

The background of the slide is a deep purple and blue starry night sky, filled with numerous small white stars and faint nebulae. A white rectangular box is positioned on the left side of the image, containing the title and subtitle text.

# Gaussian Processes Emulator

for 3x2 Pt Galaxy Clustering & Weak Lensing with LSST

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# Gaussian Processes

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- A non-parametric, Bayesian model
- Calculates the probability distribution over all possible function fitting the data.
- Prior can be specified by:

$$y \sim GP(\mu, \kappa)$$

- Here,  $\mu$  is a mean of labels ( $y$ ) and  $\kappa = \kappa(x, x')$  is a covariance function.

# Emulator

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- We used George, a python module for Gaussian process regression.
- We first standardised the data.
- We set  $\mu$  to be mean value of FoMs in training dataset and covariance to be a normalised exponential squared kernel:

$$\kappa(x, x') = \frac{1}{\sqrt{2\pi|C|}} \exp\left(-\frac{(x - x')^T C^{-1} (x - x')}{2}\right)$$

- Here,  $C$  is a 6x6 identity matrix resulting in equal scale lengths in all dimensions.
- Then, we maximise the likelihood of the fitting function.
- Finally, we make predictions, reverse the standardisation and get the final predicted values of FoM.

# Testing

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- To test the robustness of emulator with used kernel, we chose some particular scenarios out of 36 scenarios as testing sample and remaining others to be training sample.
- We made predictions using different kernels.



