Cornell University Library

We gratefully acknowledge supp
the Simons Fo
and member ins

arXiv.org > math > arXiv:1107.0145

Search or Article-id (Help | Advance

All papers

Mathematics > Probability

A CLT for Information-theoretic statistics of Non-centered Gram random matrices

Walid Hachem, Malika Kharouf, Jamal Najim, Jack W. Silverstein

(Submitted on 1 Jul 2011)

In this article, we study the fluctuations of the random variable: $$ {\mathcal I}_n(\rho) = \frac 1N \log\det(\Sigma_n \Sigma_n^* + \rho I_N),\quad (\rho>0) $$ where $\Sigma_n= n^{-1/2} D_n^{1/2} X_n\tilde D_n^{1/2} +A_n$, as the dimensions of the matrices go to infinity at the same pace. Matrices X_n and A_n are respectively random and deterministic $N\times n$ matrices; matrices D_n and $\tilde D_n$ are deterministic and diagonal, with respective dimensions $N\times N$ and $n\times n$; matrix $X_n=(X_{ij})$ has centered, independent and identically distributed entries with unit variance, either real or complex.
We prove that when centered and properly rescaled, the random variable ${\mathcal I}_n(\rho)$ satisfies a Central Limit Theorem and has a Gaussian limit. The variance of ${\mathcal I}_n(\rho)$ depends on the moment $\E X_{ij}^2$ of the variables X_{ij} and also on its fourth cumulant $\kappa= \E|X_{ij}|^4 - 2 - |\E X_{ij}^2|^2$.
The main motivation comes from the field of wireless communications, where ${\mathcal I}_n(\rho)$ represents the mutual information of a multiple antenna radio channel. This article closely follows the companion article "A CLT for Information-theoretic statistics of Gram random matrices with a given variance profile", {\em
Ann. Appl. Probab. (2008)} by Hachem et al., however the study of the fluctuations associated to non-centered large random matrices raises specific issues, which are addressed here.

Subjects:	**Probability (math.PR)**; Statistics Theory (math.ST)
MSC classes:	Primary 15A52, Secondary 15A18, 60F15
Cite as:	**arXiv:1107.0145 [math.PR]**
	(or **arXiv:1107.0145v1 [math.PR]** for this version)

Submission history

From: Walid Hachem [view email]
[v1] Fri, 1 Jul 2011 08:36:05 GMT (38kb)

Which authors of this paper are endorsers?

Link back to: arXiv, form interface, contact.

Download:

- PDF
- PostScript
- Other formats

Current browse cont
math.PR
< prev | next >
new | recent | 1107

Change to browse b
math
math.ST
stat

References & Citatio
- NASA ADS

Bookmark(what is this?)