PROJECT AND TEAM INFORMATION

Project Title

(Try to choose a catchy title. Max 20 words).

File Compression and Analysis System

Student / Team Information

Team Name: *Team #*	*Alpha Go* *SE(OS)-VI-T032*
Team member 1 (Team Lead) *(Last Name, name: student ID: email, picture):*	*Choudhary, Nupur– 22022402* *nupurofficial7@gmail.com* 
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PROPOSAL DESCRIPTION (10 pts)

Motivation (1 pt)

(Describe the problem you want to solve and why it is important. Max 300 words).

In today's digital world, file storage and transfer efficiency are crucial. Large files consume significant storage space and bandwidth, leading to increased costs and slower transfers. While compression tools exist, most lack intelligent algorithm selection, comprehensive format support, and visual analytics. Our system solves these limitations by offering multi-algorithm compression with real-time performance visualization, supporting diverse file types, and providing users with data-driven insights to optimize their compression strategy. This is particularly valuable for students, professionals, and businesses managing large volumes of files.

State of the Art / Current solution (1 pt)

(Describe how the problem is solved today (if it is). Max 200 words).

Current solutions like WinRAR, 7-Zip, and built-in OS compression tools offer basic functionality with limited algorithm choices and no performance analytics. Cloud services provide compression but raise privacy concerns. Most tools use one-size-fits-all approaches without considering file types. Advanced research in compression algorithms exists but isn't integrated into user-friendly applications. Our system bridges this gap by combining multiple specialized algorithms with an intuitive interface and analytical features.

Project Goals and Milestones (2 pts)

(Describe the project general goals. Include initial milestones as well any other milestones. Max 300 words).

Primary Goals:

- *Develop a modular compression system supporting multiple algorithms*
- *Implement format-specific compression optimization*
- *Create visualization tools for performance analysis*
- *Ensure lossless compression for supported formats*

Milestones:

- *Week 1-2: Research and select algorithms for each file type*
- *Week 3-4: Implement core compression/decompression modules*
- *Week 5: Develop archiving functionality*
- *Week 6: Build visualization dashboard*
- *Week 7: Integrate components and optimize performance*
- *Week 8: Testing, documentation, and final presentation*

Project Approach (3 pts)

(Describe how you plan to articulate and design a solution. Including platforms and technologies that you will use. Max 300 words).

We'll develop a Python-based application with these components:

- ***Frontend (Web-Based UI)**: HTML5, CSS3, and JavaScript for a responsive, user-friendly interface*
- ***Compression Engine**: Modular implementation of Huffman, LZW, RLE, etc.*
- ***Format Analyzer**: Detects file types and recommends optimal algorithms*
- ***Visualization**: Matplotlib/PyQtGraph for performance graphs*
- ***Archiving**: ZIP-like functionality with compression*

System Workflow

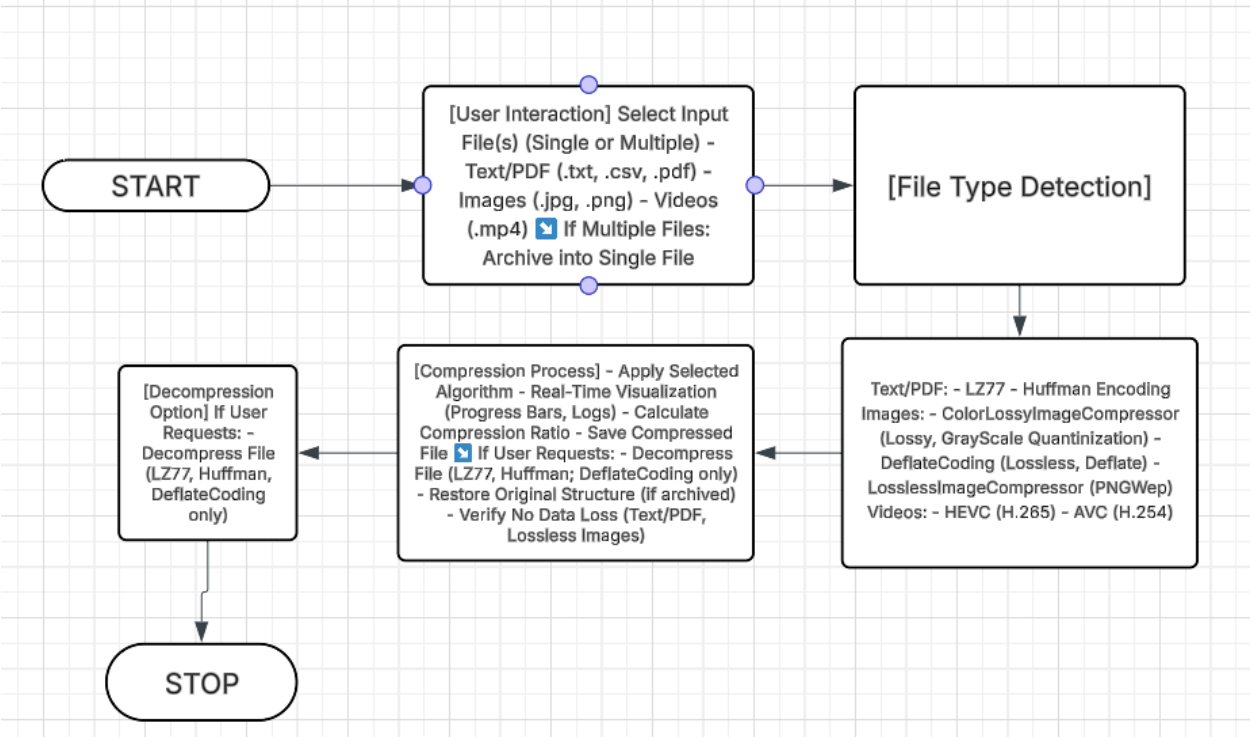
- ➔ *User uploads files via the web interface.*
- ➔ *Frontend sends files to the backend API.*
- ➔ *Backend detects file type, applies optimal algorithm, and compresses.*
- ➔ *Results (compressed file + analytics) are returned to the frontend.*
- ➔ *Visualizations (compression ratio, speed) update in real time.*

System Architecture (High Level Diagram)(2 pts)

(Provide an overview of the system, identifying its main components and interfaces in the form of a diagram using a tool of your choice).

The system consists of four main components:

1. ***User Interface*** *– Allows users to upload files (text, images, videos) and choose compression/decompression options.*
2. ***File Handler Module*** *– Detects file types and archives multiple files if needed.*
3. ***Compression Engine*** *– Applies selected algorithm (LZ77, Huffman, Deflate, HEVC, etc.) with real-time progress visualization.*
4. ***Analysis & Output Module*** *– Displays compression ratio, graphs, and handles optional decompression with structure recovery.*



The components interact seamlessly to automate the compression workflow while ensuring data integrity.

Project Outcome / Deliverables (1 pts)

(Describe what are the outcomes / deliverables of the project. Max 200 words).

The File Compression and Analysis System aims to deliver a user-friendly platform capable of compressing and decompressing files across various formats (.txt, .csv, .jpg, .png, .pdf, .mp4). The key deliverables include:

- *A functional GUI that allows users to select, compress, and decompress files.*
- *Implementation of multiple compression algorithms such as Huffman Coding, LZ77, Quantization, and more, based on file type.*
- *An archiving mechanism that allows users to bundle multiple files for unified compression and decompression while preserving the original file structure.*
- *Support for lossless as well as lossy compression techniques for text, image, video and document formats.*
- *Real-time visualization of compression progress via progress bars and logs.*
- *A compression ratio graph using libraries like Matplotlib or PyQtGraph to analyze efficiency of the compression algorithm.*

Assumptions

(Describe the assumptions (if any) you are making to solve the problem. Max 100 words)

It is assumed that the user provides non-corrupted files in standard formats supported by the system. The system is intended primarily for educational and demonstrative purposes; therefore, advanced video compression standards such as HEVC and AVC are not fully implemented. Additionally, it is assumed that files subjected to lossy compression—particularly image files—cannot be restored to their original state upon decompression.

References

(Provide a list of resources or references you utilised for the completion of this deliverable. You may provide links).

- *Reddy, M. K., Reddy, M. V. C., & Reddy, G. R. (2015). Comparative study of data compression techniques. International Journal of Computer Applications, 113(1), 26–30. https://doi.org/10.5120/19770-1551*
- *Bossen, F., Bross, B., Suhring, K., & Flynn, D. (2012). Coding structure and performance of High Efficiency Video Coding (HEVC) and H.264/AVC. In 2012 Picture Coding Symposium (PCS) (pp. 233–236). IEEE. https://doi.org/10.1109/PCS.2012.6198833*
- *Sayood, K. (2006). Introduction to Data Compression (3rd ed.). Morgan Kaufmann Publishers.*