Autocorrelation (AC) of a periodic sequence

- Sequence of period N: $x[n] = x[n+N]$
- Calculate AC over a finite window:

$$r_{xx}[l] = \lim_{M\to\infty} \frac{1}{2M+1} \sum_{n=-M}^{M} x[n]x[n-l]$$

$$= \frac{1}{N} \sum_{n=0}^{N-1} x[n]x[n-l]$$

$$r_{xx}[0] = \frac{1}{N} \sum x^2[n] = P_x$$

Average energy per sample or Power of x

$$r_{xx}[l+N] = \frac{1}{N} \sum_{n=0}^{N-1} x[n]x[n-l-N] = r_{xx}[l]$$

i.e. AC of periodic sequence is periodic