SUPPLEMENTARY MATERIAL

F. Error-Triggering Input Pairs

Table VII
ERROR-TRIGGERING INPUT PAIRS. R/W1 IS THE ABBREVIATION OF READ/WRITE VIRTUAL MEMORY #1.

Candidate Solution	Input Pair
Buggy Square Root	R2,R1,R0,R2,R0,R2; W1,W1,W2,W2,W3,W0.
Optimized Square Root	W3,W3,W1,W1,W3,W3; R0,R1,R0,R2,R0,R1.
Hierarchical Protocol	R2,R1,R4,W2,R3,R1; W2,W0,W7,W7,W7,W6.
Cuckoo Hashing Protocol	R4,R0,R5,W0,R5,R6; W0,W7,W3,W1,W0,W0.
Buggy Path ORAM	W1,R0,W3,R1,R1,W2; R3,W1,R2,W0,W3,R0.
Lethe	W1,R0,W3,R1,R1,W2; R3,W1,R2,W0,W3,R0.
PathOHeap	W1,R0,W3,R1,R1,W2; R3,W1,R2,W0,W3,R0.
ObliDB	see Table VIII

Table VIII
THE ERROR-TRIGGERING DATABASE TABLES OF OBLIDB.

Table 1	Table 2
1, B	1, A
2, B	2, B
3, C	3, C
4, D	4, D
1, C	1, C
2, B	2, B
3, C	3, C
4, D	4, D
1, C	1, C
2, B	2, B
3, C	3, C
4, D	4, D
1, D	1, D
2, B	2, B
3, C	3, C
4, D	4, D
1, C	1, C
2, B	2, B
3, C	3, C
4, D	4, D
1, B	1, B
2, B	2, B
3, C	3, C
4, D	4, D

We report the error triggering input pairs in Table VII. W1 and R1 correspond to Push 1 and Pop 1 in when testing PathOHeap. Note that the input pair of ObliDB corresponds to two tables. Each table contains two columns (one numerical column and one categorical column). We report two tables in two columns of Table VIII, respectively.

G. Minimized Error-Triggering Subsequences

We report the minimized error-triggering subsequences (marked in red) as follow.

Optimized Square Root. read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 sort read 6 read 2 read 0 read 6 write 6 read 7 read 6 read 7 read 2 read 4 read 6 read 7 write 7 read 6 write 6 read 7 write 7 read 6 read 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 write 6 write 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 sort read 6 read 2 read 0 read 6 write 6 read 7 read 6 read 7 read 2 read 0 read 1 read 6 read 7 write 7 read 6 write 6 read 7 write 7 read 6 read 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 write 6 write 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 sort read 6 read 2 read 0 read 6 write 6 read 7 read 6 read 7 read 2 read 0 read 1 read 6 read 7 write 7 read 6 write 6 read 7 write 7 read 6 read 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 write 6 write 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 sort

Buggy Square Root. read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 sort read 6 read 2 read 0 read 6 write 6 read 7 read 6 read 7 read 2 read 4 read 3 read 6 read 7 write 7 read 6 read 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 write 6 write 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 sort read 6 read 2 read 0 read 1 read 6 write 6 read 7 read 6 read 7 read 2 read 4 read 6 read 7 write 7 read 6 read 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 write 6 write 7 read 0 write 0 read 1 write 1 read 2 write 2 read 3 write 3 read 4 write 4 read 5 write 5 sort

PathOHeap write 0 write 1 write 2 write 3 write 4 write 5 write 6 write 7 write 8 write 9 write 10 write 11 write 12 write 13 write 14 write 15 write 16 write 17 write 18 write 19 write 20 write 21 write 22 write 23 write 24 write 25 write 26 write 27 write 28 write 29 write 30 write 21 write 10 write 4 write 1 write 0 read 21 write 21 read 10 read 21 read 22 write 10 read 4 read 9 read 10 write 4 read 1 read 3 read 4 write 1 read 0 read 1 read 2 write 0 write 24 write 11 write 5 write 2 write 0 read 24 write 24 read 11 read 23 read 24 write 11 read 5 read 11 read 12 write 5 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 read 0 read 0 read 2 read 5 read 12 read 26 write 26 write 12 write 5 write 2 write 0 read 26 write 26 read 12 read 25 read 26 write 12 read 5 read 11 read 12 write 5 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 write 20 write 9 write 4 write 1 write 0 read 20 write 20 read 9 read 19 read 20 write 9 read 4 read 9 read 10 write 4 read 1 read 3 read 4 write 1 read 0 read 1 read 2 write 0 write 25 write 12 write 5 write 2 write 0 read 25 write 25 read 12 read 25 read 26 write 12 read 5 read 11 read 12 write 5 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 read 0 read 0 read 2 read 5 read 11 read 24 write 24 write 11 write 5 write 2 write 0 read 24 write 24 read 11 read 23 read 24 write 11 read 5 read 11 read 12 write 5 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 write 15 write 7 write 3 write 1 write 0 read 15 write 15 read 7 read 15 read 16 write 7 read 3 read 7 read 8 write 3 read 1 read 3 read 4 write 1 read 0 read 1 read 2 write 0 write 27 write 13 write 6 write 2 write 0 read 27 write 27 read 13 read 27 read 28 write 13 read 6 read 13 read 14 write 6 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 read 0 read 0 read 2 read 5 read 11 read 23 write 23 write 11 write 5 write 2 write 0 read 23 write 23 read 11 read 23 read 24 write 11 read 5 read 11 read 12 write 5 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 write 17 write 8 write 3 write 1 write 0 read 17 write 17 read 8 read 17 read 18 write 8 read 3 read 7 read 8 write 3 read 1 read 3 read 4 write 1 read 0 read 1 read 2 write 0 write 25 write 12 write 5 write 2 write 0 read 25 write 25 read 12 read 25 read 26 write 12 read 5 read 11 read 12 write 5 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 read 0 read 0 read 2 read 6 read 13 read 27 write 27 write 13 write 6 write 2 write 0 read 27 write 27 read 13 read 27 read 28 write 13 read 6 read 13 read 14 write 6 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 write 19 write 9 write 4 write 1 write 0 read 19 write 19 read 9 read 19 read 20 write 9 read 4 read 9 read 10 write 4 read 1 read 3 read 4 write 1 read 0 read 1 read 2 write 0 write 30 write 14 write 6 write 2 write 0 read 30 write 30 read 14 read 29 read 30 write 14 read 6 read 13 read 14 write 6 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 read 0 read 0 read 1 read 4 read 10 read 21 write 21 write 10 write 4 write 1 write 0 read 21 write 21 read 10 read 21 read 22 write 10 read 4 read 9 read 10 write 4 read 1 read 3 read 4 write 1 read 0 read 1 read 2 write 0 write 22 write 10 write 4 write 1 write 0 read 22 write 22 read 10 read 21 read 22 write 10 read 4 read 9 read 10 write 4 read 1 read 3 read 4 write 1 read 0 read 1 read 2 write 0 write 23 write 11 write 5 write 2 write 0 read 23 write 23 read 11 read 23 read 24 write 11 read 5 read 11 read 12 write 5 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0 read 0 read 0 read 2 read 6 read 14 read 30 write 30 write 14 write 6 write 2 write 0 read 30 write 30 read 14 read 29 read 30 write 14 read 6 read 13 read 14 write 6 read 2 read 5 read 6 write 2 read 0 read 1 read 2 write 0

Lethe read 0 read 1 read 2 read 3 read 4 read 5 read 6 read 7 read 12 read 13 read 14 read 15 write 12 write 13 write 14 write 15 write 4 write 5 write 6 write 7 write 0 write 1 write 2 write 3 read 0 read 1 read 2 read 3 read 4 read 5 read 6 read 7 read 12 read 13 read 14 read 15 write 12 write 13 write 14 write 15 write 4 write 5 write 6 write 7 write 0 write 1 write 2 write 3 read 0 read 1 read 2 read 3 read 4 read 5 read 6 read 7 read 12 read 13 read 14 read 15 write 12 write 13 write 14 write 15 write 4 write 5 write 6 write 7 write 0 write 1 write 2 write 3 read 0 read 1 read 2 read 3 read 4 read 5 read 6 read 7 read 12 read 13 read 14 read 15 write 12 write 13 write 14 write 15 write 4 write 5 write 6 write 7 write 0 write 1 write 2 write 3 read 0 read 1 read 2 read 3 read 4 read 5 read 6 read 7 read 12 read 13 read 14 read 15 write 12 write 13 write 14 write 15 write 4 write 5 write 6 write 7 write 0 write 1 write 2 write 3

Table IX
INPUT-INDEPENDENT BUILDING BLOCKS

Building Block	Token	Description
Sort	Sort	obliviously sort all memory blocks by "tag"
Scan	SeqScan	sequentially scan a range of memory blocks
Delete	Del	delete a range of memory blocks
Rehash	Rehash	re-allocate a level of memory blocks

H. Input-independent building blocks

Table IX lists all input-independent building blocks adopted by our "Single-Sequence Distillation" optimization in Sec. IV-C. Memory access patterns of these building blocks are well-known to be *oblivious*; replacing them with tokens does not result in false negative of testing. In contrast, optimization at this step effectively simplifies lengthy memory access traces, facilitating our lightweight neural distinguisher to comprehend each trace in a speedy manner.