Assistant Fine-Tuning Performance Analysis

This document summarizes the results of fine-tuning experiments for generating formal postconditions for smart contracts using different GPT models. The analysis is based on 269 total runs.

Overall Performance Analysis

This section presents the overall success rates of each model across all tasks. Success is defined as generating postconditions that pass verification.

Total Runs Analyzed: 269

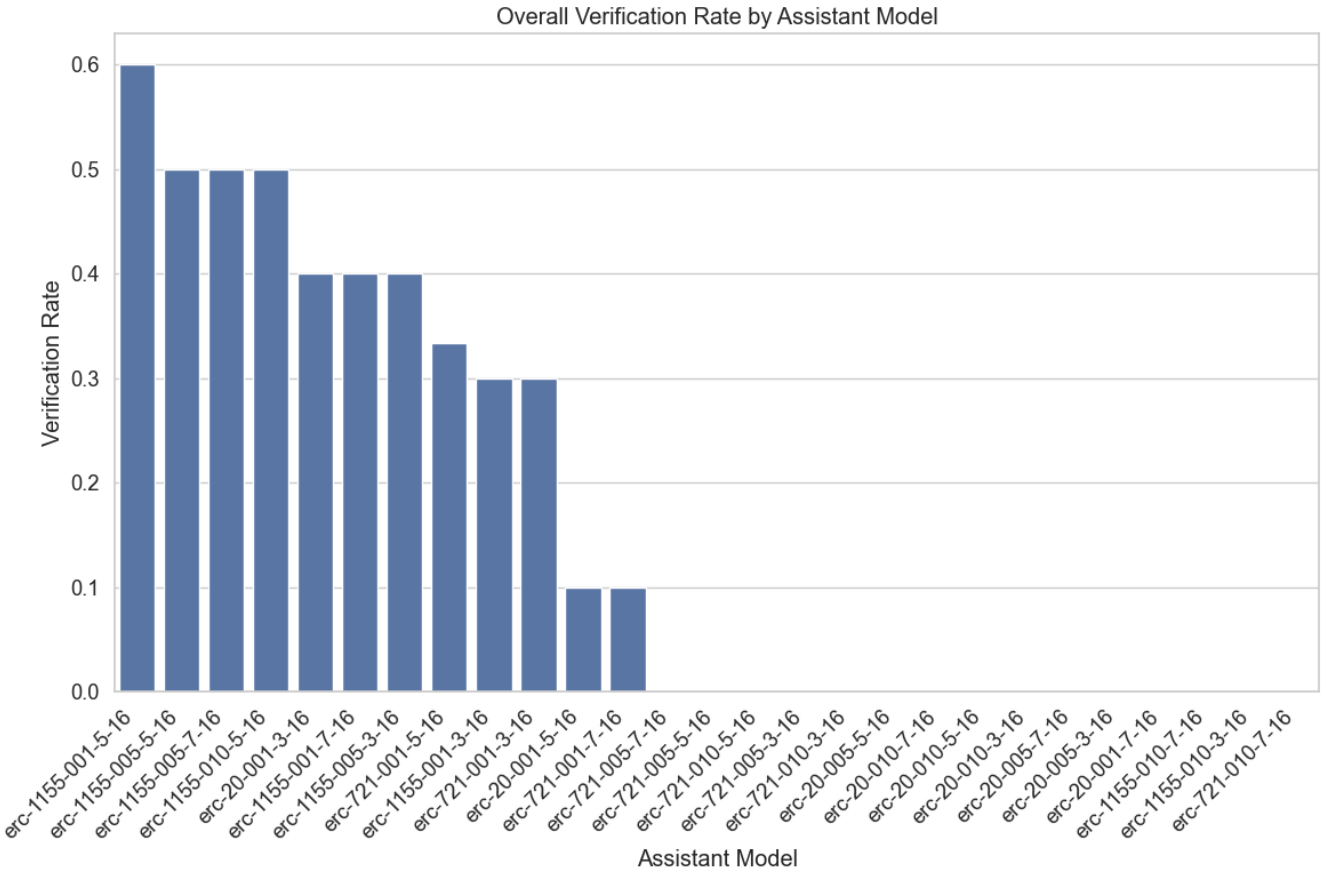
Overall Success Rates:

model	verification_rate	verified_count	total_runs
erc-1155-001-5-16	60.00	6	10
erc-1155-005-5-16	50.00	5	10
erc-1155-005-7-16	50.00	5	10
erc-1155-010-5-16	50.00	5	10
erc-20-001-3-16	40.00	4	10
erc-1155-001-7-16	40.00	4	10
erc-1155-005-3-16	40.00	4	10
erc-721-001-5-16	33.33	3	9
erc-721-001-3-16	30.00	3	10
erc-1155-001-3-16	30.00	3	10
erc-20-001-5-16	10.00	1	10
erc-721-001-7-16	10.00	1	10
erc-20-010-5-16	0.00	0	10
erc-1155-010-3-16	0.00	0	10
erc-1155-010-7-16	0.00	0	10
erc-20-001-7-16	0.00	0	10
erc-20-005-3-16	0.00	0	10
erc-20-005-7-16	0.00	0	10
erc-20-010-3-16	0.00	0	10
erc-721-005-5-16	0.00	0	10
erc-20-010-7-16	0.00	0	10
erc-20-005-5-16	0.00	0	10
erc-721-010-3-16	0.00	0	10
erc-721-005-3-16	0.00	0	10
erc-721-010-5-16	0.00	0	10

model	verification_rate	verified_count	total_runs
erc-721-005-7-16	0.00	0	10
erc-721-010-7-16	0.00	0	10

Key Observations:

- The 'erc-1155-001-5-16' model achieved the highest overall success rate at 60.00%.
- The average verification rate across all models was 16.42%.
- The 'erc-721-010-7-16' model had the lowest success rate at 0.00%.



Model Specificity Analysis

This section examines how well each model performs when requested to generate postconditions for a particular contract standard.

Success Rate (%) for each Model on each Requested Type:

model	erc1155
erc-721-010-7-16	0.00
erc-721-010-5-16	0.00
erc-721-010-3-16	0.00
erc-721-005-7-16	0.00
erc-721-005-5-16	0.00
erc-721-005-3-16	0.00
erc-721-001-7-16	10.00

model	erc1155
erc-721-001-5-16	33.33
erc-721-001-3-16	30.00
erc-20-010-7-16	0.00
erc-20-010-5-16	0.00
erc-20-010-3-16	0.00
erc-20-005-7-16	0.00
erc-20-005-5-16	0.00
erc-20-005-3-16	0.00
erc-20-001-7-16	0.00
erc-20-001-5-16	10.00
erc-20-001-3-16	40.00
erc-1155-010-7-16	0.00
erc-1155-010-5-16	50.00
erc-1155-010-3-16	0.00
erc-1155-005-7-16	50.00
erc-1155-005-5-16	50.00
erc-1155-005-3-16	40.00
erc-1155-001-7-16	40.00
erc-1155-001-5-16	60.00
erc-1155-001-3-16	30.00

Successful Runs / Total Runs for each Model on each Requested Type:

model	erc1155
erc-721-010-7-16	0 / 10
erc-721-010-5-16	0 / 10
erc-721-010-3-16	0 / 10
erc-721-005-7-16	0 / 10
erc-721-005-5-16	0 / 10
erc-721-005-3-16	0 / 10
erc-721-001-7-16	1 / 10
erc-721-001-5-16	3 / 9
erc-721-001-3-16	3 / 10
erc-20-010-7-16	0 / 10
erc-20-010-5-16	0 / 10

model	erc1155
erc-20-010-3-16	0 / 10
erc-20-005-7-16	0 / 10
erc-20-005-5-16	0 / 10
erc-20-005-3-16	0 / 10
erc-20-001-7-16	0 / 10
erc-20-001-5-16	1 / 10
erc-20-001-3-16	4 / 10
erc-1155-010-7-16	0 / 10
erc-1155-010-5-16	5 / 10
erc-1155-010-3-16	0 / 10
erc-1155-005-7-16	5 / 10
erc-1155-005-5-16	5 / 10
erc-1155-005-3-16	4 / 10
erc-1155-001-7-16	4 / 10
erc-1155-001-5-16	6 / 10
erc-1155-001-3-16	3 / 10

Efficiency Analysis

This section evaluates the efficiency of the models in terms of the number of iterations and time taken to reach a successful verification or exhaust attempts.

Average Iterations and Time per Model:

model	avg_fail_iterations	avg_success_iterations	avg_fail_time	avg_success_time	fail_rate
erc-20-005-5-16	10.0	0.0	344.77390298843386	0.0	100.00
erc-20-005-3-16	10.0	0.0	375.76180896759035	0.0	100.00
erc-721-010-5-16	10.0	0.0	187.561115026474	0.0	100.00
erc-721-010-3-16	10.0	0.0	176.60926826000212	0.0	100.00

model	avg_fail_iterations	avg_success_iterations	avg_fail_time	avg_success_time	fail_rate
erc-721-005-7-16	10.0	0.0	181.36573247909547	0.0	100.00
erc-721-005-5-16	10.0	0.0	188.43282148838043	0.0	100.00
erc-721-005-3-16	10.0	0.0	247.2128398180008	0.0	100.00
erc-20-010-7-16	10.0	0.0	272.3052050828934	0.0	100.00
erc-20-010-5-16	10.0	0.0	388.9166532278061	0.0	100.00
erc-20-010-3-16	10.0	0.0	359.22117338180544	0.0	100.00
erc-20-005-7-16	10.0	0.0	324.81093435287477	0.0	100.00
erc-721-010-7-16	10.0	0.0	181.49588105678558	0.0	100.00
erc-20-001-7-16	10.0	0.0	251.55123615264893	0.0	100.00
erc-1155-010-7-16	10.0	0.0	268.5577013015747	0.0	100.00
erc-1155-010-3-16	10.0	0.0	252.67014882564544	0.0	100.00

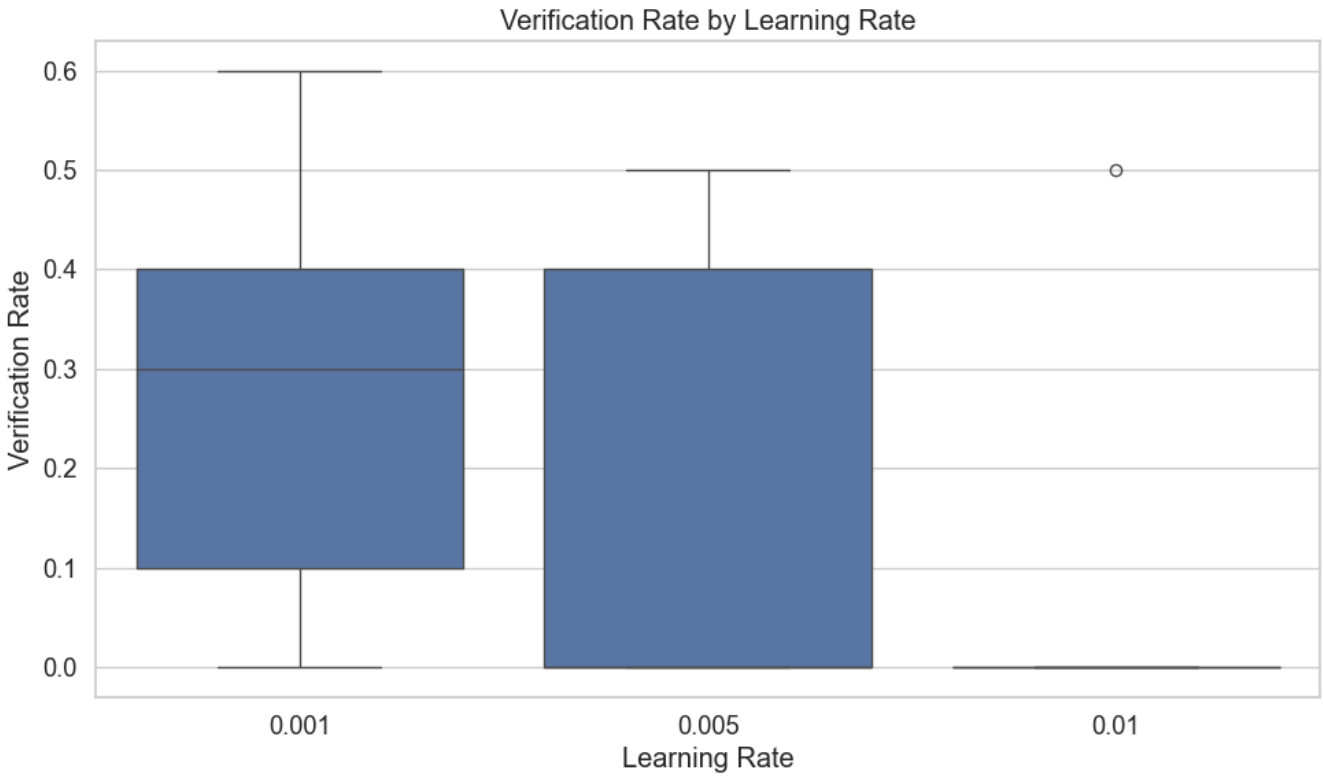
model	avg_fail_iterations	avg_success_iterations	avg_fail_time	avg_success_time	fail_rate
erc-20-001-5-16	10.0	9.0	319.5671892695957	456.85076785087585	90.00
erc-721-001-7-16	10.0	3.0	365.03221453560724	109.90961384773254	90.00
erc-721-001-3-16	10.0	2.3333333333333335	456.81361205237255	146.17995484670004	70.00
erc-1155-001-3-16	10.0	3.0	443.08687826565335	225.49767963091531	70.00
erc-721-001-5-16	10.0	1.0	308.9347548087438	84.61758232116699	66.67
erc-20-001-3-16	10.0	4.5	495.92361211776733	277.51286828517914	60.00
erc-1155-005-3-16	10.0	4.0	329.65803599357605	183.01379412412643	60.00
erc-1155-001-7-16	10.0	2.75	367.5579106807709	170.93733376264572	60.00
erc-1155-010-5-16	10.0	2.0	246.2312921524048	98.19168214797973	50.00
erc-1155-005-7-16	10.0	3.4	296.12227630615234	199.30102972984315	50.00
erc-1155-005-5-16	10.0	2.0	315.2278193950653	131.21311526298524	50.00

model	avg_fail_iterations	avg_success_iterations	avg_fail_time	avg_success_time	fail_rate
erc-1155-001-5-16	10.0	1.0	302.91807371377945	73.74164454142253	40.00

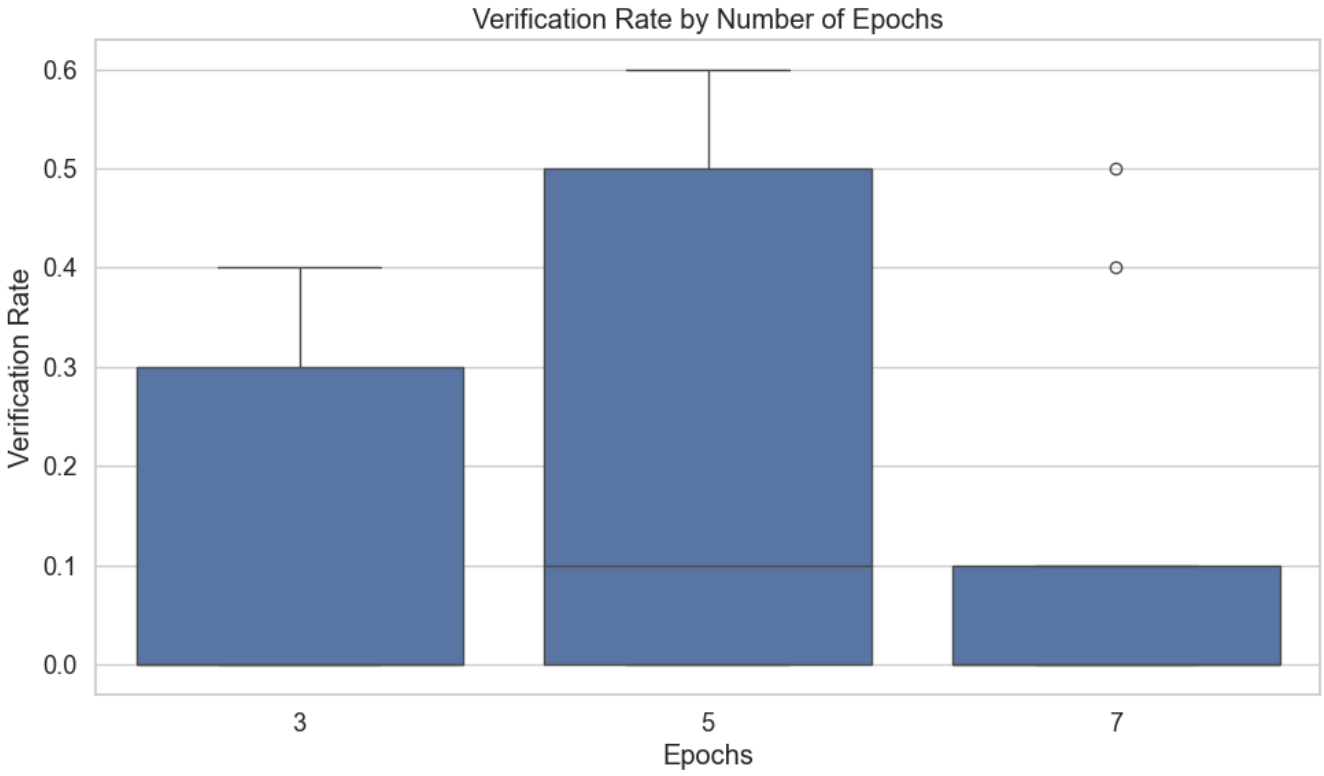
Hyperparameter Analysis

This section analyzes the impact of different hyperparameters (learning rate, epochs, batch size) on model performance.

By Learning Rate



By Epochs



By Batch Size

Function-level Verification Analysis

This section examines which specific functions are most successfully verified by each model.

Function Verification Rates

Overall Conclusion

Based on the analysis, the following conclusions can be drawn:

1. The models `erc-1155-001-5-16`, `erc-1155-005-5-16` and `erc-1155-005-7-16` demonstrated the highest overall verification rates.