1/6/2023

- Write ~~pseudocode~~ code to produce the expression of the hazard function L'

$\mathbb{P}(T=2) = [1-\mathbb{P}(T=1)]\,\underline{\mathbb{P}(\text{all children die})}$

$\mathbb{P}(\text{all children die}) = \mathbb{P}(\forall j \in \vec{N}_i,\ \text{child } j \text{ dies in cell or injection})$

The previous state has 1 in entry j, and the other entries are all free. There are 2^{n-1} such states. I need some notation for this set, ~~call it~~ for now lets call it $X_n[i]$.

```
expr = ""
for x in X_n[i]:
    for b ∈ B_L:
        z = f(Ax+b)
        extinct = True
        for j in N_i:
            extinct = extinct and z_j = 0
        if extinct:
            expr = expr + "π_x p_b +"
return expr[:-1]  # this drops the last "+" hanging on the end
```

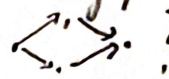
$$\sum_{x \in X_n[i]} \pi_x \sum_{b \in B_L} p_b \cancel{\mathbb{1}\Big\{\sum_{j \in \vec{N}_i} f(Ax+b)_j = 0\Big\}} = \mathbb{P}(\text{all children die})$$

$$\mathbb{1}_{\{0\}}\Big(\sum_{j \in \vec{N}_i} f(Ax+b)_j\Big)$$

$$\cancel{\boxed{\mathbb{P}(T=2) = [1-\mathbb{P}(T=1)]\, \mathbb{1}_{\{0\}}\Big(\sum_{j \in \vec{N}_i} f(Ax+b)_j\Big)}}$$

$$\boxed{\mathbb{P}(T=2) = [1-\mathbb{P}(T=1)] \sum_{x \in X_n[i]} \pi_x \sum_{b \in B_L} p_b\, \mathbb{1}_{\{0\}}\Big(\sum_{j \in \vec{N}_i} f(Ax+b)_j\Big)}$$

$\mathbb{P}(T=3) = [1-\mathbb{P}(T=2)]\,\underline{\mathbb{P}(\text{all grandchildren die})}$

This is an attempt. Does it hold on a graph like  ?

$\mathbb{P}$(all grandchildren die):

We know that the previous state has an active node in $\vec{N}_i$. So now, we also need to loop over that set.

```
expr = ""
for S in 2^{N_i} - Ø:
    for x in X_n[S]:
        for b in B_L:
            z = f(Ax+b)
            extinct = True
            for k in ∪_{j∈S} N_j:
                extinct = extinct and z_j = 0
            if extinct:
                expr = expr + "π_x p_b +"
return expr[:-1]
```

I think I'm double counting because, for instance, $X_n[\{1,2,3\}] \subsetneq X_n[\{1,2\}]$, so the end expression would include some terms twice.

So... how can I use this approach without double counting?

<u>Am</u> I <u>actually</u> double counting?

→ I think this part might mean I'm not double counting.

→ Also, ~~the outer loop should not~~ I need to factor in collisions that are guaranteed given the activation of S. This didn't ~~one~~ matter for $T=2$ but it does now since multiple nodes may be guaranteed to be active.