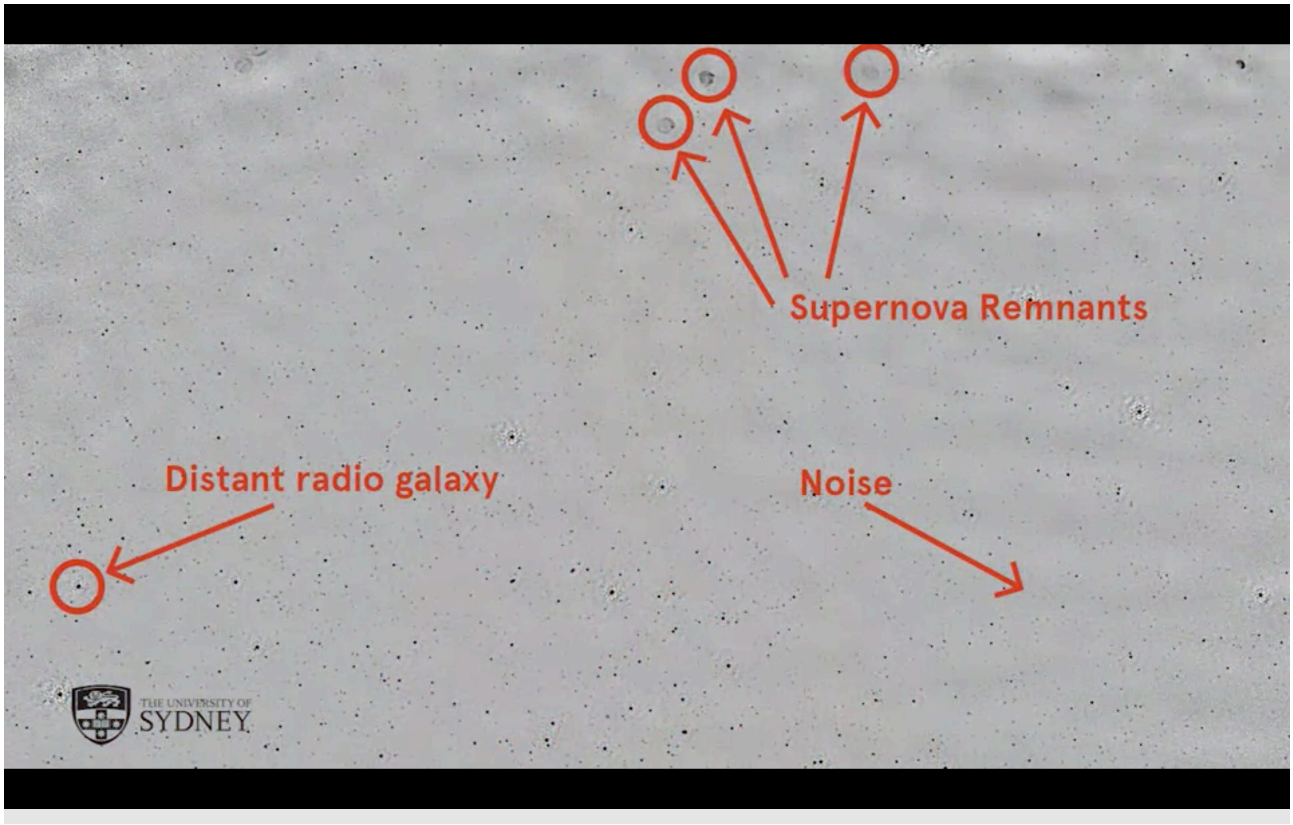
often in astronomy
signals are detected in the form of noise
In the following scenario we are asking the question how many pulsars are detected in images taken by the **Murchison wide field array telescope.**

MWA is a low frequency radio telescope, it detects radio emissions between the frequencies 80 and 300 megahertz. it has very large field of view

a typical MWA image looks like this



the grey scale is the measure of FLUX density of emission from astronomical objects
black is high flux density and grey is the background noise.
most of the black dots in this image are distant radio galaxies
but some objects in our own galaxy are the supernova remnants or pulsars to be specific

In radio astronomy flux density is measured in units of Janskys

$$1\ \mathrm{Jy} = 10^{-26}\ \frac{\mathrm{W}}{\mathrm{m}^2 \cdot \mathrm{Hz}}$$

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W = Watts
m2 = square meter
In other words flux density is the spectral power received by the telescope detector of the unit projected area

how faint astronomical objects are

Source	Flux Density (Jy)
Mobile phone	~110,000,000
Sun at 10 GHz	~4,000,000
Milky Way at 10 GHz	~2,000
Crab Pulsar at 1.4 GHz	~0.01

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observe the difference in the flux density of a terrestrial object a mobile phone an astronomical object pulsar.

Astronomy images are usually stored in the file format called .FITS to view them we can use software like DS9 or Aladin(online)

we typically call something a ‘detection’ from the images if the flux density is more than five standard deviations higher than the noise in the local region

MWA, grabs a large amount of images but not everytime we observe a detection.
however astronomers found a way,
stacking the images

Stacking works because the noise in the Images is roughly random with a gaussian distribution centered on zero, when we add region were theres noise the noise cancels out
but when we add regions were there are signals the signals add up