

Foundations of Data Science - BDA2121

Jayati Kaushik

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1 Graph Theory

Basic Concepts, Algorithms for connectedness, Shortest path, Minimum Spanning Tree.

2 High Dimensional Space

Properties, Law of large numbers, Sphere in high dimension, Generating points of the surface of a sphere, Gaussians in high dimensions, Random Projections, Applications.

3 Random Graphs and SVD

Large graphs, $G(n, p)$ model, Giant component, Connectivity, Cycles, Non-Uniform models, Applications, Best rank k approximation, Power method for computing the SVD, Applications.

4 Random Walks and Algorithms for Massive Data Problems

Reflection principle, Long leads, Changes of sign, Illustrations, Frequency Moments of data streams, Matrix Algorithms.