High-dimensional polynomial approximation via compressed sensing – Bibliography

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Abstract

This is a preliminary annotated bibliography on high-dimensional polynomial expansions for computing solutions of parametric PDEs, with a focus on compressed sensing and least squares techniques. It is based on a mini-tutorial I gave at the 2016 SIAM UQ Conference.

This document is a work in progress and contains only a partial list of relevant papers in this area. Please email me (ben_adcock@sfu.ca) with comments, suggestions for additions and updated citation information.

1 Compressed sensing references

1.1 General references

[Foucart and Rauhut, 2013]
Book on compressed sensing theory and techniques.

[Cai and Zhang, 2014]
Proof that the RIP implies stable and robust recovery with the sharp estimate $\delta_{2s} < 1/\sqrt{2}$.

1.2 Uniform recovery results

[Rudelson and Vershynin, 2008]
The RIP for Fourier and Gaussian measurements.

[Rauhut, 2010]
The RIP for bounded orthonormal systems.

[Cheraghchi et al., 2013]
[Chkifa et al., 2015]
Improvements of the log factors in the measurement condition for bounded orthonormal systems to satisfy the RIP.
1.3 Nonuniform recovery results

[Gross, 2011]
The golfing scheme.
[Candès and Plan, 2011]
Nonuniform recovery theorem for recovery of $s$-sparse vectors without the RIP. Based on coherence of the sampling distribution.
[Adcock and Hansen, 2016]
Nonuniform recovery results in the infinite-dimensional setting for subsampled isometries.

1.4 Miscellaneous

[Friedlander et al., 2012]
[Yu and Baek, 2013]
Compressed sensing with prior support information via weighted $\ell^1$ minimization.

2 Polynomial approximation

2.1 Regularity theory

[Cohen et al., 2011]
Regularity estimates for polynomial approximation of parametric elliptic PDEs.
[Tran et al., 2015]
Estimates for quasi-optimal polynomial approximations of parametric PDEs.

2.2 Reviews

[Narayan and Zhou, 2015]
Review of stochastic collocation on unstructured meshes by least squares and compressed sensing.

2.3 Approximation theory

[Migliorati, 2015]
Markov and Nikolskii inequalities for multivariate polynomials on downward closed sets.
3  Discrete least squares for polynomial approximation

3.1  Theory

[Cohen et al., 2013]
Sample complexity estimates in the one-dimensional case.
[Miglierati, 2013]
[Miglierati et al., 2014]
Sample complexity estimates in the multivariate case.
[Miglierati and Nobile, 2014]
Analysis of discrete least squares with low-discrepancy point sets.

3.2  Sampling schemes

[Narayan et al., 2014]
Sampling from the equilibrium measure and Christoffel weighting of the least-squares system.
[Zhou et al., 2015]
Sampling using randomly subsampled Gaussian quadratures.

4  Compressed sensing for polynomial approximation

4.1  \(\ell^1\) minimization

[Rauhut and Ward, 2012]
One-dimensional Legendre polynomials with preconditioning and Chebyshev sampling.
[Yan et al., 2012]
Multivariate Legendre polynomials with random sampling from the Chebyshev and uniform measures.
[Mathelin and Gallivan, 2012]
[Doostan and Owhadi, 2011]
Application to PDEs with random coefficients.

4.2  Weighted \(\ell^1\) minimization

[Yang and Karniadakis, 2013]
A reweighted \(\ell^1\) minimization techniques applied to multivariate polynomial expansions.
[Peng et al., 2014]
Adapted weights based on a priori estimates for expansion coefficients.
[Rauhut and Ward, 2013]
Theoretical results on weighted sparsity and weighted RIP for bounded orthonormal systems.
[Adcock, 2015b]
Worst-case recovery guarantees for deterministic samples in one dimensions.
[Adcock, 2015a]
Nonuniform recovery guarantees for weighted $\ell^1$ minimization with arbitrary weights. Optimal sample complexity estimates for $L^\infty$ function norm weights.
[Chkifa et al., 2015]
Uniform recovery guarantees for weighted $\ell^1$ minimization with $L^\infty$ function norm weights and polynomial approximations in downward closed sets.

4.3 Design of sampling points

[Hampton and Doostan, 2014]
Coherence-optimal sampling.
[Jakeman et al., 2016]
Sampling with respect to the weighted equilibrium measure, with preconditioning via the Christoffel function.
[Tang and Iaccarino, 2014]
[Guo et al., 2016]
Subsampled Gaussian quadratures.
[Xu and Zhou, 2014]
Deterministic interpolation grids based on Weil points.

4.4 Sparsity enhancement

[Jakeman et al., 2014]
Best basis selection technique.
[Yang et al., 2015]
Sparsity enhancement via coordinate rotations.

4.5 Gradient sampling

[Peng et al., 2015]
Compressed sensing for Legendre and Hermite polynomial expansions using function and gradient evaluations
References


Analysis of discrete least squares on multivariate polynomial spaces with evaluations in low-discrepancy point sets analysis of discrete least squares on multivariate polynomial spaces with evaluations in low-discrepancy point sets. *Preprint*.


Interpolation via weighted $\ell_1$ minimization. *arXiv:1308.0759*.


Analysis of quasi-optimal polynomial approximations for parameterized PDEs with deterministic and stochastic coefficients. Ornl/tm-2014/468, Oak Ridge National Laboratory.


