Mass-luminosity relation from observational data requires an independent measure of stellar mass.

\[ L \propto M^3 \]
Mass-luminosity relation from binary stars:

\[ L \propto M^3 \]
Hertzsprung-Russel diagram

\[ L \propto T_{\text{eff}}^6 \]
Hertzsprung-Russel diagram from GAIA

\[ L \propto T_{\text{eff}}^6 \]
Main sequence lifetimes versus mass

\[ \tau \propto M^{-2} \]
HR diagram of a cluster of stars, all stars formed simultaneously
HR diagram of a cluster of stars, all stars formed simultaneously.

Star absolute magnitude

Main sequence
Main sequence turn off points of different clusters

Star absolute magnitude

Star color