

# CS-CHEST V1.0a

## A MATLAB<sup>®</sup> Toolbox for Compressive Channel Estimation

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### Installation Notes

Download `cs-chest_v1.0a.zip` and extract all files into a folder. The required password for unzipping is freely available via email from [gtauboec@nt.tuwien.ac.at](mailto:gtauboec@nt.tuwien.ac.at). Personal/institutional details are requested to be included into this email.

CS-CHEST V1.0a requires the following two software packages to be installed:

- CVX: <http://cvxr.com/>
- SPGL1: <http://www.cs.ubc.ca/labs/scl/spgl1/>

### Quick Start Guide

Executing `CheEst.m` computes the channel estimation MSE for the recovery algorithms Basis Pursuit, Lasso, OMP, and CoSaMP using the DFT basis, a combined DFT-DPSS basis, a deterministically optimized basis, and a statistically optimized basis and stores the results into the file `ergebnisse_CheEst.mat`.

Executing `display_results.m` imports the data stored in `ergebnisse_CheEst.mat` and displays (some of) the results in a MATLAB<sup>®</sup> figure.

### Notes

CS-CHEST V1.0a aims to serve as a proof of concept that compressive channel estimation is able to produce reliable channel estimates for a small number of pilots. The routines are not optimized in any way and an improvement in terms of e.g. running time is certainly possible. Furthermore, the code documentation is poor and support will not be provided in general. However, questions via email will be probably answered; however, this cannot be guaranteed.

For algorithmic details, see [1].

Note that the performance of the applied recovery algorithms depends strongly on some initial parameters. Therefore, bad performance results are typically due to mismatched parameter settings. Furthermore, for some simulation scenarios, a large number of iterations is required in order to average over a sufficiently large number of transmitted symbols and channel realizations.

The code implemented in `CheEst.m` and `display_results.m` was essentially used to generate the MSE plot of Figure 5 in [1]. However, the required modifications for producing the results depicted in Figures 3 and 4 of [1] should be straightforward, provided that the correct parameter settings for the recovery algorithms are used.

Academic use of the toolbox is permitted, commercial use prohibited, cf. `License_Agreement_CS-CHEST.pdf`. For commercial use, please contact [gtauboec@nt.tuwien.ac.at](mailto:gtauboec@nt.tuwien.ac.at).

### References

- [1] G. Tauböck, F. Hlawatsch, D. Eiwien, and H. Rauhut, "Compressive estimation of doubly selective channels in multicarrier systems: Leakage effects and sparsity-enhancing processing," *IEEE J. Sel. Top. Signal Process.*, vol. 4, no. 2, Apr. 2010, pp. 255-271.