

Parallel Linear Solver for Multiple RHSs

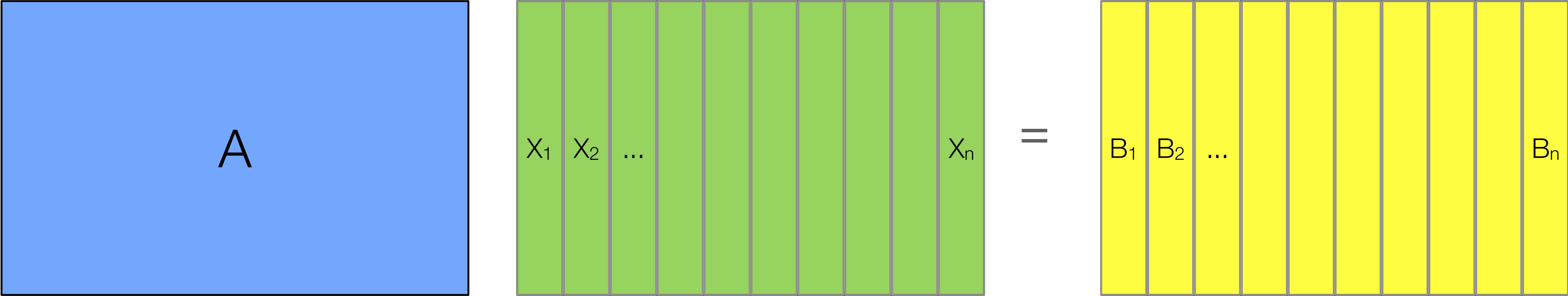
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Topics of Discussion

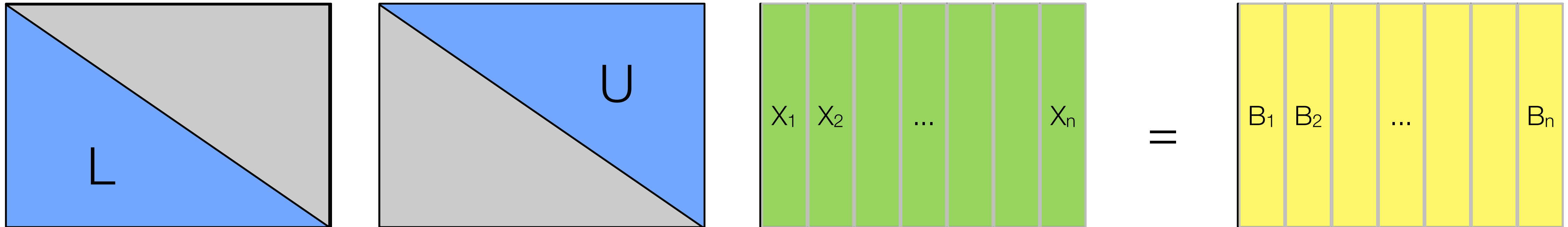
- $AX = B$
- $LUX = B$
 - Forward Substitution
 - Backward Substitution

Solving $AX = B$



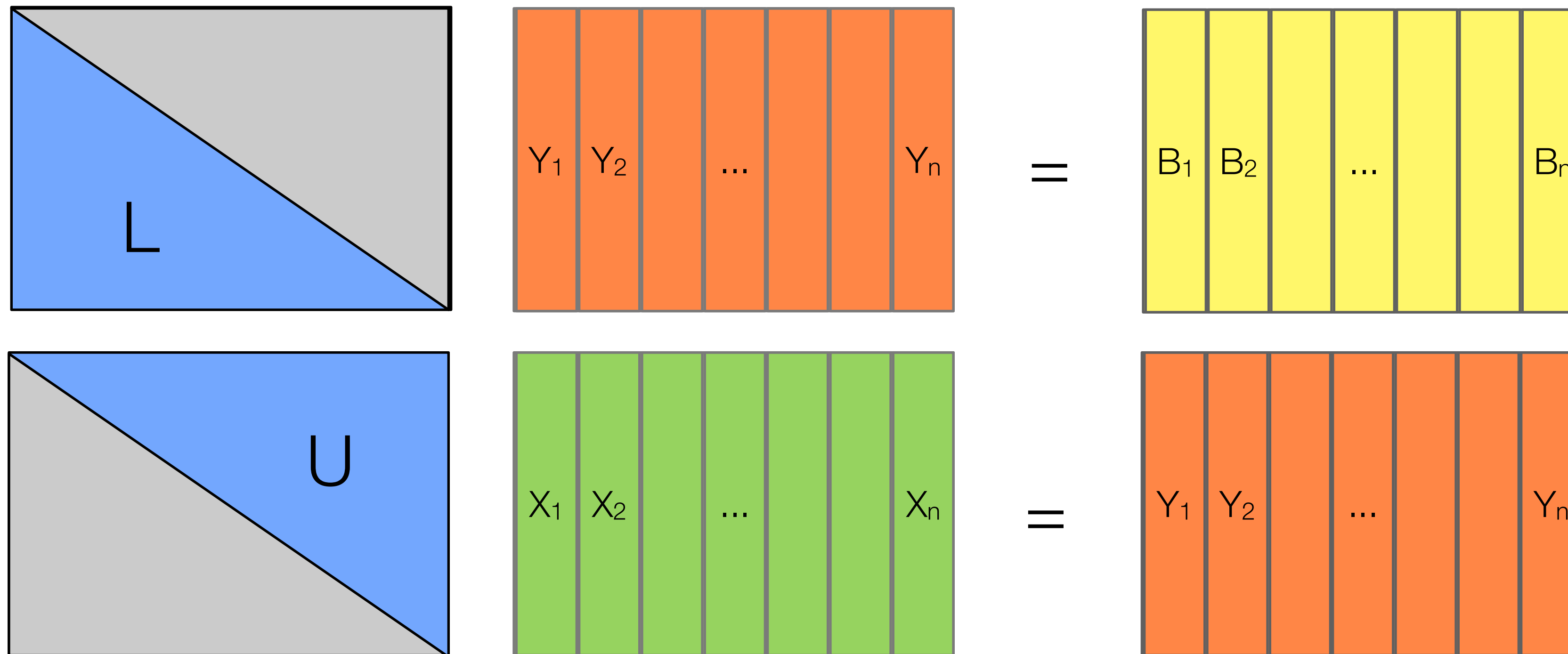
- r independent right hand sides
- r associated solution vectors

$$LUX = B$$



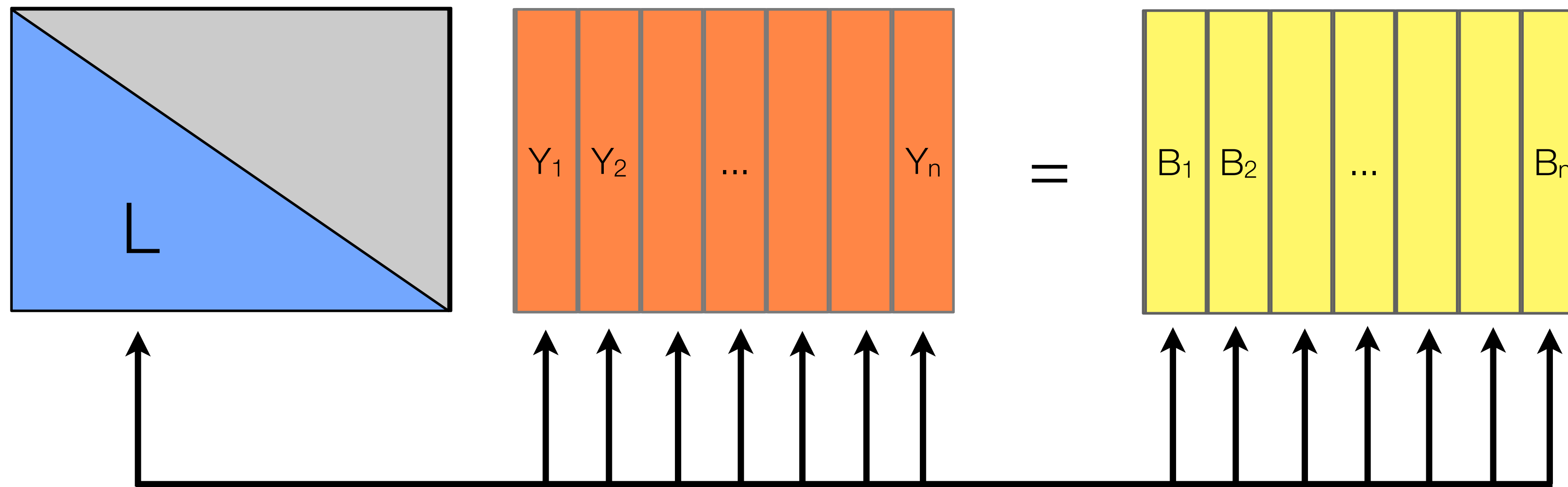
- Assume an LU Factorization has been performed
- Has a resulting bandwidth of k

$$LUX = B$$



- Forward substitution sweep
- Backward substitution sweep

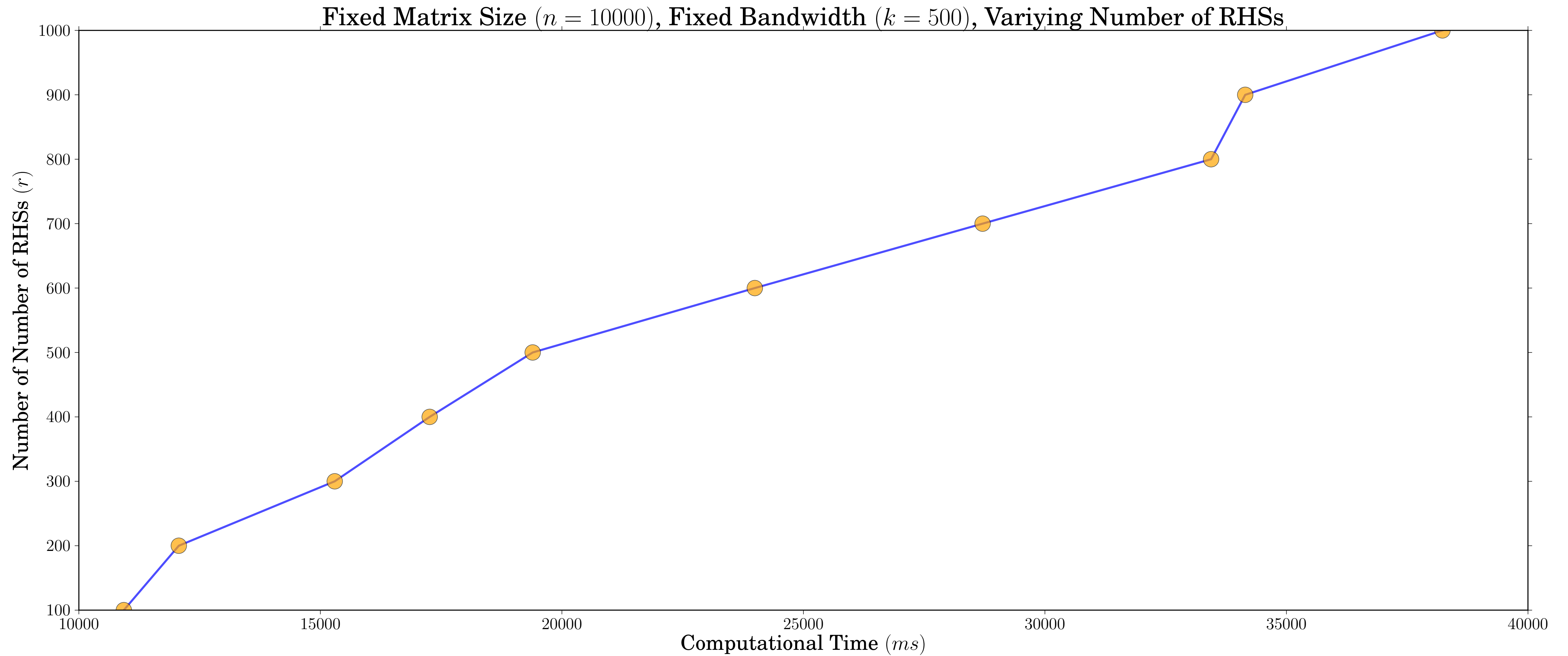
Oppertunities for Parallelism



```
// Forward solve  $Ly = b$   
for ( $i = 0; i < n; i++$ )  
{  
   $y[i] = b[i];$   
  for ( $j = 0; j < i; j++$ )  
  {  
     $y[i] -= L[i, j] * y[j];$   
  }  
   $y[i] /= L[i, i];$   
}
```

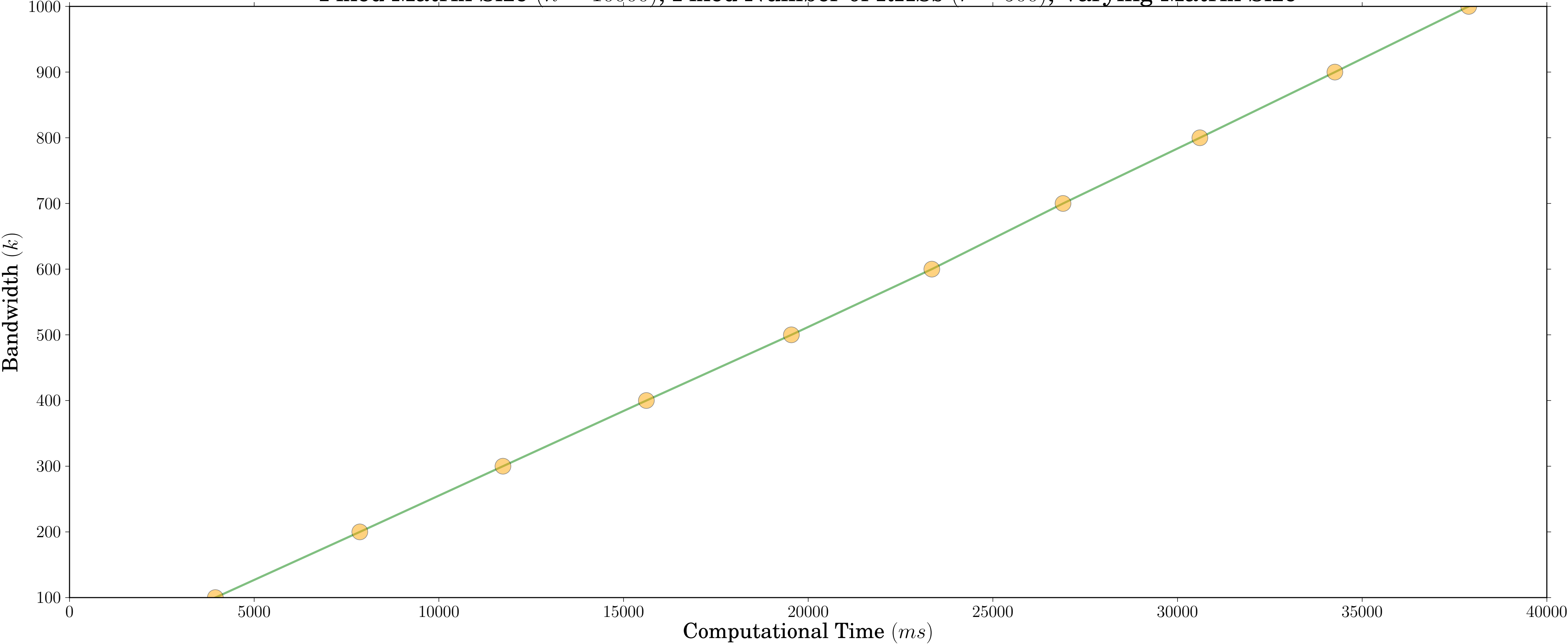
- r forward and back solve threads
- Additional parallelism in fwd and back solve

Results

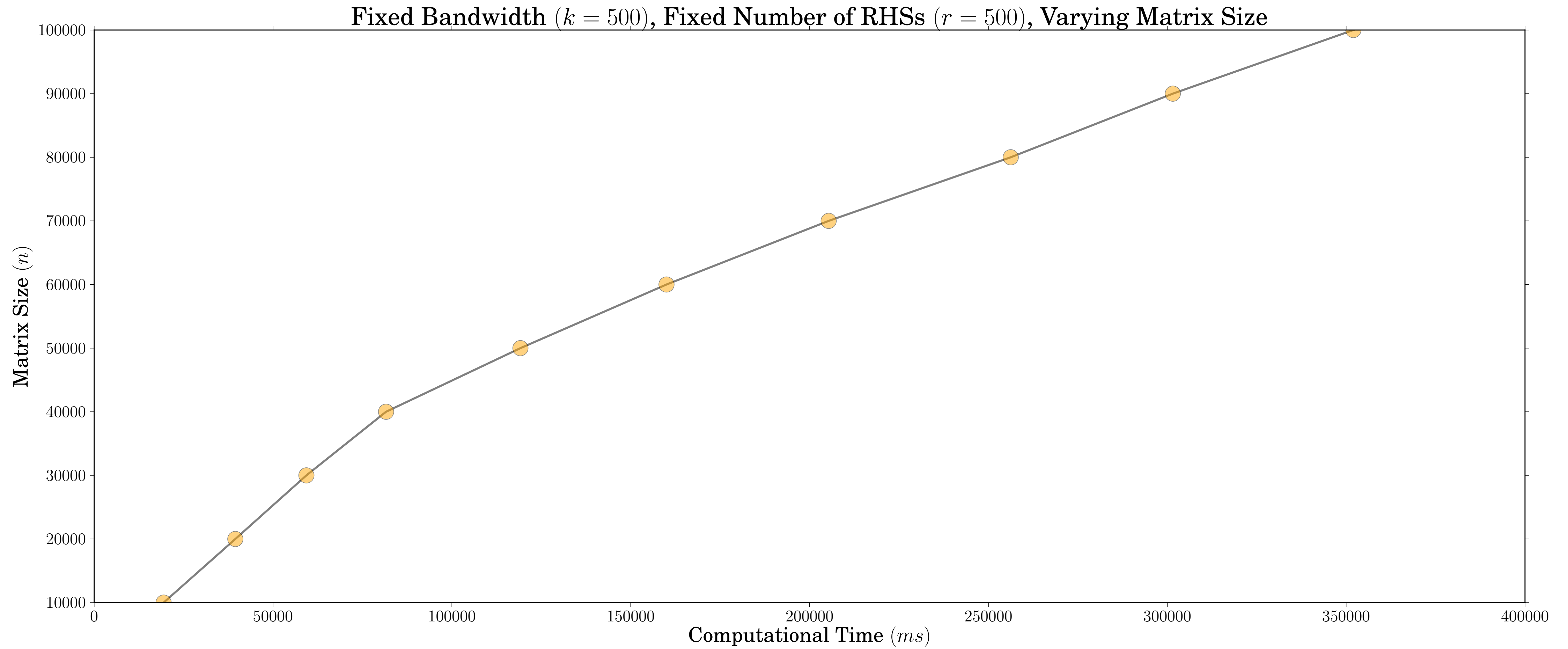


Results

Fixed Matrix Size ($n = 10000$), Fixed Number of RHSs ($r = 500$), Varying Matrix Size



Results



Thank You

- Professor Negrut
- Radu Serban
- Ang Li