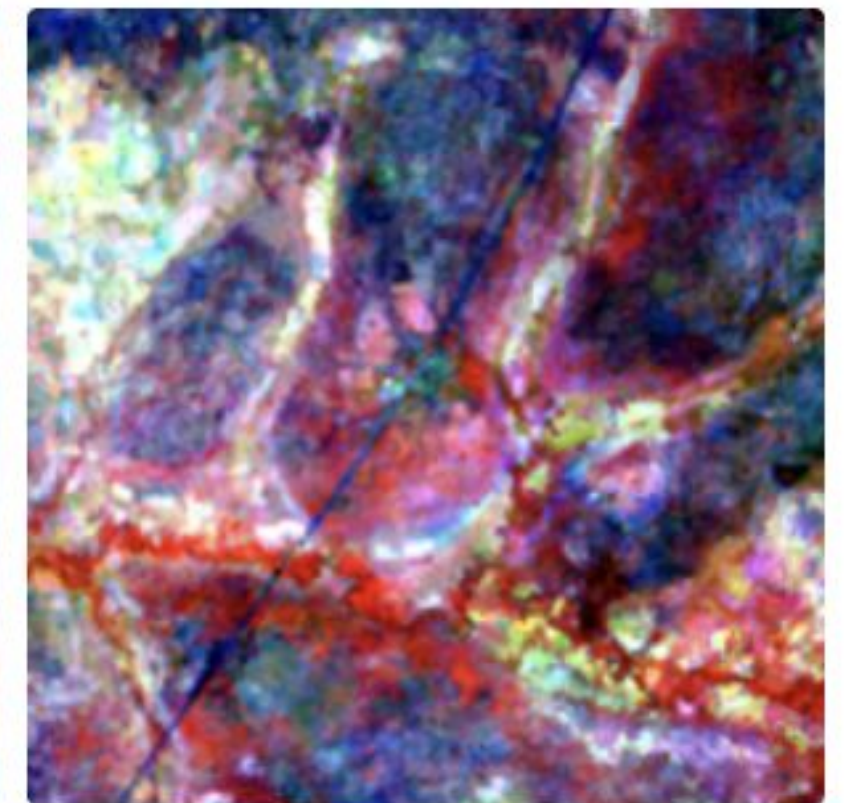
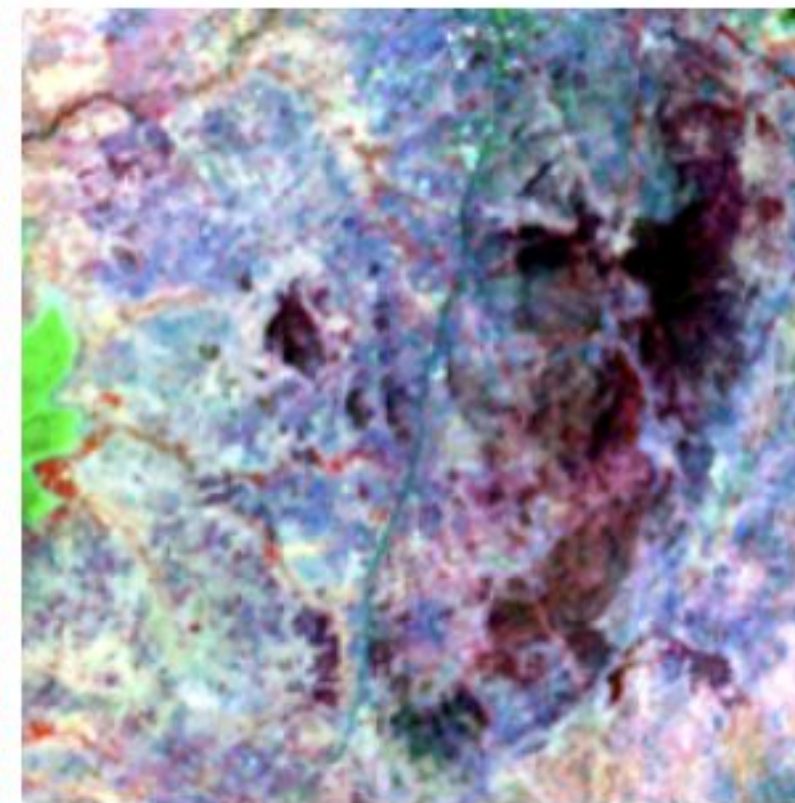
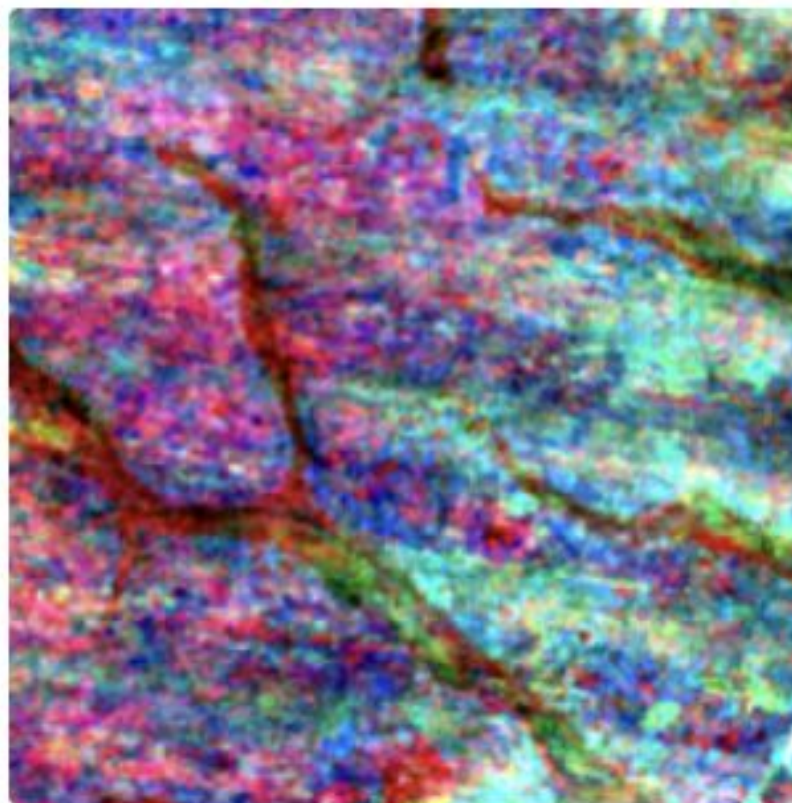
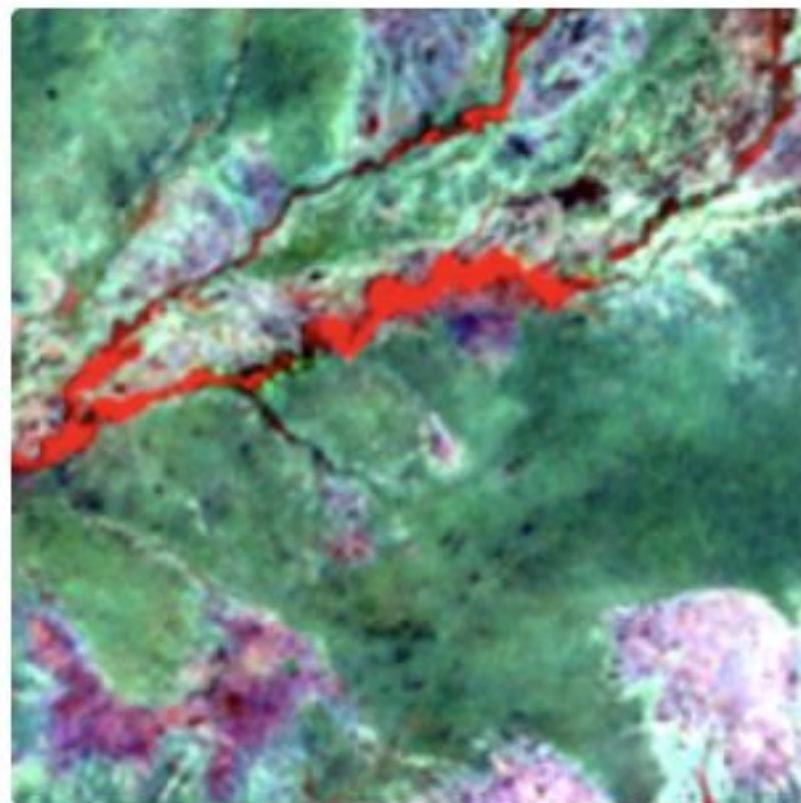
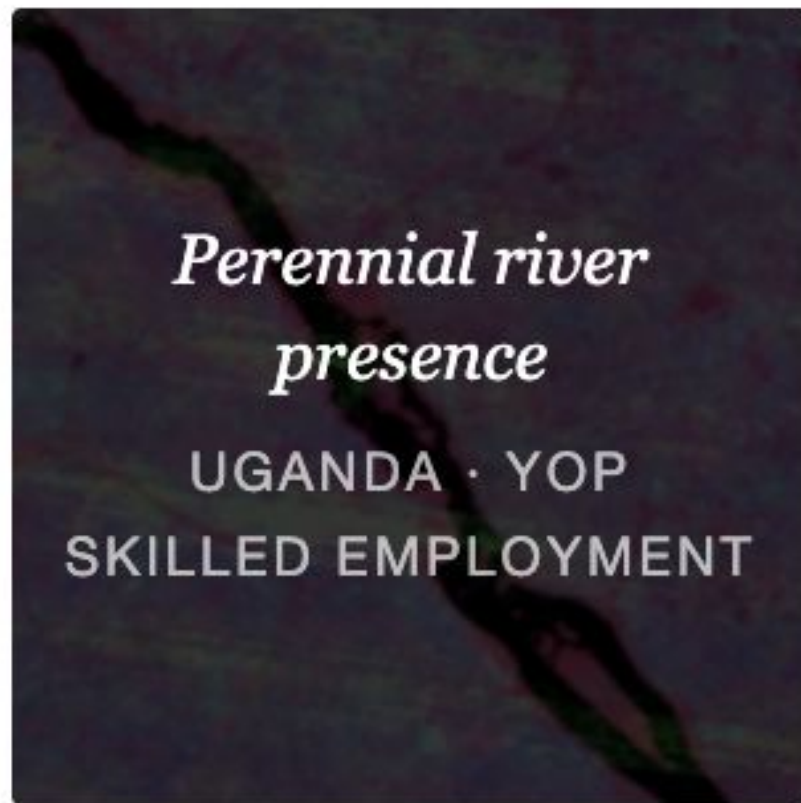
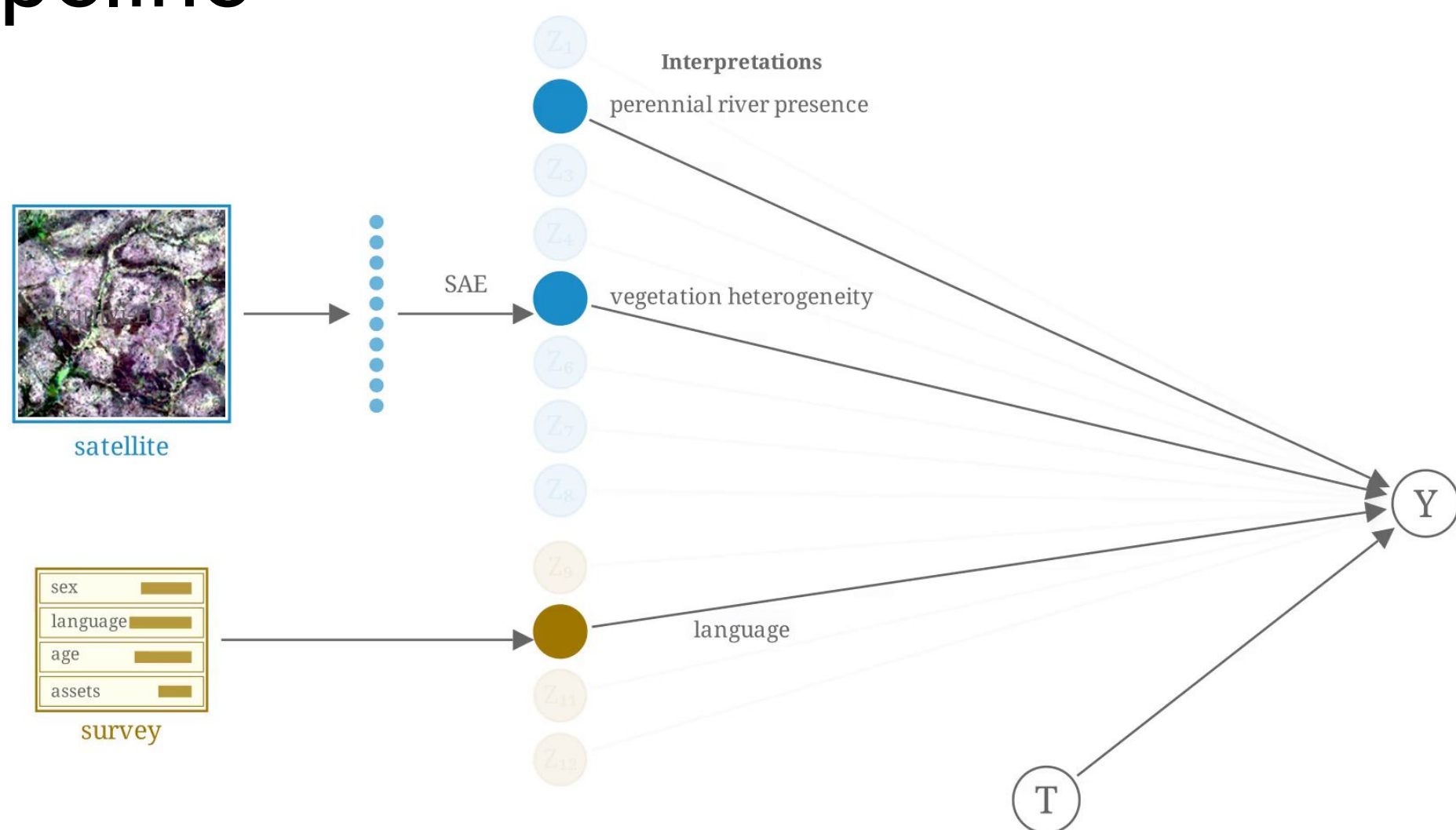


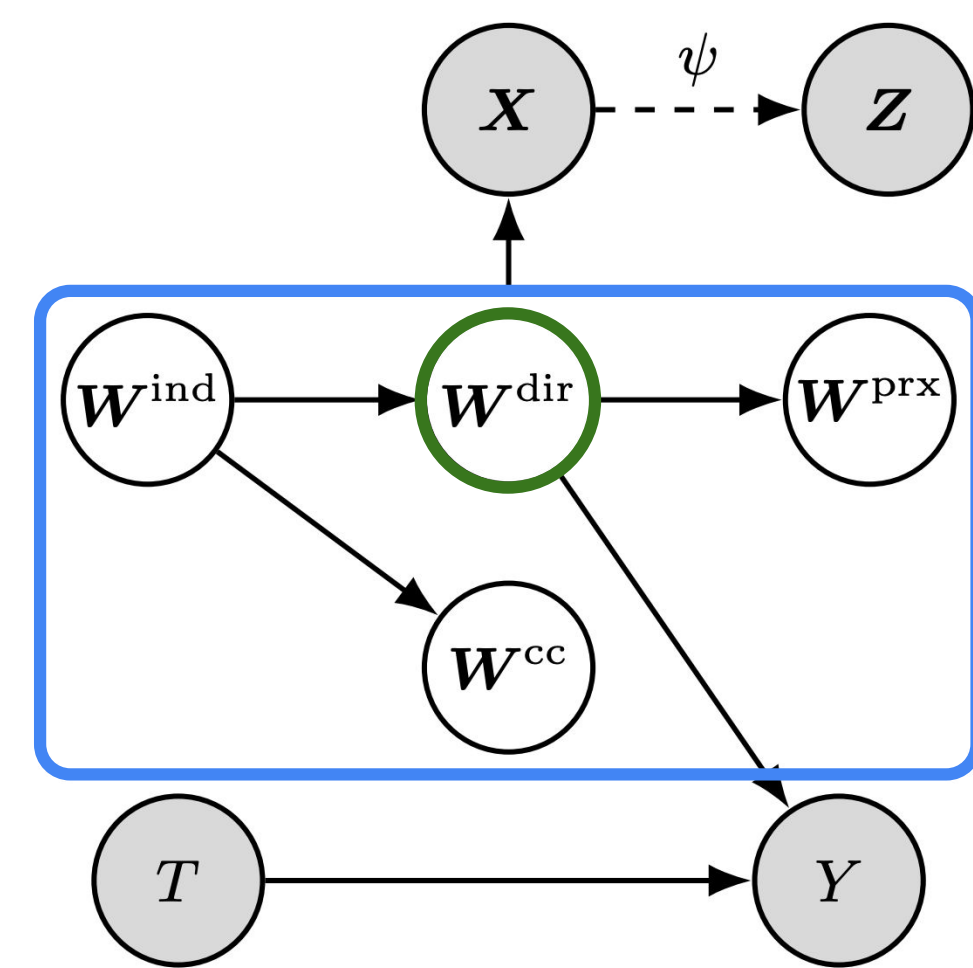


► River corridors sustain subsistence fishing and bush-crop farming; where these livelihood alternatives exist, the grant's pull into skilled trade is weakest — **outside-option effect** (Roy, 1951).

Pipeline



From Effect Modification to Interaction



Assumptions

Experiment Design:

- Causal Identifiability
- Measurement Sufficiency

Representation Learning

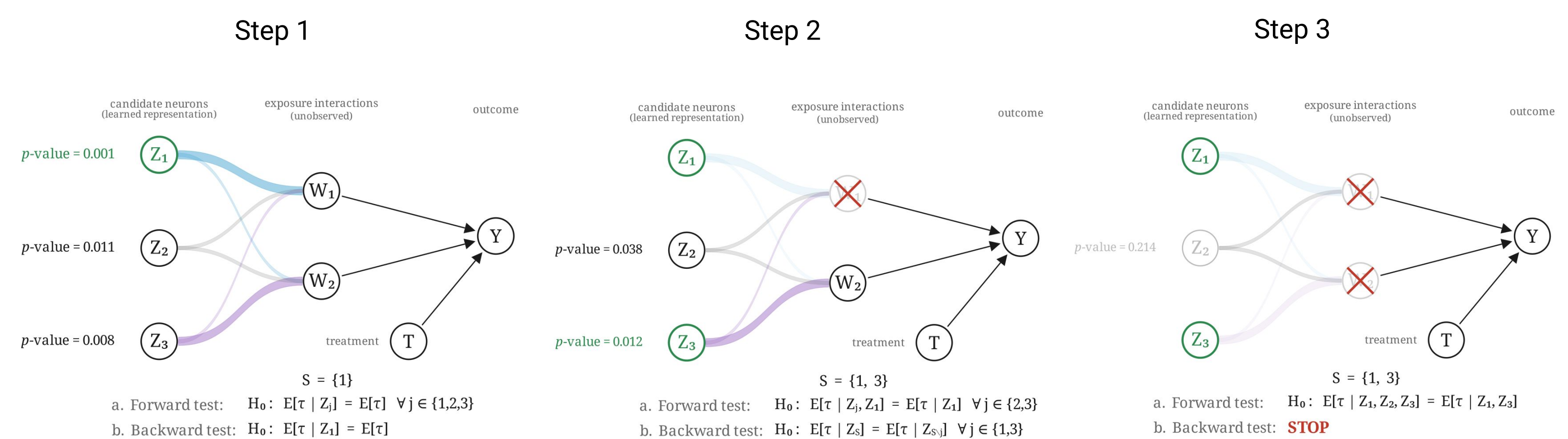
- Representation Sufficiency
- Principal Alignment

Other

- Faithfulness
- Valid conditional tests

Method (NEXIS)

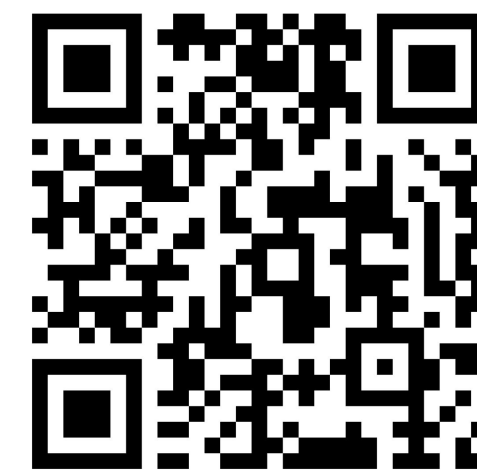
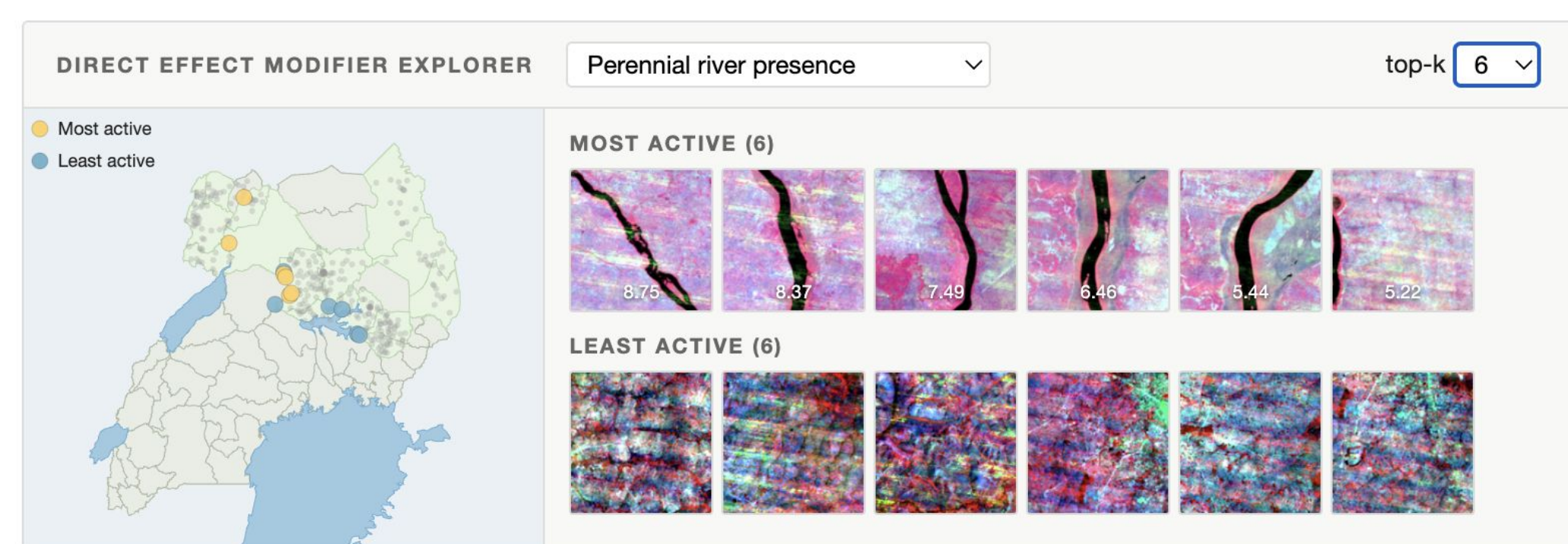
Minimal and Sufficient → Causal and Interpretable



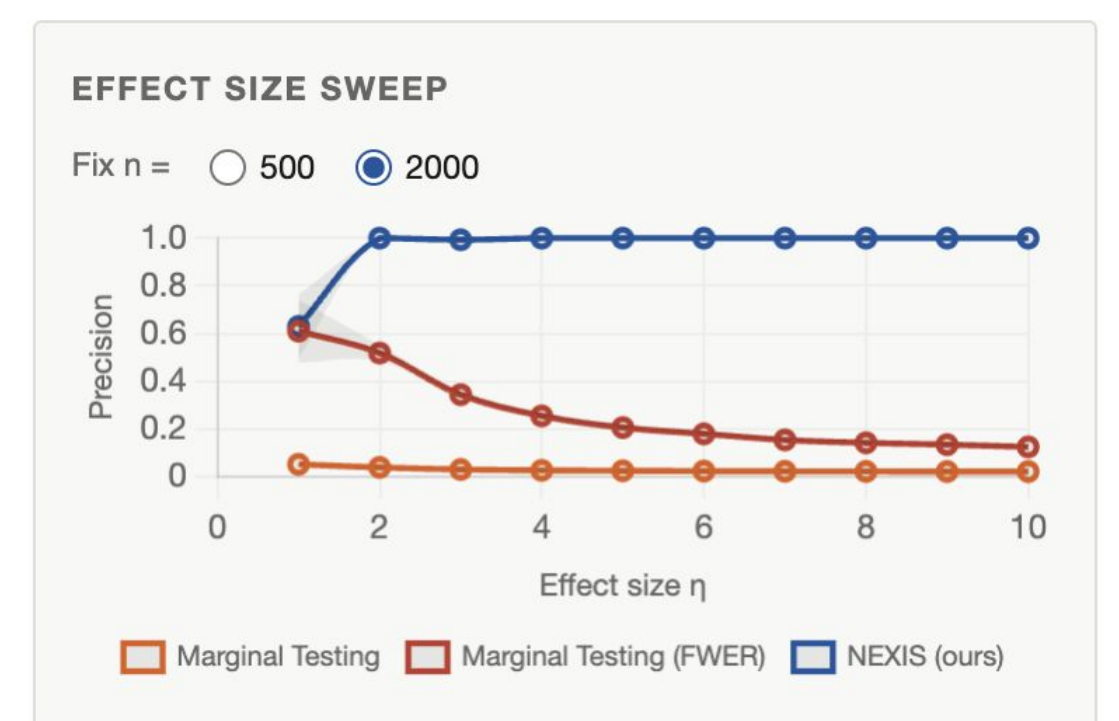
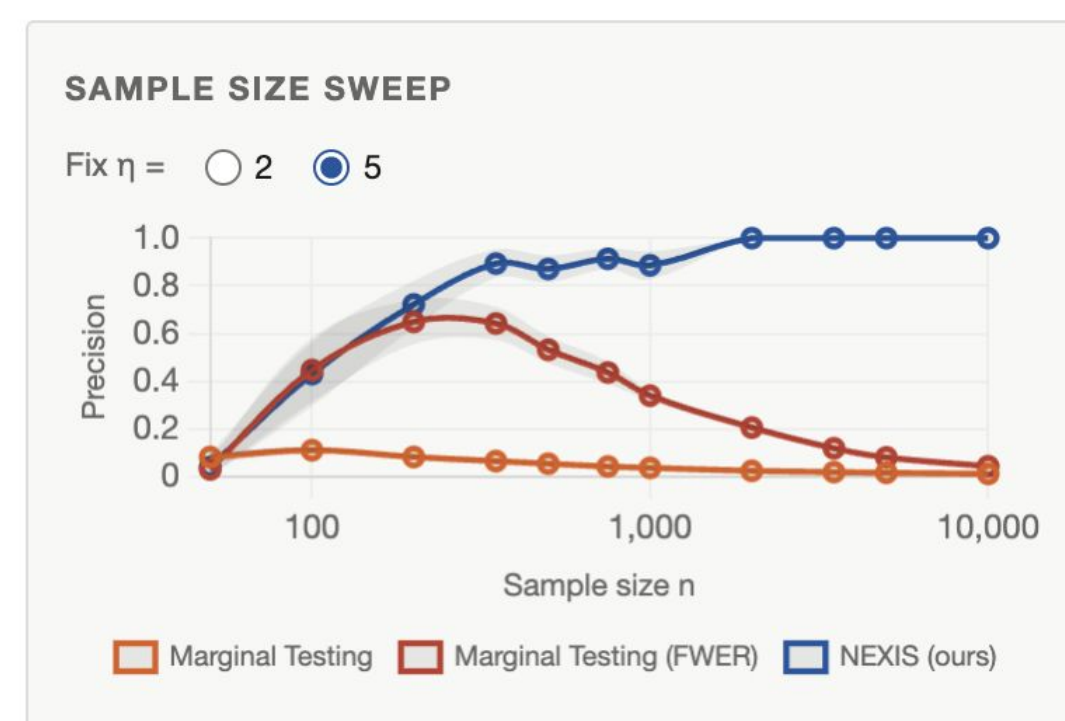
Experiments

Real-world: extended the analysis of 2 anti-poverty programs in Africa

Direct Effect Modifier	GATE active	GATE inactive	Δ	p-value
Linguistic group				
Karamojong	-0.030 (0.060)	+0.372 (0.022)	-0.403 (0.063)	7.7×10^{-10}
Lugbara	+0.092 (0.061)	+0.347 (0.023)	-0.255 (0.065)	1.6×10^{-5}
Iteso/Pallisa	+0.674 (0.058)	+0.288 (0.022)	+0.386 (0.062)	6.3×10^{-8}
Satellite atoms				
Perennial river presence	+0.089 (0.098)	+0.330 (0.021)	-0.242 (0.100)	2.1×10^{-4}
Vegetation spatial heterogeneity	+0.214 (0.038)	+0.373 (0.025)	-0.159 (0.045)	6.7×10^{-5}



Semi-synthetic: Controlled Experiments manipulating CelebA dataset.



Take away (theoretical): Measure more + Represent better → Mechanistic effect explanation (NEW) → Policy

Take away (applied): Environmental factors are dominant interactors in anti-poverty programs