

## **Analysis of Algorithms**

**Amypo Technologies Pvt Ltd** 



# Agenda Day 10 - Analysis of Strassen's Algorithm

• Strassens Matrix Mutiplication



## Introduction to Strassen's Matrix Multiplication

Strassen's Matrix Multiplication is an advanced algorithm for multiplying matrices efficiently, reducing the time complexity for large matrices.



## Basic matrix multiplication algorithm

Concept

Traditional method involving row-by-column multiplication and addition.

Usage

Applicable to smallsized matrices and for educational purposes. Complexity

Has a time complexity of  $O(n^3)$  for two n x n matrices.



## Limitations of the basic algorithm

1 Time Complexity

Quadratic time
complexity, limiting
performance for
large matrices.

2 Scalability

Not efficient for multiplying very large matrices due to its time

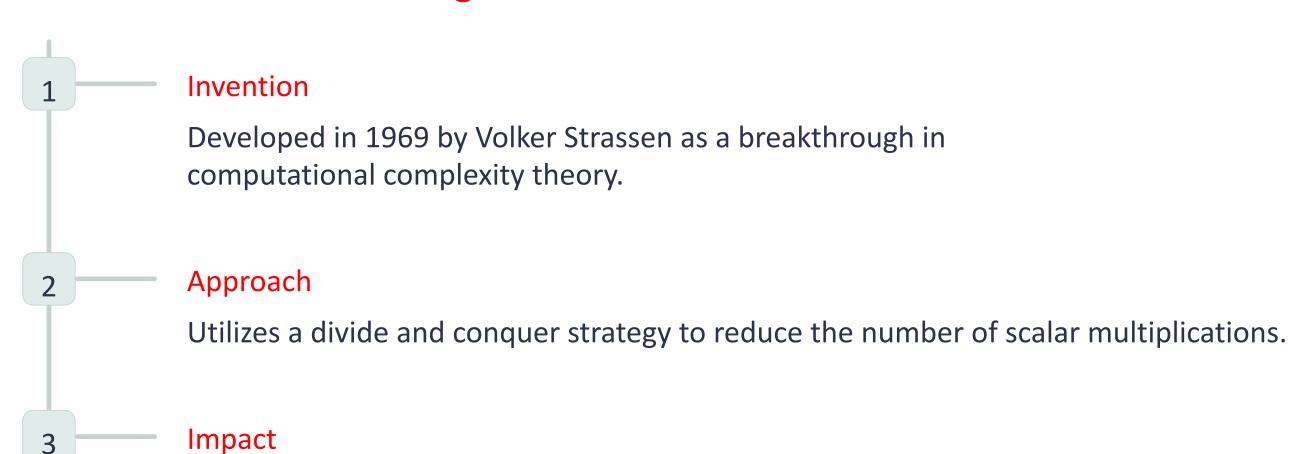
complexity.

Resource
Consumption

High utilization of computational resources for larger matrices.



### Overview of Strassen's algorithm



Revolutionized matrix multiplication by introducing a faster method.



## Divide and conquer approach

1

#### Divide

Split the matrices into smaller submatrices to simplify the calculations.

7

#### Conquer

Perform recursive multiplication on the submatrices.

3

#### Combine

Recompose the matrices using the results of the submatrix products.



## Recursive steps of Strassen's algorithm

#### **Base Case**

Identify the point where matrix multiplication stops recursively.

#### Multiplication

Perform the Strassen's algorithm on the submatrices.

#### Addition & Subtraction

Combine results using addition and subtraction operations.



## Complexity analysis of Strassen's algorithm

 $O(n^{\log 7})$ 

**Time Complexity** 

Space Efficient

Resource Usage

**Innovative** 

Efficiency

Reduces the number of scalar multiplications from 8 to 7.



#### Conclusion and future directions

### **Optimization**

Continuous efforts to fine-tune the algorithm for better performance.

## **Application**

Exploring applications in diverse fields like graphics rendering and scientific simulations.

#### **Innovation**

Adapting the principles of Strassen's algorithm for new computational challenges.