Final Project

STAT 447

2024-04-09

Introduction and Review:

Before we discuss Dirichlet Processes, some fundamental groundwork in probability measure theory will be established. We will briefly recap the concepts of σ-algebra, probability measures and Dirichlet Distributions. We will take slightly more relaxed definitions than can be found in formal measure theory works such as (Billingsley 2012).

Let $\mathbb{X}$ be a well-defined sample space. A σ-algebra $\mathcal{F} \subseteq P(\mathbb{X})$ is a set satisfying the following:

1. The entire sample space $\mathbb{X}$ is in $\mathcal{F}$.
2. For all sets $A \in \mathcal{F}$, the complement $A^c \in \mathcal{F}$. This property is referred to as "closure under complementation."
3. For any countable index set I and collection of sets $\{A_i\}_{i \in I}$ such that $\forall i \in I, A_i \in \mathcal{F} \implies \bigcup_{i \in I} A_i \in \mathcal{F}$. This is referred to as "closure under countable unions." More detail on properties 1-3 can be found in analysis works such as (Rudin 1986). For the sake of this work,

For the sake of this work, we are more interested in *probability measures*, which are built on σ-algebra. A probability μ measure $\mu : \mathcal{F} \mapsto [0, 1]$ is a pro

(Teh 2006)

Sources

Acknowledegements: Miscellaneous information such as knowledge on sets, power sets, subsets and countability from (Demirbas and Rechnitzer 2023).

Billingsley, Patrick. 2012. *Probability and Measure, Anniversary Edition*. Wiley.

Demirbas, Seckin, and Andrew Rechnitzer. 2023. "An Introduction to Mathematical Proof : MATH 220." Free web and pdf textbook. https://personal.math.ubc.ca/~PLP/.

Rudin, Walter. 1986. *Real and Complex Analysis*. 3rd ed. McGraw-Hill.

Teh, Yee Whye. 2006. "Dirichlet Process." Course Notes for Gatsby Computational Neuroscience Unit Tutorial. https://mlg.eng.cam.ac.uk/zoubin/tut06/ywt.pdf.