



Streaming Submodular Maximization under Noise

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Abstract: There is an ever-growing need for analyzing data streams such as images, videos, or sensor data, in a timely manner. Due to technological advances, such streams steadily grew in volume and throughput over the past years. Thus, the study on the streaming algorithms to extract representative information as a function of the massive data to maximize some objective function is important and urgent. Most of the previous works assume a noise-free environment. In many realistic applications obtaining exact function values is hard or computing such values may cost much. We therefore consider a noisy version of the problem. We address a more general problem to select a subset of at most k elements from the stream to maximize a noisy set function, which does not need to be submodular. To be specific, we cast our problem as the streaming submodular maximization problem with multiplicative and additive noise models. We develop an efficient thresholding streaming algorithm, which provides a $\frac{1}{k+1}$ -approximation for the noisy models and has a memory independent of the data size. In our numerical experiments, we extensively evaluate the effectiveness of our thresholding streaming algorithm on some real applications datasets.

简介：徐大川，北京工业大学数理学院，教授，博士生导师。2002 年于中国科学院数学与系统科学研究院计算数学与科学工程计算研究所获得博士学位，2004 年于中国科学院数学与系统科学研究院应用数学研究所博士后出站。曾访问斯坦福大学，加拿大新布伦瑞克大学，西蒙弗雷泽大学，香港中文大学等。研究兴趣包括：组合优化，近似算法，机器学习与优化，算法博弈论，鲁棒优化，供应链管理等。中国运筹学会数学规划分会副理事长/秘书长，北京运筹学会副理事长，中国运筹学会副秘书长/理事，中国数学会理事。《Applied Mathematics and Computation》、《Asia-Pacific Journal of Operational Research》、《Journal of the Operations Research Society of China》、《Statistics, Optimization and Information Computing》、《运筹与管理》编委，《Algorithmica》、《Journal of Combinatorial Optimization》、《运筹学学报》特约编委。曾获得中国运筹学会青年论文奖一等奖、中国运筹学会运筹新人奖。主持国家自然科学基金六项，国家自然科学基金重点项目子课题一项。在科学出版社出版学术专著《设施选址问题的近似算法》，在 Mathematical Programming, Omega, INFORMS Journal on Computing, Algorithmica, Theoretical Computer Science, Journal of Combinatorial Optimization, Journal of Global Optimization, Information Process Letters, Operations Research Letters 等发表学术论文 100 余篇。《J. GTAPH THEORY》等国际著名 SCI 学术期刊，主持多项国家自然科学基金及省部级课题并著有英文学术论著两部。