Testing LaTeX sty file

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Contents

1 Testing Colored Boxes

1.1 What are those

Theorem 1.1. Every odd number is the difference of two squares.

Lemma 1.1. If p divides ab, then p divides a or b.

Definition 1.1. A prime is a number with no nontrivial divisors.

Example 1.1. The number 7 is prime.

Exercise 1.1. Prove that there are infinitely many primes.

1.2 What are these

Note 1.1. This is equivalent to showing that primes cannot be bounded above.

Theorem 1.2. If something is suspicious...

Proof. Let n be odd. Then $n = 2k + 1$. Observe that

$$(k+1)^2 - (k)^2 = (k^2 + 2k + 1) - k^2 = 2k + 1 = n.$$

Thus every odd number is a difference of two squares. □

Proposition 1.1 (Bayes Rule)**.** $\Pr(A \mid B) = \dfrac{\Pr(B \mid A)\Pr(A)}{\Pr(B)}$.

Corollary 1.1. Every prime p is either 2 or odd.....

2 Math Shorthands

Some math macros and operators:

2.1 Probability

$$X \sim \mathrm{Bin}(n,p), \quad Y \sim \mathrm{Ber}(\theta), \quad Z \sim \mathcal{N}(0,1).$$

$$\theta \sim \mathrm{Beta}(\alpha,\beta), \quad \lambda \sim \mathrm{Gamma}(k,\theta), \quad N \sim \mathrm{Delta}(\mu).$$

$$\mathbb{E}[X], \quad \mathrm{Var}(X), \quad \mathrm{Cov}(X,Y), \quad \Pr(A \cap B).$$

Conditional expectation: $\mathbb{E}\left[X \,|\, Y\right]$
Conditional probability: $\mathbb{P}\left(A \,|\, B\right)$
Density notation: $p(x)\,, q(z)$

2.1.1 Gaussian Processes

Define prior: $f \sim \mathcal{GP}(0, k(x,x'))$
Posterior mean: $\mu'(x^*) = k(x^*, X)\left(\mathbf{K} + \sigma^2 I\right)^{-1} y$

2.2 Optimization

$$\operatorname*{arg\,min}_{x \in \mathbb{R}^n} f(x), \qquad \operatorname*{arg\,max}_{\theta \in \Theta} \Pr(D \mid \theta).$$

$$\sup_{x \in \mathbb{R}} g(x), \qquad \inf_{n \geq 1} a_n.$$

2.3 Linear Algebra

$$A\boldsymbol{v} = \lambda \boldsymbol{v}, \quad \mathrm{rank}(A), \quad \mathrm{tr}(A), \quad \mathrm{Null}(A).$$

Transpose: A^{T}
Inverse: A^{-1}
Half fraction: $\frac{1}{2}x^2$
Diagonal matrix: $\mathrm{diag}(\boldsymbol{x})$

3 Warnings and Drafts

This section might contain misleading or incomplete arguments.

Do not attempt this at home: Probability measure $\mathbb{P}$ over an uncountable set can behave counterintuitively.

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4 Algorithms

Algorithm 1 Sample Pseudocode

Initialize $x \leftarrow 0$
while $x < 10$ **do**
    $x \leftarrow x + 1$
return x

5 Cross References

We can reference earlier results:

- See Theorem 1.1.
- See Lemma 1.1.
- See Definition 1.1.
- See Example 1.1.
- See Exercise 1.1.

6 Draft notes and side notes

This is a sentence. ¡¡Check this step later.¿¿
This needs a picture . Draw diagram here

A Background on Measure Theory

Appendix material here.

B Background on Information Theory

No information....

C Bibliography Example

We can cite classic references: see [2, 1].

References

[1] Thomas M. Cover and Joy A. Thomas. *Elements of Information Theory*. Wiley, 2006.

[2] Walter Rudin. *Real and Complex Analysis*. McGraw-Hill, 1987.