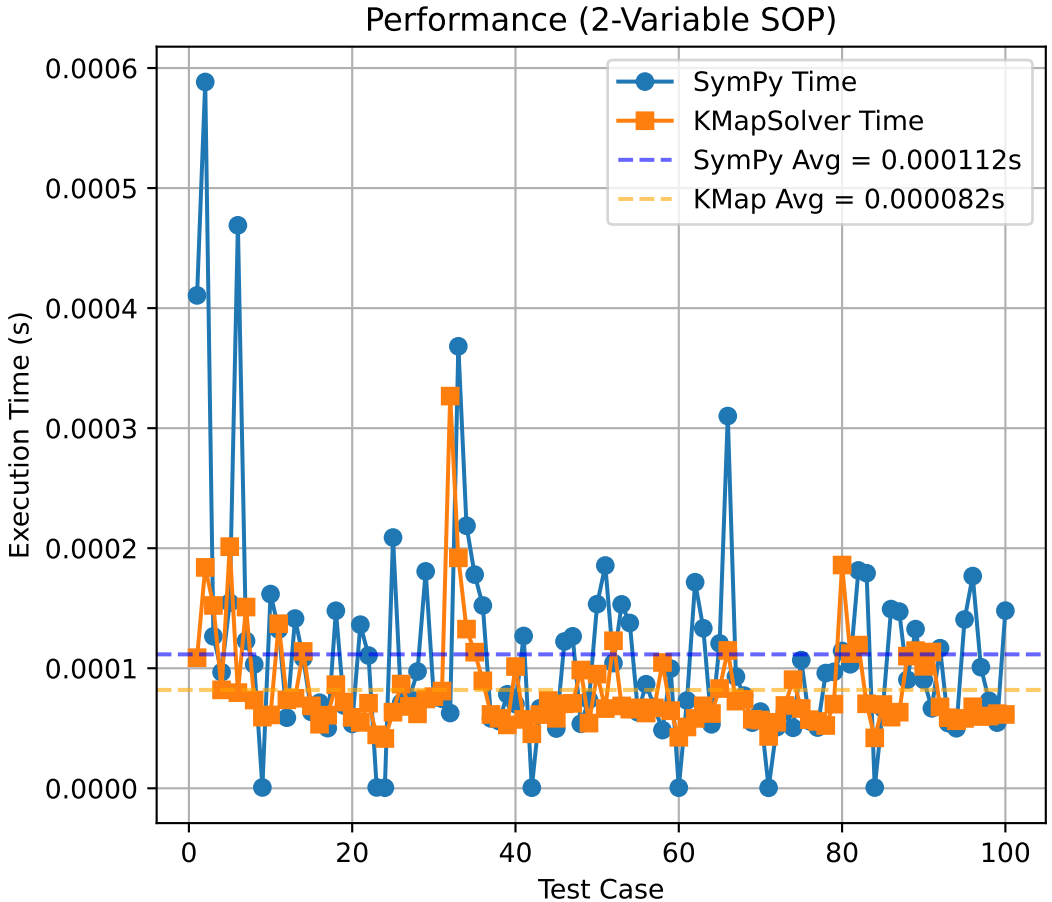
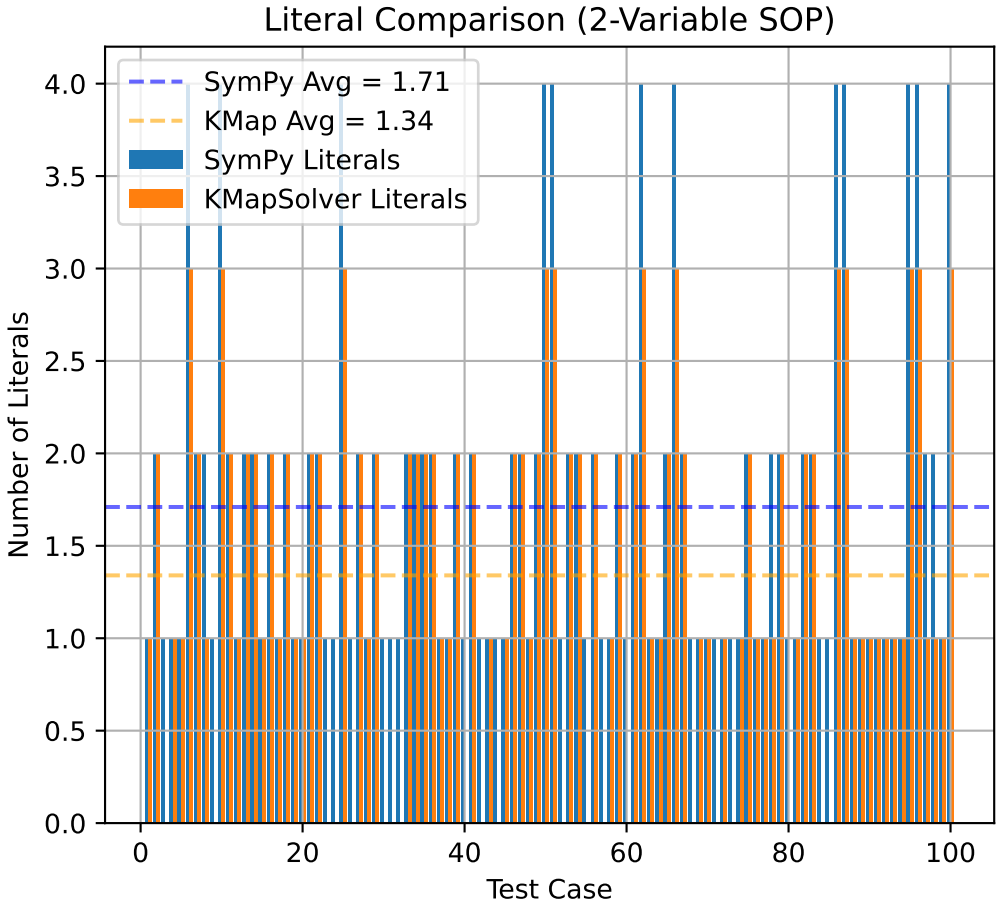
Inference Report

Performance and Simplification Benchmark between SymPy and StanLogic

---

Generated on November 12, 2025


Performance (2-Variable SOP)
SymPy Time
KMapSolver Time
SymPy Avg = 0.000112s
KMap Avg = 0.000082s
Execution Time (s)
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0.0000
0
20
40
60
80
100
Test Case


Literal Comparison (2-Variable SOP)
SymPy Avg = 1.71
KMap Avg = 1.34
SymPy Literals
KMapSolver Literals
Number of Literals
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
Test Case

INFERENCE: 2-Variable SOP

```
================================================================================
```

INFERENCE SUMMARY

```
================================================================================
```

EXECUTION TIME ANALYSIS

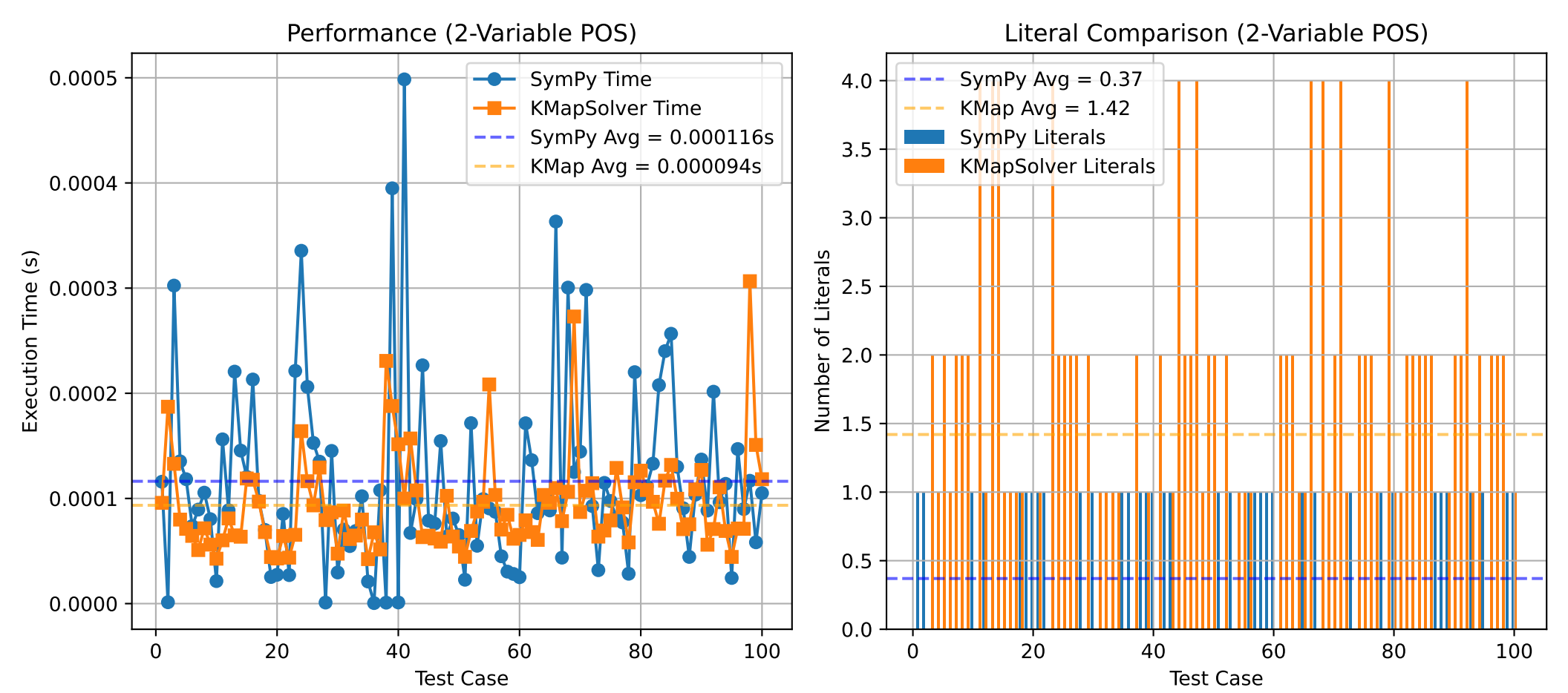
```
  Average SymPy Time:      0.000112 s
  Average KMapSolver Time: 0.000082 s
  Difference:              -0.000030 s (-26.54%)
  Std. Dev (ΔTime):        0.000084 s
  Deviation Ratio:         0.753
  → KMapSolver is faster than SymPy on average.
  → Execution times are stable and consistent.
```

LITERAL COUNT ANALYSIS

```
  Average SymPy Literals:  1.71
  Average KMap Literals:   1.34
  Difference:              -0.37 (-21.6%)
  Std. Dev (ΔLiterals):    0.49
  Deviation Ratio:         0.284
  → KMapSolver produces more minimal logical forms (fewer literals).
  → Literal simplifications are consistent.
```

OVERALL VERDICT

```
  □ KMapSolver achieves comparable or superior simplification efficiency with minimal
time overhead.
================================================================================
```


Performance (2-Variable POS)
SymPy Time
KMapSolver Time
SymPy Avg = 0.000116s
KMap Avg = 0.000094s
Execution Time (s)
0.0000
0.0001
0.0002
0.0003
0.0004
0.0005
0
20
40
60
80
100
Test Case
Literal Comparison (2-Variable POS)
SymPy Avg = 0.37
KMap Avg = 1.42
SymPy Literals
KMapSolver Literals
Number of Literals
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
0
20
40
60
80
100
Test Case

INFERENCE: 2-Variable POS

```
================================================================================
```

INFERENCE SUMMARY

```
================================================================================
```

EXECUTION TIME ANALYSIS

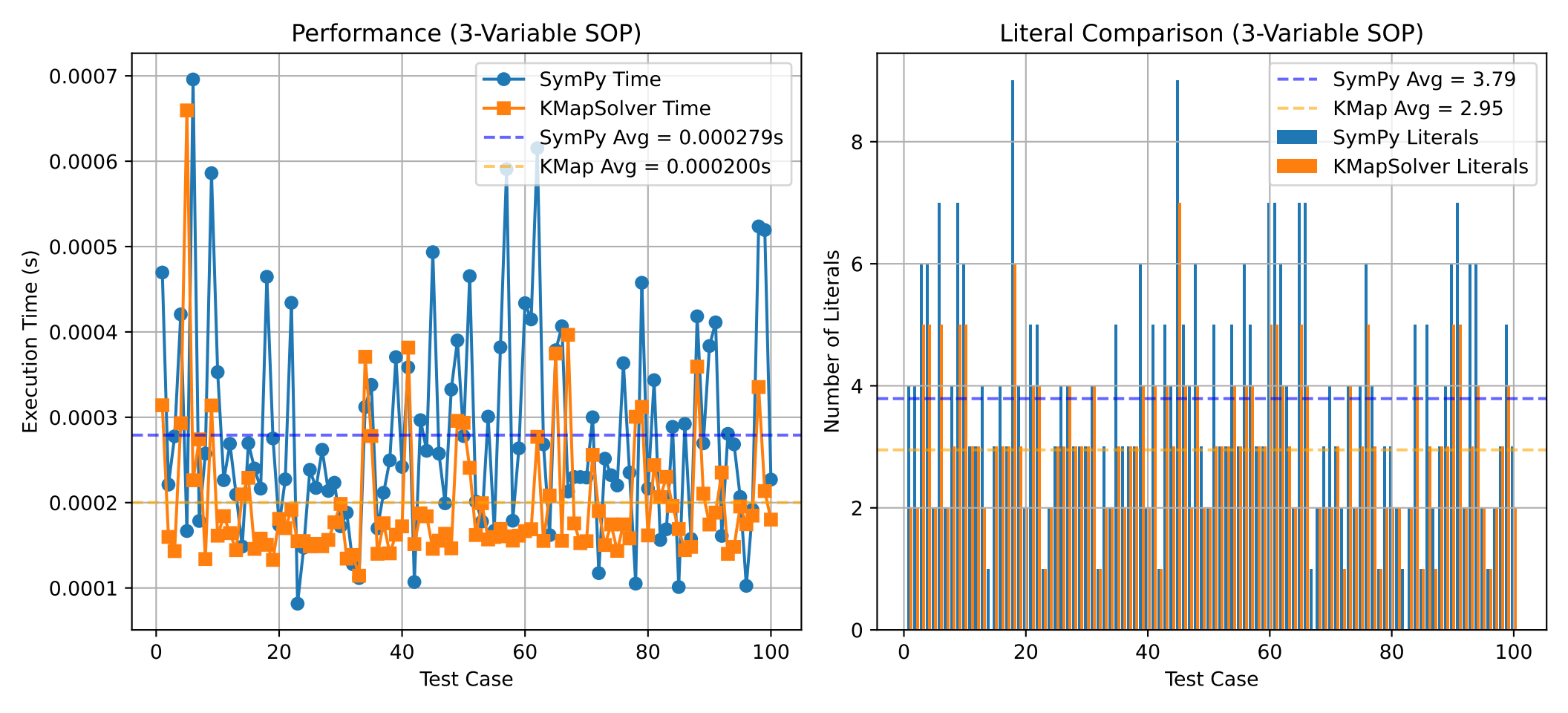
```
  Average SymPy Time:      0.000116 s
  Average KMapSolver Time: 0.000094 s
  Difference:              -0.000023 s (-19.63%)
  Std. Dev (ΔTime):        0.000092 s
  Deviation Ratio:         0.788
  → KMapSolver is faster than SymPy on average.
  → Execution times are stable and consistent.
```

LITERAL COUNT ANALYSIS

```
  Average SymPy Literals:  0.37
  Average KMap Literals:   1.42
  Difference:              +1.05 (+283.8%)
  Std. Dev (ΔLiterals):    1.59
  Deviation Ratio:         4.284
  → SymPy produces slightly simpler expressions on average.
  → Literal simplifications are consistent.
```

OVERALL VERDICT

```
  □ KMapSolver outperforms SymPy in runtime while maintaining correctness.
================================================================================
```


Performance (3-Variable SOP)
SymPy Time
KMapSolver Time
SymPy Avg = 0.000279s
KMap Avg = 0.000200s
Execution Time (s)
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
20
40
60
80
100
Test Case
Literal Comparison (3-Variable SOP)
SymPy Avg = 3.79
KMap Avg = 2.95
SymPy Literals
KMapSolver Literals
Number of Literals
8
6
4
2
0
0
20
40
60
80
100
Test Case

INFERENCE: 3-Variable SOP

```
================================================================================
```

INFERENCE SUMMARY

```
================================================================================
```

EXECUTION TIME ANALYSIS

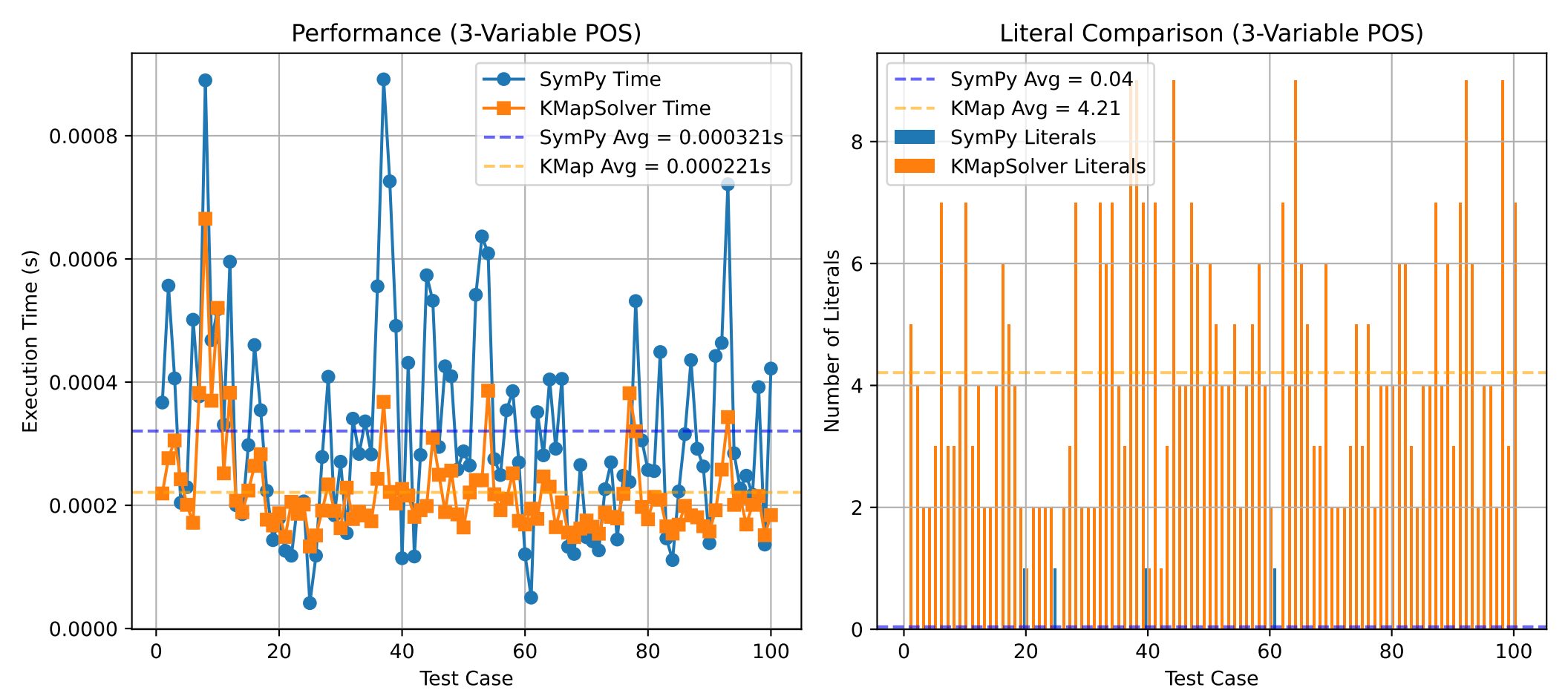
```
  Average SymPy Time:      0.000279 s
  Average KMapSolver Time: 0.000200 s
  Difference:              -0.000079 s (-28.29%)
  Std. Dev (ΔTime):        0.000131 s
  Deviation Ratio:         0.470
  → KMapSolver is faster than SymPy on average.
  → Execution times are stable and consistent.
```

LITERAL COUNT ANALYSIS

```
  Average SymPy Literals:  3.79
  Average KMap Literals:   2.95
  Difference:              -0.84 (-22.2%)
  Std. Dev (ΔLiterals):    0.85
  Deviation Ratio:         0.224
  → KMapSolver produces more minimal logical forms (fewer literals).
  → Literal simplifications are consistent.
```

OVERALL VERDICT

```
  □ KMapSolver achieves comparable or superior simplification efficiency with minimal
time overhead.
================================================================================
```


Performance (3-Variable POS)
SymPy Time
KMapSolver Time
SymPy Avg = 0.000321s
KMap Avg = 0.000221s
Execution Time (s)
0.0000
0.0002
0.0004
0.0006
0.0008
0
20
40
60
80
100
Test Case
Literal Comparison (3-Variable POS)
SymPy Avg = 0.04
KMap Avg = 4.21
SymPy Literals
KMapSolver Literals
Number of Literals
0
2
4
6
8
0
20
40
60
80
100
Test Case

INFERENCE: 3-Variable POS

==========

INFERENCE SUMMARY

==========

EXECUTION TIME ANALYSIS

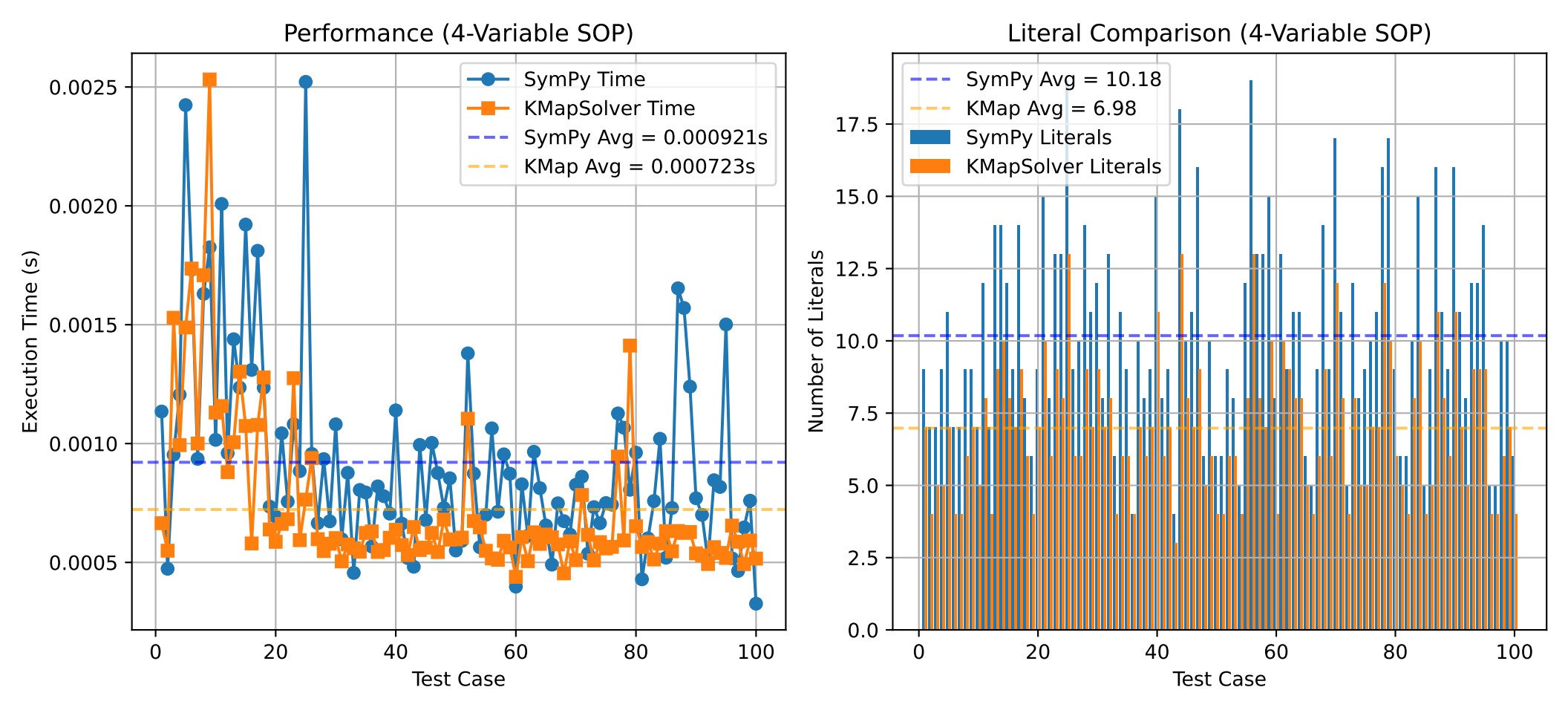
```
  Average SymPy Time:      0.000321 s
  Average KMapSolver Time: 0.000221 s
  Difference:              -0.000100 s (-31.05%)
  Std. Dev (ΔTime):        0.000132 s
  Deviation Ratio:         0.412
  → KMapSolver is faster than SymPy on average.
  → Execution times are stable and consistent.
```

LITERAL COUNT ANALYSIS

```
  Average SymPy Literals:  0.04
  Average KMap Literals:   4.21
  Difference:              +4.17 (+10425.0%)
  Std. Dev (ΔLiterals):    2.25
  Deviation Ratio:         56.190
  → SymPy produces slightly simpler expressions on average.
  → Simplification outcomes vary across inputs.
```

OVERALL VERDICT

```
  □ KMapSolver outperforms SymPy in runtime while maintaining correctness.
==========
```


Performance (4-Variable SOP)
SymPy Time
KMapSolver Time
SymPy Avg = 0.000921s
KMap Avg = 0.000723s
Execution Time (s)
0.0025
0.0020
0.0015
0.0010
0.0005
0
20
40
60
80
100
Test Case
Literal Comparison (4-Variable SOP)
SymPy Avg = 10.18
KMap Avg = 6.98
SymPy Literals
KMapSolver Literals
Number of Literals
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
0
20
40
60
80
100
Test Case

INFERENCE: 4-Variable SOP

```
================================================================================
```

INFERENCE SUMMARY

```
================================================================================
```

EXECUTION TIME ANALYSIS

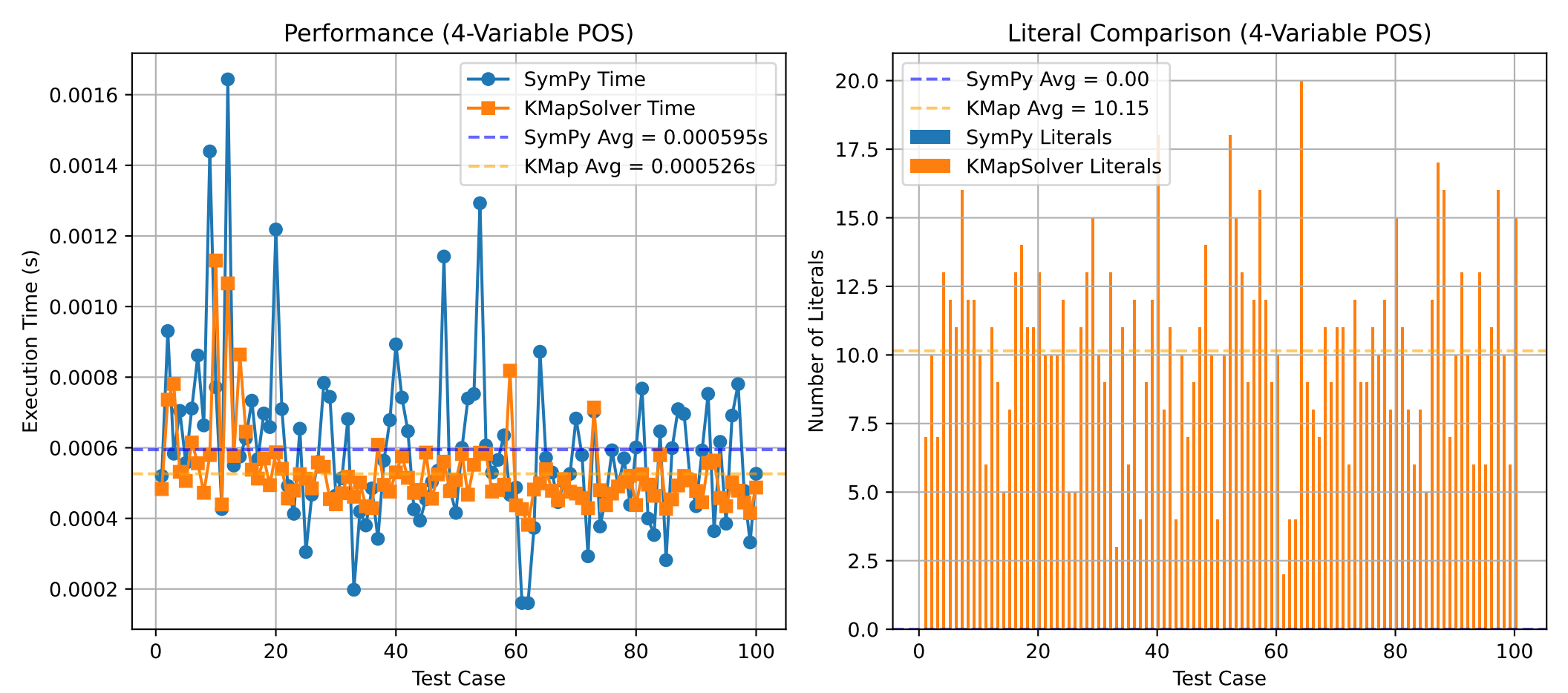
```
  Average SymPy Time:      0.000921 s
  Average KMapSolver Time: 0.000723 s
  Difference:              -0.000199 s (-21.56%)
  Std. Dev (ΔTime):        0.000343 s
  Deviation Ratio:         0.373
  → KMapSolver is faster than SymPy on average.
  → Execution times are stable and consistent.
```

LITERAL COUNT ANALYSIS

```
  Average SymPy Literals:  10.18
  Average KMap Literals:   6.98
  Difference:              -3.20 (-31.4%)
  Std. Dev (ΔLiterals):    1.50
  Deviation Ratio:         0.147
  → KMapSolver produces more minimal logical forms (fewer literals).
  → Literal simplifications are consistent.
```

OVERALL VERDICT

```
  □ KMapSolver achieves comparable or superior simplification efficiency with minimal
time overhead.
================================================================================
```


Performance (4-Variable POS)
SymPy Time
KMapSolver Time
SymPy Avg = 0.000595s
KMap Avg = 0.000526s
Execution Time (s)
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0
20
40
60
80
100
Test Case
Literal Comparison (4-Variable POS)
SymPy Avg = 0.00
KMap Avg = 10.15
SymPy Literals
KMapSolver Literals
Number of Literals
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
0
20
40
60
80
100
Test Case

INFERENCE: 4-Variable POS

```
================================================================================
```

INFERENCE SUMMARY

```
================================================================================
```

EXECUTION TIME ANALYSIS

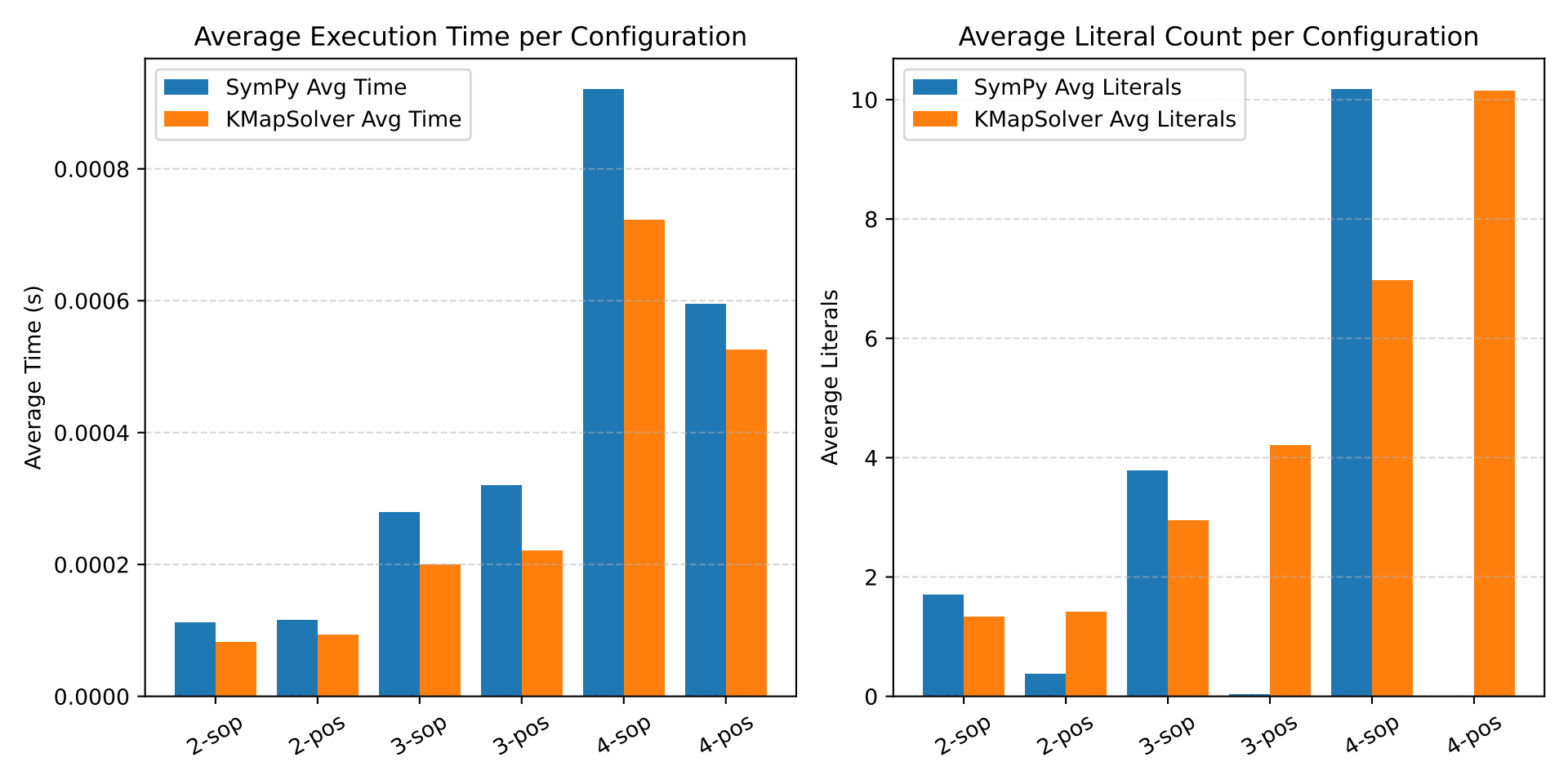
```
  Average SymPy Time:      0.000595 s
  Average KMapSolver Time: 0.000526 s
  Difference:              -0.000068 s (-11.48%)
  Std. Dev (ΔTime):        0.000207 s
  Deviation Ratio:         0.348
  → KMapSolver is faster than SymPy on average.
  → Execution times are stable and consistent.
```

LITERAL COUNT ANALYSIS

```
  Average SymPy Literals:  0.00
  Average KMap Literals:   10.15
  Difference:              +10.15 (+0.0%)
  Std. Dev (ΔLiterals):    3.57
  Deviation Ratio:         0.000
  → SymPy produces slightly simpler expressions on average.
  → Simplification outcomes vary across inputs.
```

OVERALL VERDICT

```
  □ KMapSolver outperforms SymPy in runtime while maintaining correctness.
================================================================================
```


Average Execution Time per Configuration
SymPy Avg Time
KMapSolver Avg Time
Average Time (s)
0.0000
0.0002
0.0004
0.0006
0.0008
2-sop
2-pos
3-sop
3-pos
4-sop
4-pos
Average Literal Count per Configuration
SymPy Avg Literals
KMapSolver Avg Literals
Average Literals
0
2
4
6
8
10
2-sop
2-pos
3-sop
3-pos
4-sop
4-pos

OVERALL INFERENCE REPORT

Generated on November 12, 2025

==========

INFERENCE SUMMARY

==========

EXECUTION TIME ANALYSIS

```
Average SymPy Time:      0.000391 s
Average KMapSolver Time: 0.000308 s
Difference:              -0.000083 s (-21.24%)
Std. Dev (ΔTime):        0.000064 s
Deviation Ratio:         0.163
→ KMapSolver is faster than SymPy on average.
→ Execution times are stable and consistent.
```

LITERAL COUNT ANALYSIS

```
Average SymPy Literals:  2.68
Average KMap Literals:   4.51
Difference:              +1.83 (+68.1%)
Std. Dev (ΔLiterals):    4.75
Deviation Ratio:         1.769
→ SymPy produces slightly simpler expressions on average.
→ Simplification outcomes vary across inputs.
```

OVERALL VERDICT

 KMapSolver outperforms SymPy in runtime while maintaining correctness.

==========