Meeting 3 17 2023

Everybody was there.

I. Amber has been working on hybridization, Dennis & Amber on ‘keep the best.’

We went over how hybridization would work. The basic idea:

Start with a code for our currently ‘best’ network: 110011 for illustration.
Pick some random spots:

110011

Now generate some number of random networks: 111000
000111
101010

For each of these we’ll generate two offspring. The first offspring in each case substitutes the random network’s numbers at that spot for the red ones above. The second offspring substitutes the random network’s numbers at that spot for the black ones above.

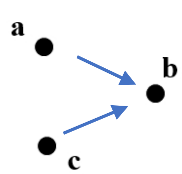
In this example, our offspring would be: 110001 111010
100111 010111
100011 111010 if I’ve done this right.

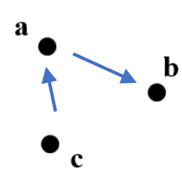
We pick the best of the lot, and that’s our ‘best’ for the next round.

There are lots of variations on hybridization, but all use the same basic mechanisms. We’ll see if we can make this one work.

II. Keep the best. We will often have a network that has some parts that come out ‘right’, some that don’t. For example:

The world’s network, we’ll suppose is: Our current representation is:





The evidence generated by the world is:

Activation a results in [b_1]
b results in [ ]
c results in [b_1]

The evidence generated by our representation is:

Activation a results in [b_1]
b results in [ ]
c results in [a_1]

Here our activations at a and b are giving us the right answer. So whatever links are indicated from a and b and right.

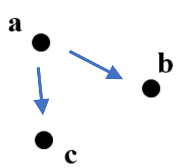
We keep those, using our heuristics only on what's wrong: we single-mutate the c activation values, or randomly single- double mutate it, or hybridize but only with 'randoms' that differ from our base in c activations.

III. Patrick outlined a challenge for Zhongming. All our examples, as Dennis has pointed out, use complete (time) evidence activations that can give us the full story to reconstruct the world's network.

The question: What if we **don't** have the full evidence story. How much of an impact does that have on our inability to figure out what the world is like? The measure: how many networks are consistent with the partial evidence we have?—the more networks are consistent with that partial evidence, the more theories we can't choose between and thus the more ignorant we are.

It would be wonderful if we could figure out how much ignorance results when we don't have activation evidence at root nodes (arrows only come from them), leaf nodes (arrows only come into them) or central nodes (arrows both in and out)…and depending on the structure of the network.

Example:

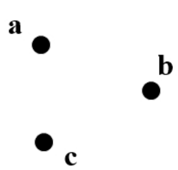


The 'full' evidence from this network would be: a [b_1, c_1]
b [ ]
c [ ]

Suppose we didn't know what happens if we activate b (but knew the rest). Then we'd have two possible networks: the real one, and one in which there was also a link from b to c.

Suppose we didn't now what happens if we activate c. 2 potential networks again.

Now suppose we didn't know what happens if we activate a. All of these would be consistent with the evidence that remains:



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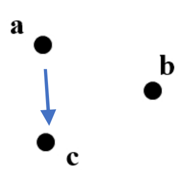

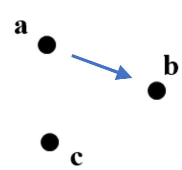

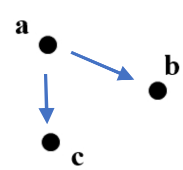

So if the world's network is this, and we lose evidence from the root node, we have an 'error variance' of 4.

The question for Zhongming: Is there any potential generalization here, regarding how much error variance we introduce if our evidence is missing for different points at different network structures?

IV. Sophia led us through John Stuart Mill's 'method of agreement,' 'method of difference,' and 'joint method of agreement and difference' as "how to figure out whether events of type X cause events of type Y" circa 1843.

Scans of her handout should be attached.

It would be cool in final presentation if we end up being able to say 'and of course Hume and Mill present partial algorithms for what we're talking about, but only partial.'

V. Dennis and Patrick agreed that the 'see what happens if you **de**activate b' idea sounds a whole lot like 'd-separation' in Judea Pearl's work. Both D an P promised to try to track down more on that.

For next week:

Dennis & Amber are going to keep working on hybridization and 'keep the best.'

Sophia is going to take a look at 'draft 1' from a while ago.

Zhongming is going to see if he can make any progress on the 'error incumbent on limited evidence' problem.

Patrick & Dennis are going to try to track down d-separation and related issues.