Channel capacity in bits per second

We need to relate following concepts:

- Data rate: in bits per second that need to be communicated
- Bandwidth: of transmitted signal as constrained by the transmitter and the nature of transmission medium (in Hertz)
- noise: the average level of noise over the communication path

Nyquist capacity

1. We assume channel free of noise.
2. Limitation is only on bandwidth of the signal.
3. If the signals to be transmitted are binary, then the data rate that can be supported by B HZ of the channel bandwidth is 2B bps.
4. If we use multilevel signaling with M levels, then Nyquist formula becomes C= 2B log2 M

Shannon's Capacity formula

1. Plugs noise into calculation of achievable bit rate.
2. Shannon's great result is:
3. C = B log2 (1 + SNR), where C is channel capacity in bps, and B is channel bandwidth in Hz.
4. This is theoretical upper bound on capacity.