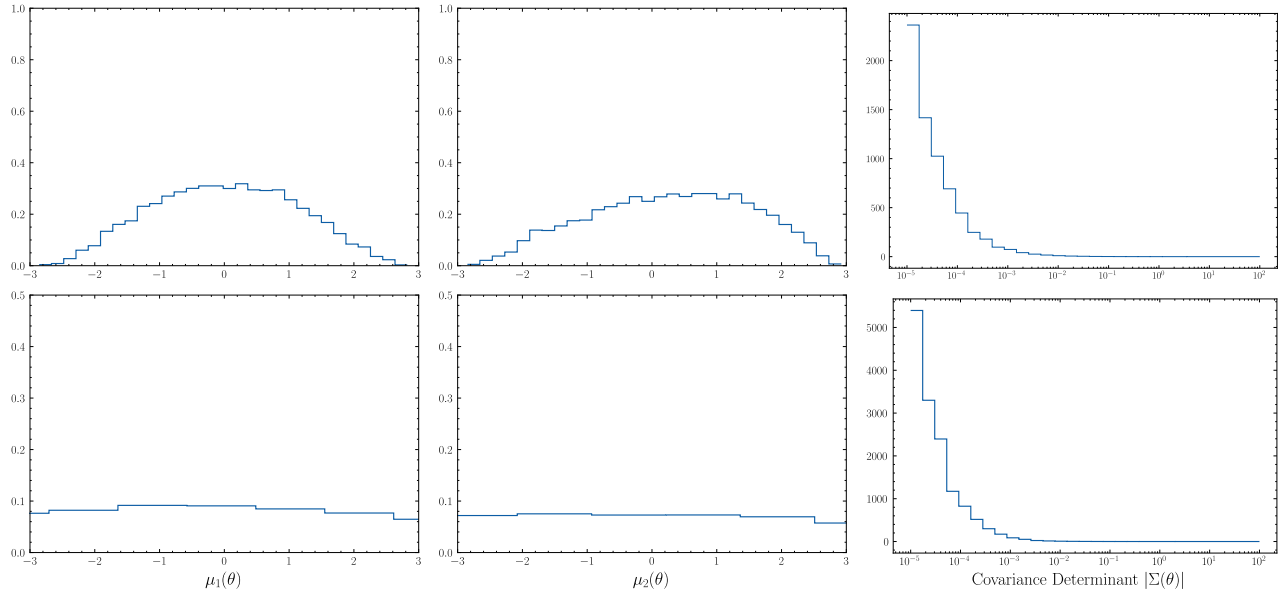


Figure 1: Prior distributions learned for the SLCP with distractors (SLCP-D) simulator. The bottom plots correspond to a prior learned using an InfoNCE objective, whilst the top plots correspond to a prior learned using GED. SLCP-D samples from a 2D multivariate Gaussian with parameterized mean $\mu(\theta)$ and covariance $\Sigma(\theta)$. The left and center plots show the marginal distributions for $\mu(\theta)$, whilst the right plots show the distribution for the determinant of the covariance.

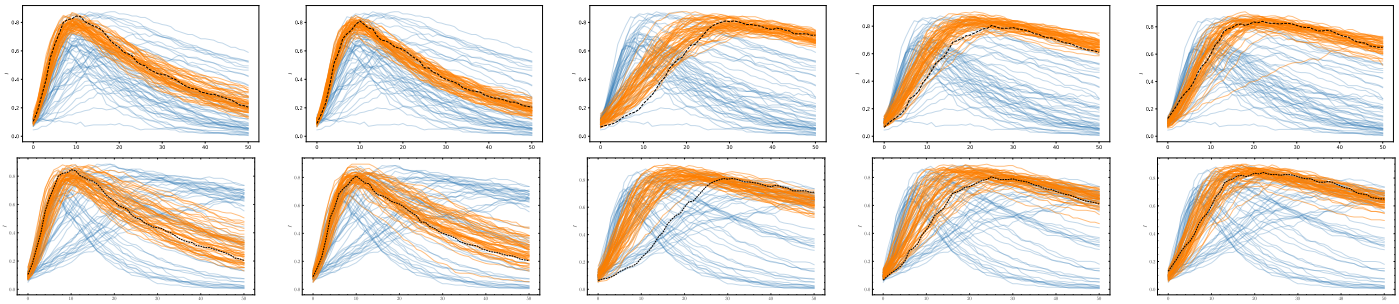


Figure 2: Five SBI experiments using an approximate reference prior trained with an InfoNCE objective. In the top row, posterior samples are generated via MCMC and using a density ratio estimator trained via NRE after the prior has been learned. In the bottom row, posterior samples are generated via MCMC and using the density ratio estimator trained implicitly as the reference prior is learned. Blue (resp. orange) infection curves are prior (resp. posterior) predictive samples. The dashed black curves are the infection curves for which posteriors are generated. The two rows demonstrate that inferences are almost identical for NRE trained using the reference prior and the ratio estimator trained *while* learning the reference prior.

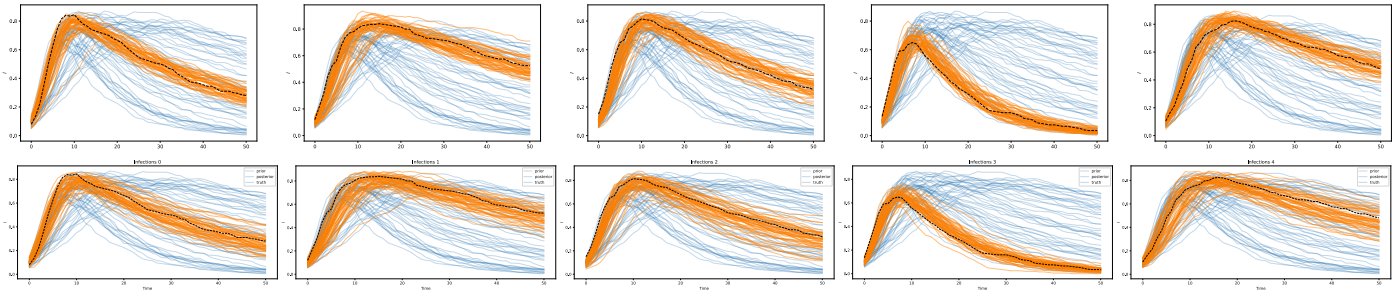


Figure 3: Five SBI experiments using an approximate reference prior trained using GED. In the top row, posterior samples are computed using NPE after the prior has been learned. In the bottom row, posterior samples are computed using the neural posterior trained implicitly as the reference prior is learned. Blue (resp. orange) infection curves are prior (resp. posterior) predictive samples. The dashed black curves are the infection curves for which posteriors are generated. The two rows demonstrate that inferences are almost identical for NPE trained using the reference prior and the posterior estimator trained *while* learning the reference prior.

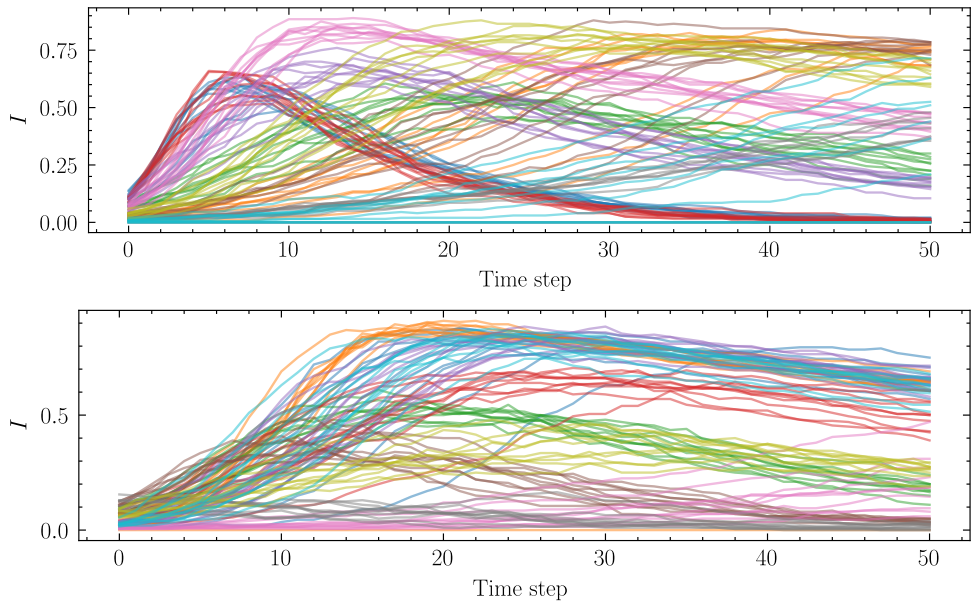


Figure 4: Infection curves sampled from two priors learned using only the time series tracking the proportion of infected individuals, rather than the time series joinlty tracking the proportion of susceptible, infected and recovered individuals. The top plot was generated from a prior trained via an InfoNCE objective, whilst the bottom plot corresponds to a prior trained using GED. Infection curves of the same colour were generated using the same parameter.

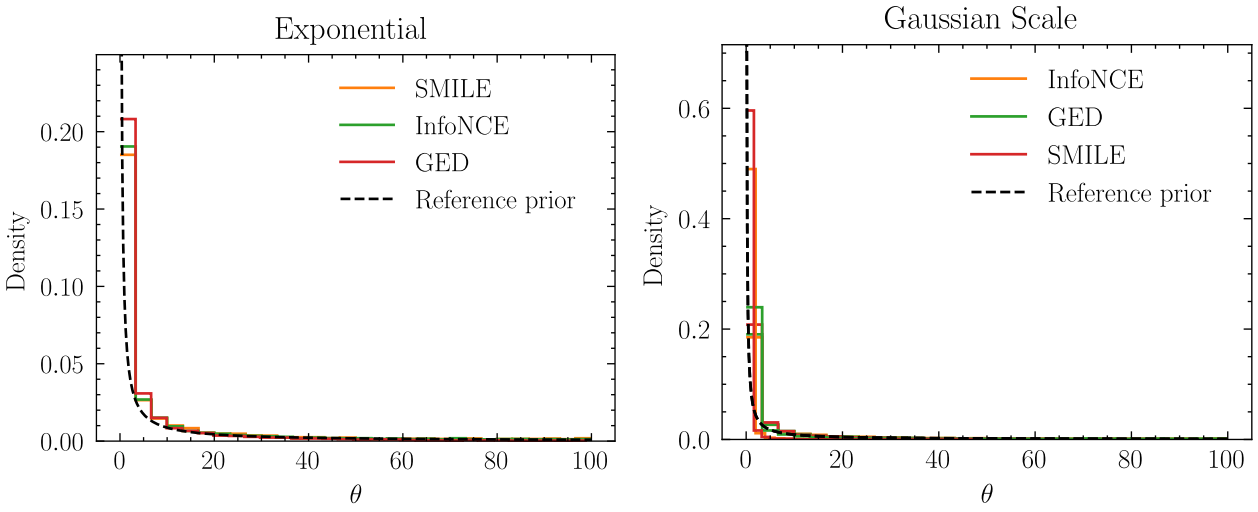
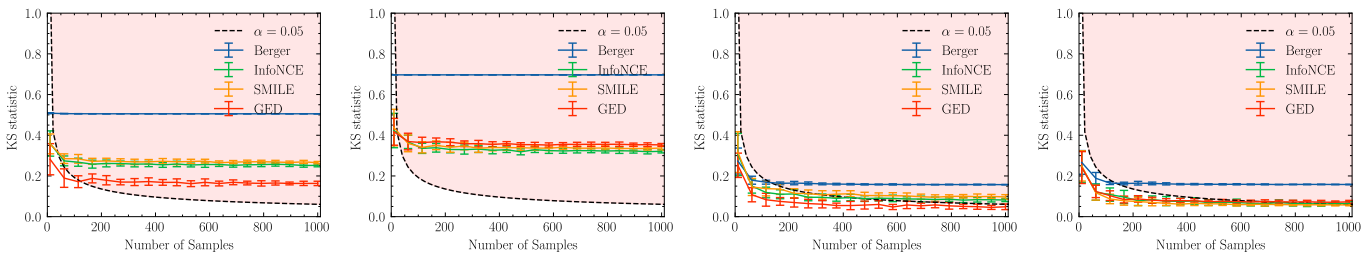


Figure 5: Learned priors for the exponential and scale Gaussian simulators.



(a) Gaussian Scale Model (b) Exponential Model (c) Triangular Model (d) AR1 Model

Figure 6: A plot of the Komolgorov-Smirnov statistics computed by comparing every learned prior to the corresponding ground truth reference prior. The blue line corresponds to the prior returned by Berger's classical numerical algorithm.