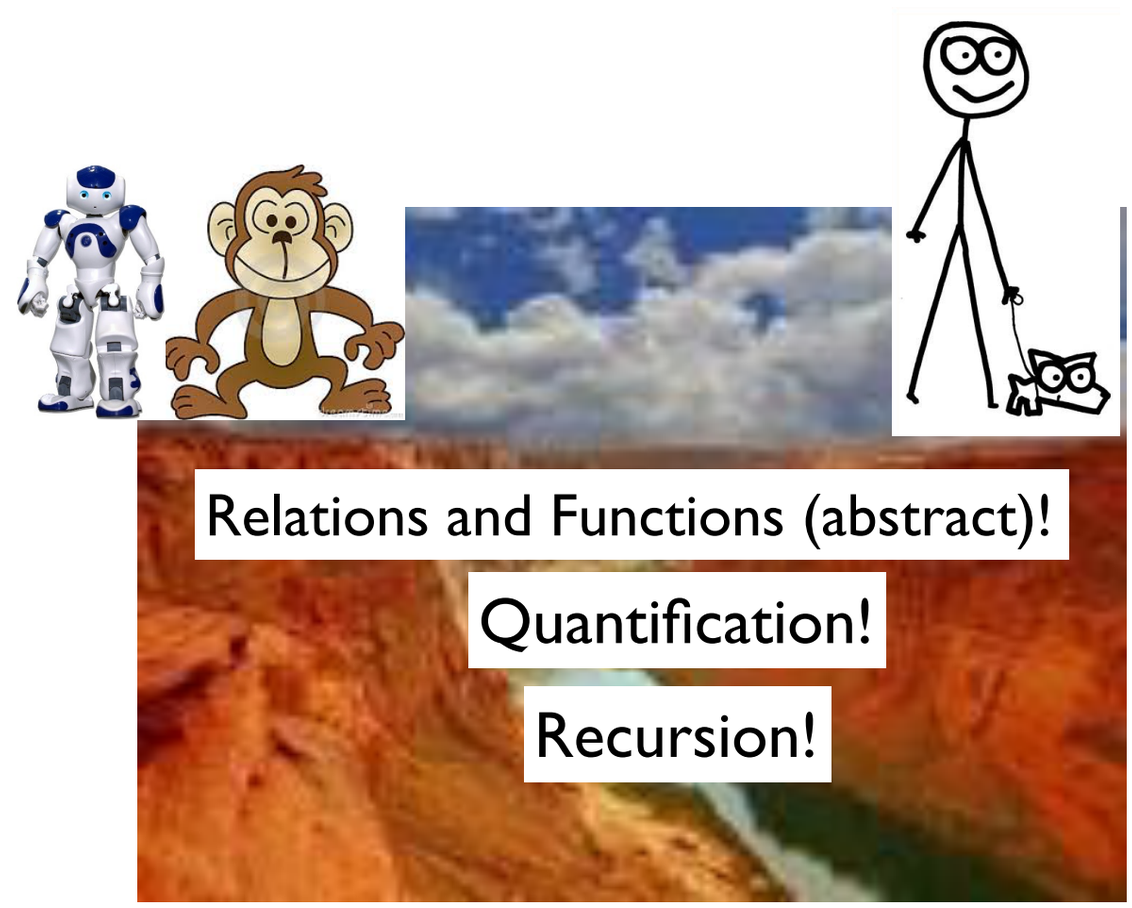

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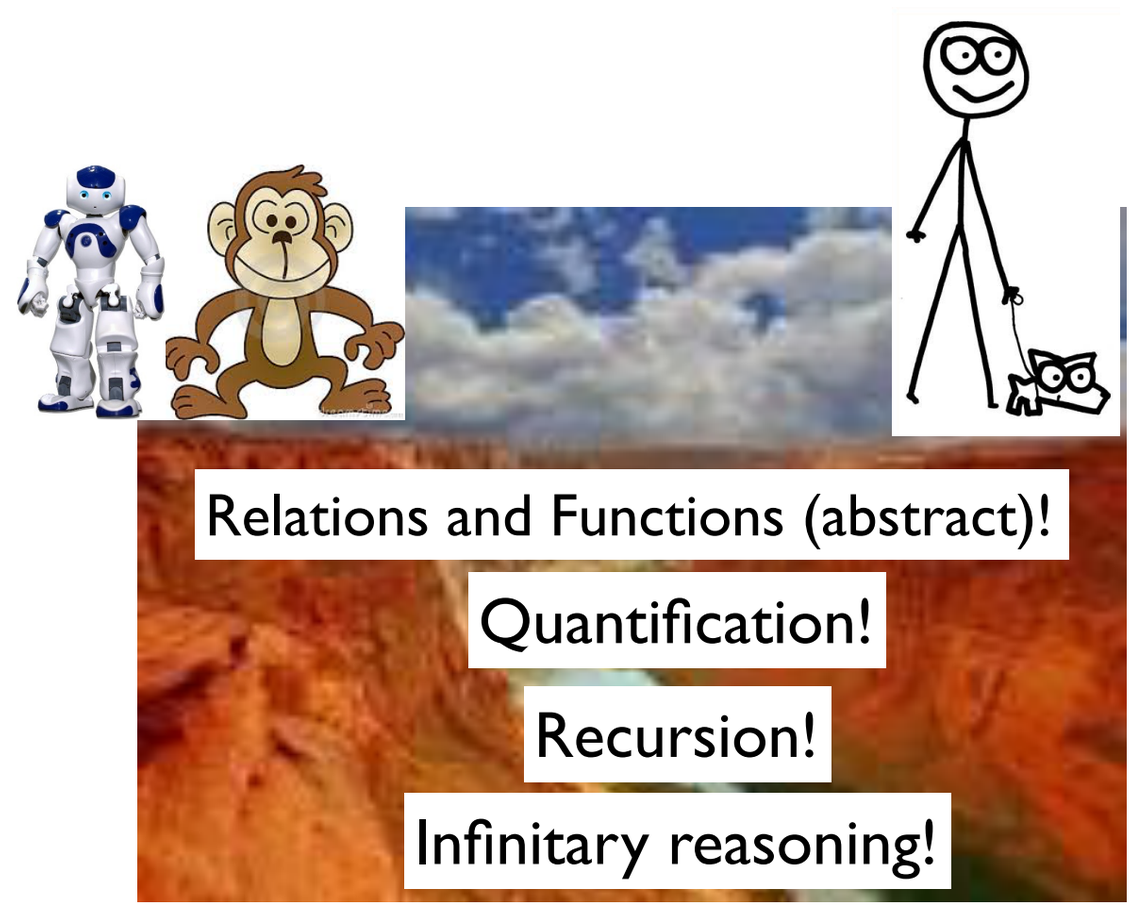

The Canyon of Discontinuity (or Darwin's Dread)

Relations and Functions (abstract)!

The Canyon of Discontinuity (or Darwin's Dread)

Relations and Functions (abstract)!

Karkooking Problem (later) …

Everyone feebersisks anyone who feebersisks someone.

Deskputer feebersisks Blineyooker.

Can you infer that everyone feebersisks Blineyooker?

ANSWER:

JUSTIFICATION:

Karkooking Problem (later) …

Everyone feebersisks anyone who feebersisks someone.

$$\forall x \forall y[(\exists z(Karkooks(y,z) \rightarrow Karkooks(x,y)]$$

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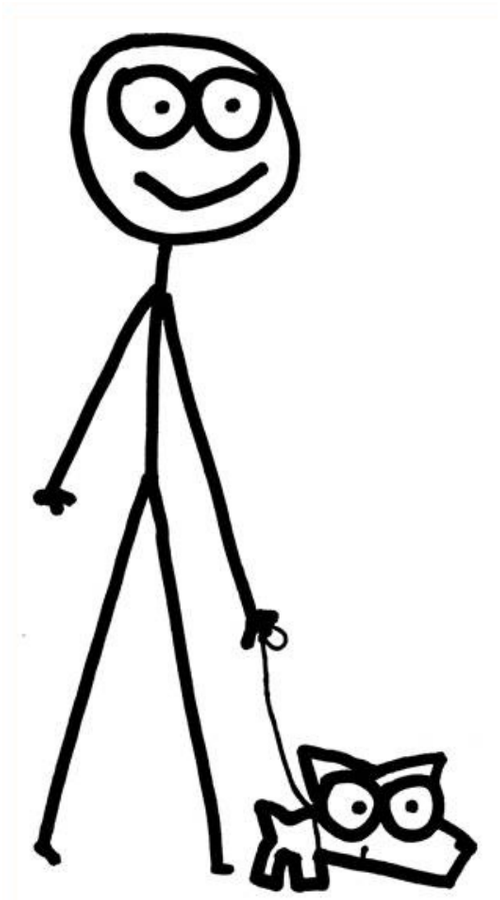
https://chat.openai.com/share/fa8c3f76-32ed-482a-bc04-ce80d0d536be

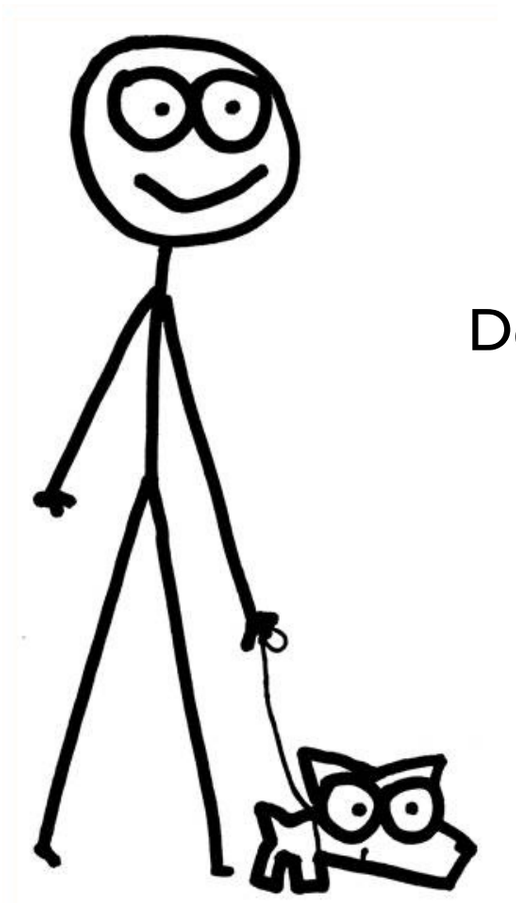
Relations and Functions!

Quantification!

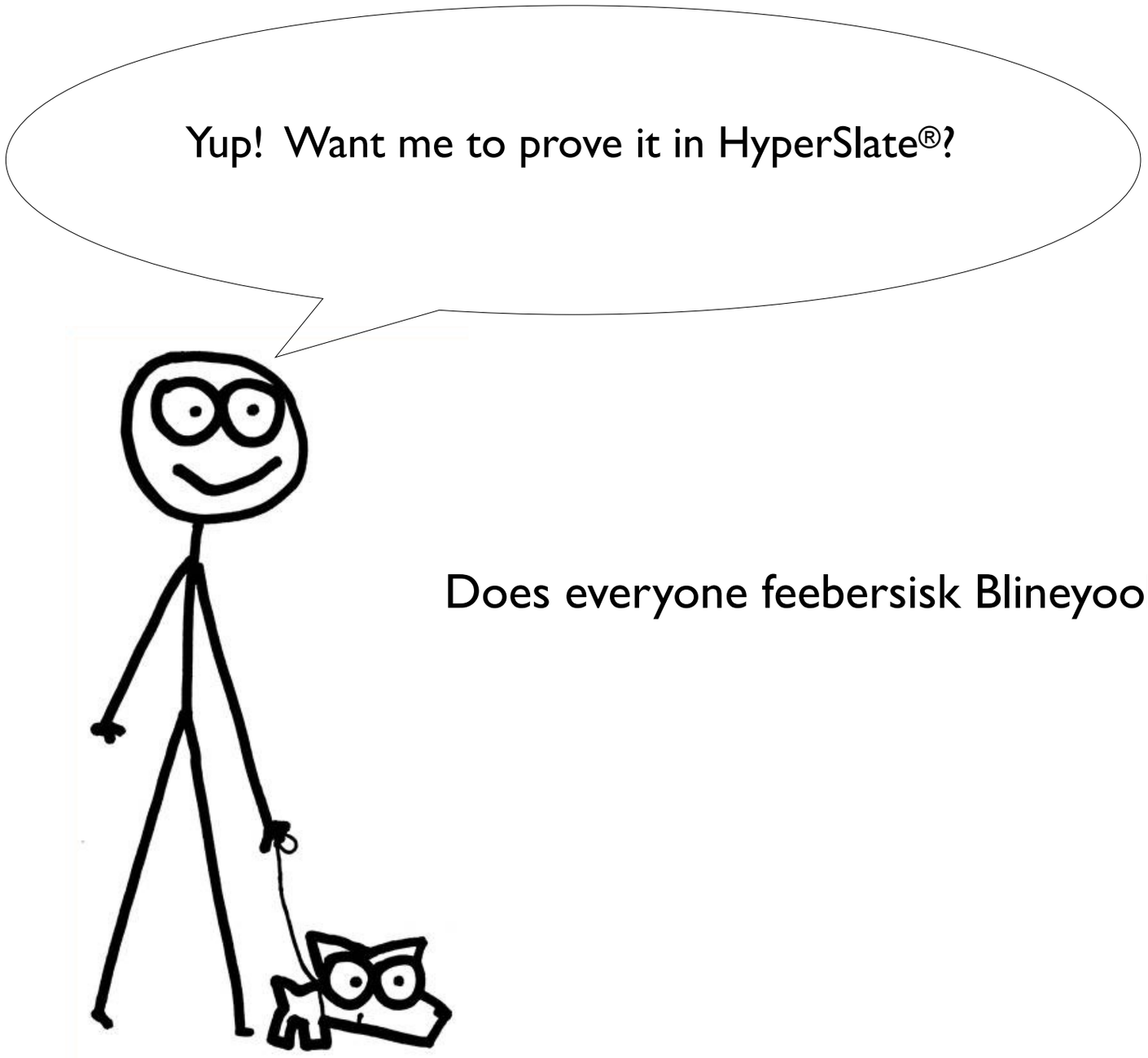
Recursion!

Infinitary Reasoning!





Does everyone feebersisk Blineyooker?


Yup! Want me to prove it in HyperSlate®?
Does everyone feebersisk Blineyooker?

Yup! Want me to prove it in HyperSlate®?

?

?

?

Does everyone feebersisk Blineyooker?

Discontinuity, briefly …

Relations and Functions!

Quantification!

Recursion!

Relations and Functions!

Quantification!

Recursion!

Relations and Functions!

Quantification!

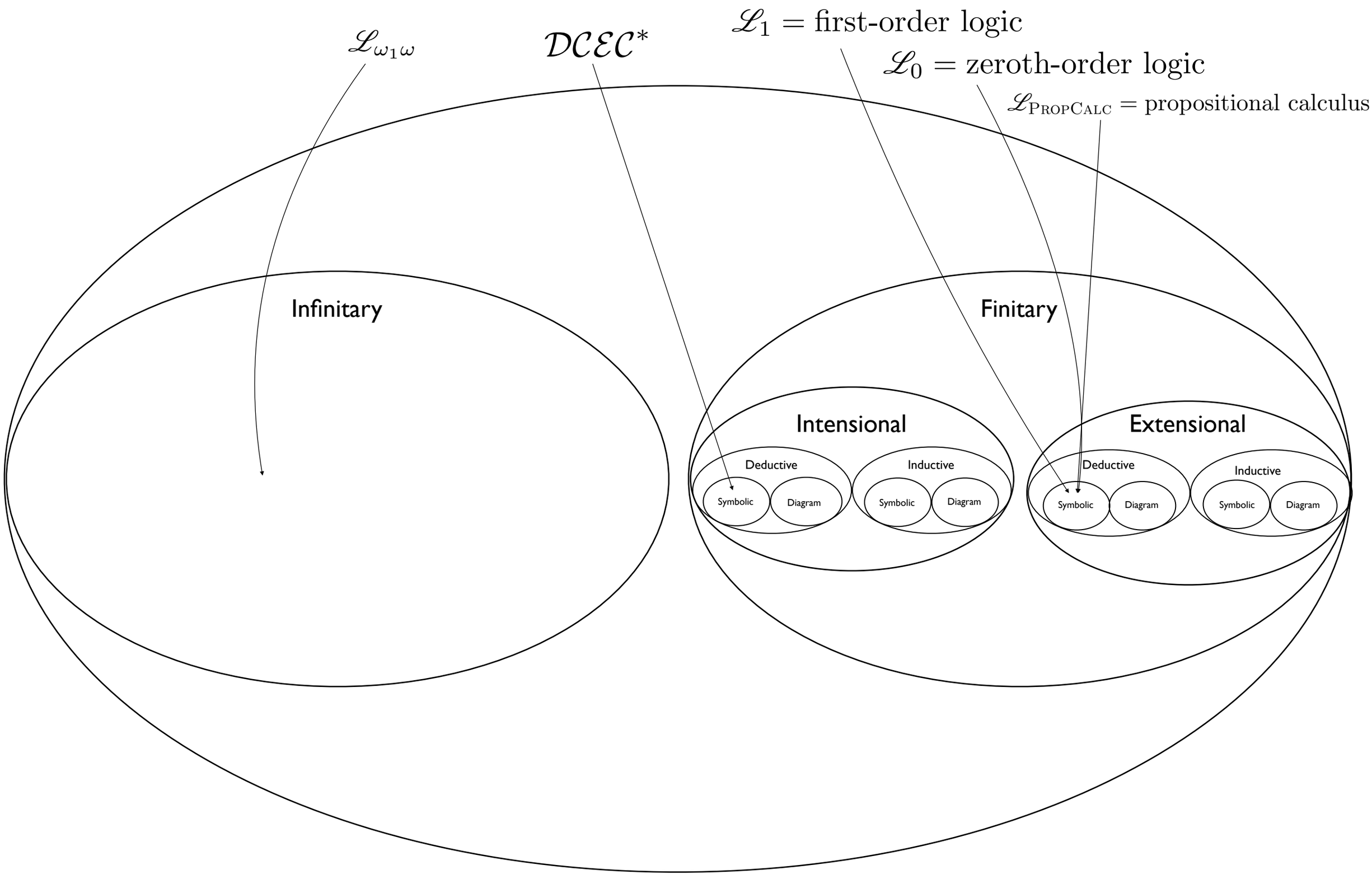
Recursion!

Relations and Functions!

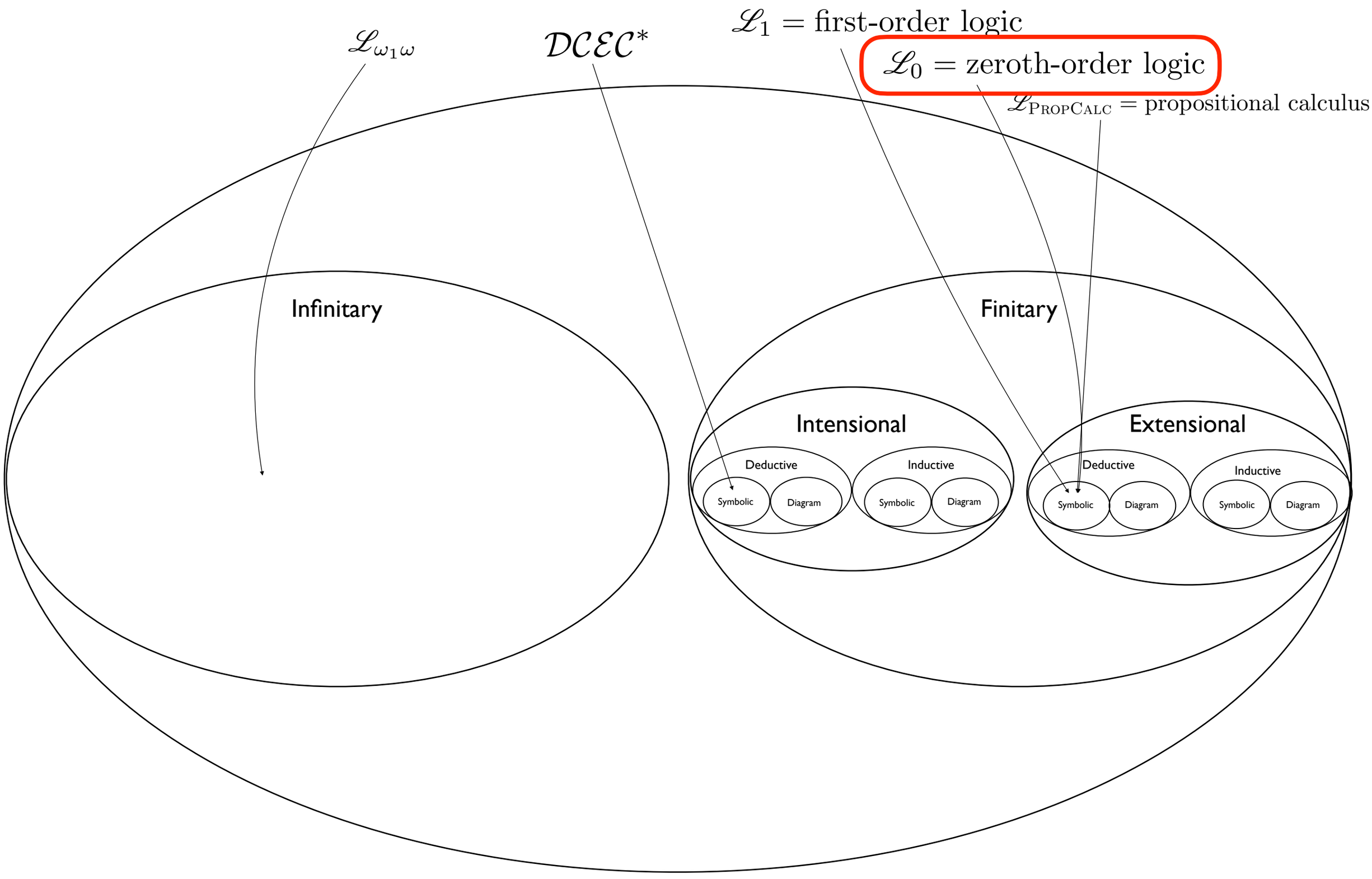
Quantification!

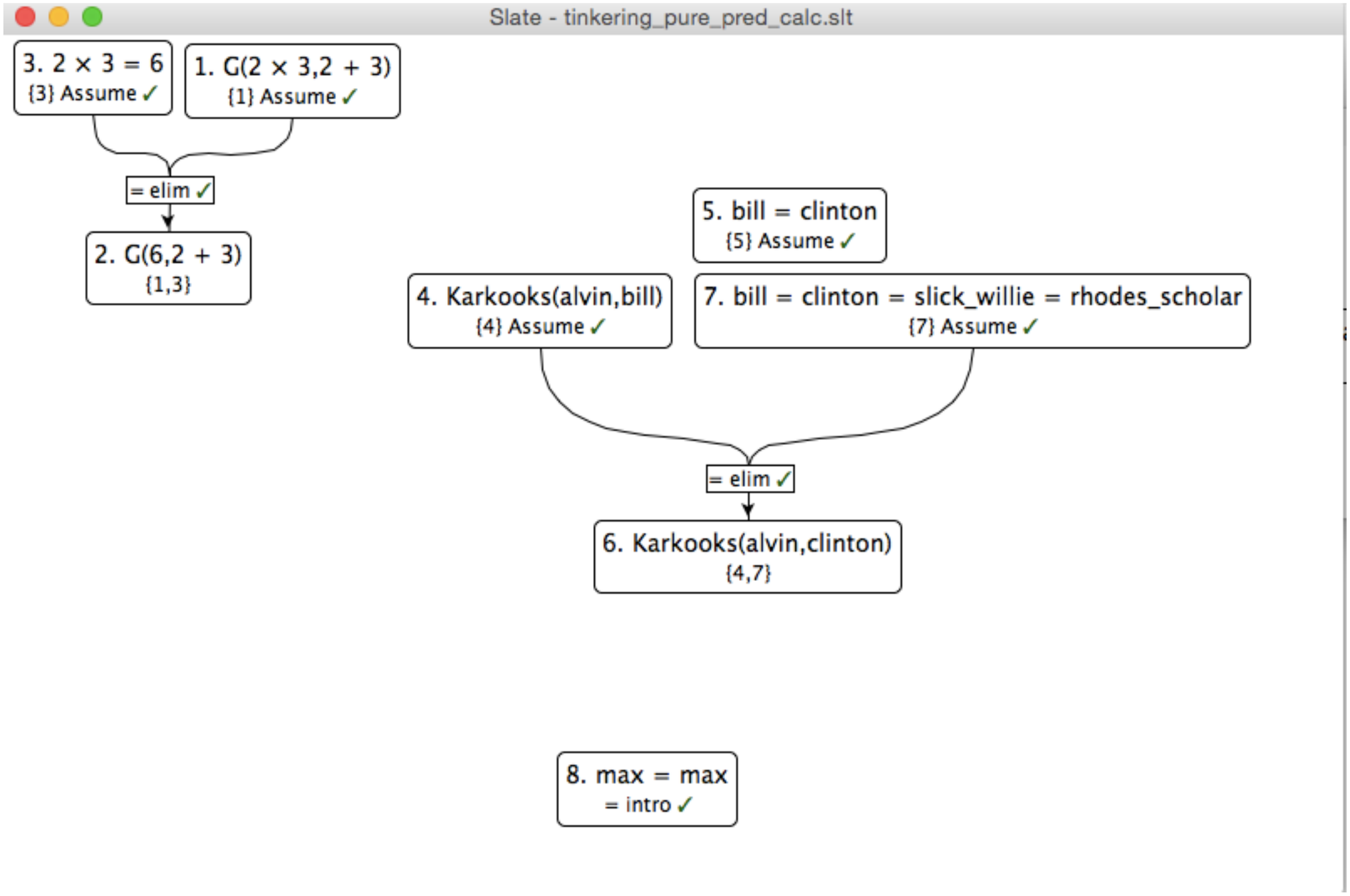
Recursion!

The Universe of Logics



The Universe of Logics

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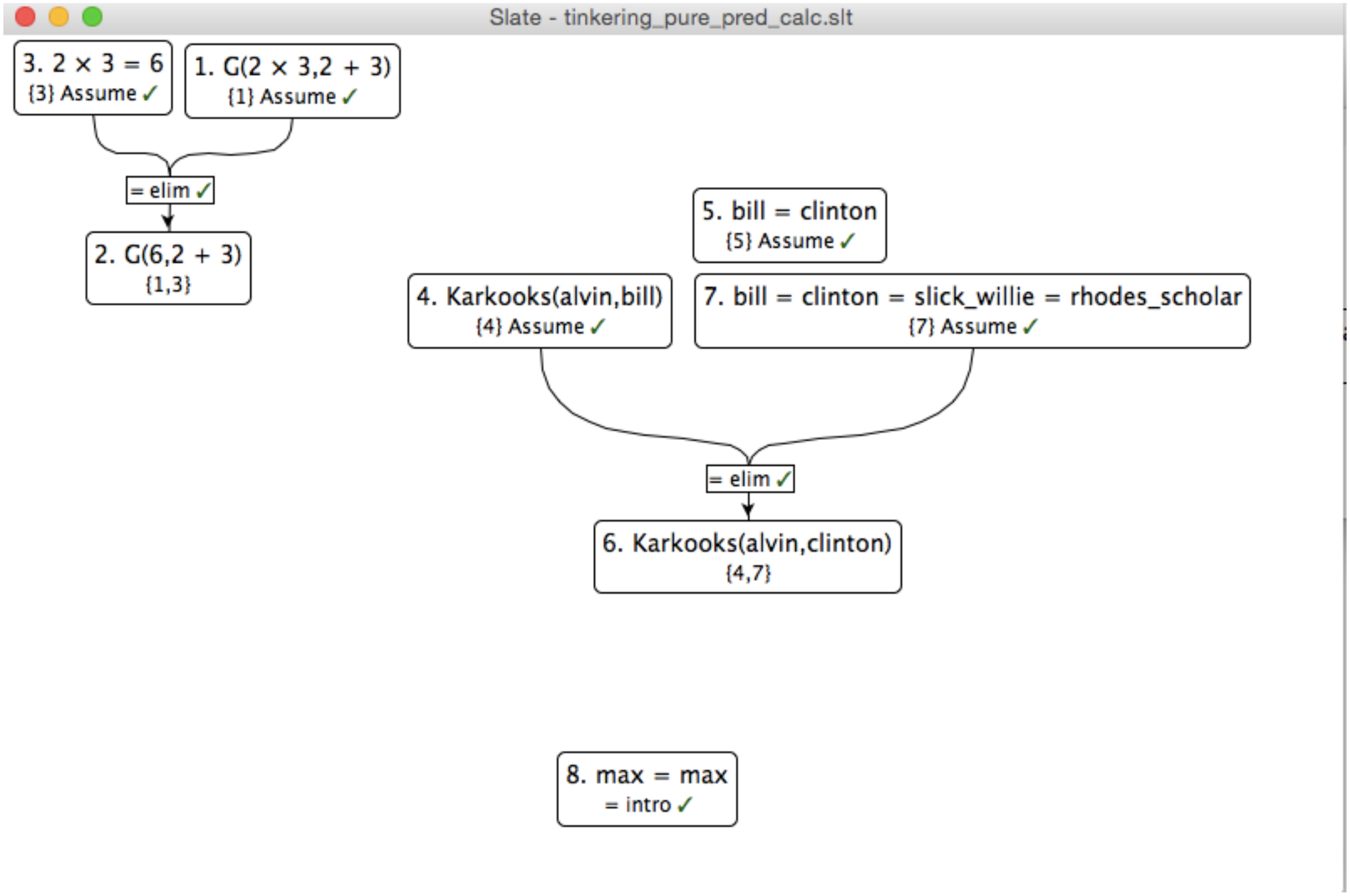
3. 2 × 3 = 6
{3} Assume ✓
1. G(2 × 3,2 + 3)
{1} Assume ✓
= elim ✓
2. G(6,2 + 3)
{1,3}
5. bill = clinton
{5} Assume ✓
4. Karkooks(alvin,bill)
{4} Assume ✓
7. bill = clinton = slick_willie = rhodes_scholar
{7} Assume ✓
= elim ✓
6. Karkooks(alvin,clinton)
{4,7}
8. max = max
= intro ✓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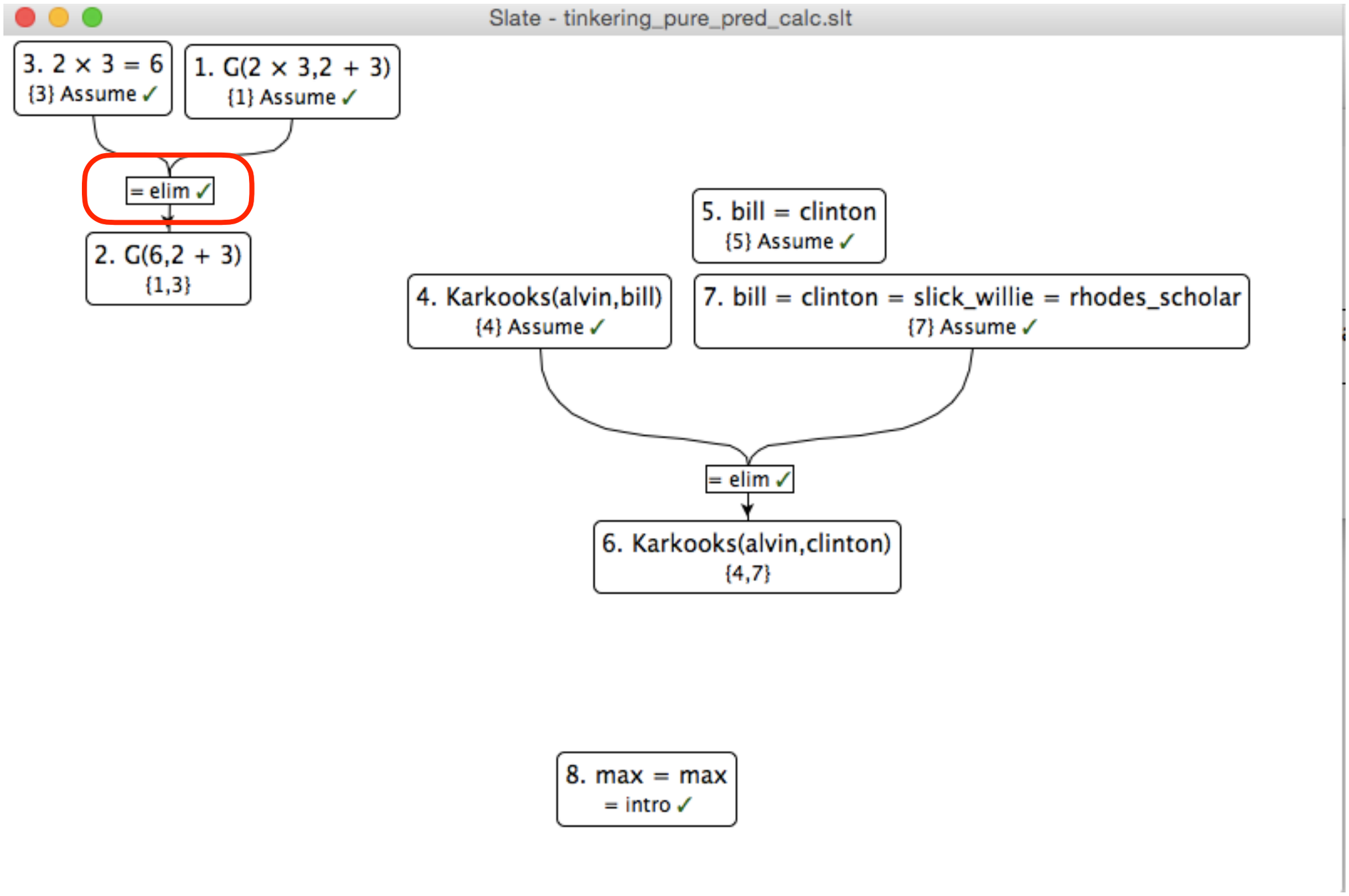
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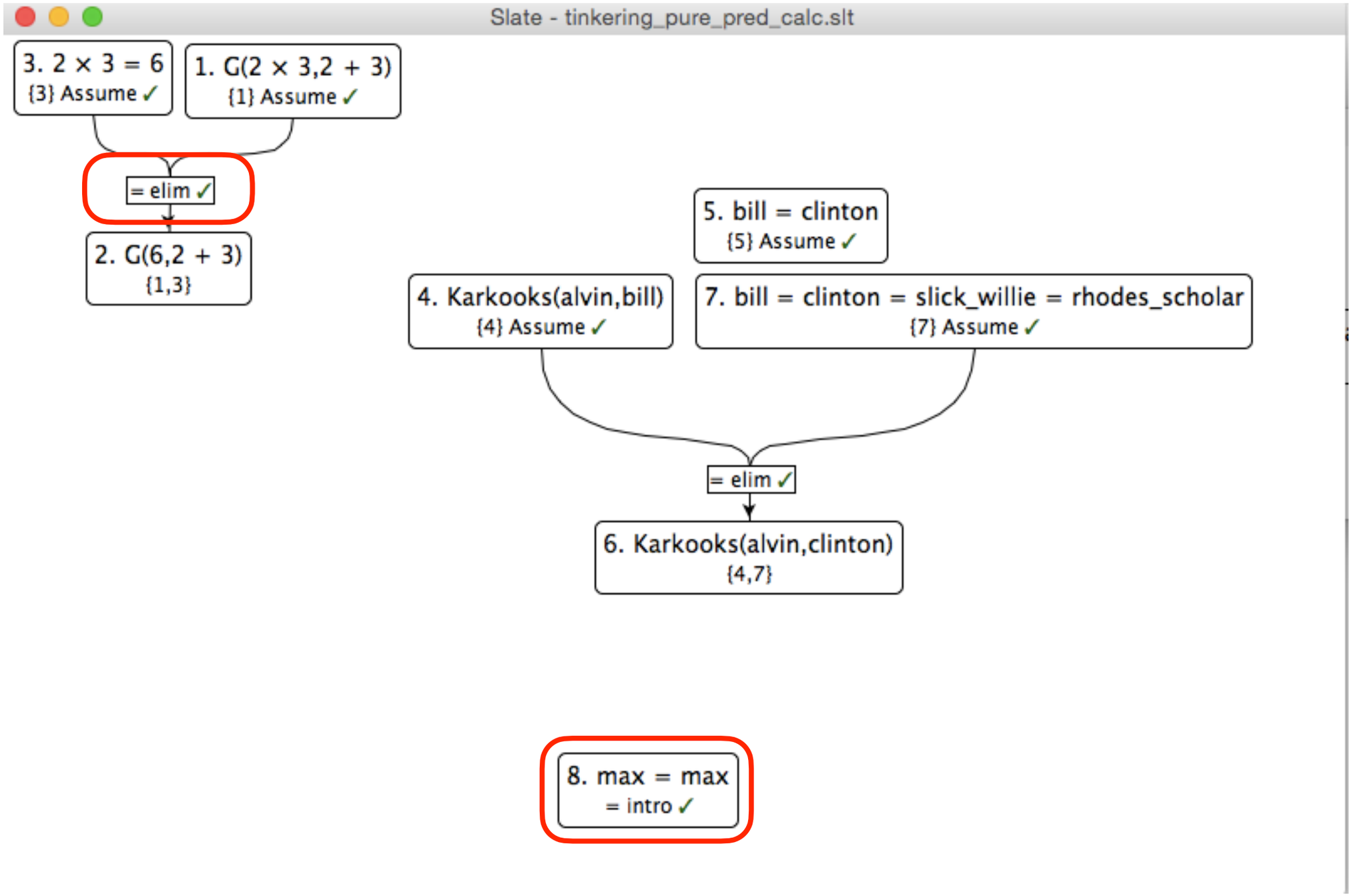
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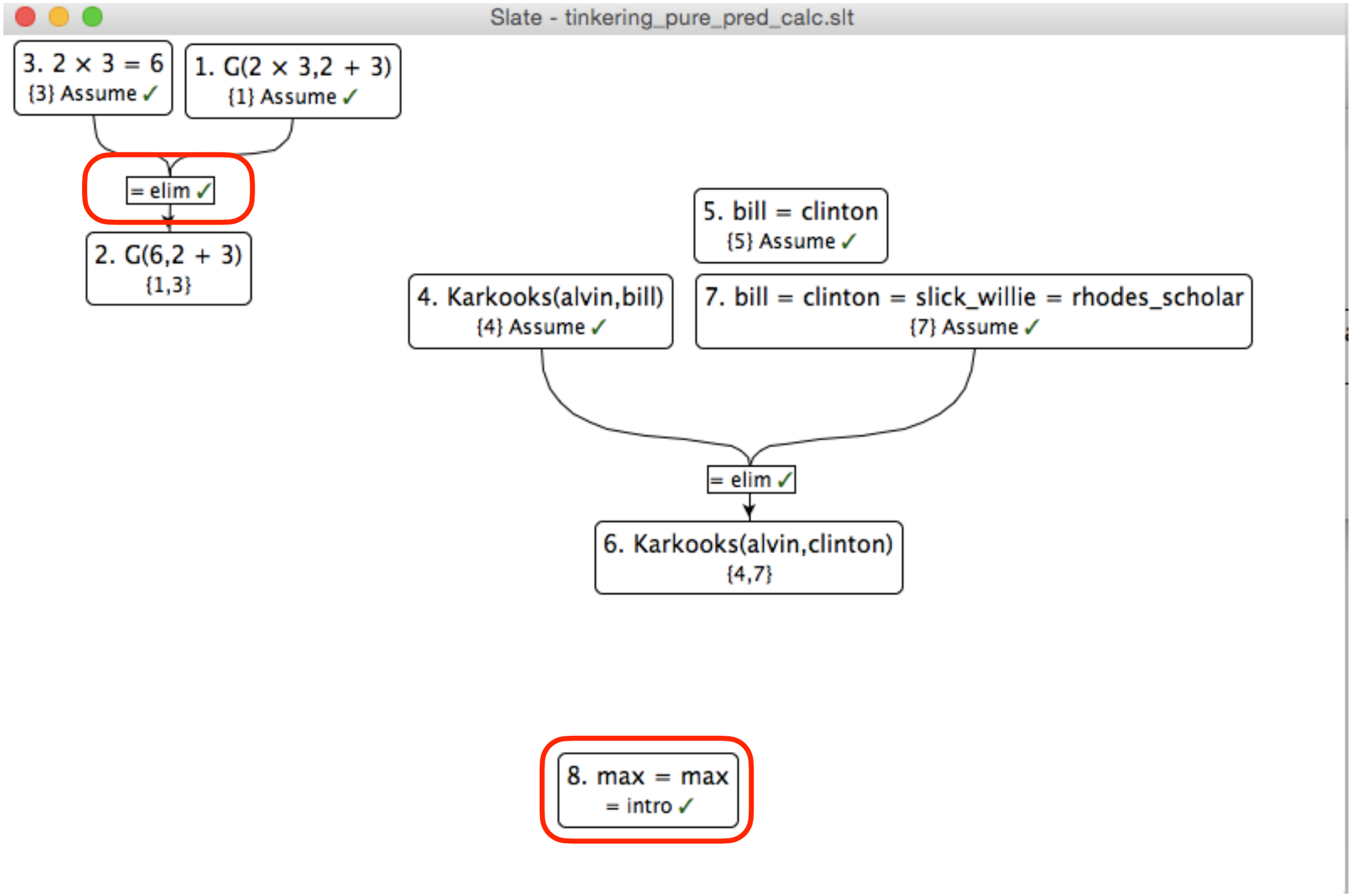
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PPC Problem …

Larry

Larry attended Hotchkiss before entering Harvard, from which he graduated with a degree in Scandinavian Studies. He aspires to be a Diplomat representing the United States to Sweden. Larry is from a rather wealthy family: his trust fund is valued at $7 billion; his father collects exotic islands, his mother precursor-to-Impressionism masterpieces, and his three bachelor brothers, fast, classic European luxury sedans capable of heart-pounding top speeds. Larry's command of math never exceeded what is covered on the SAT, and he has long forgotten even this material. He does not understand what a computer or computer program is, but nonetheless makes continuous use of social networking technology, including specifically **facebook**, on which he is liked by four people, all in his nuclear family, save for one, and that one is a brilliant female with a penchant for driving fast European sedans *really* fast. Say what you will about Larry, he is arrestingly eloquent without notes of any kind when speaking about geopolitics, in any venue; knows perhaps more about the history of Northern Europe (including its mythology) than any man alive; and while in keeping with his upbringing is a Hayekian capitalist, is rumored to generously donate millions each year to Big Brothers Big Sisters, AA, and Samaritan's Purse.

Lucy

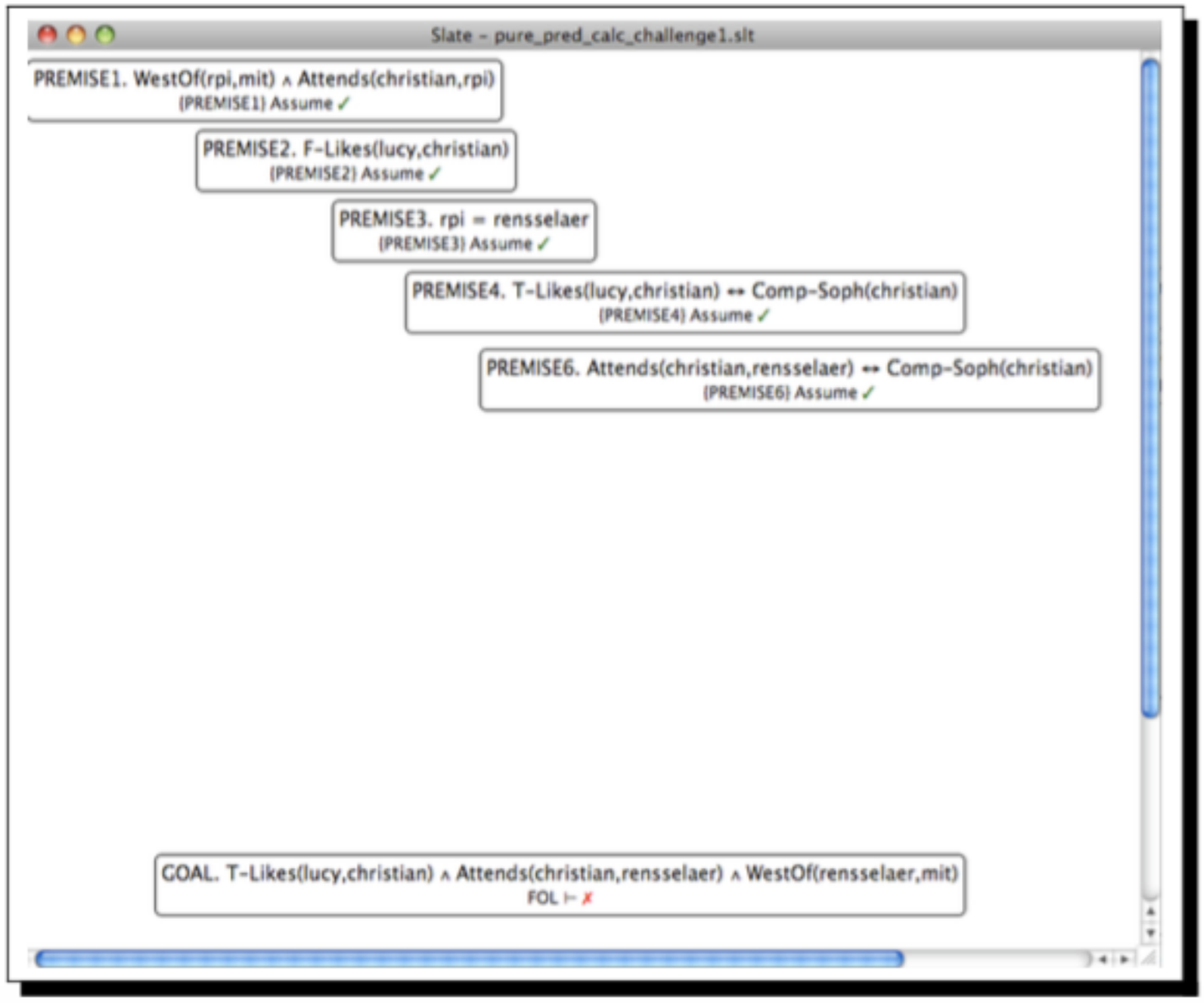
Lucy is a brilliant but poor hacker from a broken, impoverished home in Buffalo NY. A motherless only child raised by a single, devoted father who made ends meet (between binges on the bottle) as a brilliant but itinerant Daimler mechanic, she saw more heartache in her youth than that catalogued in a thousand country-song sagas. As a sophomore at MIT, she (successfully) petitioned to move directly to the PhD program in computer science without having to suffer the — to use her words — "torturous tedium" of the junior and senior years. This rapid "ascension" was all the more remarkable because her first year in college was not spent at MIT, but at Erie Community College, where on day one of *Java 101*, the professor insisted she come to her office after class, whereupon was launched a tutor-student relationship that initially centered not around not Java, but the language for which Professor Kuth has a secret passion: Prolog. Lucy has consistently rebuffed the overtures of all males at MIT, a group she disdains for their universally poor command of matters computational. Lucy stays in touch with her father by email (and as of this writing has managed to maintain her atheism despite his conversion and testimony), and with but five friends on **facebook**, one of whom has attended an Ivy-League institution, and one of whom, an entrepreneur co-running a startup company in the mobile computing space, attends a likewise techie university 2.5-hrs-drive to-the-west-of MIT.

Key

'Larry' :: `larry`
'Lucy' :: `lucy`
'Virginia' :: `virginia`
'Prescott' :: `prescott`
'Hank' :: `hank`
'Abe' :: `abe`
'Ben' :: `ben`
'Charles' :: `charles`
'Christian' :: `christian`
'Harvard' :: `harvard`
'MIT' :: `mit`
'RPI' :: `rpi`
'Rensselaer' :: `rensselaer`
`father-of` is a function; eg we can say: `(father-of lucy)`
`brother-of` is a function; eg we can say: `(brother-of larry)`
x is rich iff `(Rich x)`
x is employed at *y* iff `(EmployedAt x y)`
x is west of *y* iff `(WestOf x y)`
x attends *y* iff `(Attends x y)`
x had i-contact with *y* iff `(IContact x y)`
x facebook-likes *y* iff `(F-Likes x y)`
x truly likes *y* iff `(T-Likes x y)`
x is an alum of *y* iff `(Alum x y)`
x is a hacker iff `(Hacker x)`
x is computationally sophisticated iff `(Comp-Soph x)`
x is a female iff `(Female x)`
x is a generous iff `(Generous x)`
x is eloquent iff `(Eloquent x)`
x is a brother of *y* iff `(Brother x y)`
x knows Norse mythology iff `(K-Norse-Myth x)`
x knows who Huginn and Muninn are iff `(K-H-M x)`

Implement this example from the book!

Figure 3.1: A Proof Challenge in the Pure Predicate Calculus



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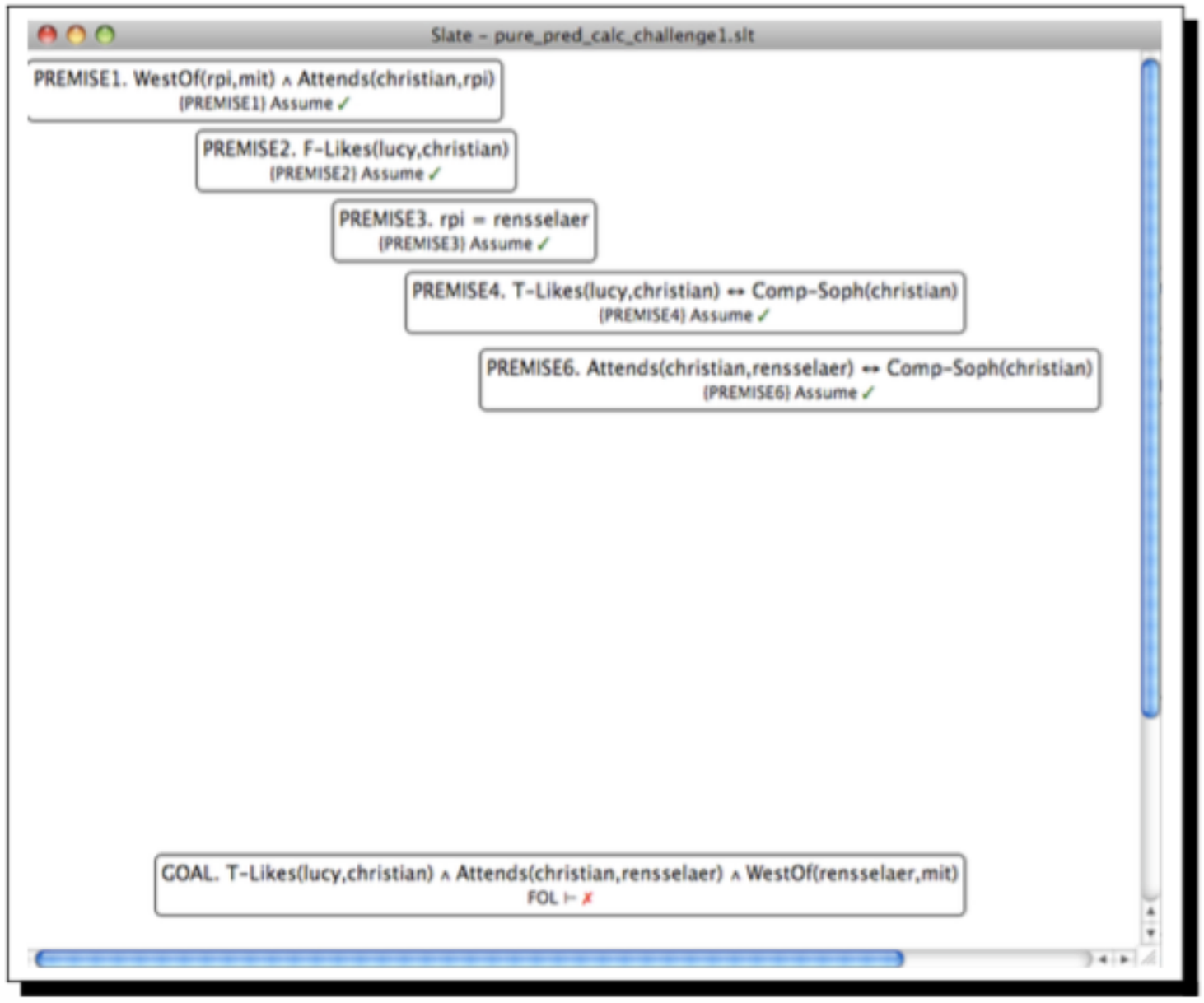

Part I: *Slutten.*

Part I: *Slutten.*

Part II: *Slutten.*