



## Colloquium Series



### History, Overview, and Connections between Real Analysis and Probability Theory

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**Abstract:** Probability theory was not commonly viewed as an objective or rigorous part of mathematics until 1933 when Andrey Nikolaevich Kolmogorov provided an axiomatic foundation for the theory. This would not have been possible before the 20th century, as Kolmogorov's work relied heavily on the advancements made in real analysis by Henri Léon Lebesgue in 1901. During this time, Lebesgue formulated his theory of measure which he then used to frame a new method of integration, one that would generalize Riemann's method. This talk will cover a brief timeline of what advancements were taking place that allowed us to arrive at these two pivotal moments in history. We start with discussing the notions of integration in the 1700s by Newton and Leibniz up until the work of Lebesgue, as well as introduce the concept of measure which was never considered a branch of mathematics until the late 19th and early 20th centuries, but has become a foundational part of modern probability theory and integration theory. Switching to probability, we discuss the history of probability theory, beginning as far back as in 1713 where Jacob Bernoulli first formulated the definition of probability. Lastly, we draw on the connections between Lebesgue's theory of measure and integration and their analogies within probability theory that were discussed by Kolmogorov.

**Keywords:** History, Probability Theory, Real Analysis, Measure, Kolmogorov, Lebesgue, Integration.

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