



Bayesian Inference of SPT Models

Summer Project Report

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I. Introduction

This is a simple template that can be used for a report.

II. Features

II.1. Colorful items

The main color can be set with the `color` property, which affects inline code, lists, links and important items.

- These bullet
 - points
 - are colored
1. It also
 2. works with
 3. numbered lists!

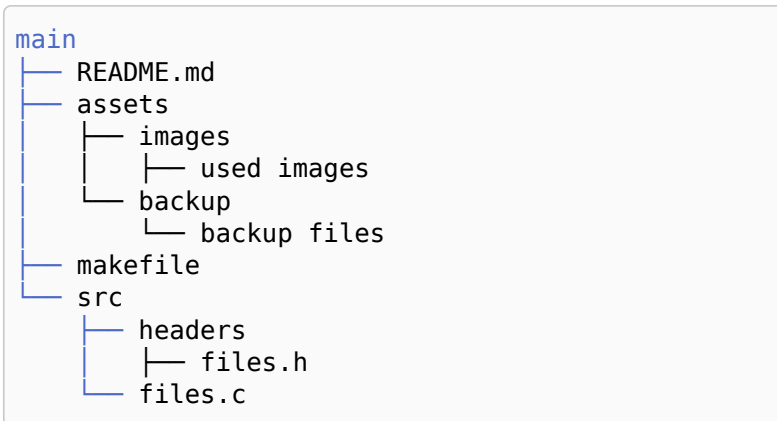
This is an highlight. That can be set in the `template.typ` file.

The package [codelst](#) is used by default, and you can add some more of your liking if you want.

II.2. Customized items

Figures are customized but this is settable in the template file. You can of course reference them Figure 1.

Figure 1 :: Source tree



III. Enjoy !

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IV. Start

V. Introduction

Our first project is to reproduce “Bayesian Inference with information model content check for Langevin Equation”[1]. First, we start with a basis of stochastic thermodynamics with an assigned reading from [2]. We begin with basic stochastic processes and then Langevin dynamics. We then focus on a specific stochastic process called the Ornstein-Uhlenbeck process. Then we derive the Euler-Maruyama integrator for the same process using CLT. In parallel to this project we will also be replicating the paper “Fast Bayesian Inference of optical trap stiffness and particle diffusion”

some stuff lolololol

VI. Stochastic Processes

Definition 6.1 (Wiener Process): The pdf of the Wiener process $\widehat{W}(t)$ is defined to be

$$P(\widehat{W}(t + \Delta t) = x | \widehat{W}(t) = x') = \frac{1}{\sqrt{2\pi\Delta t}} e^{-\frac{(x-x')^2}{2\Delta t}} \quad [1]$$

with $P(\widehat{W}(t) = x) = \delta(x)$ where $\delta(x)$ is the Dirac Delta function.

Definition 6.2 (Lolcat): The lolcat is fuking fucked up A white gaussian is any stochastic variable $\hat{\xi}(t)$ which satisfies the following properties:

$$1. \quad \langle \hat{\xi}(t) \rangle = 0 \quad [2]$$

$$2. \quad \langle \hat{\xi}(t) \hat{\xi}(t') \rangle \propto \delta(t - t') \quad [3]$$

References

- [1] J. Krog and M. A. Lomholt, “Bayesian inference with information content model check for Langevin equations,” *Physical Review E*, vol. 96, no. 6, Dec. 2017, doi: [10.1103/physreve.96.062106](https://doi.org/10.1103/physreve.96.062106).
- [2] N. Shiraishi, *An Introduction to Stochastic Thermodynamics: From Basic to Advanced*. Springer Nature Singapore, 2023. doi: [10.1007/978-981-19-8186-9](https://doi.org/10.1007/978-981-19-8186-9).