

Revisiting the Risk Elicitation Puzzle: A Machine Learning Approach

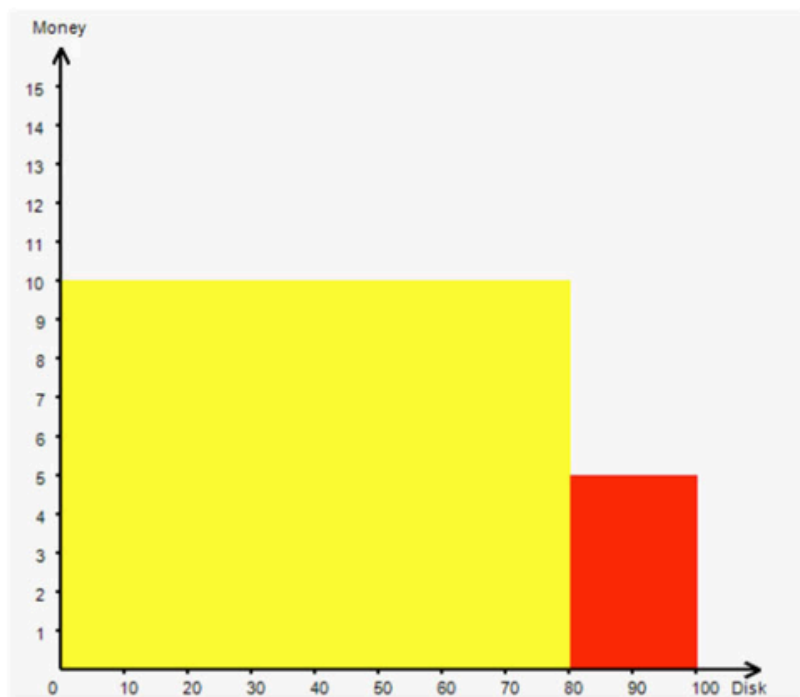
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What is risk elicitation

30\$ upfront or
100\$ with a 30%
chance

Pairwise Choices

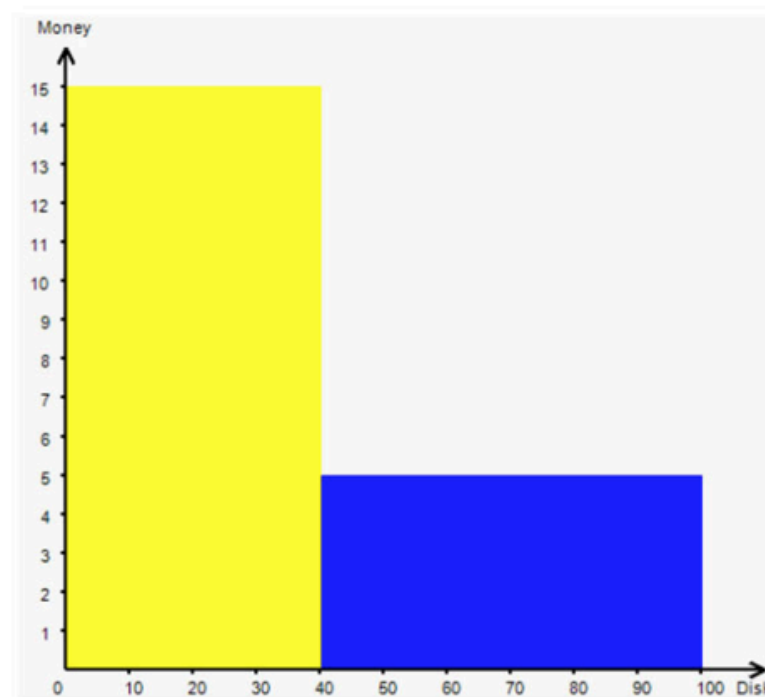
Lottery 1



You will either
receive £10 with chance 0.8
or
receive £5 with chance 0.2

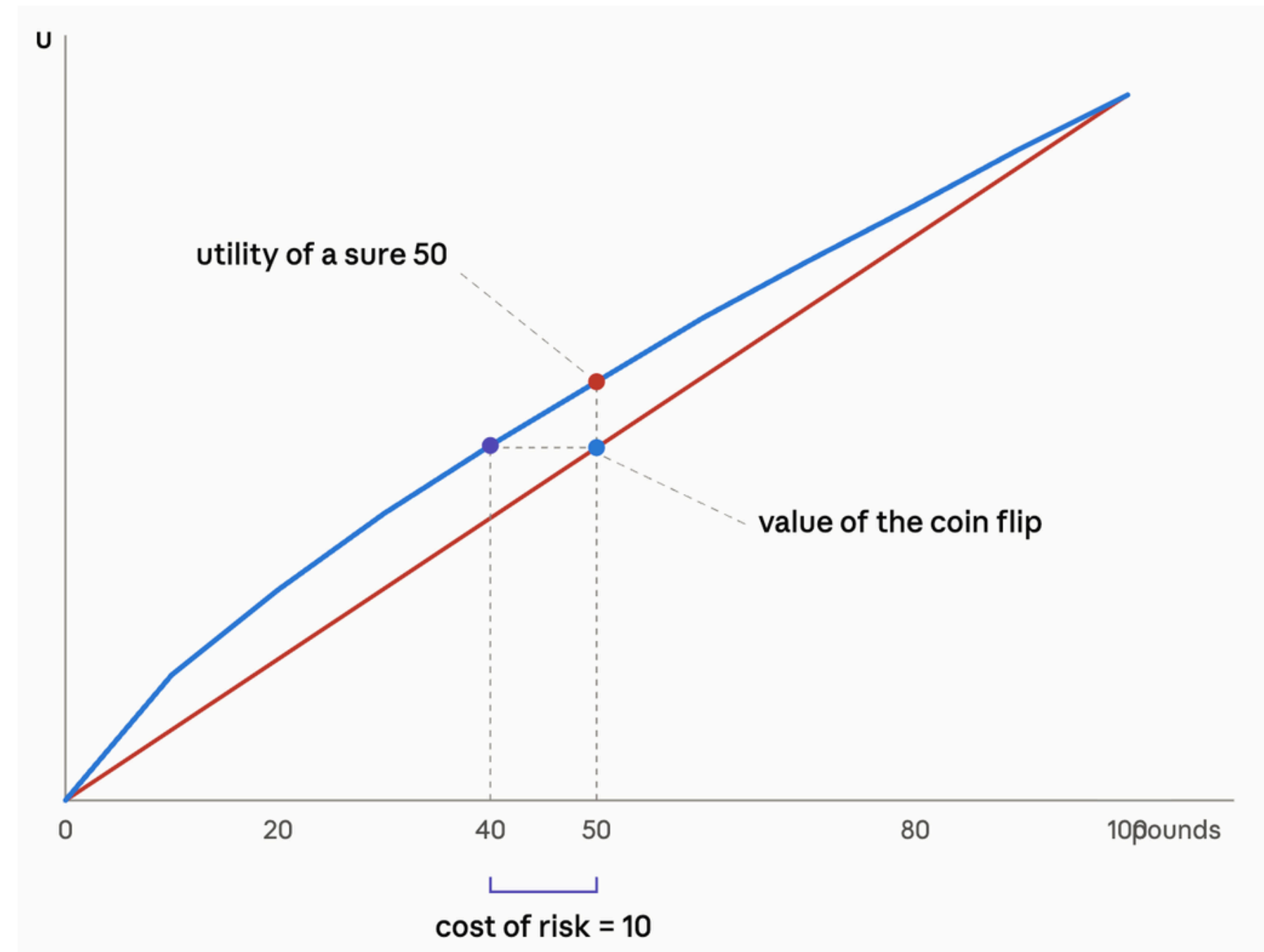
Left

Lottery 2 Problems Left: 48/80



You will either
receive £15 with chance 0.4
or
receive £5 with chance 0.6

Right



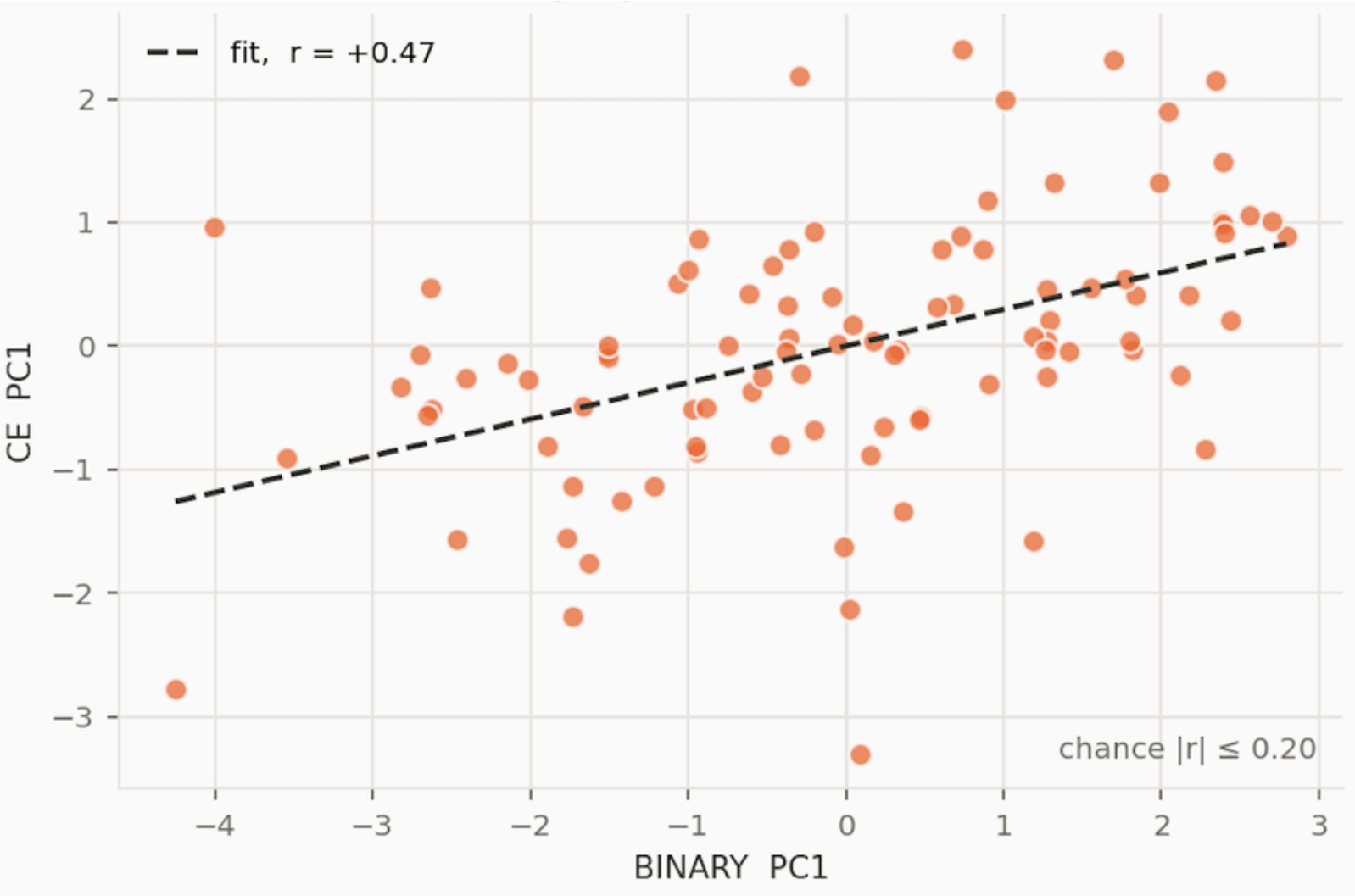
CRRA

$$u(c) = \frac{c^{1-\gamma}}{1-\gamma}$$

CARA

$$u(c) = -e^{-\alpha c}$$

PCA



Allocation

task	x	y	ex	ey	prob
1	20	80	0.5	1	0.1

Pairwise choices

pa1	pa2	pa3	pa4	pb1	pb2	pb3	pb4	max	min	choice
0	0.4	0.6	0	0.2	0	0.8	0	10	0	1

Certainty equivalent

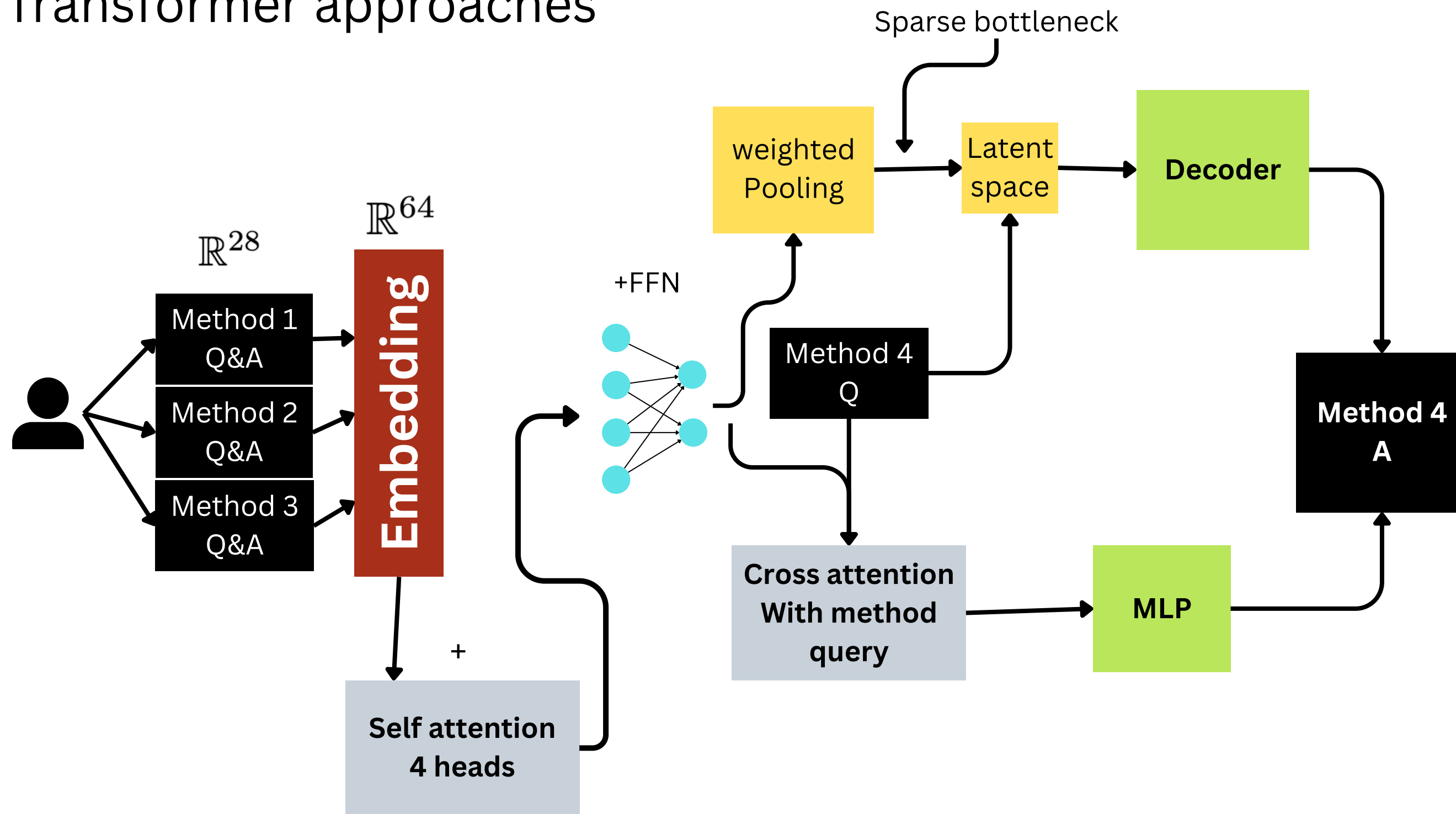
problem_id	prob	x	y	range	choice
0	0.9	5	0	5	5

Holt laury

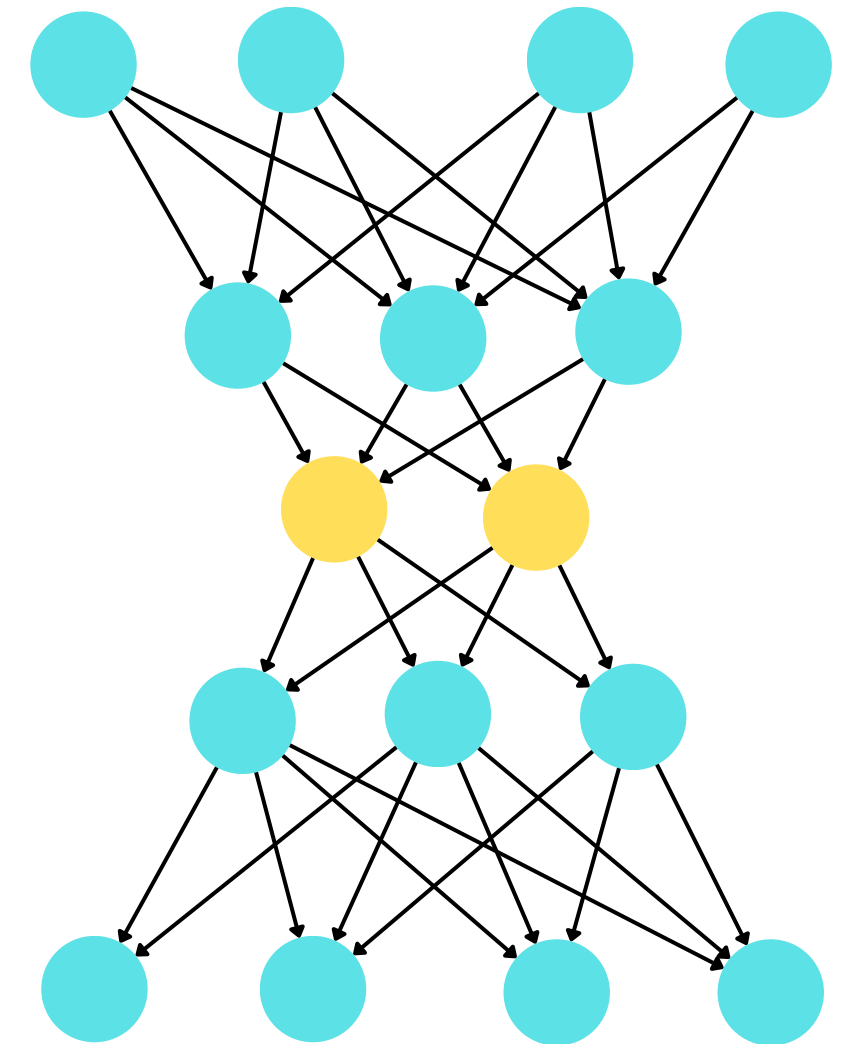
task	x1	prob	x2	certain	switch	choice_x	xmax	xmin
1	5	1	0	2.5	4	1	5	0

Data and Methods

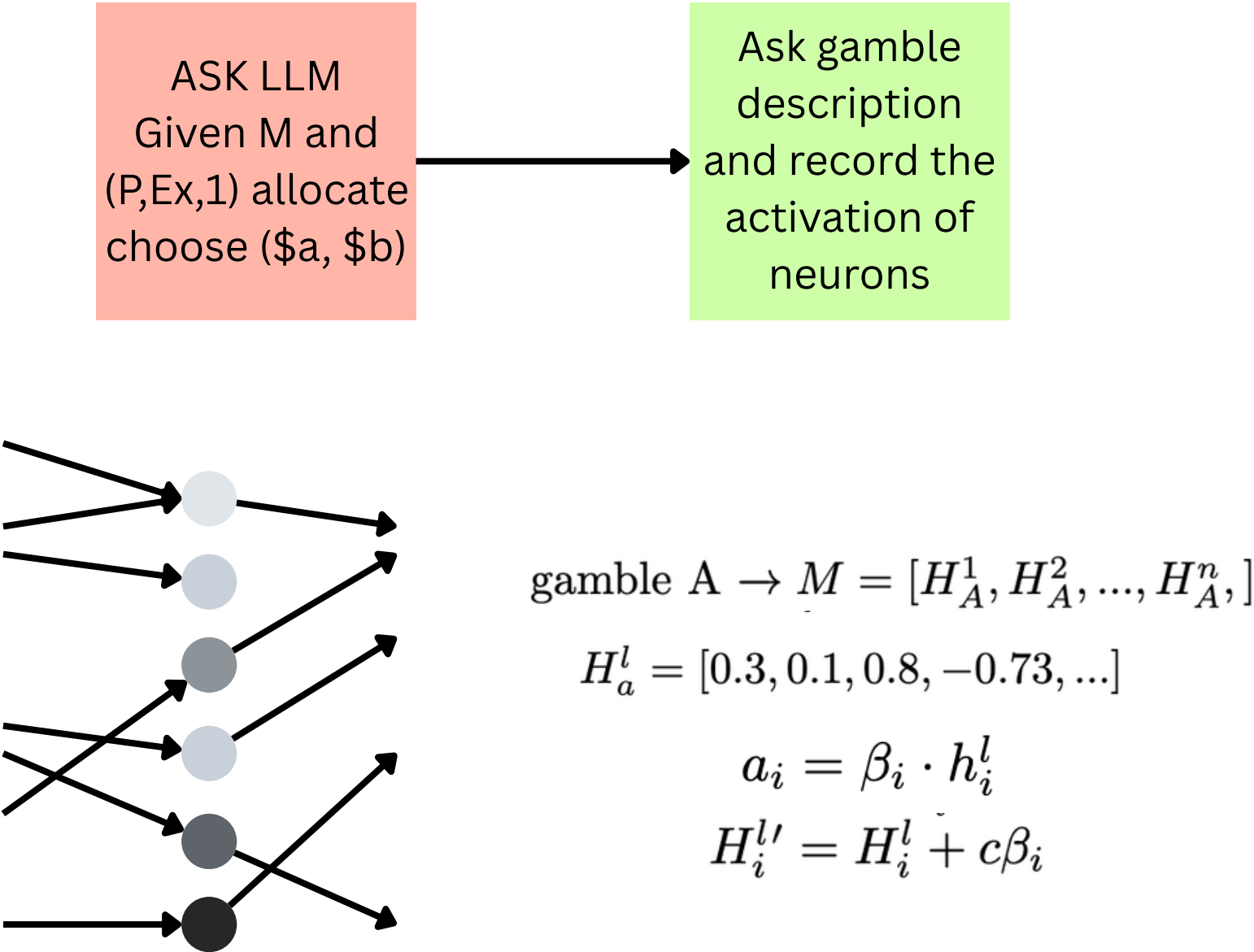
Transformer approaches



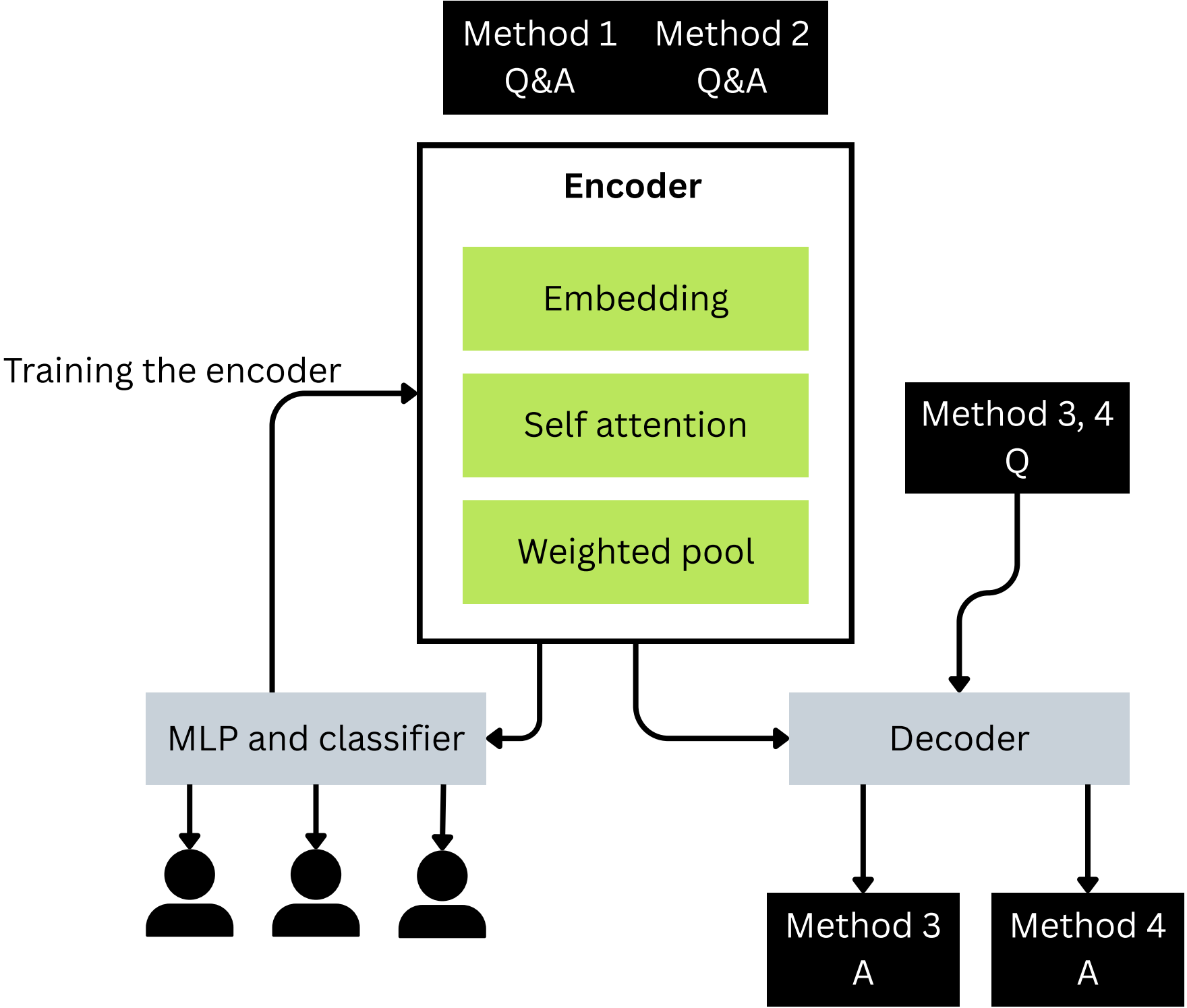
SAE and latent space



Steering vector approach



Individual Classifier decoder



Results

	PL	PC	CE	ALLO	PL-sim	PC-sim	CE-sim	ALLO-sim
SAE	60.1 floor 60.1 -0.1	79.2 floor 79.5 -0.3	33.8 floor 30.0 +3.8	42.3 floor 48.8 -6.5	84.9 floor 73.5 +11.4	86.4 floor 81.3 +5.1	73.4 floor 65.8 +7.5	72.0 floor 66.1 +5.9
Set transformer	51.6 floor 60.1 -8.6	71.5 floor 79.5 -8.1	31.4 floor 30.0 +1.4	48.4 floor 48.8 -0.4	57.6 floor 73.5 -15.9	75.0 floor 81.3 -6.3	66.3 floor 65.8 +0.5	72.5 floor 66.1 +6.4
PL transformer	58.3 floor 59.6 -1.2	79.3 floor 79.2 +0.0	33.4 floor 29.8 +3.7	49.2 floor 48.3 +1.0	91.7 floor 73.8 +18.0	91.4 floor 81.8 +9.6	85.4 floor 65.2 +20.2	90.3 floor 65.9 +24.4
Within method transformer	57.2 floor 61.4 -4.3	84.4 floor 79.7 +4.7	44.1 floor 29.7 +14.5	63.9 floor 48.3 +15.6	82.0 floor 74.7 +7.3	91.1 floor 80.8 +10.3	81.9 floor 65.2 +16.7	87.2 floor 65.8 +21.4
PCA predictor		85.6 floor 79.7 +5.9	50.5 floor 29.7 +20.8	65.8 floor 48.3 +17.4		95.5 floor 80.8 +14.8	94.9 floor 65.2 +29.8	93.1 floor 65.8 +27.3
Person classifier	59.8 floor 58.4 +1.5	79.0 floor 78.4 +0.6	33.6 floor 29.4 +4.2	53.2 floor 49.7 +3.4	76.9 floor 73.8 +3.1	84.4 floor 81.1 +3.4	73.4 floor 66.2 +7.2	72.3 floor 65.5 +6.8

Discussion

Is there a latent risk vector

**How noisy is individual risk
preference**

**What makes these the right
approaches**