

# Astronomy from 4 perspectives: the Dark Universe

---

prepared by: Florence participants

## questions: Supernova-cosmology and dark energy

### *1. FLRW-models and the equation of state*

- (a) What are the ingredients (fields?) that enter into a FLRW metric?
- (b) How does each field behave as the universe expands?

### *2. light propagation in relativity*

- (a) What is the equation that describes light propagation in a curved space-time?
- (b) How does the presence of a body exerting gravity affect light paths?
- (c) How does curvature affect light propagation?
- (d) How does expansion affect light propagation?

### *3. distance measures*

- (a) How do we measure distance in a curved space-time?
- (b) What is the angular distance?
- (c) How do we disentangle red-shift from curvature?

### *4. supernova-cosmology*

- (a) Why are Type Ia supernovae standard candles?
- (b) Why is it important to observe them at high redshift?
- (c) Why are they not enough to fully constrain the cosmology?