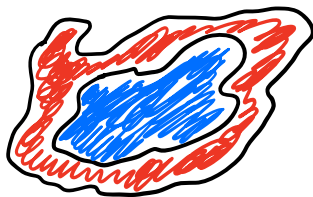


Is Entanglement Necessary for

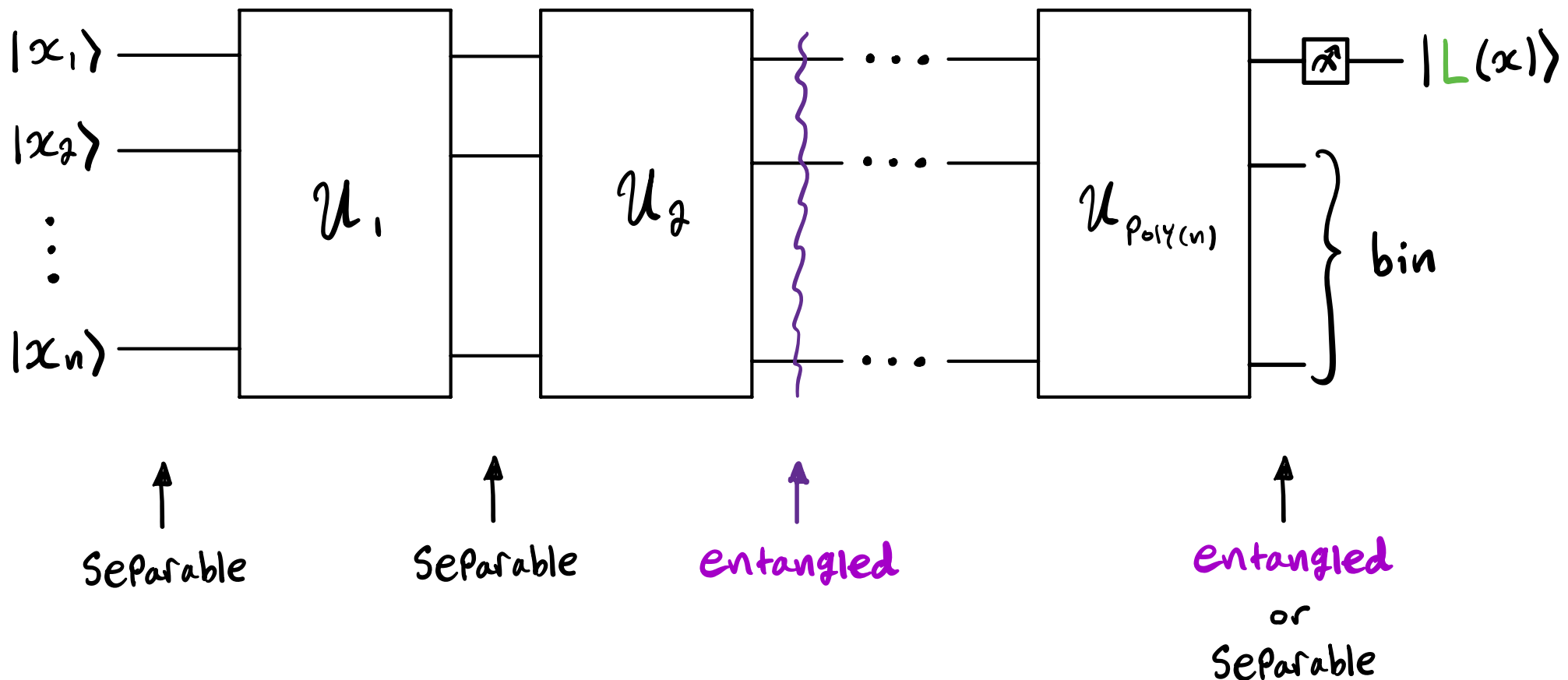
$BPP \neq BQP$?



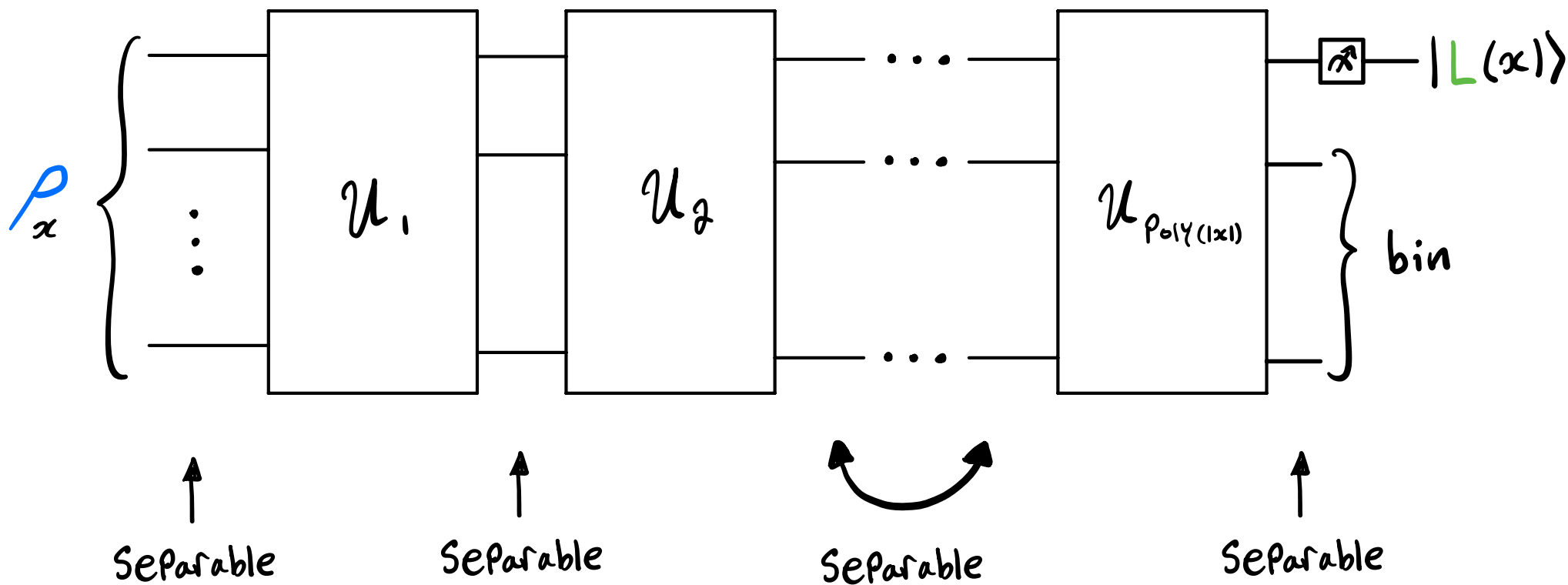
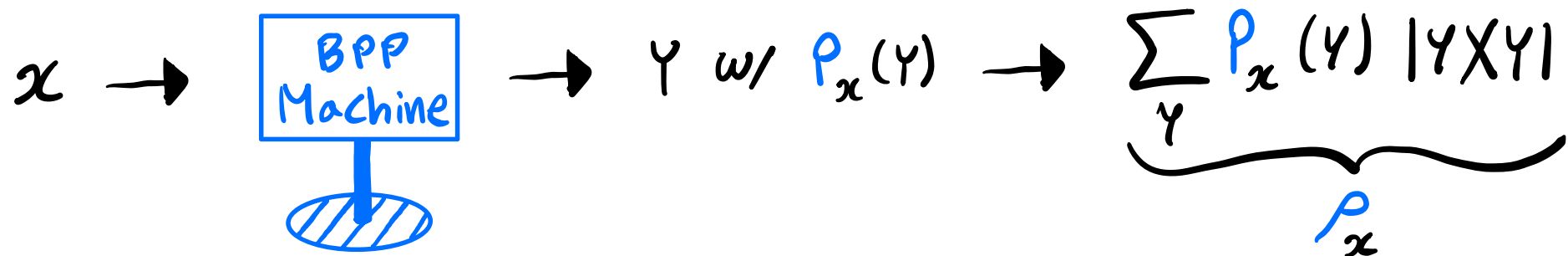
Matthew Fox

University of Colorado Boulder

Q: Does every (uniform, poly-size) circuit for $L \in \text{BQP} \setminus \text{BPP}$ necessarily entangle its input?



Q: Decide $L \in \text{BQP} \setminus \text{BPP}$ like this?



Def: $L \in \text{BQP}_{\text{sep}}$ iff $L \in \text{BQP}$ and "entanglement is not necessary to decide L ".

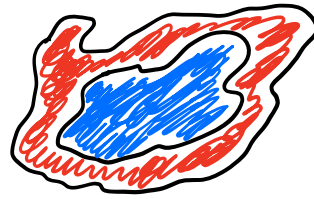
Basic Properties:

- $\text{BPP} \subseteq \text{BQP}_{\text{sep}} \subseteq \text{BQP}$
- $\text{BPP} = \text{BQP}_{\text{sep}} \rightarrow$ "entanglement necessary"
- $\text{BQP}_{\text{sep}} = \text{BQP} \rightarrow$ "entanglement NOT necessary"

Some Complexity Questions:

- $\text{BPP} \stackrel{?}{=} \text{BQP}_{\text{sep}}$
- $\text{PostBQP}_{\text{sep}}$ and PH collapse?
- Deferred Measurements in BQP_{sep}
- Non-entangling oracles

Thank You!



Slides

