

## **Tutorials hands-on understanding stellar evolution of massive stars using MESA stellar evolution code data.**

### Objectives:

1. Understand the evolution of the star.
2. Learn about the structure of the star.

### Preparations:

1. MESA data (history and profile data)
2. Evolution and profile script (provided)

We are going to use computed data from MESA stellar evolution code to plot the evolution and structure of  $25 M_{\odot}$  model. The python script is available from [https://github.com/lizayusof/VSOA\\_2024](https://github.com/lizayusof/VSOA_2024)

We shall follow the description from

<http://user.astro.wisc.edu/~townsend/resource/teaching/astro-310-F21/python-lab/mesa-web-history.html#exploring-a-history-file>

but we are going to modify it for massive star model.

For this exercise, we shall produce:

#### a) For the evolution

1. HR diagram
2. Temperature vs density diagram
3. Evolution of mass with respect to star age
4. Evolution of stellar abundance with respect to the star age

#### b) For the structure

1. Radius vs mass
2. Radius vs luminosity
3. Radius vs density
4. Radius vs stellar abundance