



# INTERNSHIP PROGRESS

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Modeling curriculum learning



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# WEEKLY OBJECTIVES

	FEBRUARY	MARCH	APRIL	MAY
W1	/	Level 2: accuracy RL Level 2: learning progress RL	Level 3: integrate all LVL2 and manually set weights	Compare performances Written report
W2	/	Unify level 1 Compare different versions of the model	Fix LP + learn about policy gradient	Written report
W3	Level 1: implement tasks and neural network	Prepare the presentation	Hyperspace/Grid search + simple policy gradient exercise	(exams)
W4	Finish 3 models for Level 1 Level 2: accuracy RL learning	<b>LAB PRESENTATION</b> Integrate all suggestions	Level 3: policy gradient	(exams)

Past week

Upcoming week

# LAST WEEK'S OBJECTIVES



1

FIGURE OUT WHY RM HAS PATTERNS



4

Primary goals

## FIX PLOTS

- Grid search
- Bar plots
- Trials plots



②

## PLOT OTHER MEASUREMENTS

For the grid search:  
speed of learning (in progress) and quality of learning



③

## WRITE REPORT

In progress

④

## SUMMARISE FINDINGS

Write a short summary of findings, questions and plan for next week.

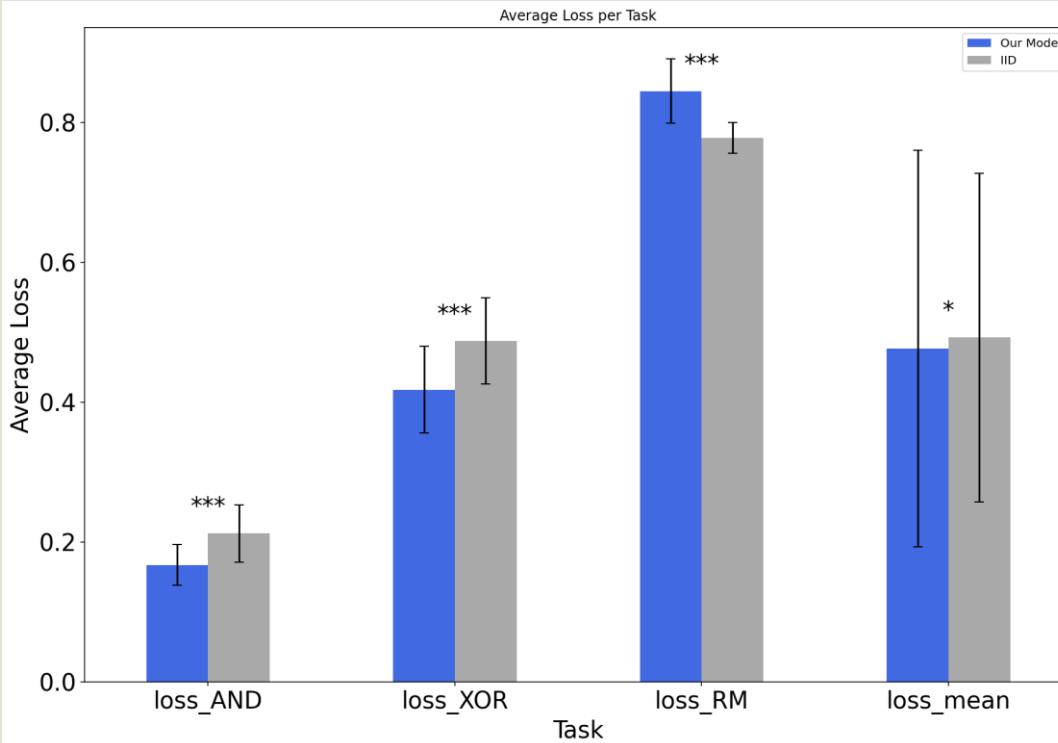


⑤

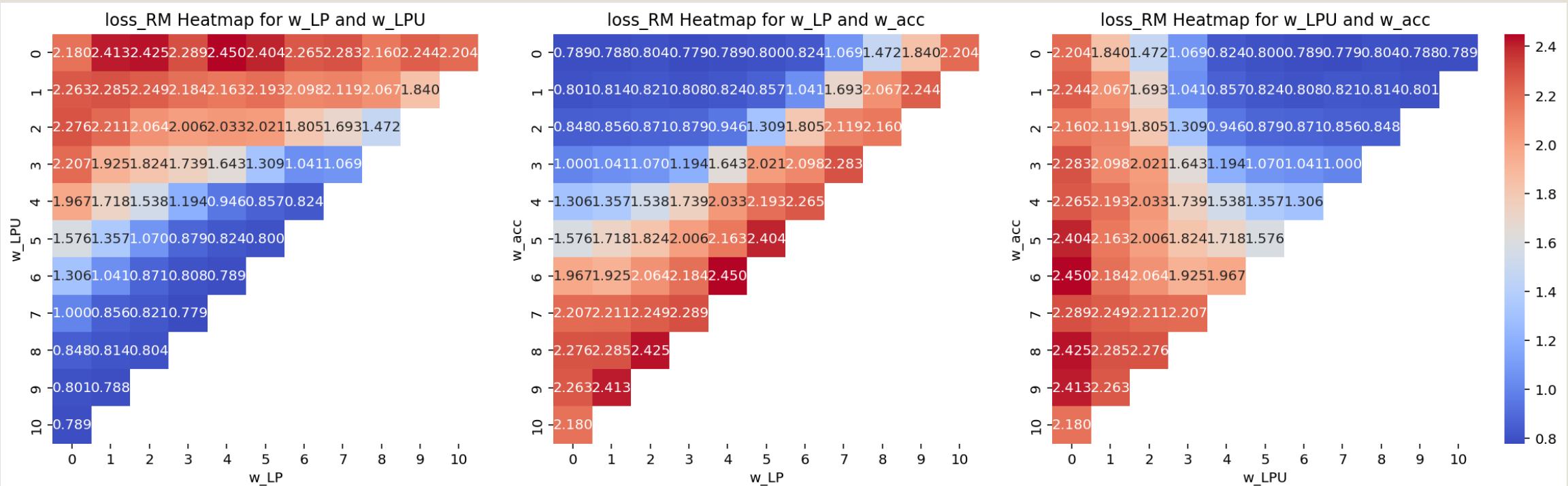
2025

Problem: RM shows patterns + a significant difference between the model and IID

## Random mapping grid search + t test



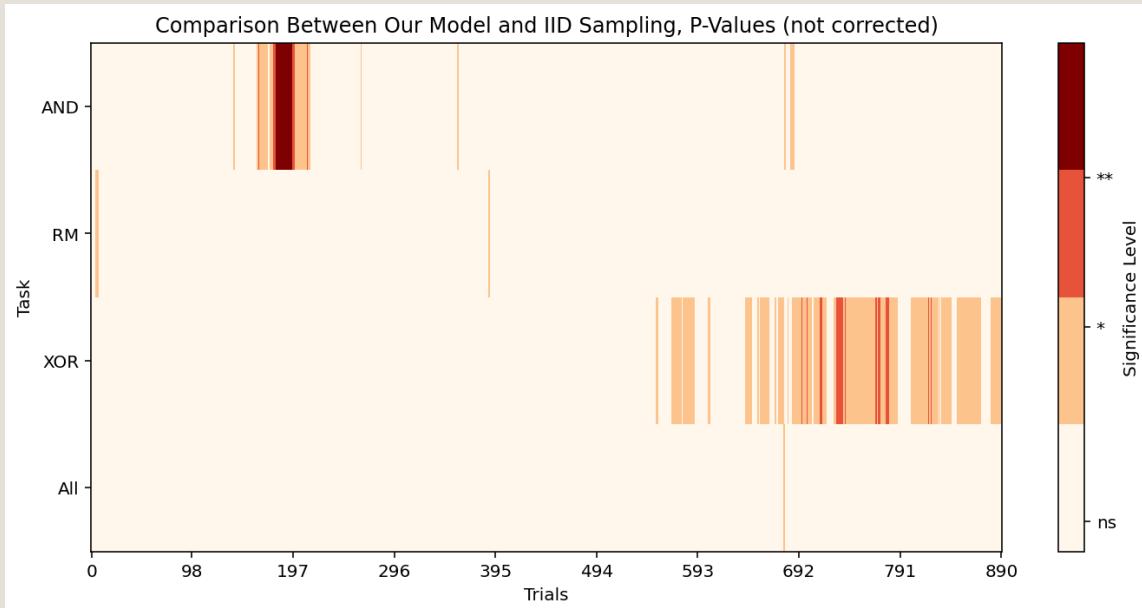
## Random mapping grid search + t test



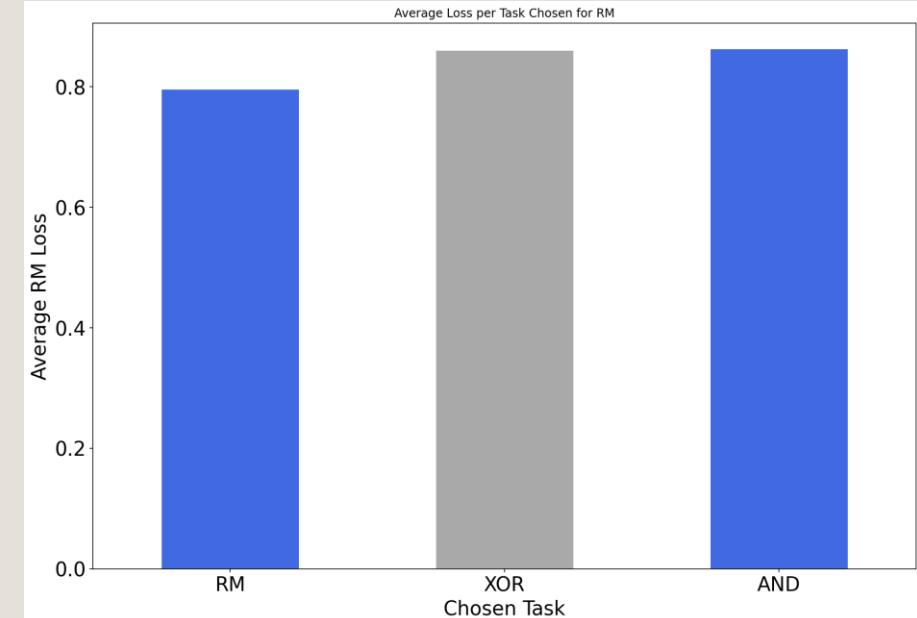
Best combination

$\text{LP} = 3, \text{LPU} = 7, w_{\text{acc}} = 0$

## Random mapping grid search + t test



No difference on a trial-to-trial basis

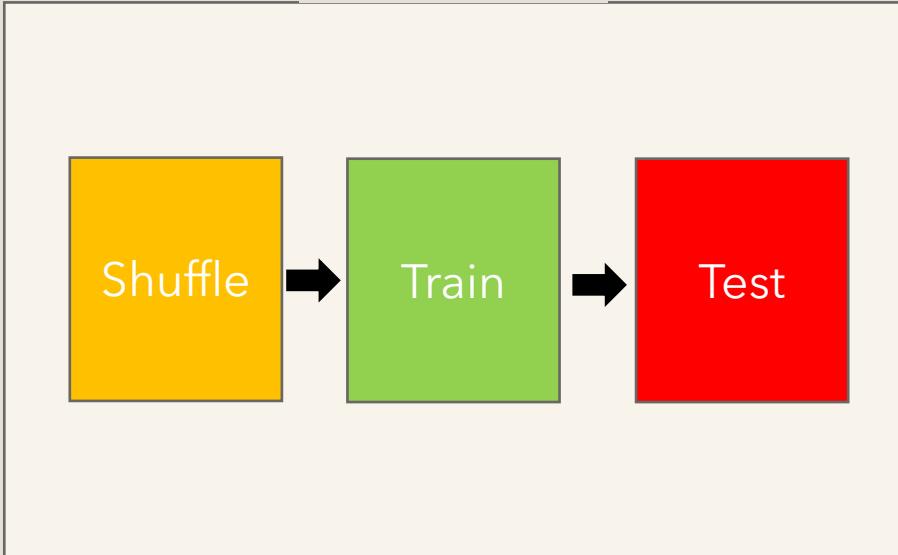


Lower loss when RM is chosen

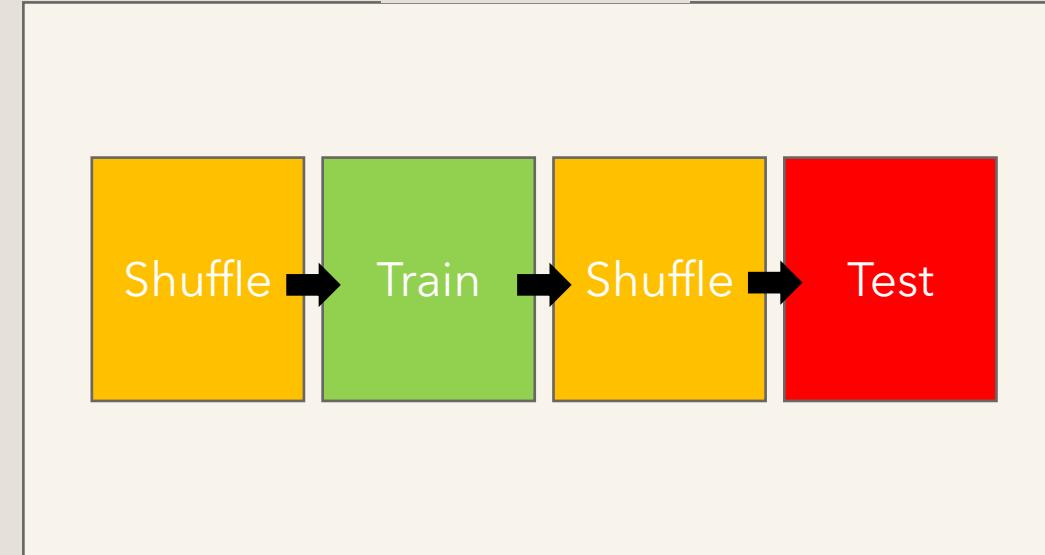
Hypothesis: No improvement over time  
But an improvement overall  
= Improvement within single trials?

## Solution 1: second shuffle within a trial

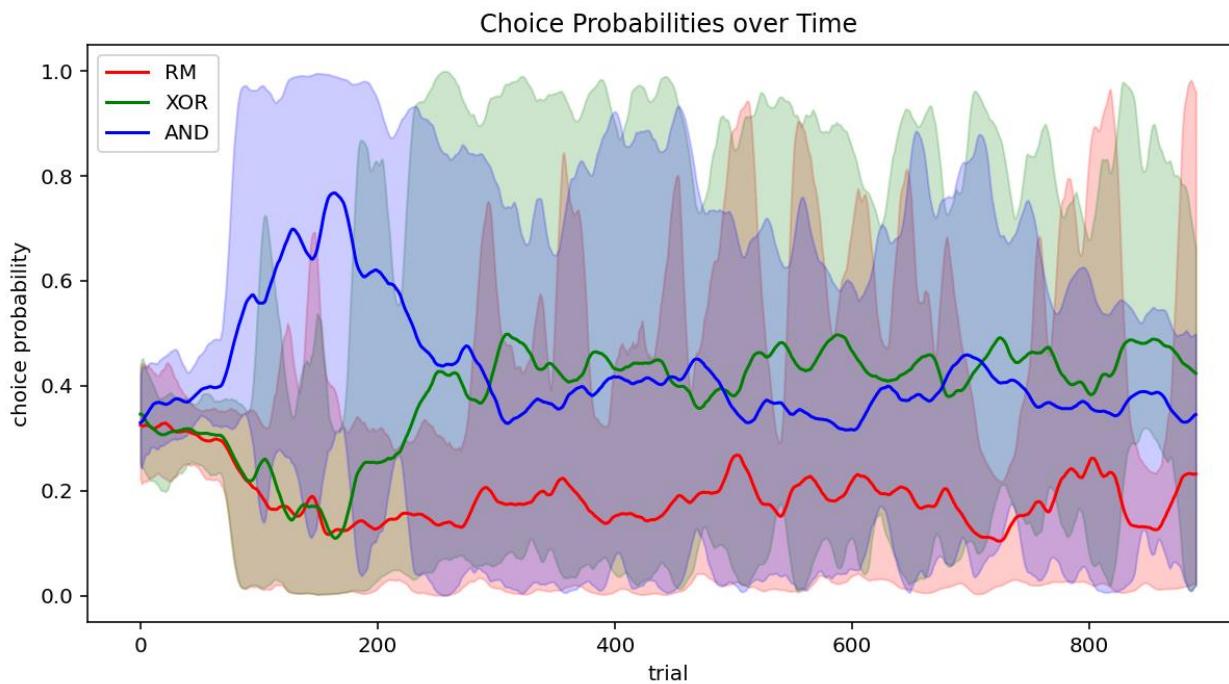
Single Trial: Then



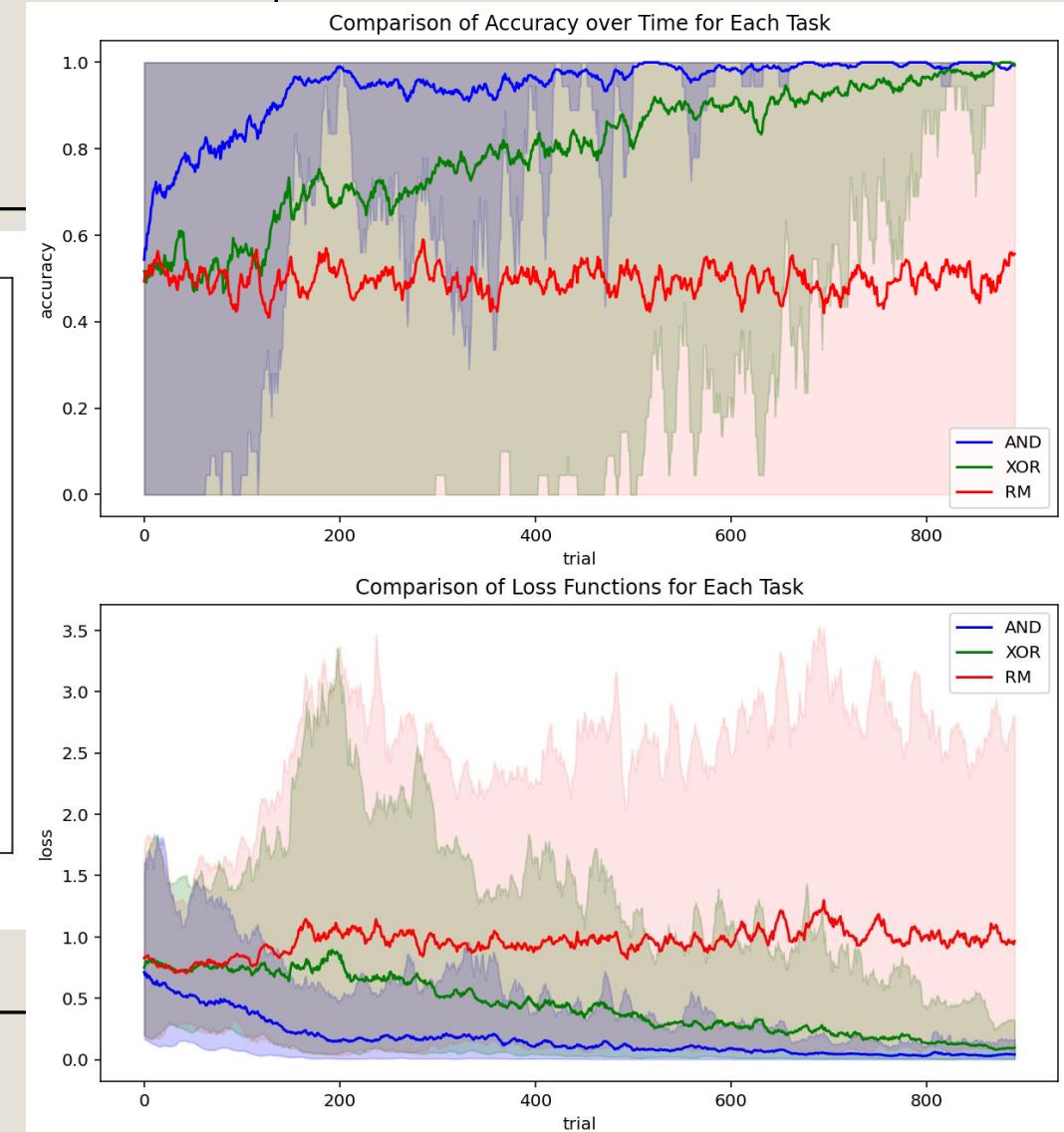
Single Trial: Now



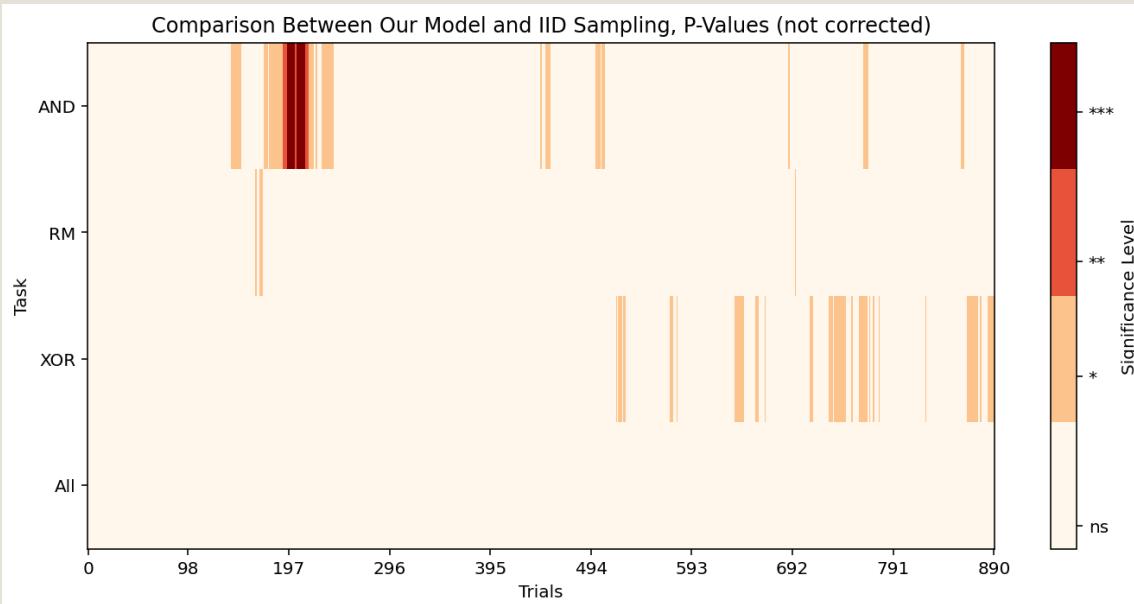
## Solution 1: second shuffle within a trial



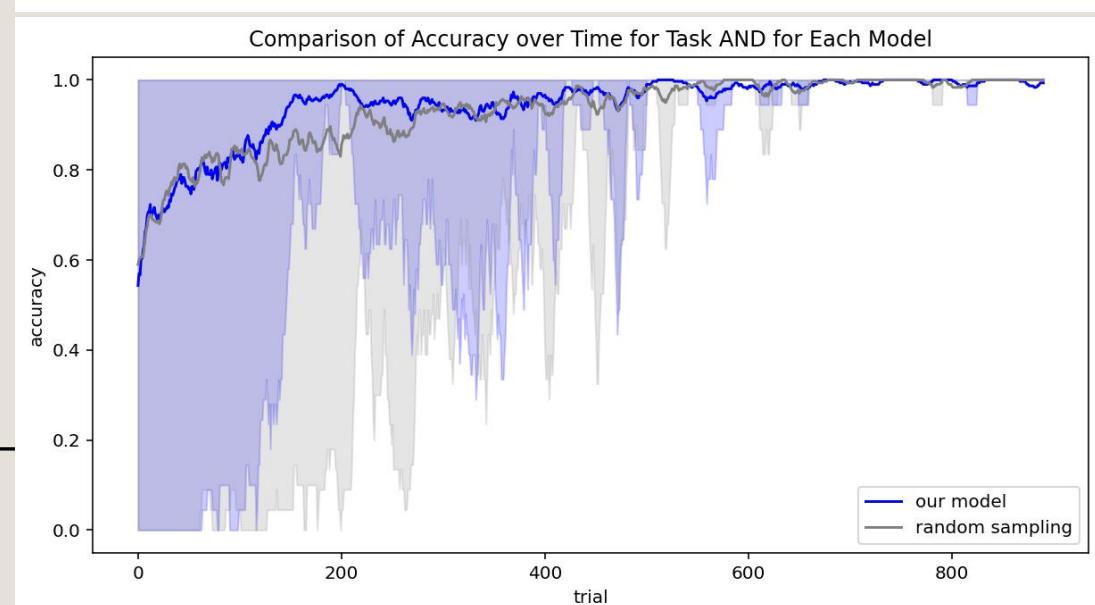
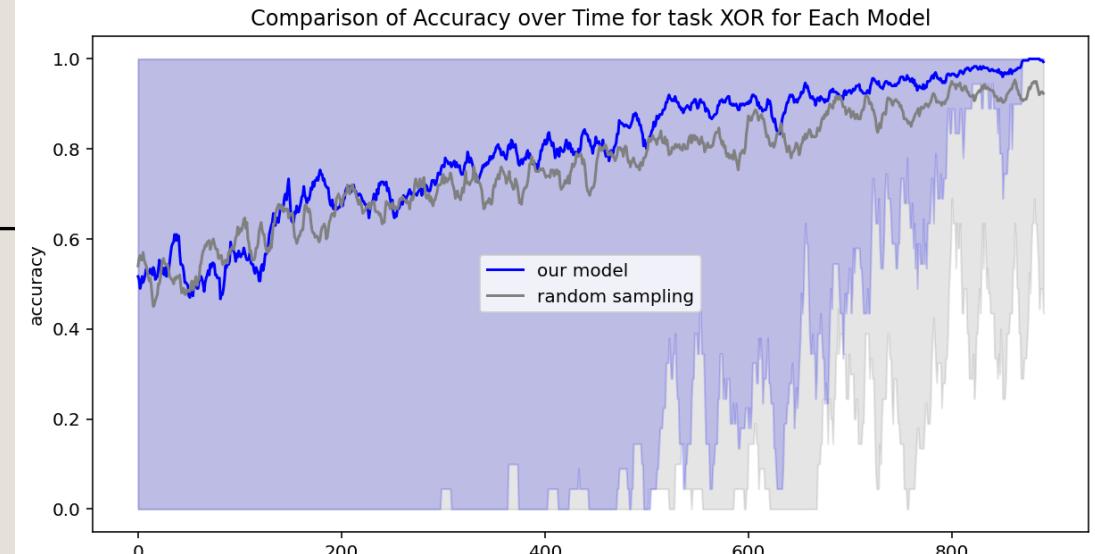
RM is being selected less often now that it's increasingly random.



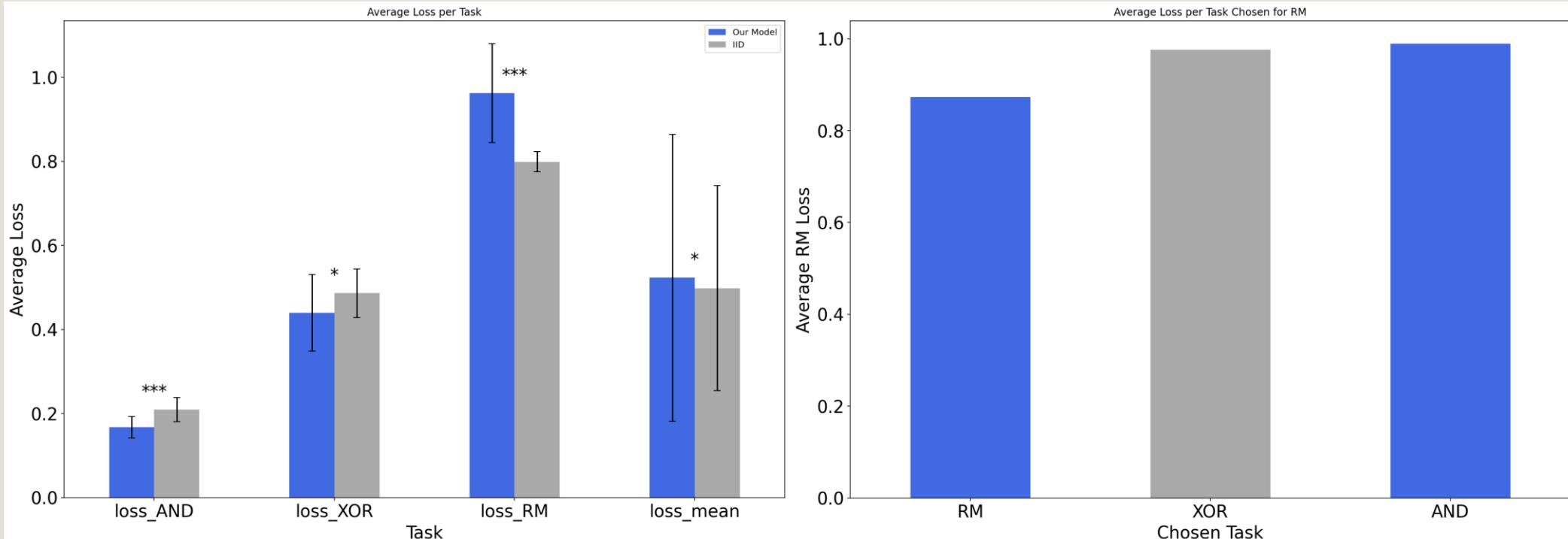
## Solution 1: second shuffle within a trial



Still an improvement for AND and XOR.



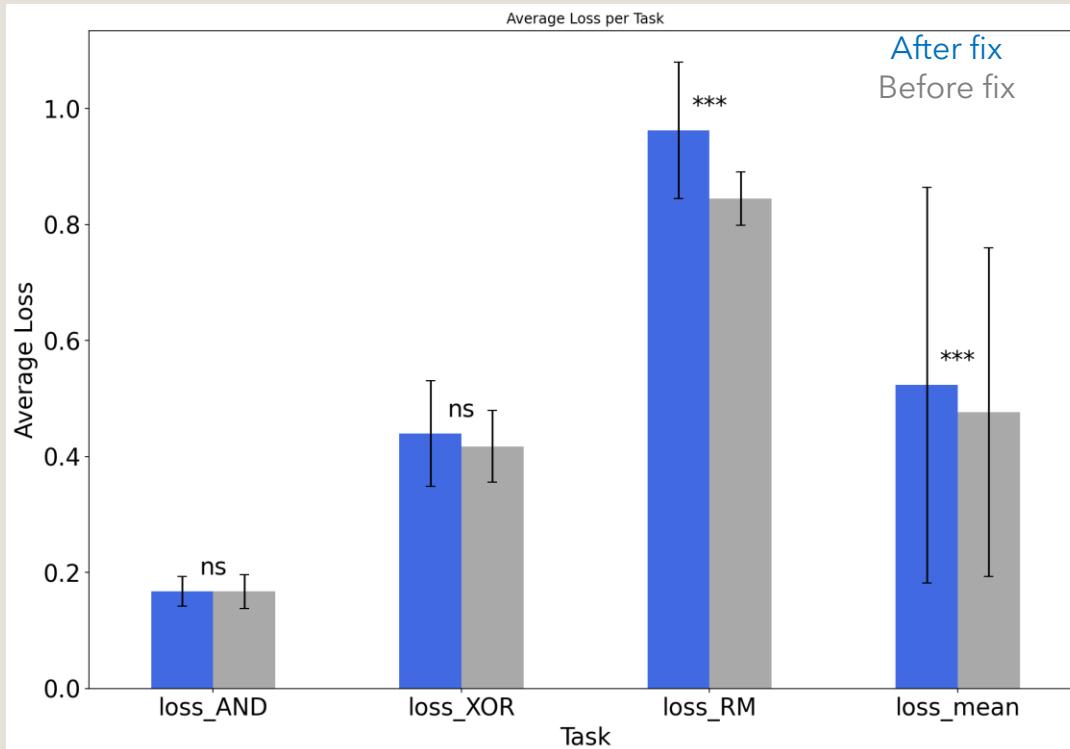
## Solution 1: second shuffle within a trial



Doesn't fix the issue: amplifies it.

Now our model has higher average loss than IID.

## Solution 1: second shuffle within a trial



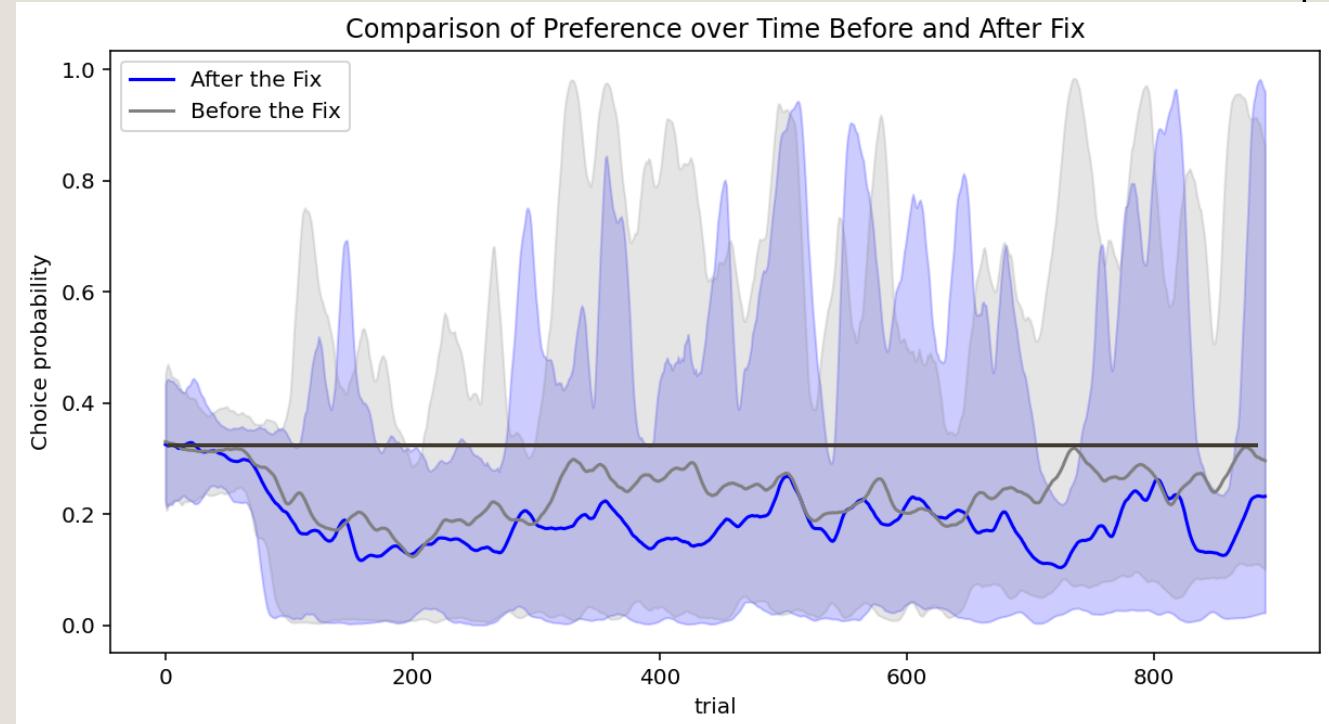
Comparison between before and after  
the fix

## Solution 1: second shuffle within a trial

Conclusion: the less RM is being picked, the higher the loss.

Hypothesis 2: catastrophic forgetting of RM.

The weights are being overwritten and straying away from caution (chance-level confidence for RM)



Pick rate + 33% (IID)

## Conclusion

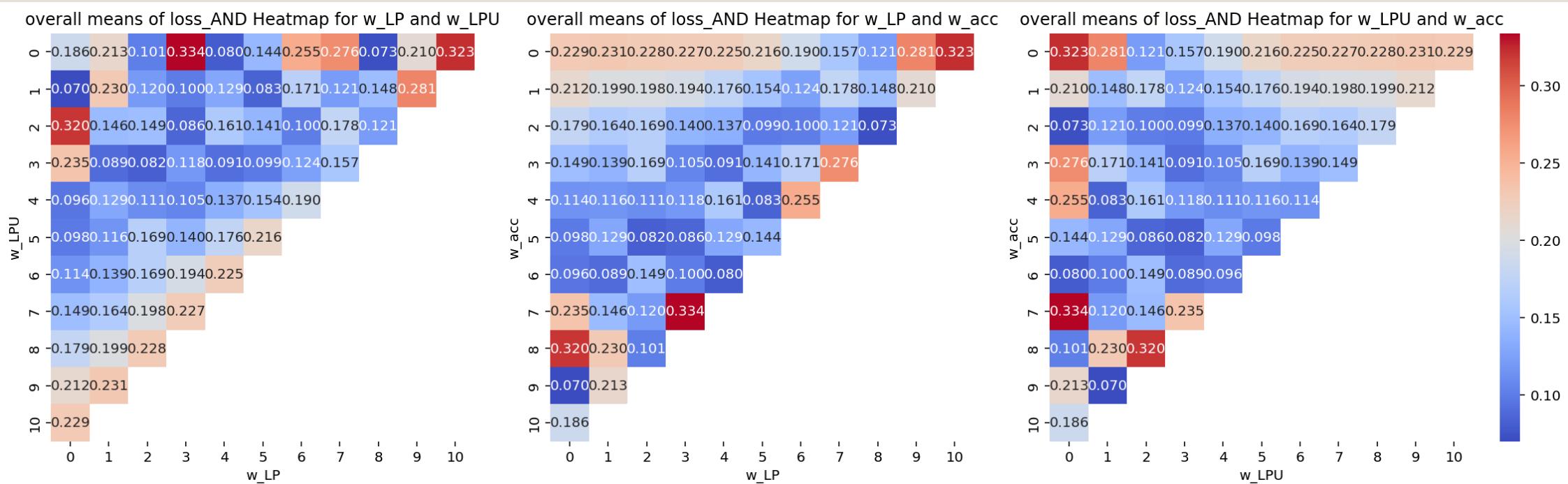
Despite being impossible, the Random Tasks still needs to be learned by the model to prevent higher loss levels → **the model must learn that it's impossible (and must give chance-level answers)**

### Questions:

- Could a policy gradient model detect this (noisy trial-to-trial data)?
- Do humans also do this?

Complete grid search results

## For the AND task: Mean accross all trials

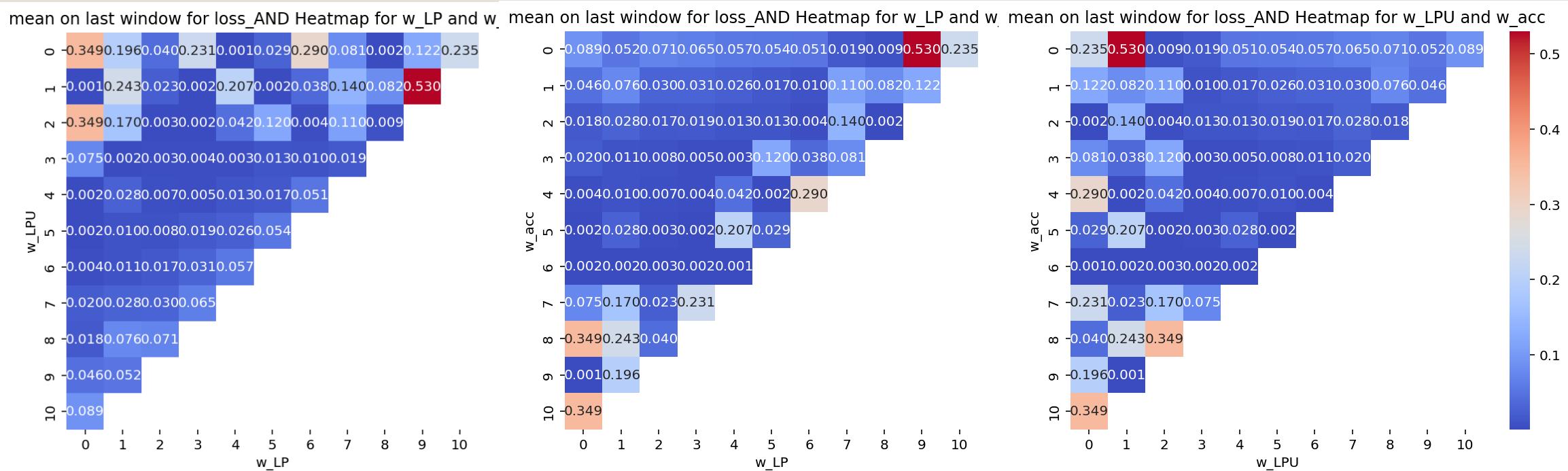


### Best combination

LP = 0, LPU = 1, Acc = 9

Loss = 0.0699

## For the AND task: Last window (40 trial) loss

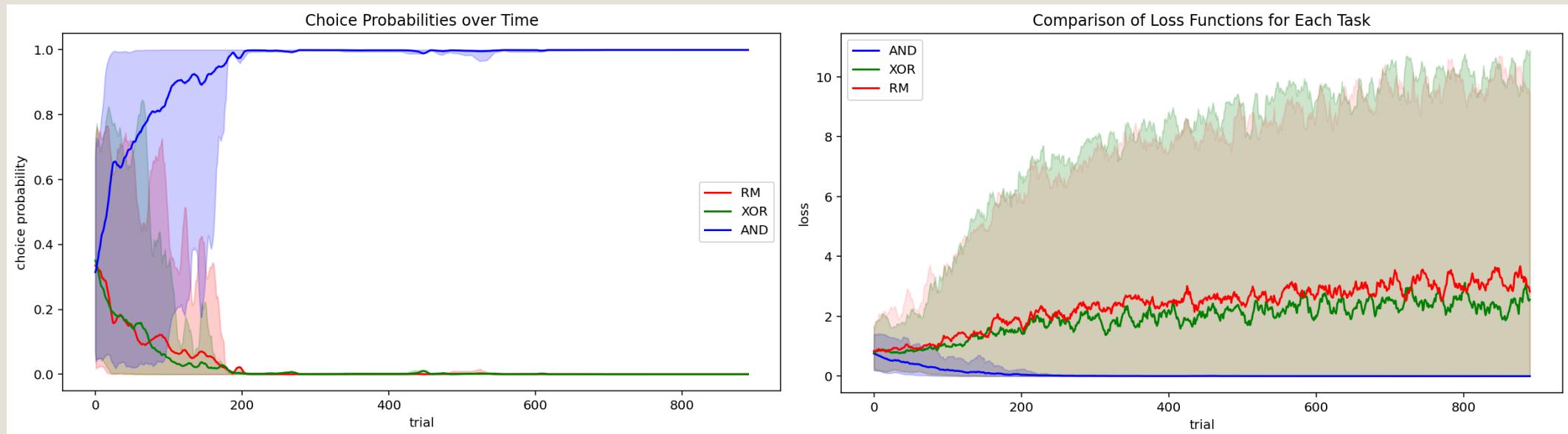


### Best combination

LP = 0, LPU = 1, Acc = 9

Loss = 0.0008

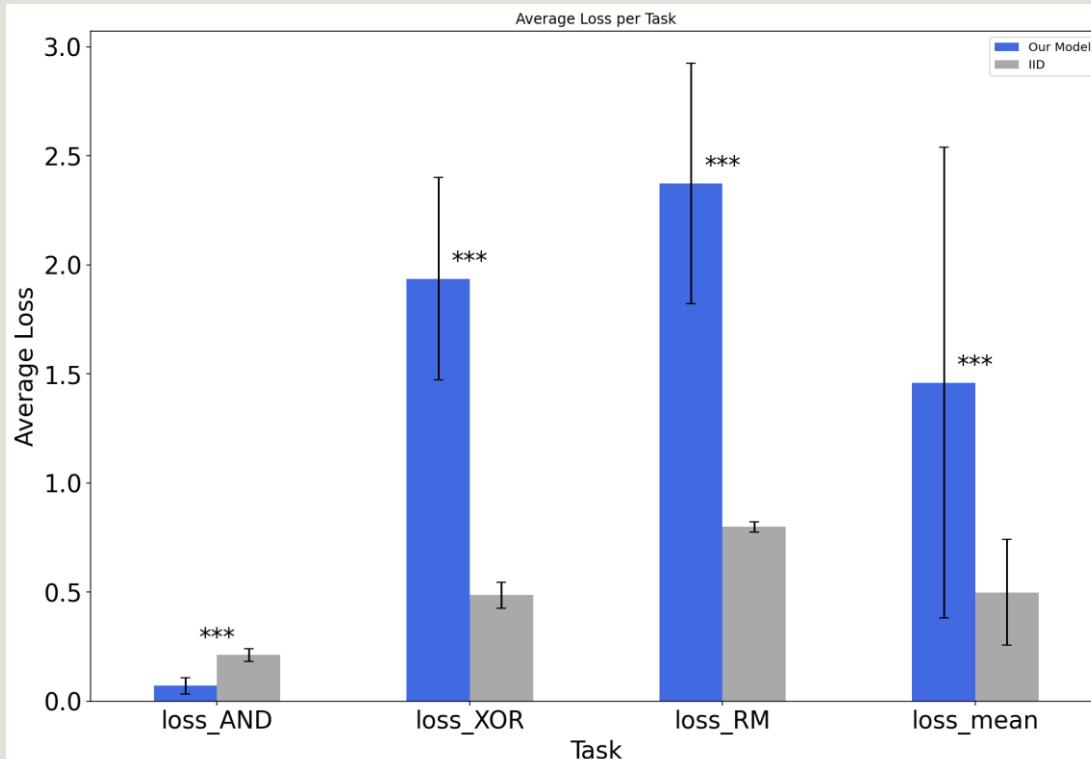
## AND: Statistical analysis for the winning combination



### Best combination

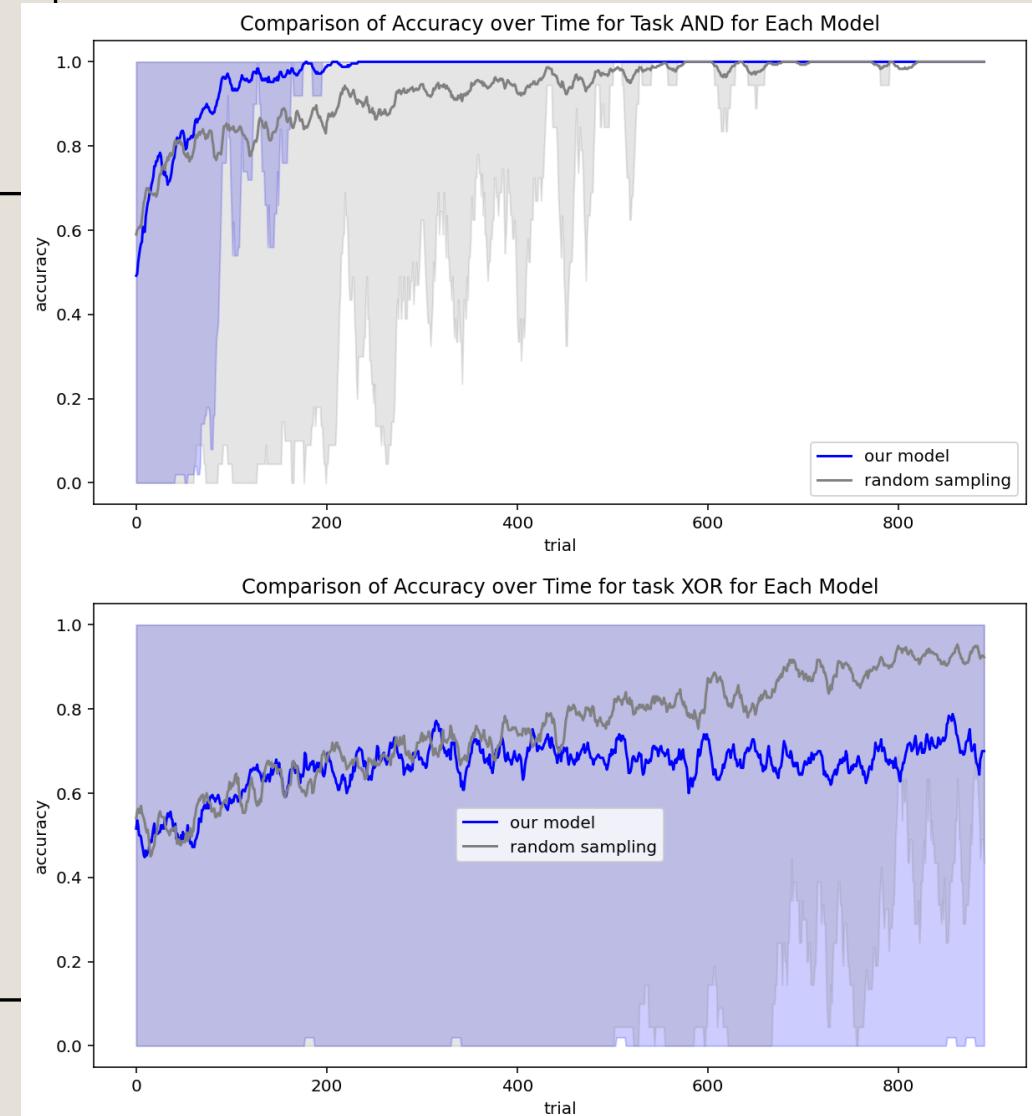
LP = 0, LPU = 1, Acc = 9

## AND: Statistical analysis for the winning combination

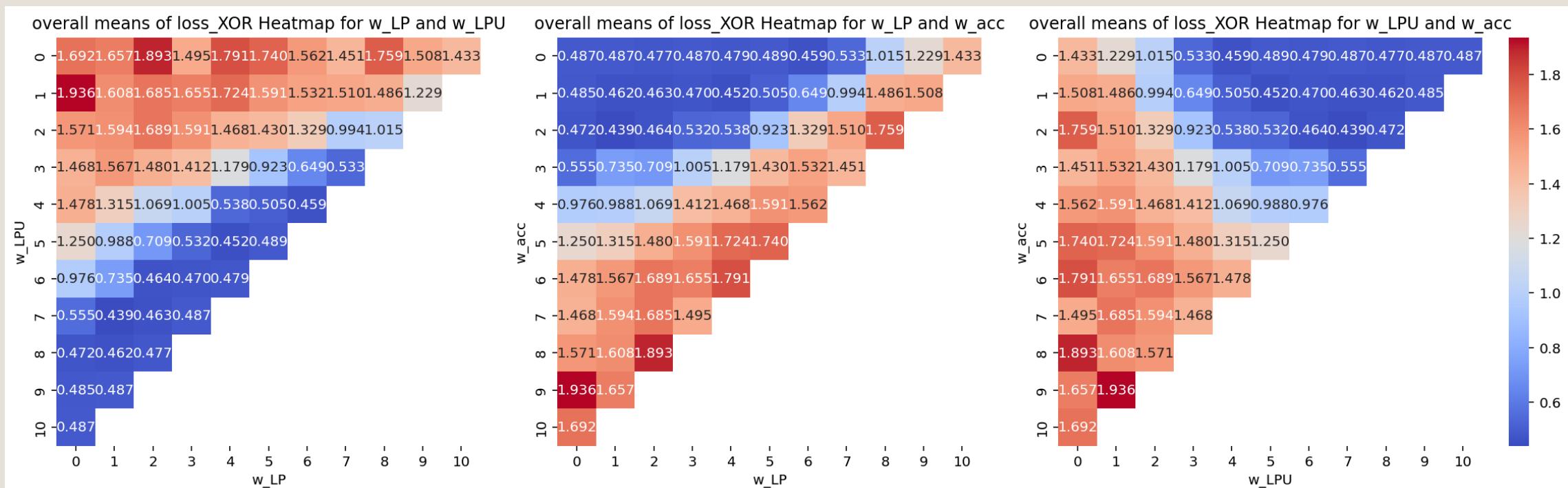


**Best combination**

LP = 0, LPU = 1, Acc = 9



## For the XOR task: Mean accross all trials

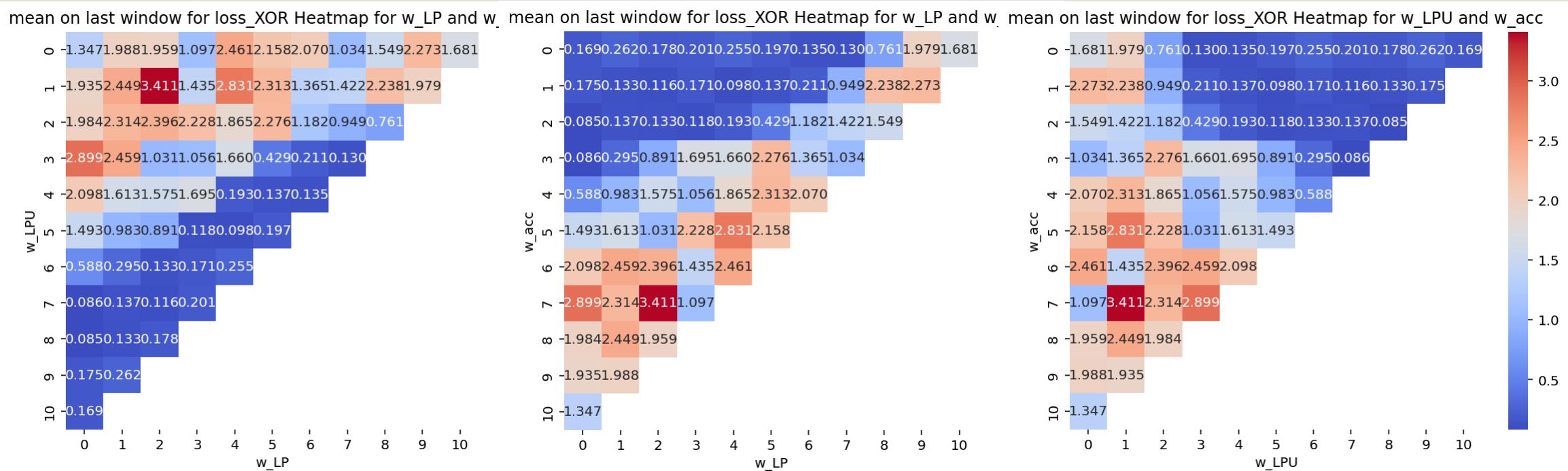


### Best combination

LP = 1, LPU = 7, Acc = 2

Loss = 0.4395

## For the XOR task: Last window (40 trial) loss

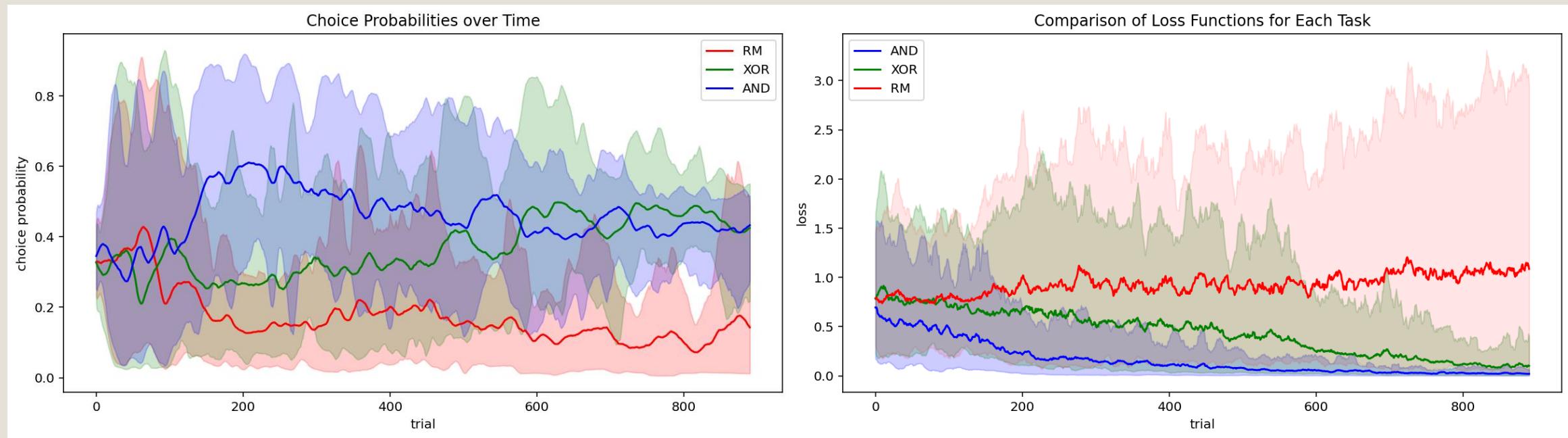


### Best combination

LP = 0, LPU = 8, Acc = 2

Loss = 0.0846

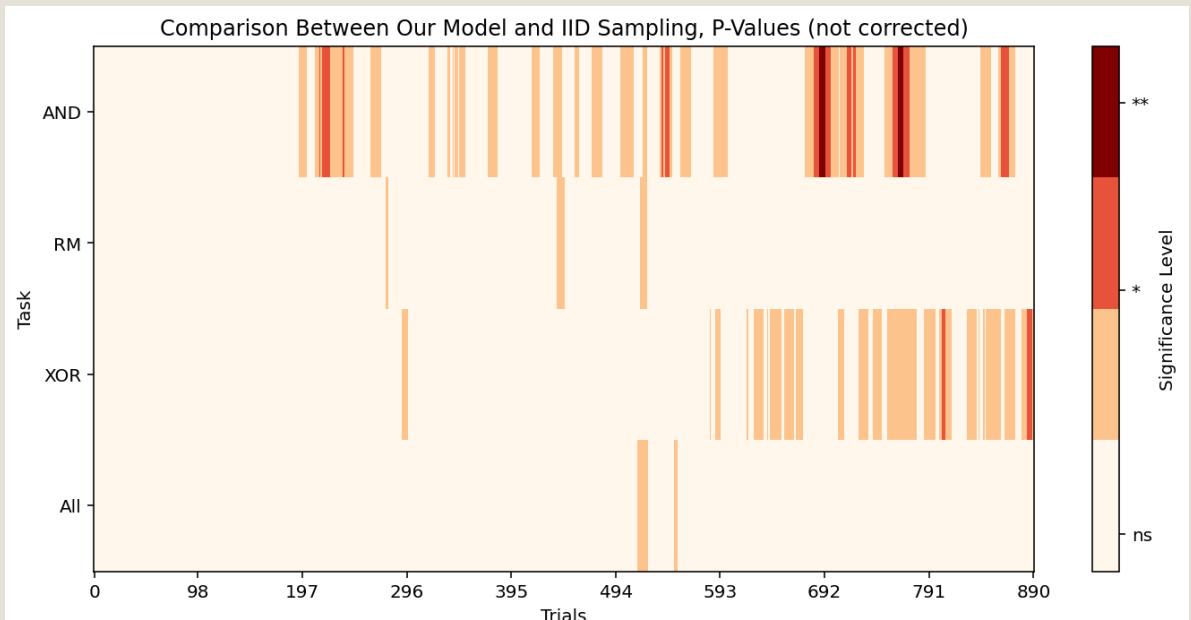
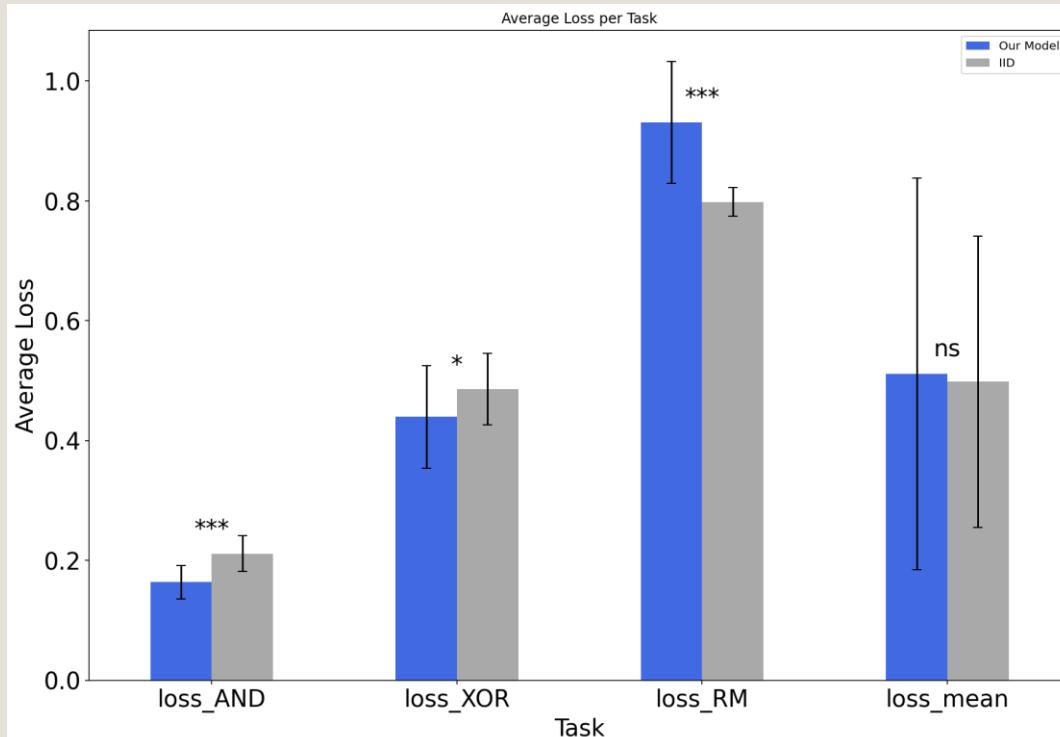
## XOR: Statistical analysis for the winning combination



### Best combination

LP = 1, LPU = 7, Acc = 2

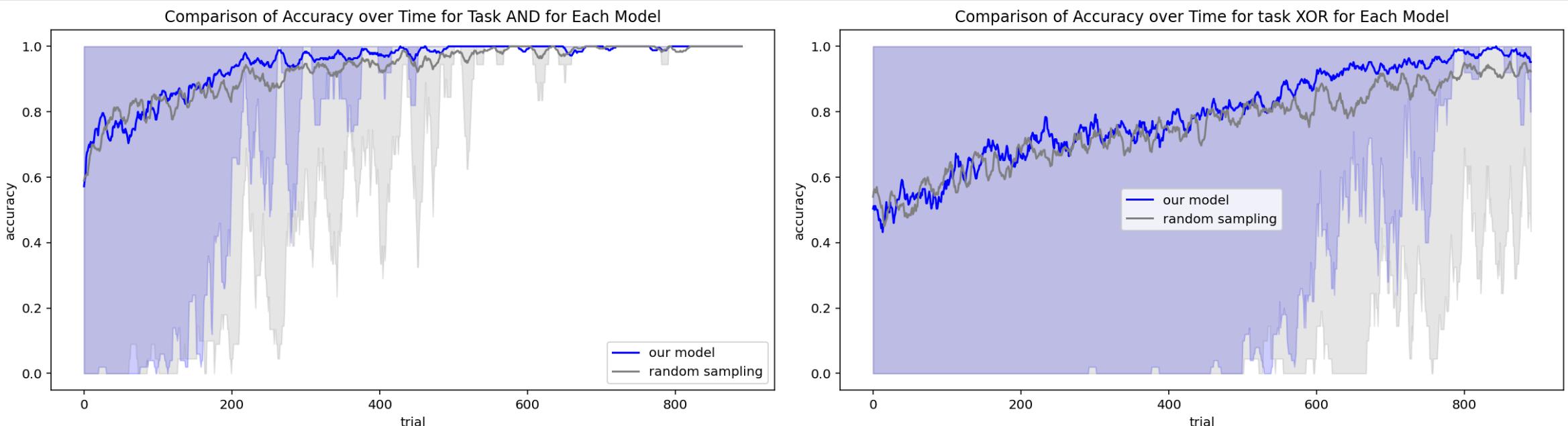
## XOR: Statistical analysis for the winning combination



**Best combination**

LP = 1, LPU = 7, Acc = 2

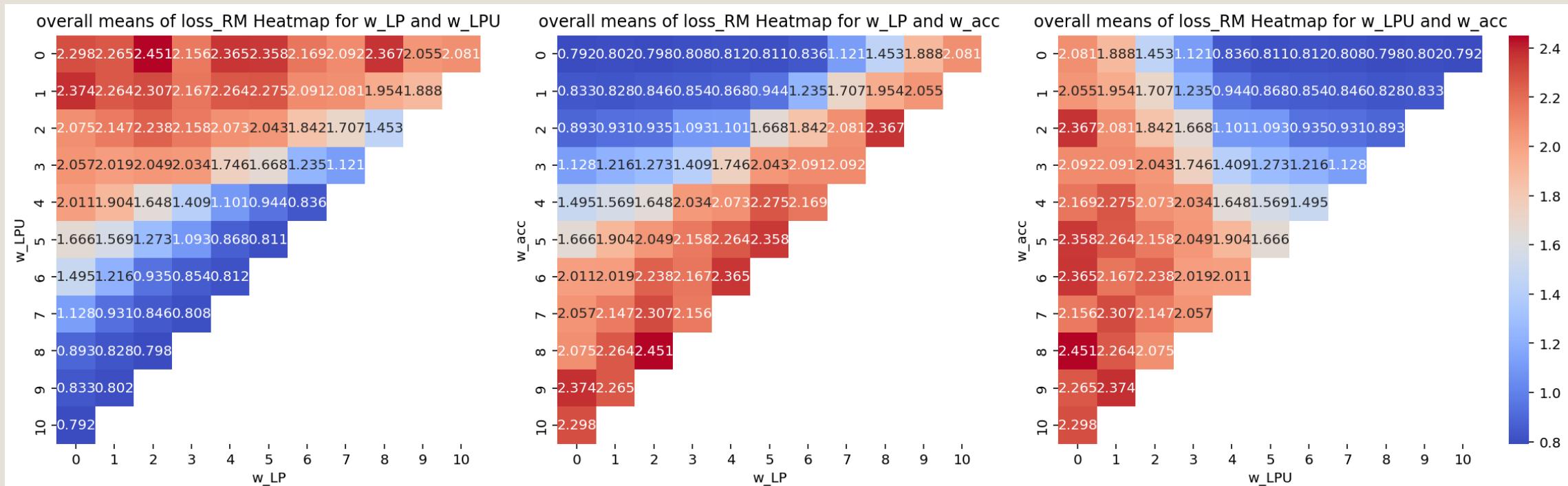
## XOR: Statistical analysis for the winning combination



### Best combination

LP = 1, LPU = 7, Acc = 2

## For the RM task: Mean accross all trials

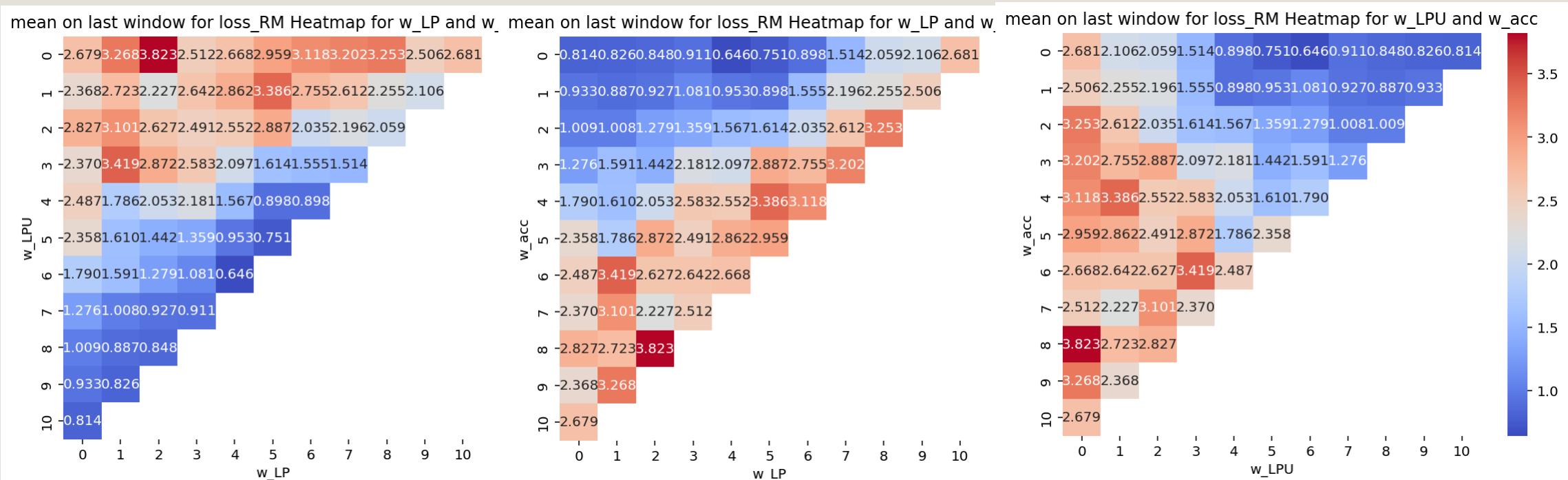


### Best combination

LP = 0, LPU = 10, Acc = 0

Loss = 0.7917

## For the RM task: Last window (40 trial) loss

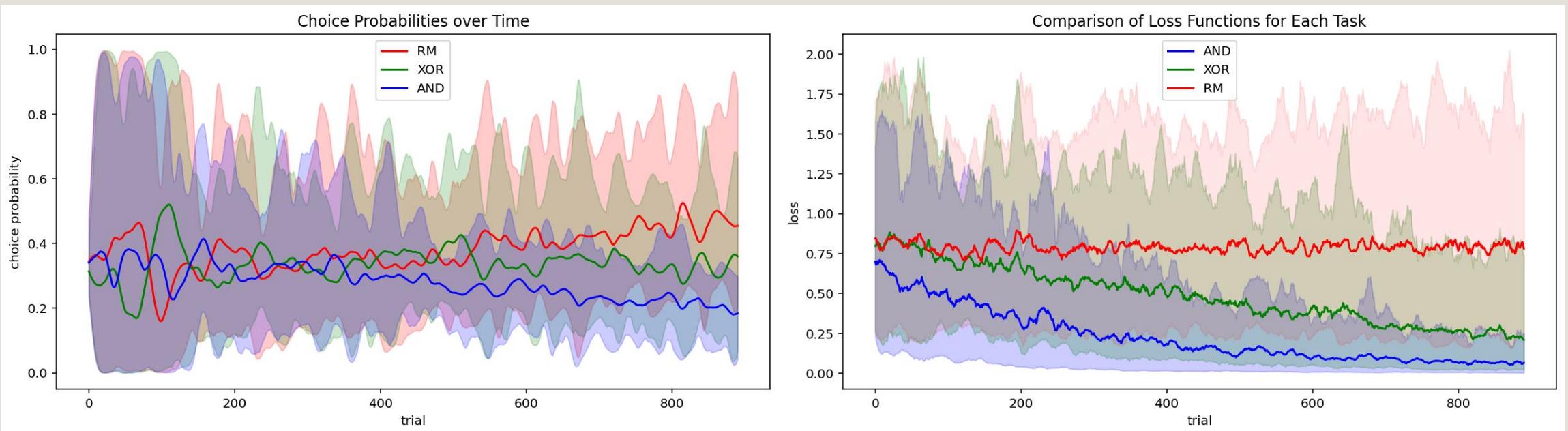


**Best combination**

LP = 4, LPU = 6, Acc = 0

Loss = 0.6455

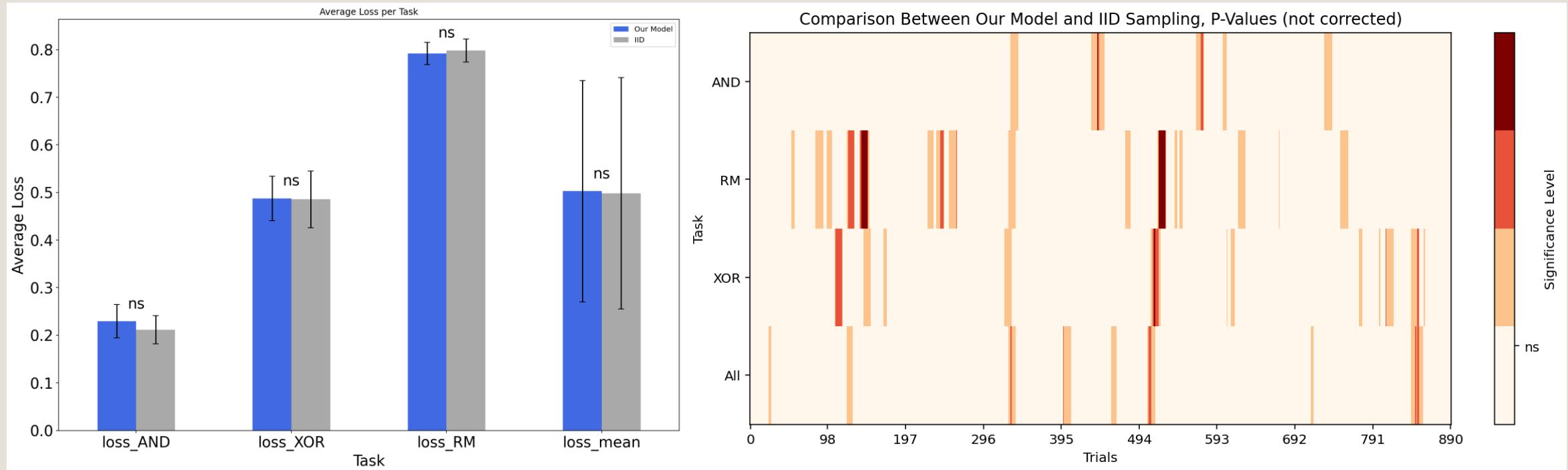
## RM: Statistical analysis for the winning combination



### Best combination

LP = 0, LPU = 10, Acc = 0

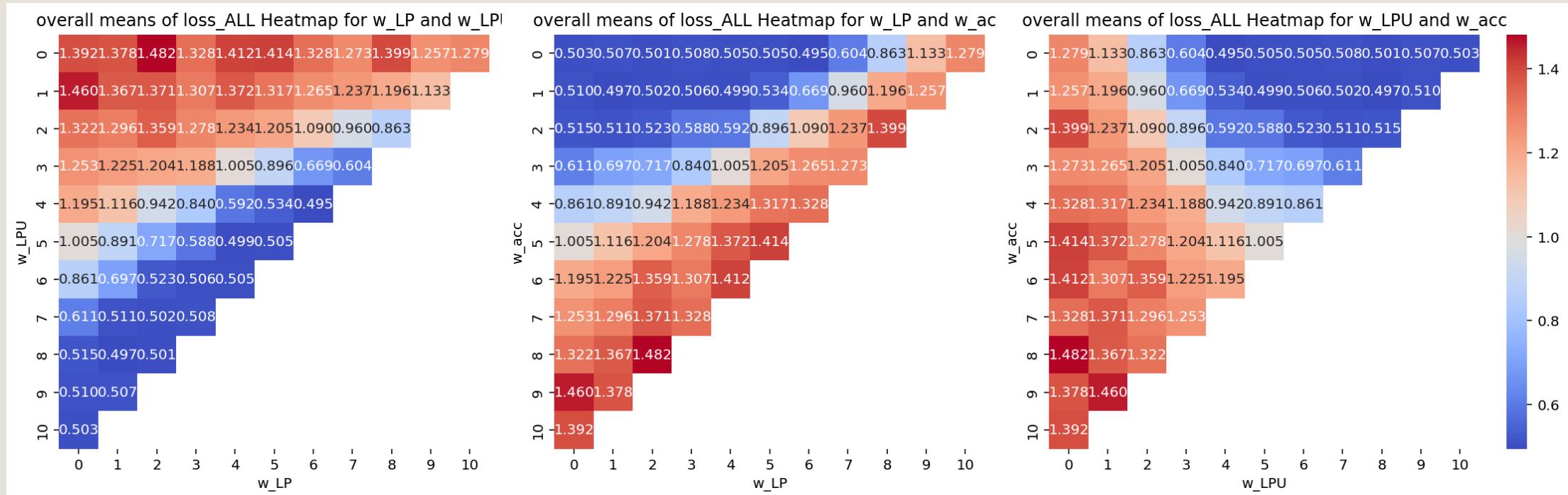
## RM: Statistical analysis for the winning combination



**Best combination**

LP = 0, LPU = 10, Acc = 0

For All tasks: Mean accross all trials

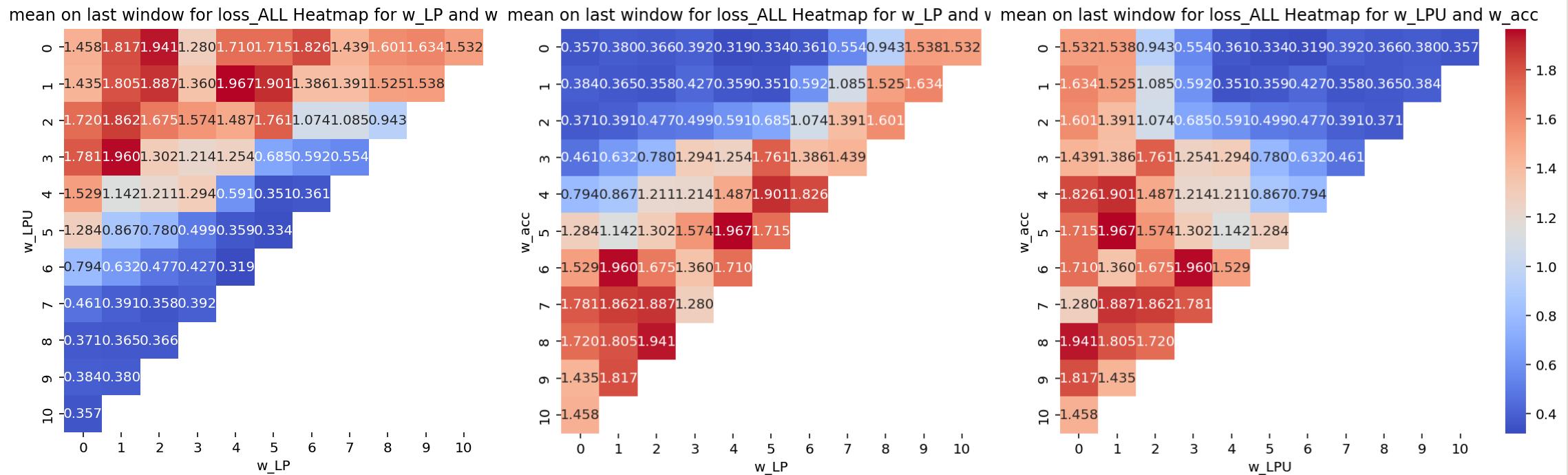


### Best combination

LP = 6, LPU = 4, Acc = 0

Loss = 0.4945

## For the All tasks: Last window (40 trial) loss

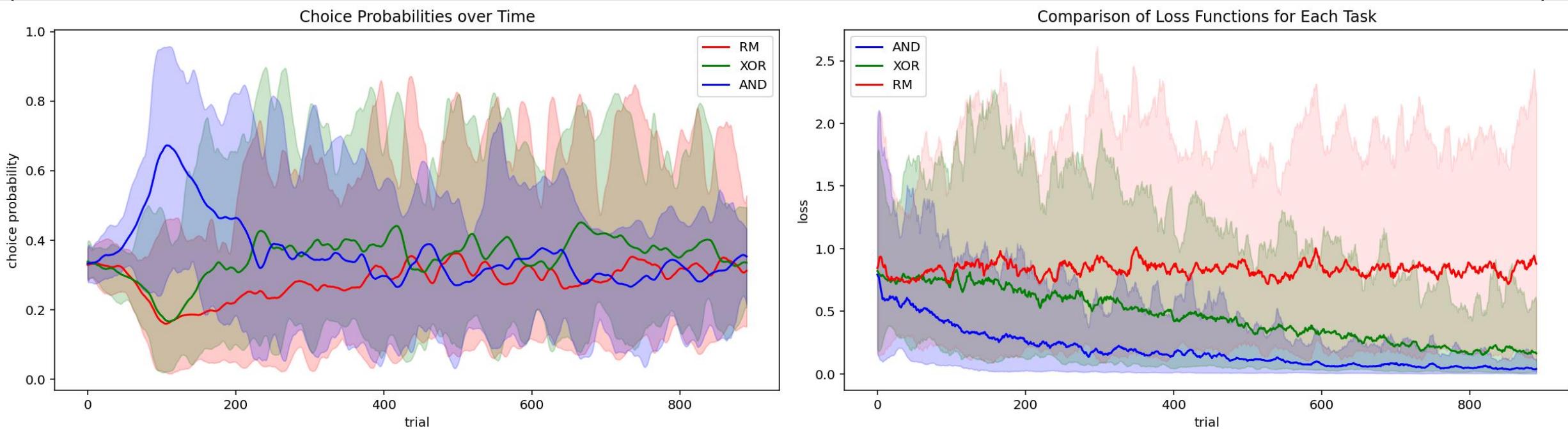


### Best combination

LP = 4, LPU = 6, Acc = 0

Loss = 0.3191

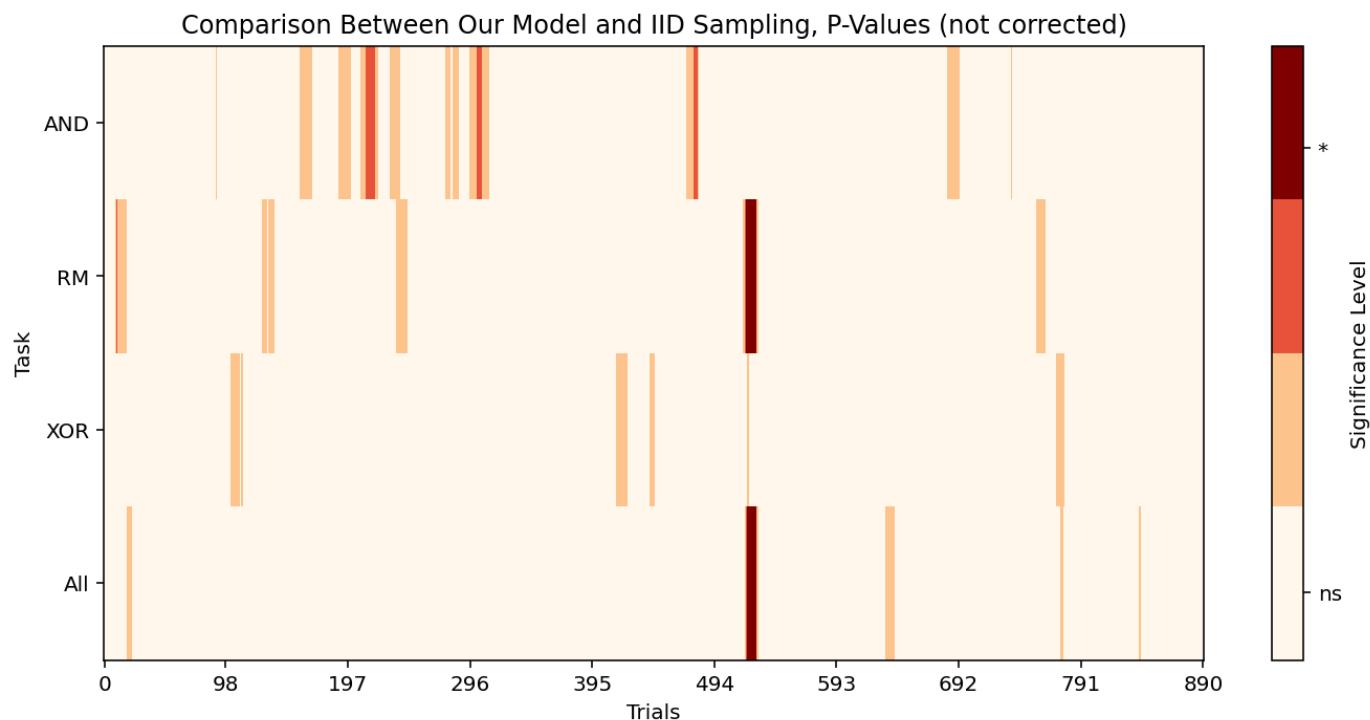
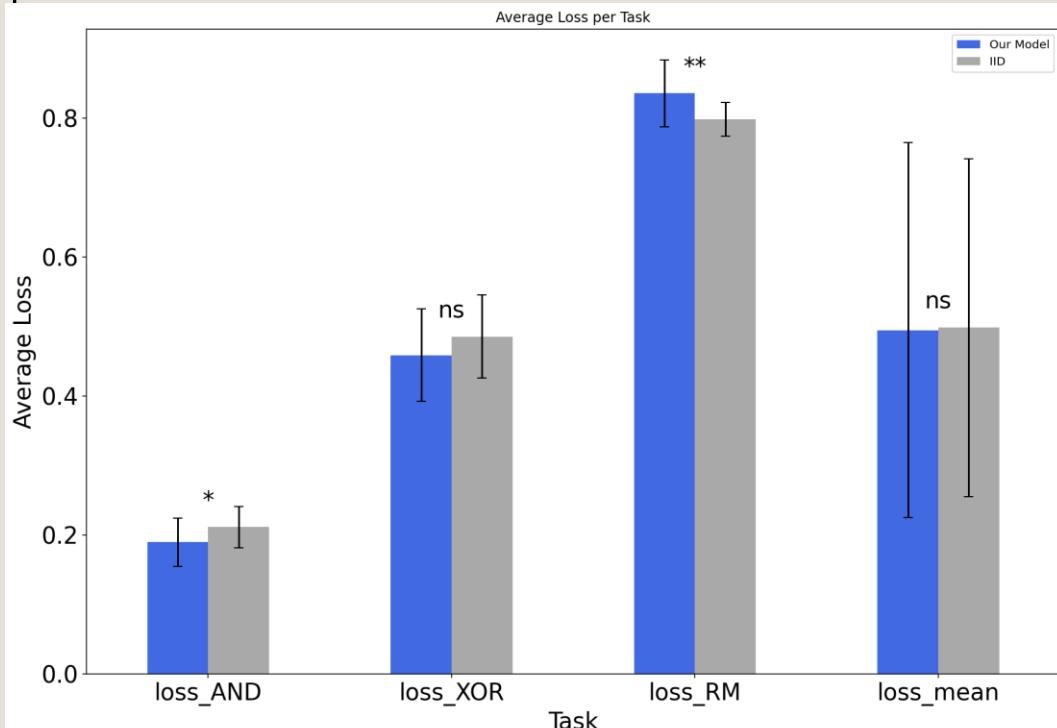
## ALL: Statistical analysis for the winning combination



### Best combination

LP = 6, LPU = 4, Acc = 0

## ALL: Statistical analysis for the winning combination

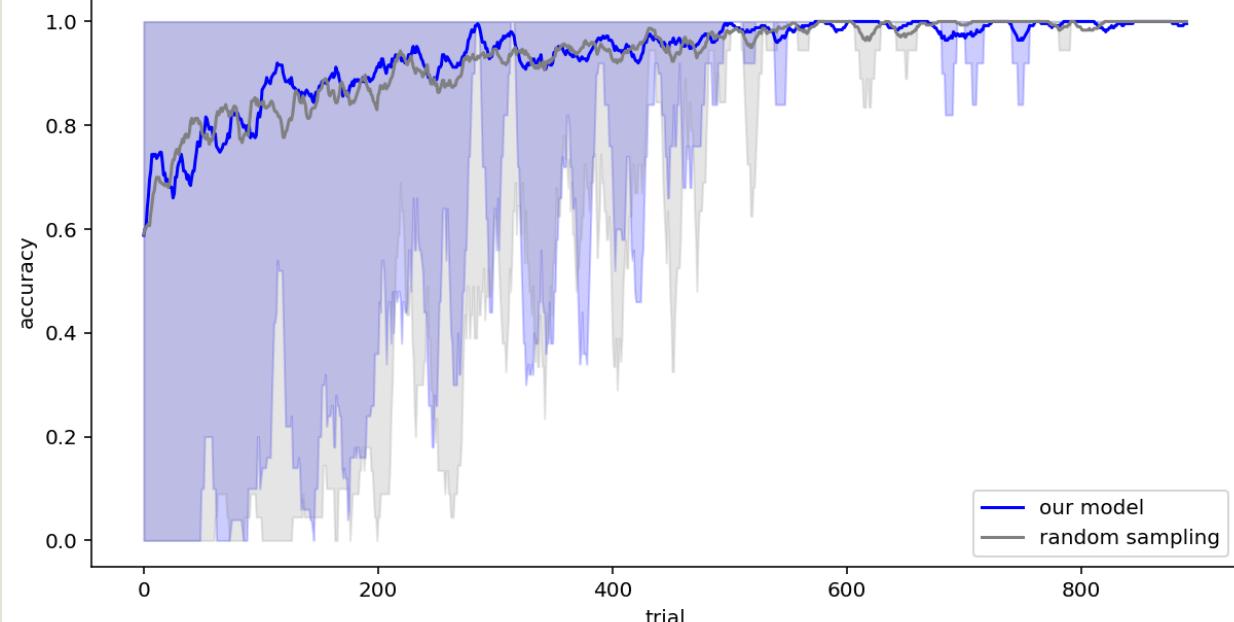


**Best combination**

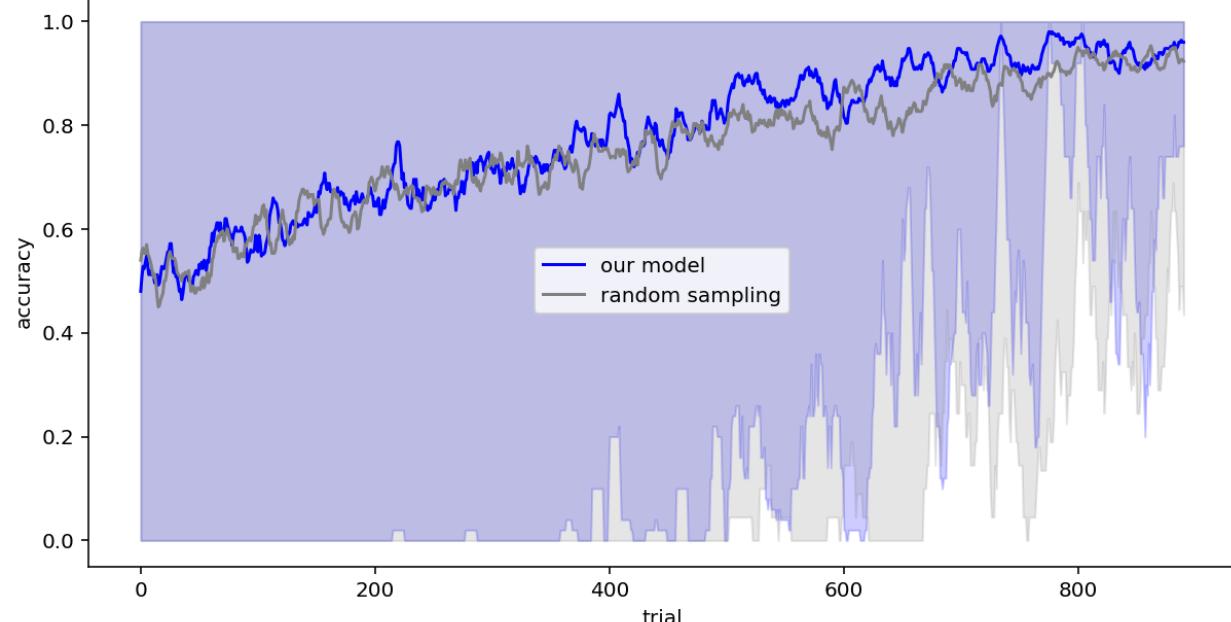
LP = 6, LPU = 4, Acc = 0

## ALL: Statistical analysis for the winning combination

Comparison of Accuracy over Time for Task AND for Each Model



Comparison of Accuracy over Time for task XOR for Each Model



## Best combination

LP = 6, LPU = 4, Acc = 0

## Conclusion

There **is catastrophic interference** for RM yet none of the criteria really prefers RM.

**LPU** helps with catastrophic interference, but **insufficient**

Perhaps **Novelty** would've helped with it?

# QUESTIONS

QUESTION	<ul style="list-style-type: none"><li>■ Poster?</li></ul>
QUESTION	<ul style="list-style-type: none"><li>■ ...</li></ul>
NOTES	<ul style="list-style-type: none"><li>■ ...</li></ul>

# NEXT WEEK'S OBJECTIVES



1

WRITE THE REPORT

IMPROVE GRAPHS

To fit in the report.

②

IMPROVE SCRIPT

And upload to github

③

ADD COMMENTS

From today's meeting

④

DONE!

⑤