CODECHECK certificate 2025-022

https://doi.org/10.5281/zenodo.16814874

Item	Value
Title	Reinforcement Learning With Model Predictive Control for Highway Ramp Metering
Authors	Filippo Airaldi (0000-0001-6595-2932), Bart De Schutter (0000-0001-9867-6196) and Azita Dabiri (0000-0002-4051-4896)
Publication	https://doi.org/10.1109/TITS.2025.3549227
Publication repository	https://doi.org/10.4121/d5074606-82f4-40e9-93cd-cf27f22e501d
Codecheckers	Yasel Quintero (0009-0005-9240-7370)
Date of check	2025-08-04
Summary	Full reproduction of figures in the article using precomputed results
Codecheck repository	https://github.com/codecheckers/certificate-2025-022

Table 1: CODECHECK summary

Summary

This CODECHECK resulted in a full reproduction of the figures presented in the publication. The author provided a GitHub repository with clear instructions for reproducing the figures using precomputed results included in the repository. The author also provided instructions for running the simulations to regenerate the results, but given the substantial computing resources required for this task, it was deemed out-of-scope for this codecheck.

Output	Comment
Figure_3.png	manuscript Figure 3
Figure_4.png	manuscript Figure 4
Figure_5.png	manuscript Figure 5
Figure_6.png	manuscript Figure 6
Figure_7.png	manuscript Figure 7
Figure_8.png	manuscript Figure 8
Figure_9.png	manuscript Figure 9
Figure_10.png	manuscript Figure 10

Table 2: Summary of output files generated

CODECHECKER notes

The reproduction of this project was straightforward. The codechecker followed the instructions in the repository with two minor alterations:

1. installing the project's dependencies within a conda environment to avoid version conflicts with other Python packages on the system
2. fixing a typo in the command to reproduce Figure 4

The steps followed were:

1. Download the project.

```
git clone https://github.com/FilippoAiraldi/mpcrl-for-ramp-metering.git
cd mpcrl-for-ramp-metering
```

2. Create a conda environment using the Python version specified in the README of the repository.

```
conda create -n myenv python=3.11.4
conda activate myenv
```

3. Install the project's dependencies within the environment.

```
pip install -r requirements.txt
```

4. Regenerate Figures 3, 5, 4, 6, 7, 8, 9, 10.

```
python visualization.py sims/lstdq_15_dynamics_a_rho_wo_track_higher_var.xz
--all --paper
```

5. Regenerate Figure 4, changing the backslashes (\) to forward slashes (/).

```
python visualization.py sims/lstdq_15_dynamics_a_rho_wo_track_higher_var.xz
sims/ddpg_15.xz sims/nonlearning_mpc_15.xz
sims/pi_alinea_15_with_queue_manag.xz --cost
```

Manifest Files

Figure_3.png

Comment: Figure 3 in the manuscript.

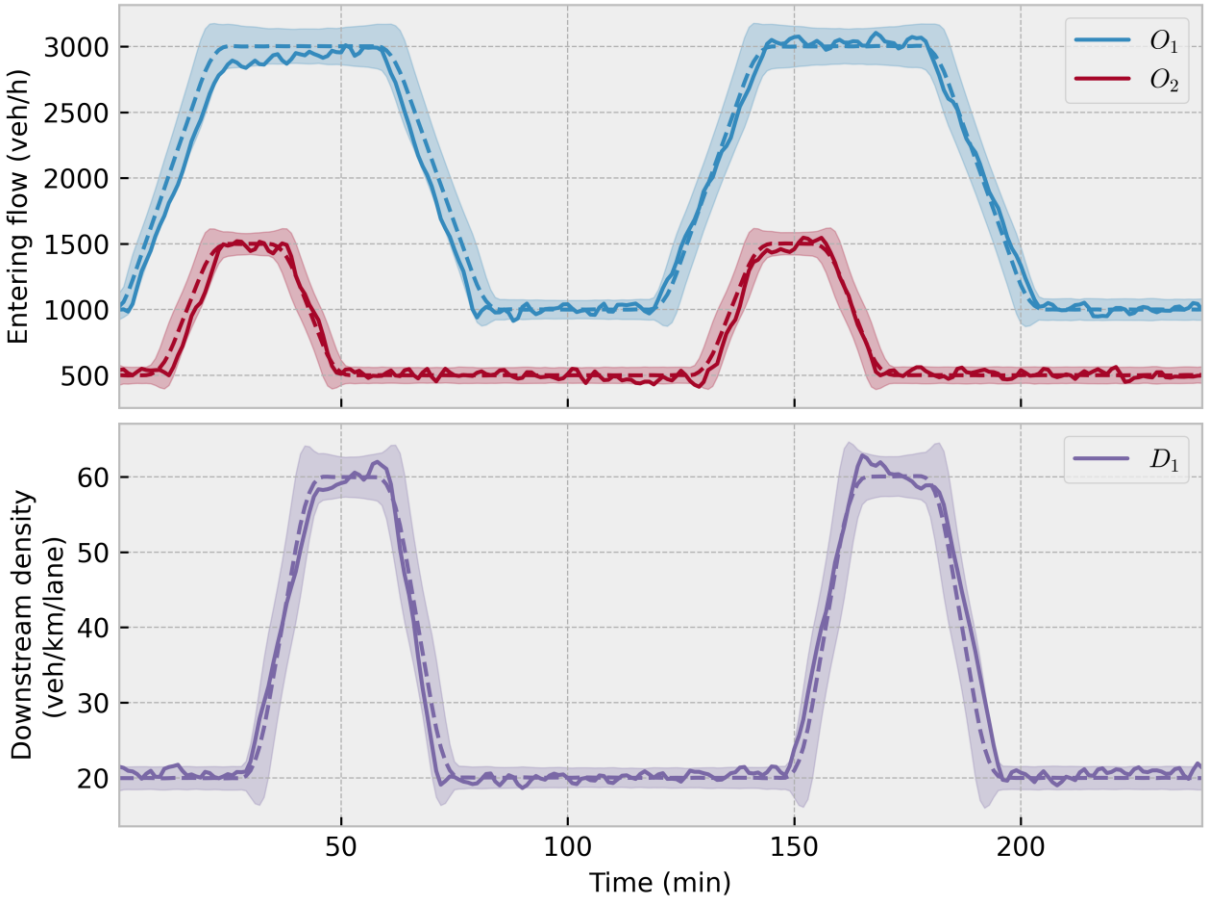


Figure_4.png

Comment: Figure 4 in the manuscript.

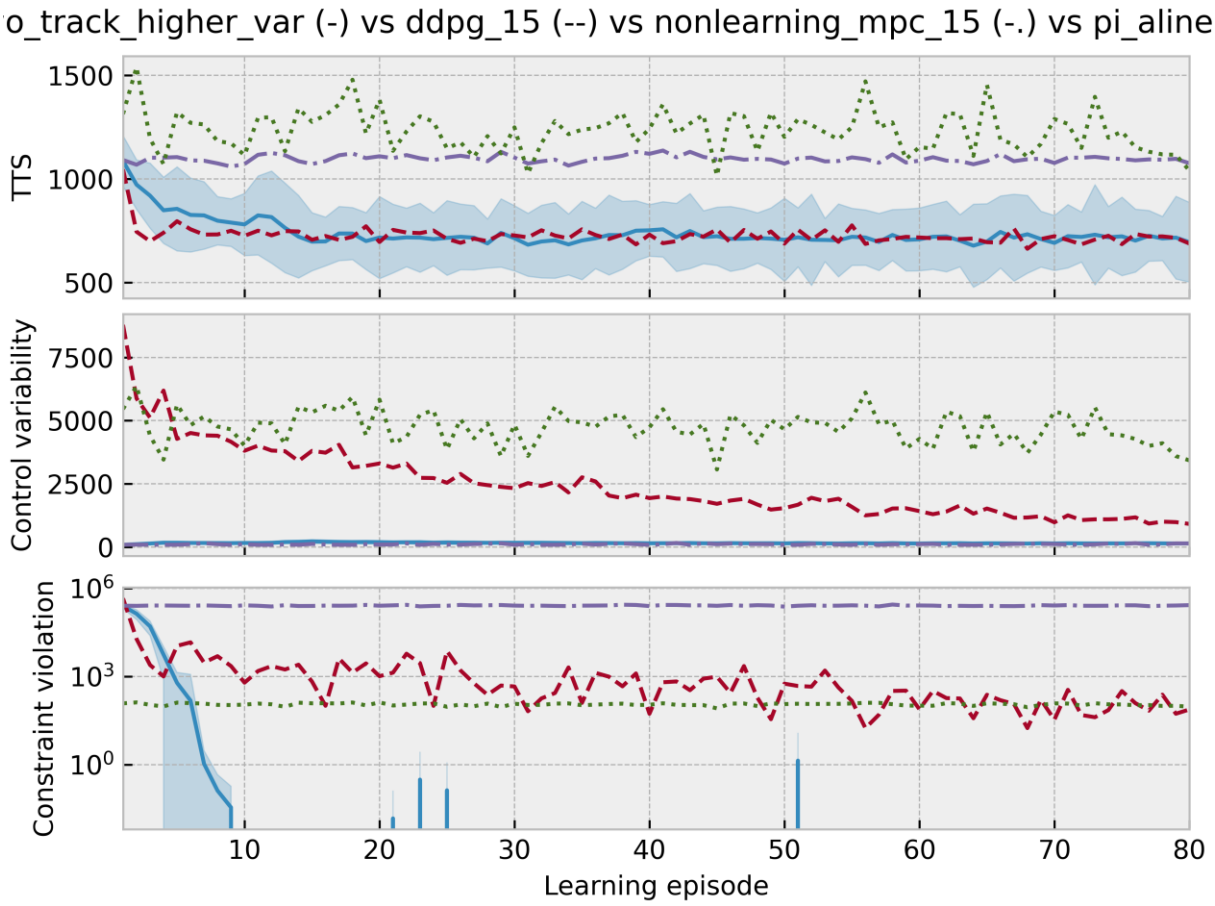


Figure_5.png

Comment: Figure 5 in the manuscript.

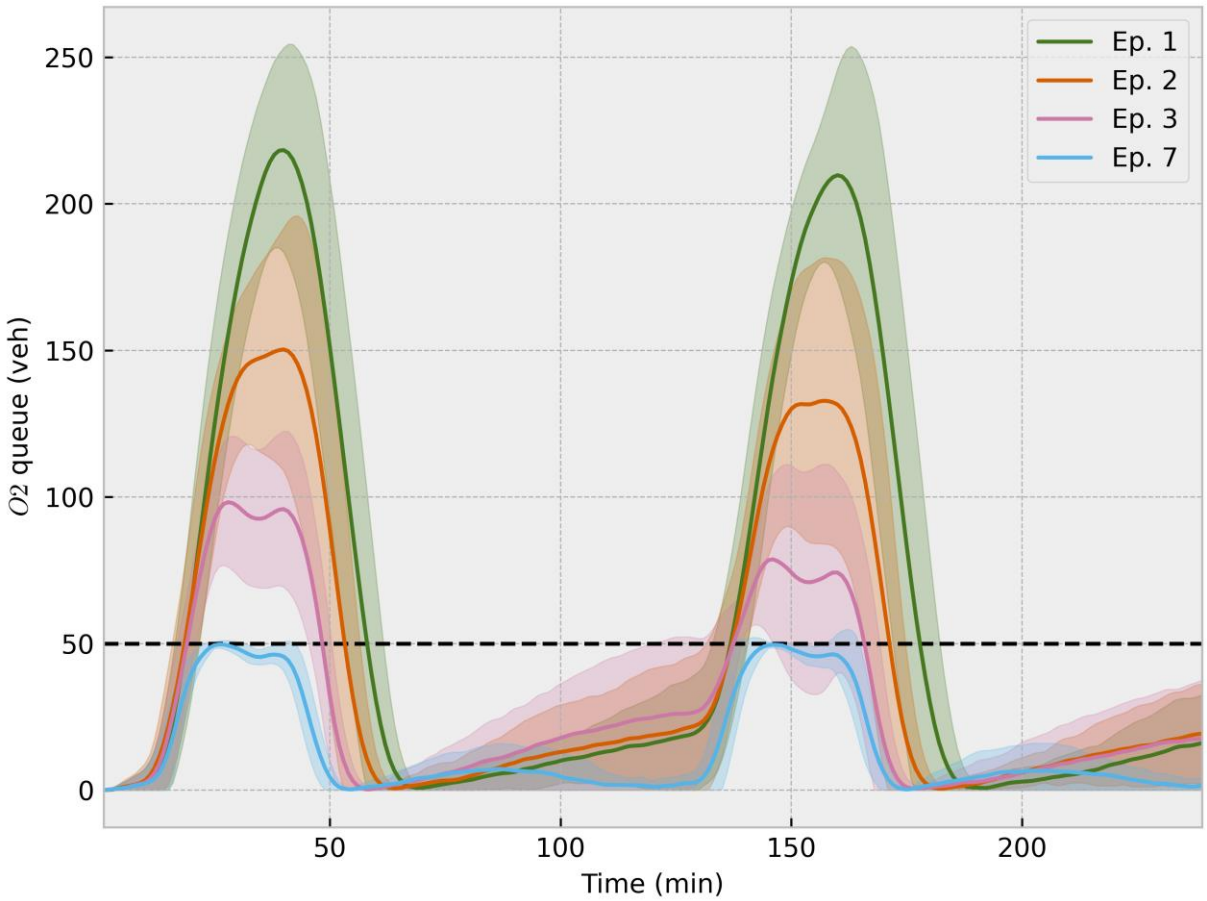


Figure_6.png

Comment: Figure 6 in the manuscript.

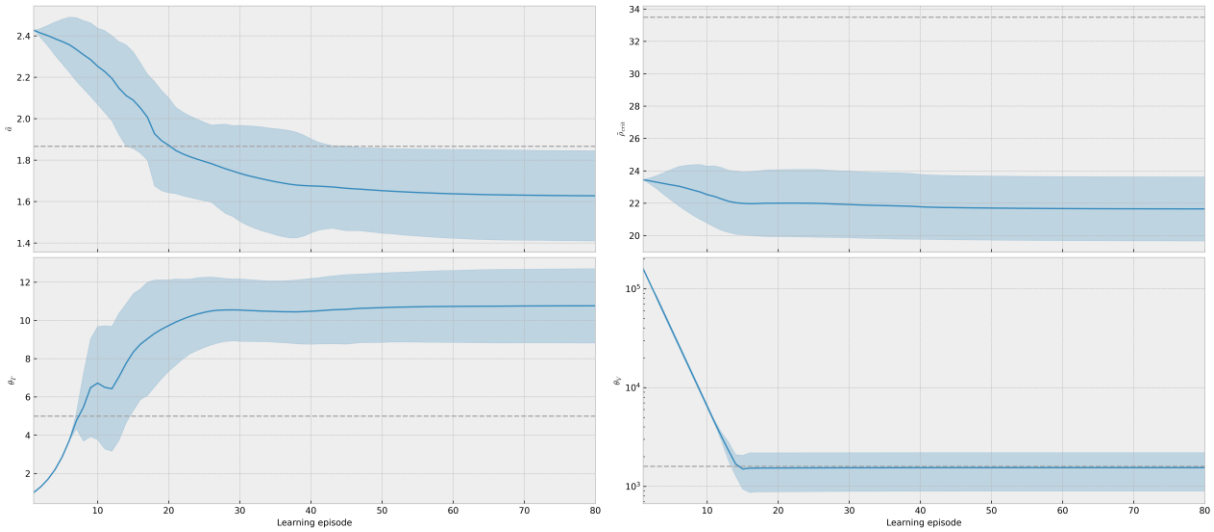


Figure_7.png

Comment: Figure 7 in the manuscript.

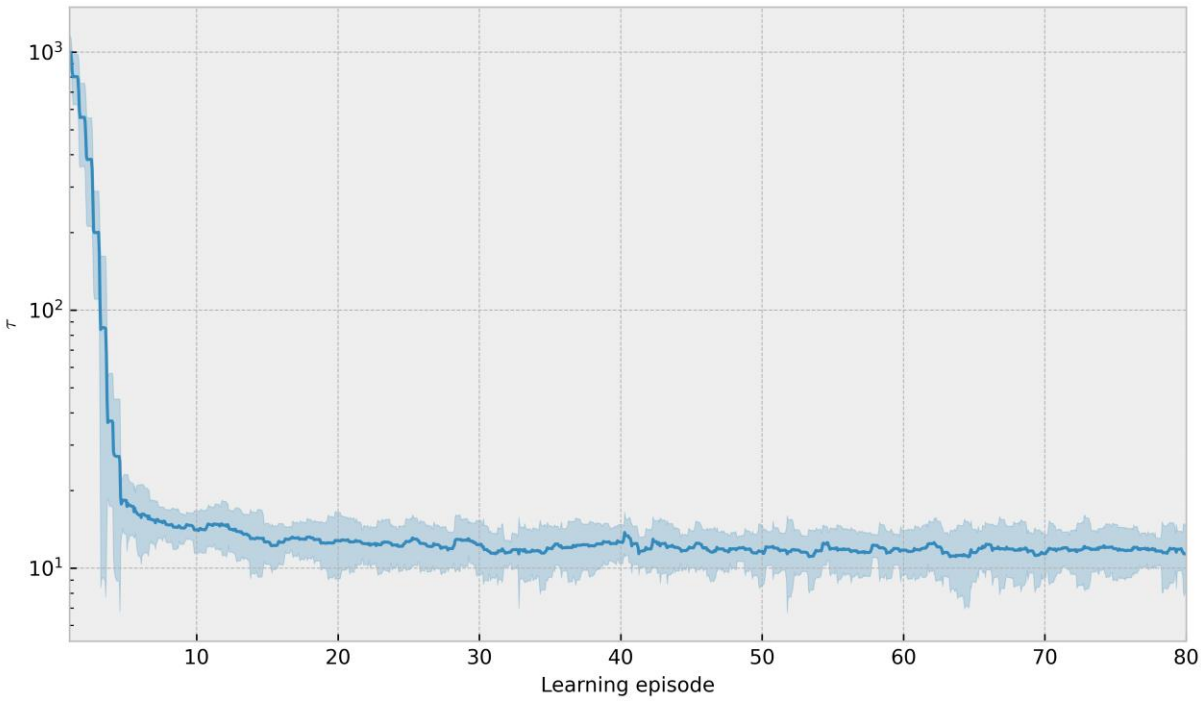


Figure_8.png

Comment: Figure 8 in the manuscript.

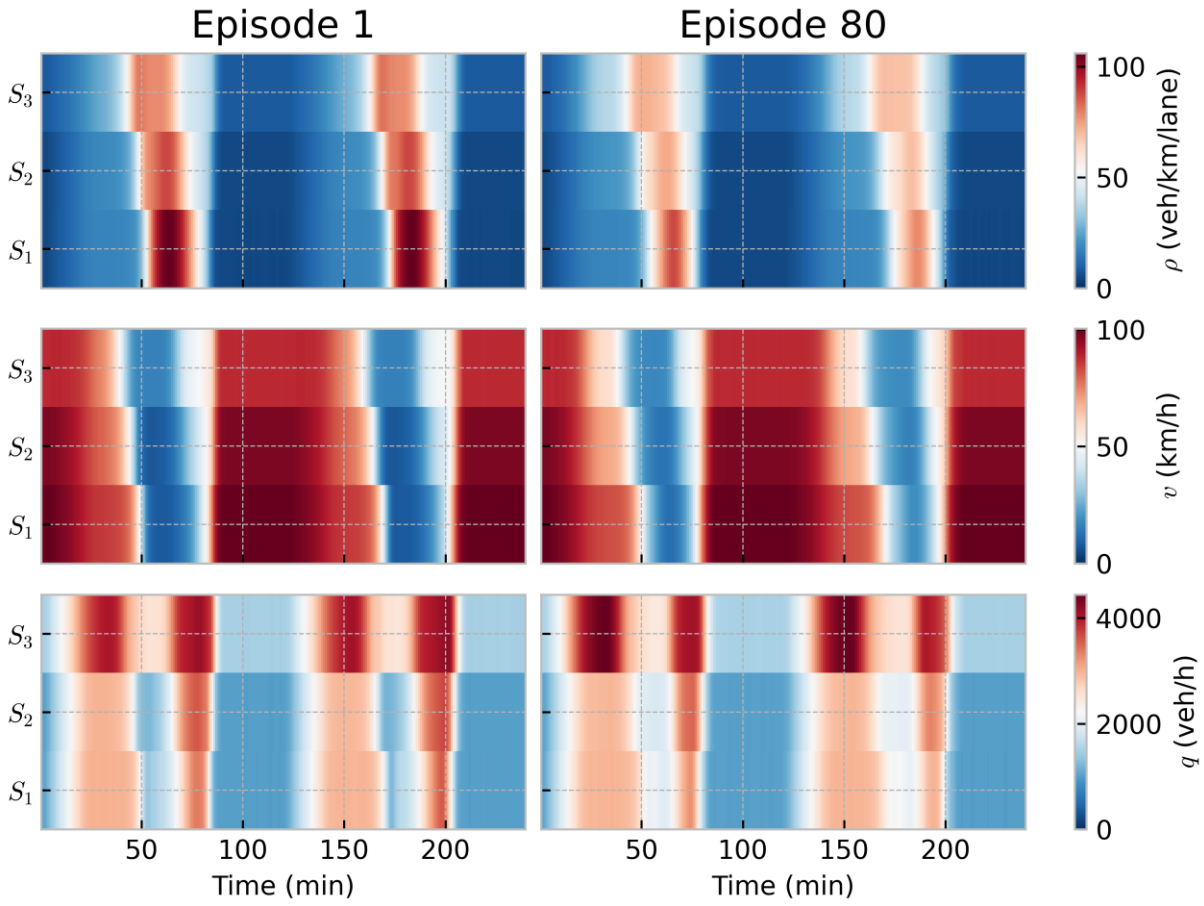


Figure_9.png

Comment: Figure 9 in the manuscript.

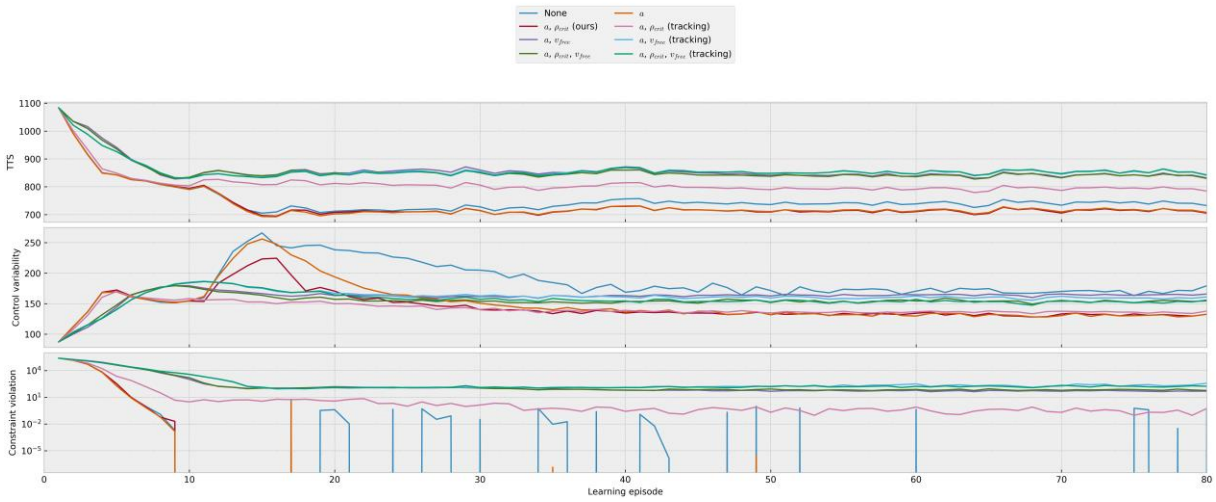
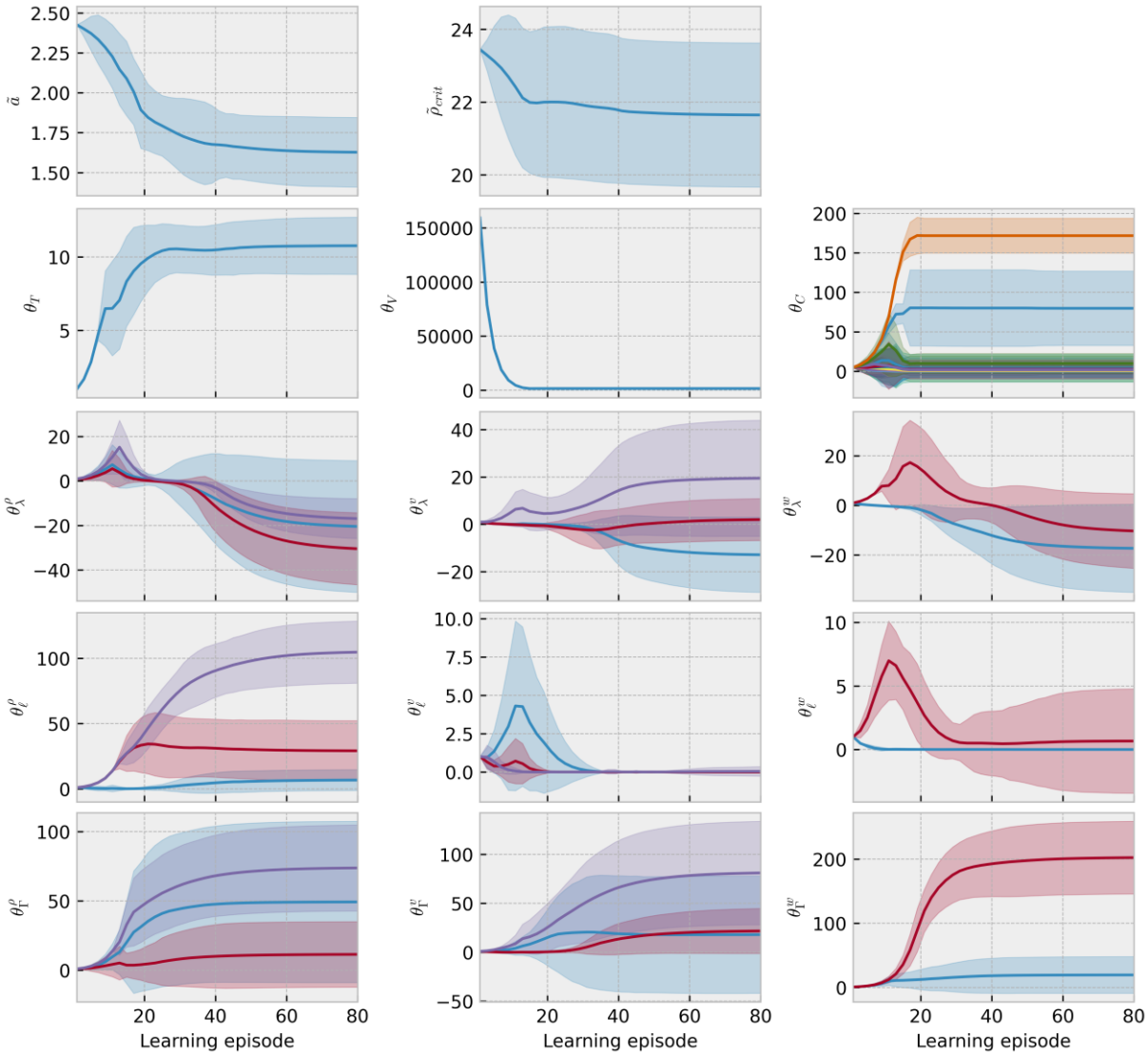


Figure_10png

Comment: Figure 10 in the manuscript.



Acknowledgements

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The codecheckers would like to thank the author Filippo Airaldi for promptly answering any questions that came up during the CODECHECK process.

Citing this document

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About CODECHECK

This certificate confirms that the codecheckers could independently reproduce the results of a computational analysis given the data and code from a third party. A CODECHECK does not check whether the original computation analysis is correct. However, as all materials required for the reproduction are freely available by following the links in this document, the reader can then study for themselves the code and data.