# Identify bad ICA components

[HAPPE -> MARA Winkler 2014, 2011]

1. Mean local skewness of 15 s windows -> The local skewness feature identifies components with time series outliers, where higher skewness values indicate likely artifact

<Freq domain>

1. Average alpha band log power -> Brain-derived components typically manifest robust levels of alpha-band power, whereas artifact-driven components do not
2. “Lambda”: deviation of spectrum from 1/f, 6 frequencies used to fit -> This feature is particularly sensitive to muscle artifact, which typically manifests as a power spectrum with very poor fit to the 1/f distribution
3. Mean square error of spectrum from 1/f fit in 8-15 Hz range -> fit error feature is nonspecific to artifact types but instead serves as a generalized marker of artifact probability

<spatial info>

1. Log difference between max and min amplitudes over sensors -> takes the (log) difference between the largest and smallest activation magnitudes across the scalp for a component, where artifact components typically exhibit larger range within patterns
2. Current density (minimum) norm -> , makes use of the 10–20 channel locations input to MARA and reflects the solution to source-modeling the component using a model that was designed to fit cerebral-based activity

The current density norm feature is similarly non-specific to certain types of artifact components, but instead captures general artifact probability

[Barbati 2004]

1. Kurtosis: , z > 1.64 (w.r.t all ICs and segments) for more than 20% of segments
2. Kurtosis across segments, one component with smallest positive (as Gaussian noise)
3. Entropy: , z > 1.64 (w.r.t all ICs and segments) for more than 20% of segments, estimated within segments.
4. Power spectrum density correlation coefficient with real ECG, EOG, one component with max correlation for each.
5. Un-reject components based on spectral characteristics [manual selection, subjective]
6. Possibly filter some components "if necessary" [manual, varying bands, subjective] to reduce noise

[FASTER Nolan 2010]

1. Correlation with EOG chains
2. Spatial kurtosis
3. Slope in filter band
4. Hurst exponent
5. Median gradient

[Winkler]

contains 13 features from a component’s time series, 9 features from its spectrum and 16 from its pattern.