COMP 3980 – Assignment 1

User Guide: ELFInspect

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Purpose

`ELFInspect` is a binary-safe command-line tool written in C that validates and inspects **ELF (Executable and Linkable Format)** files.
It verifies the ELF header, extracts metadata such as class, endianness, type, machine, and entry point, and reports detailed results.
The program uses **low-level POSIX I/O** (`open`, `read`, `fstat`, `lseek`, `close`) for maximum control and safety.

Obtaining

Clone or copy the assignment repository from GitHub Classroom:

```
git clone
https://github.com/faghaarabi/3980---Assignment-1-elfinspect.git
cd elfinspect
```

Building

The program builds with any POSIX-compliant C compiler (e.g., `gcc`).
On Linux or macOS terminal:

```
gcc -std=c17 -Wall -Wextra -pedantic -o elfinspect elfinspect.c
```

No external libraries are required beyond the C standard library and `sys/stat.h`.

Running

Use this syntax:

```
./elfinspect <filename>
```

Example:

```
./elfinspect /bin/ls
```

If no argument is given, the program prints:

```
Usage: ./elfinspect <filename>
```

Environment

- **Operating System:** Linux or macOS (note that macOS binaries are Mach-O, not ELF)
- **Compiler:** `gcc` or `clang`
- **Permissions:** Read access to target files

Command-Line Arguments

Argument	Description
`<filename>`	Path to the binary file to inspect. Must be a regular file readable by the user.

Program Output

For valid ELF files, `ELFInspect` prints:

```
File: /bin/ls
```

```
Valid ELF: yes
Magic: 7f 45 4c 46
Class: ELF64
Endianness: Little Endian
Version: 1
Type: Executable (ET_EXEC)
Machine: x86-64 (EM_X86_64)
Entry point: 0x00000000000023f0
```

For invalid files (too small, wrong magic, truncated, etc.), it prints:

```
Valid ELF: no
Error: Magic number mismatch
```

Example Tests

Below are example commands used for testing (see report for details):

Test #	Command	Expected Result
1	`./elfinspect`	Usage error (message displayed)
2	`./elfinspect no_such_file`	Fail – cannot open file
3	`./elfinspect .`	Fail – not a regular file
4	`./elfinspect too_small_file`	Fail – invalid ELF
5	`./elfinspect not_elf.txt`	Fail – wrong magic
6	`./elfinspect /bin/ls`	Pass (on Linux); Mach-O on macOS
7	`./elfinspect /lib/x86_64-linux-gnu/libc.so.6`	Pass – valid ELF
8	`./elfinspect truncated_elf`	Fail – truncated file
10	`./elfinspect valid_elf_exec`	Pass – valid ELF

11–14	`./elfinspect big_endian`, `small_elf32`, `minimal_elf64`, `ei_class_valid`	Pass – correct header parsing
15–19	Invalid ELF headers tests (`wrong_small_32`, `invalid_endianness`, etc.)	Fail – handled correctly