Identifying Counterparts of Radio Galaxies in Ultra-deep LOFAR fields

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Motivation

- Finding counterparts of radio sources crucial for maximising scientific output
 - Allows photo-z estimates → gives luminosity, physical sizes, etc.
 - Study properties of radio galaxies and their hosts, how these properties evolve, etc.
 - Source classification: Separate SFGs, AGN, HERG/LERG

ELAIS-N1 @150MHz

• 80hrs integration, ~24uJy/beam rms





ELAIS-N1 @150MHz





Radio-Optical Cross-Match

 Likelihood Ratio (LR) technique - statistical tool to find counterparts to radio galaxies

$$LR = \frac{f(r)q(m,c)}{n(m,c)}$$

Iterated until q(m,c) converges

LR Results

- Redder galaxies more likely to host a radio source
- Robust: Cross-identification fraction > 95%





LR Technique (more details)

$$real(m) = total(m) - n(m)N_{radio}\pi r^2$$

$$q(m) = \frac{real(m)}{\sum_{m_i} real(m)} Q_0$$

LOFAR

- Low frquency (MHz) radio telescope
- SKA pathfinder

