Non-uniform sampling
denoising applied to nuclear magnetic resonance
Guillaume Laurent, Christian Bonhomme

To cite this version:
Guillaume Laurent, Christian Bonhomme. Non-uniform sampling
denoising applied to nuclear magnetic resonance. Spring School on Sparse Representations and Compressed Sensing, Apr 2016, Ilmenau, Germany. hal-01516795

HAL Id: hal-01516795
https://hal.sorbonne-universite.fr/hal-01516795
Submitted on 2 May 2017

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Distributed under a Creative Commons Attribution - NonCommercial - ShareAlike 4.0 International License
Non-Uniform Sampling & Denoising applied to Nuclear Magnetic Resonance

G. LAURENT, C. BONHOMME
Laboratoire de Chimie de la Matière Condensée de Paris

Context
Increasing sensitivity

- NUS and SVD are useful to increase sensitivity
- Efficient algorithms are critical
- Graphic card is a low cost option (Nvidia GTX 750 = 120 €)

Highlights

- Automatic SVD thresholding
- Sparse matrix SVD
- Combining NUS and SVD

Future work

- V. BARRET-VIVIN, F. PORTIER and M. ROBIN for samples
- P. P. MAN for Java application
- W. WOELFFEL for python application

Acknowledgements

References


Non-Uniform Sampling (NUS)

Physico-chemical spectroscopic analysis

Precise but poor sensitivity
100 mg of sample needed
Broad noisy peaks for distributed environments

Spectra denoising

Singular Value Decomposition (SVD)
Low rank approximation

Tools

NUS and SVD are useful to increase sensitivity
Efficient algorithms are critical
Graphic card is a low cost option (Nvidia GTX 750 = 120 €)

Results

Specific license
Useful for narrow peaks (parsimonious data)

CPU: Central Processing Unit
GPU: Graphics Processing Unit
Massively parallel (Nvidia CUDA)

CPU time / 100:
- Divide and conquer: / 8
- SSE3 Instructions: / 3
- Intel MKL Library: / 2
- Single Precision: / 2

Acknowledgements

Spring School on Sparse Representations and Compressed Sensing, 4th-8th April 2016, Ilmenau, Germany