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**Algorithm 1** Recursive matrix singular value decomposition,  
 $(U, \Sigma, V) = R - MSvd(M_n, C_n)$ .

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**Input:**

Initial matrix  $M_n$ .

Incremental matrix  $C_n$ .

**Output:**

Decomposition results  $U, S, V$  of matrix  $[M_n \ C_n]$ .

1: **if** ( $n == 1$ ) **then**

2:    $[U, \Sigma, V] = svd(M_1)$ .

3: **else**

4:    $[U_m, \Sigma_m, V_m] = R - MSvd(M_{n-1}, C_{n-1})$ .

5:    $[U, \Sigma, V] = mix(M_{n-1}, C_{n-1}, U_m, \Sigma_m, V_m)$ .

6: **end if**

7: **return**  $U, S, V$ .

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