

A photograph of the Eiffel Tower in Paris at dusk. The tower is illuminated with warm orange lights, standing out against a pale blue and purple twilight sky. In the foreground, a group of people are seen from behind, standing on a boat or a walkway overlooking the river. They are looking towards the tower. The water of the river is visible in the lower part of the frame. The overall mood is serene and scenic.

# Neutrinos in astrophysics and cosmology





# Neutrinos in astrophysics and cosmology

- Learning about the neutrino from cosmology and astrophysics
- Learning about cosmology and astrophysics from neutrinos
- BSM neutrinos in cosmology

# Learning about the SM neutrino from cosmology

- What are the uncertainties?
- What is the space for improvement?
- Distrust of cosmology bounds: Is it that we don't understand cosmology, or that *particle physicists* don't understand cosmology?

# Neutrinos as a probe of cosmology & astrophysics

- Photons vs neutrinos: what can we learn from this “new age of astronomy”?
- Is IceCube seeing anything strange?
- Can  $\nu$  astronomy be as rich as photon astronomy?
- What is the ultimate experimental limit?

# BSM neutrinos in cosmology

- **eV**: Anomalies,  $N_{\text{eff}}$
- **keV**: Warm DM, structure formation, ...
- **$10^{15}$  GeV**: Leptogenesis, GUT
- Does seeing one of these scenarios say anything about the others?

