

1. Record Nr.	UNINA9910838231703321
Autore	Hassanieh Haitham
Titolo	The Sparse Fourier Transform : Theory and Practice
Pubbl/distr/stampa	San Rafael : , : Morgan & Claypool Publishers, , 2018 ©2018
ISBN	1-947487-04-3
Edizione	[1st ed.]
Descrizione fisica	1 online resource
Collana	ACM books ; ; 19
Disciplina	515/.723
Soggetti	Fourier transformations Sparse matrices
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Contents -- Preface -- 1. Introduction -- PART I. THEORY OF THE SPARSE FOURIER TRANSFORM -- 2. Preliminaries -- 3. Simple and Practical Algorithm -- 4. Optimizing Runtime Complexity -- 5. Optimizing Sample Complexity -- 6. Numerical Evaluation -- PART II. APPLICATIONS OF THE SPARSE FOURIER TRANSFORM -- 7. GHz-Wide Spectrum Sensing and Decoding -- 8. Faster GPS Synchronization -- 9. Light Field Reconstruction -- 10. Fast In-Vivo MRS Acquisition with Artifact Suppression -- 11. Fast Mu1ti-Dimensional NMR Acquisition and Processing -- 12. Conclusion -- A. Proofs -- B. The Optimality of the Exactly k-Sparse Algorithm 4.1 -- C. Lower Bound of the Sparse Fourier Transform in the General Case -- D. Efficient Constructions of Window Functions -- E. Sample Lower Bound for the Bernoulli Distribution -- F. Analysis of the QuickSync System -- G. A 0.75 Million Point Sparse Fourier Transform Chip -- References -- Author Biography.
Sommario/riassunto	The Fourier transform is one of the most fundamental tools for computing the frequency representation of signals. It plays a central role in signal processing, communications, audio and video compression, medical imaging, genomics, astronomy, as well as many other areas. Because of its widespread use, fast algorithms for computing the Fourier transform can benefit a large number of applications. The fastest algorithm for computing the Fourier transform

is the Fast Fourier Transform (FFT), which runs in near-linear time making it an indispensable tool for many applications. However, today, the runtime of the FFT algorithm is no longer fast enough especially for big data problems where each dataset can be few terabytes. Hence, faster algorithms that run in sublinear time, i.e., do not even sample all the data points, have become necessary. This book addresses the above problem by developing the Sparse Fourier Transform algorithms and building practical systems that use these algorithms to solve key problems in six different applications: wireless networks, mobile systems, computer graphics, medical imaging, biochemistry, and digital circuits.
