Insignito Interview Assignment - Beamforming

You are given 3 hours to complete this assignment.

Please send your solution to dor@insignito.co.il by the end of the given time.
Any utility functions, test functions, and other scripts you used during the development process should also be attached.

You are given recordings from a 50-channel microphone array. In the scenario, two main acoustic sources are present:

- azimuth = −0.069 rad, elevation = 0 rad
- azimuth = 1.029 rad, elevation = 0.017 rad

Your goal is to design a beamformer that separates these sources in space and achieves the best possible SNR for each one.

Provided Data:
You will receive:

1. Multichannel WAV file - 50 synchronized channels containing a mixture of the two sources.
2. Microphone positions - 3D positions of all 50 microphones, in a consistent coordinate system.
3. Source directions - Azimuth/elevation (in radians) for the two sources, as listed above.

Your Task:
Use the mic positions and source directions to design a beamformer that enhances each source while suppressing other noise.
You may use any reasonable approach

Deliverables:

1. Code (Python)
    a. Loads the multichannel WAV and mic positions.
    b. Save each source output as a WAV file.
2. The 2 WAV outputs of your code.
3. Short explanation

Note

This is a real recording from real microphones in an open field – don't assume all channels are perfect. Inspect the data and handle any issues as you see fit.

Coordinates:

$$x = \cos(-\ azimuth)\cos(-\ elevation)$$
$$y = \sin(-\ azimuth)\cos(-\ elevation)$$
$$z = \sin(-\ elevation)$$

We will evaluate you based on separation quality, code clarity, and how clear your explanation is.
Good luck!