#flo #inclass

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1 | ACT (applied category theory) <> linguistics?

sounds epic.

talk with Tai-Danae Bradley - she took, so can ask about: group theory and measure theory

- wrote the articles as a study tool, thought that the mathematical language was "a little terse"
- she chatted with 3b1b? also runs pbs infinite (that's her)
- wait… she works at googlex?? "the moonshot factory" sick. KBxSort#moonshot
  - or, worked? past tense?
  - recently spun out of alphabet and now works at `https://www.sandboxaq.com` (broke ssl?) #revisit check out later when not on nueva wifi

1.1 | linguistics and category theory

idea of algebraic: orange + fruit → orange fruit also an idea of statistical: orange + idea → orange idea? doesn't make sense. this is represented with frequency

is some type of mathematical structure → uses KBxSystemsofSystemsinNatureandDeepLearning#category theory and mathematics/quantum/index

1.1.1 | machine systems of language understanding

now we are talking about GPT3 and such corsaurus and pomes might be useful here asked for gpt to compare dolphins and some random singer, and it worked great!

so she asks, essentially, wtf? what is the math here, and how does it do it? answer: category theory, apparently.

> CT is the network of relationships between mathematical objects

CT is the bridge.

objects and morphisms

1. The Yoneda Lemma "an objet is completely determined by its relationships to other objects" this is, up to isomorphism KBx3DInclass#isomorphism KBx3DInclass#isomorphism relations

   two sets have the same cardinality iff they have the same num of elements set's Z and X, X^Z is the set of all functions from Z → X

   the actual definition given sets X and Y, then X is isomorphic to Y iff $X^Z \cong Y^Z$ for all sets Z.

   thinks of taking X^Z for a given Z as a given 'vantage point' so saying that they are iso from all vantage points means they are themselves iso

   but apparently, this is way overkill, because all need is one set?

$Z - \{*\}$, set with single element $\{*\} \to X$ is just a choice of an element in X so we can say that $X \cong Y$ iff $X^{\{*\}} \to Y^{\{*\}}$

we can think about specifying words in the same way

once we assign probabilities to morphisms, then we have what is called

enriched category theory where each morphism has its own structure, with probability

in the category of *sets*, the Yoneda lemma turns out to be overkill.

2. classical → quantum probability we know that a joint probability distribution gives rise to marginal probabilities, and that marginalizing loses info KBxJointAndMarginalProbabilities marginal probabilities are just the sums of rows and column but! classically, marginalizing loses info, unless we do some quantum witchery?

   (a) quantum witchery represent's as a matrix M then does $M^\intercal M$
   %%
   $$\begin{pmatrix} \frac{1}{3} & \frac{1}{3} & 0 \\ \frac{1}{3} & & \end{pmatrix}$$
   %%
   the squares of the entries of the eigenvalues of $M^\intercal M$ are the conditional probability distributions on our org X?? *wtf?*

   sets? bad. not enough structure. instead, we look at functions on sets? and this gives us the structure we need?

   density operators is a special type of linear operator, which is self adjoint and positie semidefinite with trace one and these density operators ***are*** quantum states

   we can visually represent tensors and morphisms graphically, called tensor network diagrams KBxModuleOneLinalgTed#Tensor Products KBxQuantumLectureThree#tensor products

   also the concept of a projection operator? where you map every vec to its projection onto a given vec?

   and this gets us to entanglement?? whatta what what? i am lost. #review this on her website