

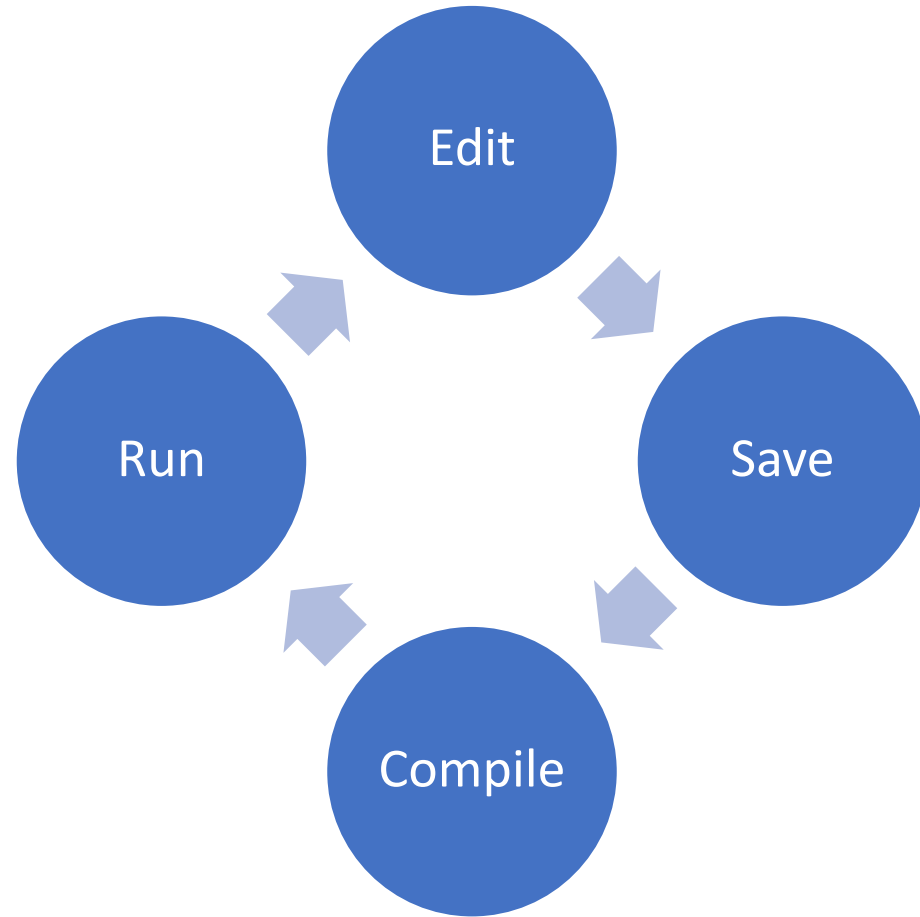
# Programming

in Fortran, C and Python

# Text Editors

- To write a program, you need a text editor
- Any text editor is fine, but some are made to help programmers
- Classic editors (installed everywhere, but difficult to use)
  - vi
  - emacs
- Friendly editors
  - gedit
  - kate

# Workflow



# Edit a Fortran program

Enter the command:

```
kate waves.f90 &
```

# waves.f90

```
real, parameter :: pi = 4*atan(1.0), f1 = 440.0, f2 = 466.0
real, parameter :: duration = 0.2, samplerate = 2000.0
real :: t, y

t = 0.0
do while (t <= duration)
  y = sin(2*pi * f1 * t) + sin(2*pi * f2 * t)
  print *, t, y
  t = t + 1/samplerate
end do

end program
```

# Compile & run

To compile:

```
gfortran waves.f90 -o waves
```

To run:

```
./waves
```

# Plotting the result

Run the program with output redirection:

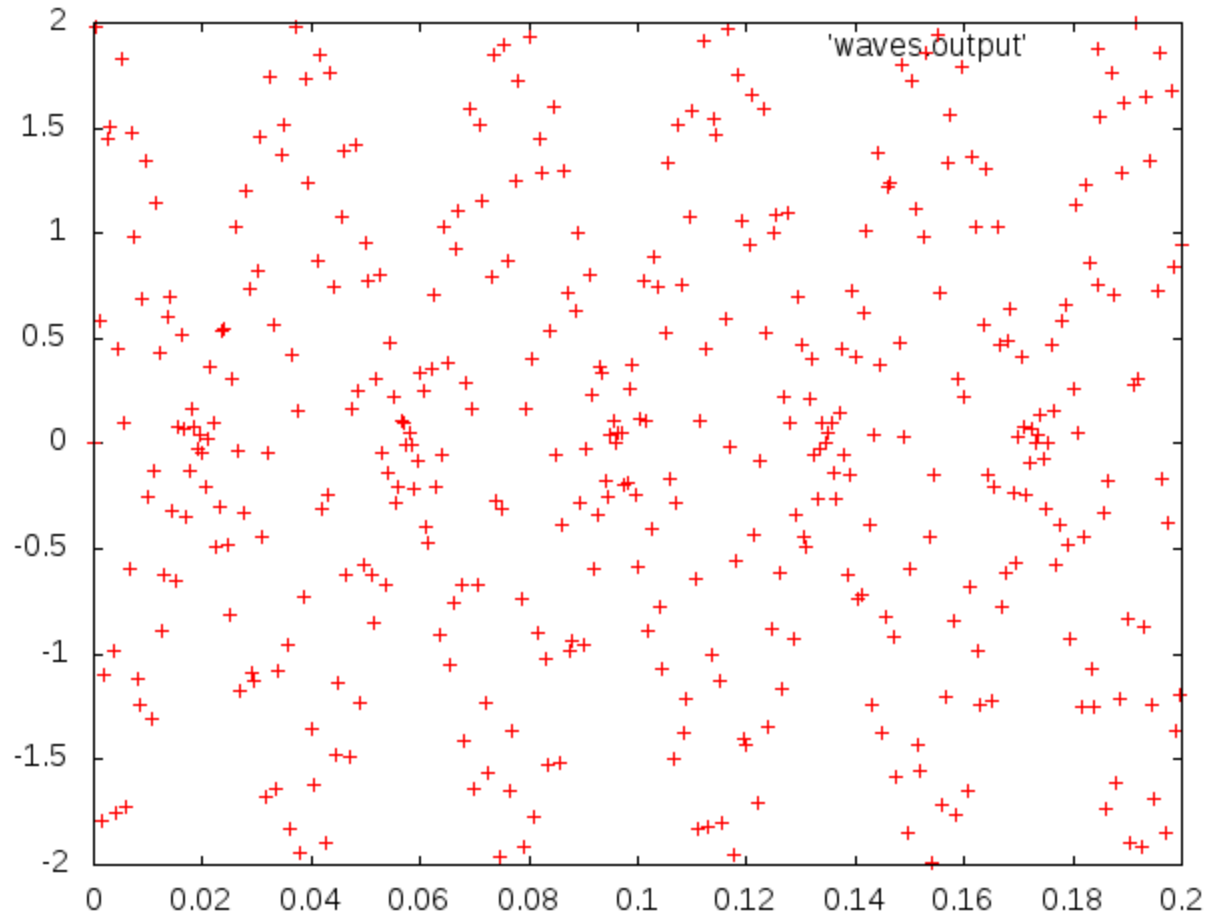
```
./waves > waves.output
```

Start the program gnuplot:

```
gnuplot
```

# Gnuplot

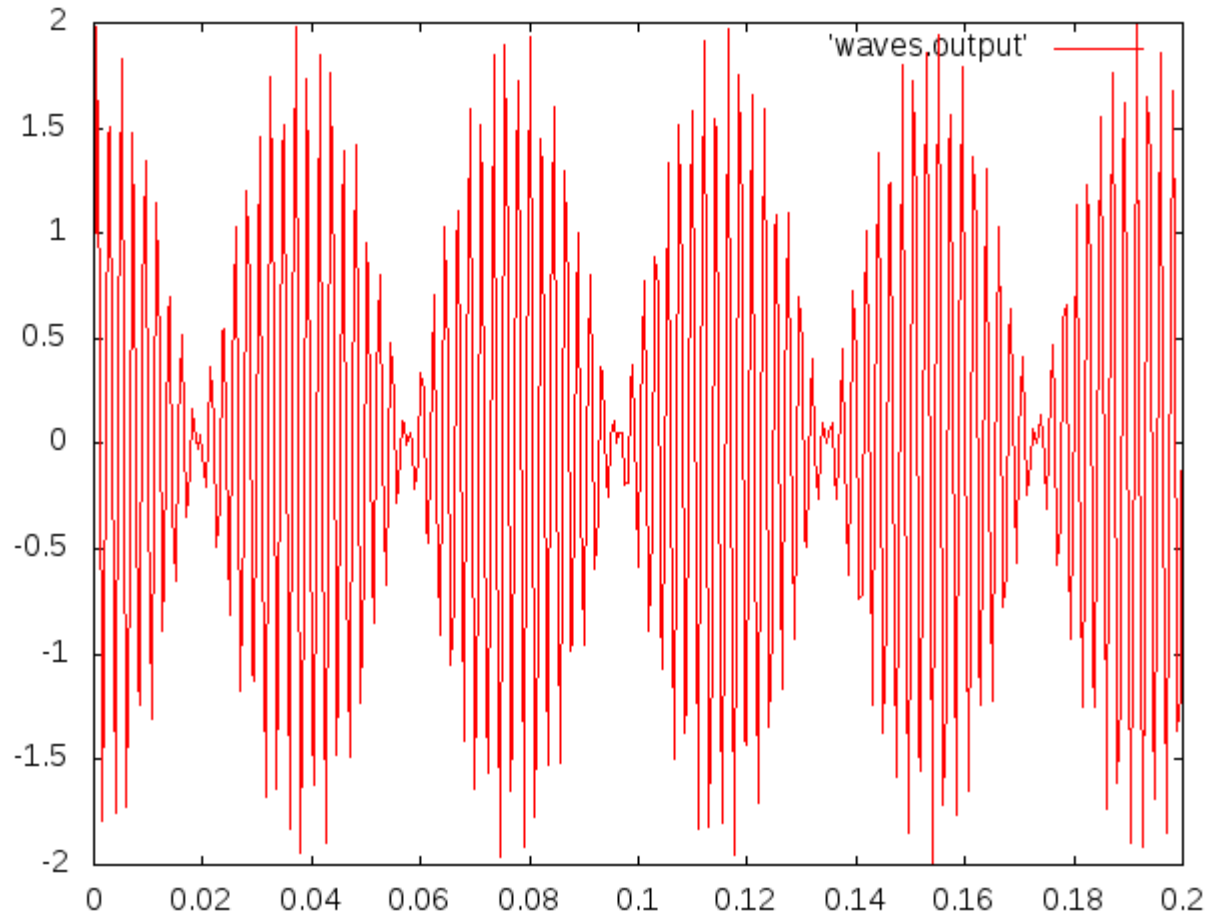
```
plot 'waves.output'
```





# Gnuplot

```
plot 'waves.output' with lines
```



# Saving the figure from Gnuplot

```
set terminal postscript eps color
set output 'waves.eps'
replot
```

OR

```
set terminal png
set output 'waves.png'
replot
```

# waves.c

```
#include <math.h>
#include <stdio.h>

#define f1 440.0
#define f2 466.0
#define duration 0.2
#define samplerate 2000.0

int main() {
    double t, y;
    for (t = 0.0; t <= duration; t += 1/samplerate) {
        y = sin(2*M_PI * f1 * t) + sin(2*M_PI * f2 * t);
        printf("%g\t%g\n", t, y);
    }
}
```

# Compiling and running the C program

```
gcc waves.c -o cwaves -lm  
./cwaves
```

# waves.py

```
#!/usr/bin/python
```

```
import numpy as np
```

```
import matplotlib.pyplot as plt
```

```
f1=440.0
```

```
f2=466.0
```

```
samplerate = 2000.0
```

```
duration = 0.2
```

```
t = np.arange(0.0,duration,1/samplerate)
```

```
plt.plot(t,np.sin(2*np.pi * f1 * t) + np.sin(2*np.pi * f2 * t))
```

```
plt.show()
```

# Run the python program

```
chmod +x waves.py
```

```
./waves.py
```

OR

```
python waves.py
```

# Required packages

The libraries used in this code might not be installed yet. If there are error messages, run:

```
sudo apt install python-numpy
```

```
sudo apt install python-matplotlib
```

```
sudo apt install python-tk
```