# Collaborative Design:

Pro-functors, categorification, and Monoidal categories:

Takeaway: Understanding Mathematical theory of co-design (collaborative design) and hence understanding constructs like profunctors, monoidal categories and categorifying.

→ Understanding Collaborative design:

Codesign: A desi heirarchical design process where each a large-scale system is divided into sub-group (& further sub-sub-groups), each group working on th a sub project.

co-design diagram:

• The small boxes can be considered as sub-projects (groups)
• The wires connecting to the L.H.s of the boxes are requirements and the ones on the R.H.S are produces

   And if box A ~~produces~~ requires a resource that box B produces, then A's requirements must be less-than-or-equal-to B's production.

• The box marked $\Sigma$ correspond to summing inputs.

   Ex: 4.1

## Formalizing:

Each of the boxes in a co-design diagram correspond to a feasibility relation (giving an idea about feasibility of a sub-project based on produce & requirements)

P is the preorder of resources to ~~produced~~ be produced

R is the resources to be required.

~~Feasibility~~ ~~relation~~ ~~hence~~ defines

The __Box__ says " yes, I can provide p given r" (true)
   or " No, I can't provide p given r" (false)

$(p, r) \in P \times R$

Feasibility relation hence define a function $\phi: P \times R \longrightarrow Bool$.
With two conditions (to make sense)

(a) If $\phi(p, r) = $ true and $p' \leq p$, then $\phi(p', r) = $ true

(b) If $\phi(p, r) = $ true and $r \leq r'$, then $\phi(p, r') = $ true