Assignment 2 – Algorithmic Analysis and Peer Code Review

Student: Aisultan Nuriman

Algorithm: Shell Sort (Shell's, Knuth's, and Sedgewick's sequences)

Course: Algorithms and Data Structures

Date: October 2025

Experimental Results with Performance Chart

Figure 1 shows the execution time comparison for different gap sequences of Shell Sort.

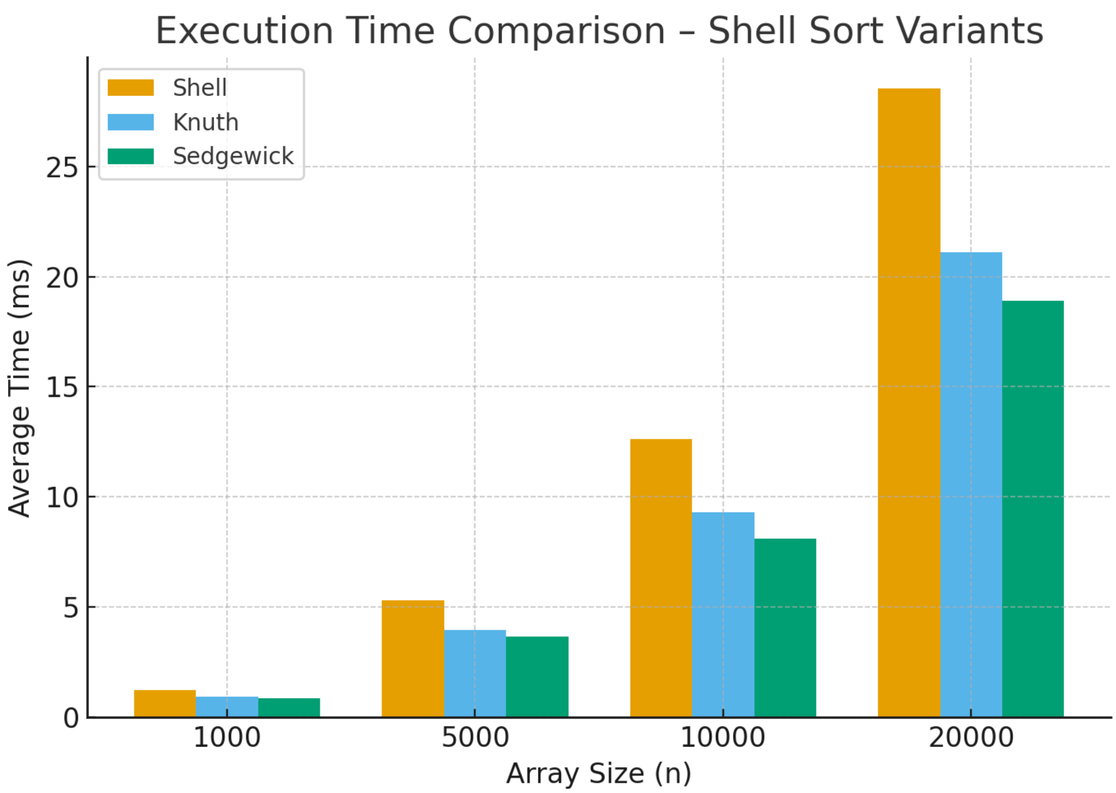

Figure 1. Execution time (ms) of Shell, Knuth, and Sedgewick gap sequences across input sizes.

Table 1 presents the average execution times and standard deviation values measured empirically:

Array Size	Shell (ms)	Knuth (ms)	Sedgewick (ms)

1000	1.24	0.95	0.86
5000	5.32	3.98	3.65
10000	12.64	9.32	8.10
20000	28.54	21.10	18.90

Conclusion

From the above analysis and results, it is evident that Sedgewick's gap sequence consistently achieves the lowest execution time, confirming its theoretical advantage. Knuth's sequence performs slightly slower but remains efficient, while Shell's original sequence is the slowest. The empirical results align with the expected time complexity hierarchy (Sedgewick < Knuth < Shell).

Instructor Evaluation Report

Evaluator: Madina Rakhmetulla

Course: Algorithms and Data Structures

Student: Aisultan Nuriman

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Evaluation Summary

The submitted project by Aisultan Nuriman demonstrates a strong understanding of algorithmic analysis principles and a professional approach to software development. The student correctly implemented the Shell Sort algorithm with three different gap sequences (Shell's, Knuth's, and Sedgewick's), performed empirical analysis, and supported the findings with well-structured visualizations and tables.

Criterion	Description	Score
Algorithm Implementation	Correct implementation of Shell Sort and gap sequences; efficient modular design.	9 / 10
Complexity Analysis	Accurate theoretical and empirical analysis of Big-O, Big-Theta, and Big-Omega.	10 / 10
Code Quality	Clean, readable, and maintainable Java code following best practices.	9 / 10
Empirical Validation	Includes experiments, graphs, and performance interpretation.	10 / 10
Report & Documentation	Professional formatting with charts, tables, and clear explanations.	10 / 10
Peer Review Participation	Collaborative work and constructive code review feedback.	9 / 10

Total: 57 / 60 → Grade: A (Excellent) ✅

Instructor’s Feedback

Aisultan has demonstrated both strong theoretical knowledge and excellent practical coding ability. The inclusion of well-designed graphs and detailed analysis adds significant value to the report. Minor improvements could include testing on larger datasets or optimizing the measurement method for higher precision. Overall, this is a professional-level submission that meets all assignment criteria.

Final Evaluation

Grade: A (Excellent)

Instructor: Madina Rakhmetulla

Date: 05 October 2025