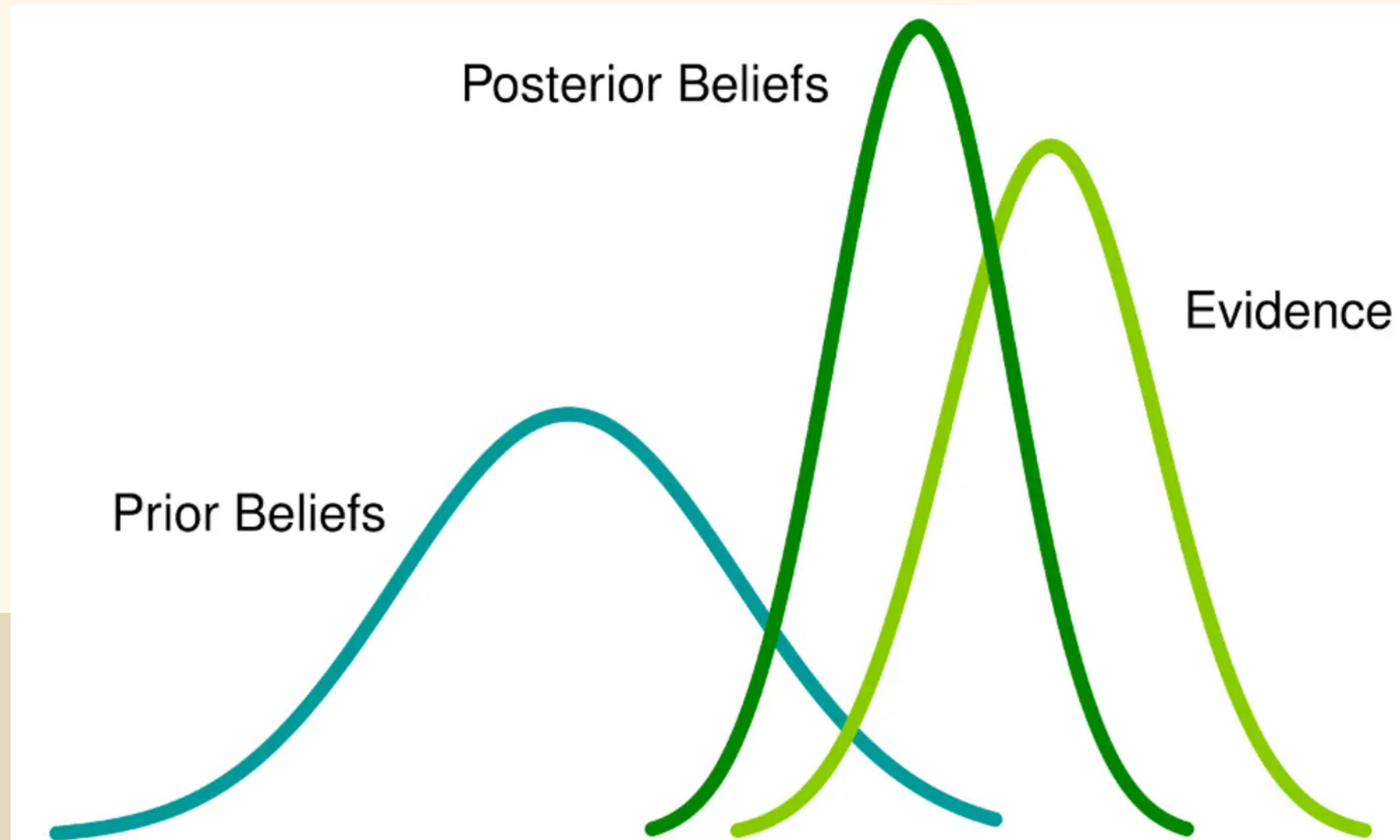# TEAM DEKU

THEME CHOSEN

Parallelizing Monte Carlo Simulation of Financial Derivatives using SYCL

BAYESIAN MACHINE LEARNING

BAYESIAN MACHINE LEARNING

Bayesian Machine Learning answer the question
Given

- a set of unobservable random variables
- a set of observable random variables
- distributions for random variables
- a model that relates all those variables
- some data (i.e. observed random variables)

What unobservable random values will produce that data?

STOCK PRICE

Stock Price is a stochastic measure. That is, there is no deterministic way to calculate stock price. Stock price is given by the equation

$$dS_t = \mu S_t dt + \sigma S_t dB_t$$

OR

$$S_t = S_0 e^{(\mu - \frac{\sigma^2}{2})t + \sigma B_t}$$

To solve this we need to use a model, as well and algorithm to solve that model

MODEL

I will use the Hull and White model.

$$\theta = U(0, 1)$$

$$\mu = N(-5, 1)$$

$$\sigma = U(0.001, 2)$$

$$dW = U(0, 0.1)$$

$$y_t = y_{t-1} + \theta.(\mu - t_{t-1}) + \sigma.dW$$

$$Return = Normal(0, y_t)$$

MARKOV CHAIN MONTE CARLO

A class of algorithms used to take posterior functions and create results. It has many algorithms, all doing one thing:

Use monte carlo simulations to create the posterior function as the markov chain

PLAN AND TIMELINE

First Iteration

THE ENTIRE ALGORITHM IS CODED USES THE DEFAULT QUEUE THAT SYCL PROVIDES. JUST PURE FUNCTIONS AND USMS. NO DATAMANAGEMENT CLASS, NO KERNELS.

Second Iteration

METROPOLISHASTINGS ALGORITHM IS SHIFTED TO THE GPU.

Third Iteration

EULERMARUYAMA IS SHIFTED TO THE GPU

Fourth Iteration

CODE IS OPTIMISED