Gaussian Process

Sixth week of machine learning workshop

Outline

- What is gaussian process?
  - Introduction
  - Motivation by giving example from nonlinear regression
  - What is different in solving nonlinear regression with parametric model and non-parametric model like gaussian process
- Multivariate gaussian distribution
  - Marginalization
  - Conditional distribution
  - Multivariate gaussian distribution is closed under conditioning and marginalization.
- Covariance matrix
  - Radial basis function kernel
  - Periodic kernel
  - Linear kernel
- The effect of kernel hyperparameter on the function
  - The effect of "L" in radial basis function on smoothness
  - How would be possible to learn hyperparameters?
- Prior distribution over function
  - How to go from prior to posterior distribution by having the training data
  - Conditioning
  - Computational complexity $O(N^3)$ (N is the number of training samples)

- How to scale gaussian process to work in the case of more than thousand samples
- Introduction to deep gaussian process

References

1. Gaussian Processes for Machine Learning. Book by Carl Edward Rasmussen and Christopher K. I. WilliamsThe
2. Gaussian Processes: From the Basics to the State-of-the-Art. Dr. Richard E. Turner. YouTube link
3. Görtler, et al., "A Visual Exploration of Gaussian Processes", Distill, 2019.
4. Deep Gaussian Processes. Damianou, A. and Lawrence, N., 2013. Proceedings of the Sixteenth International Conference on Artificial Intelligence and Statistics, Vol 31, pp. 207--215. PMLR.