

List of Publications

Per Christian Hansen

Professor in Scientific Computing, Villum Investigator
DTU Compute – The Department of Applied Mathematics and Computer Science, Section for Scientific Computing, Technical University of Denmark, DK-2800 Lyngby, Denmark.
Email: pcha@dtu.dk. URL: www.compute.dtu.dk/~pcha

Books

- B.1 P. C. Hansen, J. S. Jørgensen, W. R. B. Lionheart, M. S. Andersen, K. J. Batenburg, Y. Dong, E. T. Quinto, and J. Sijbers, *Computed Tomography: Algorithms, Insight, and Just Enough Theory*, SIAM, Philadelphia, 2021 (336 pages).
- B.2 P. C. Hansen, V. Pereyra, and G. Scherer, *Least Squares Data Fitting with Applications*, Johns Hopkins University Press, 2012 (305 pages).
- B.3 P. C. Hansen, *Discrete Inverse Problems: Insight and Algorithms*, SIAM, Philadelphia, 2010 (213 pages).
- B.4 P. C. Hansen, J. G. Nagy, and D. P. O’Leary, *Deblurring Images: Matrices, Spectra, and Filtering*, SIAM, Philadelphia, 2006 (130 pages). Korean translation, Jin Publishing Co., 2007.
- B.5 P. C. Hansen, *Rank-Deficient and Discrete Ill-Posed Problems: Numerical Aspects of Linear Inversion*, SIAM, Philadelphia, 1998 (247 pages).

Edited Book

- E.1 P. C. Hansen, B. H. Jacobsen, and K. Mosegaard (Eds.), *Methods and Applications of Inversion*, Lecture Notes in Earth Science, Vol. 92, Springer, Berlin, 2000 (304 pages).

Invited Chapters

- I.1 P. C. Hansen and H. B. Nielsen, *Least squares solution of linear systems*; invited chapter in L. Hogben (Ed.), *Handbook of Linear Algebra*, 2. Ed., CRC Press, 2013.
- I.2 P. C. Hansen, H. B. Nielsen, C. Ankjærgaard, and M. Jain, *Two exponential models for optically stimulated luminescence*; invited chapter in V. Pereyra and G. Scherer (Eds.), *Exponential Data Fitting and Its Applications*, Bentham eBooks, 2010; pp. 128–144. <http://www.bentham.org/ebooks/9781608050482>.
- I.3 P. C. Hansen, *The L-curve and its use in the numerical treatment of inverse problems*; invited chapter in P. Johnston (Ed.), *Computational Inverse Problems in Electrocardiology*, WIT Press, Southampton, 2001; pp. 119–142.

Publications in International Journals

- 1 B. M. Afkham, Y. Dong, and P. C. Hansen, *Uncertainty quantification of inclusion boundaries in the context of X-ray tomography*, SIAM/ASA J. Uncertain. Quantific., to appear.
- 2 F. Uribe, J. M. Bardsley, Y. Dong, P. C. Hansen, and N. A. B. Riis, *A hybrid Gibbs sampler for edge-preserving tomographic reconstruction with uncertain view angles*, SIAM/ASA J. Uncertain. Quantific., 10 (2022), pp. 1293–1320, doi: 10.1137/21M1412268.

- 3 P. C. Hansen, K. Hayami, and K. Morikuni, *GMRES methods for tomographic reconstruction with an unmatched back projector*, J. Comp. Appl. Math., 413 (2022), 114352, doi: 10.1016/j.cam.2022.114352 (open access).
- 4 N. A. B. Riis, Y. Dong, and P. C. Hansen, *Computed tomography with view angle estimation using uncertainty quantification*, Inverse Problems, 37 (2021), 065007. doi: 10.1088/1361-6420/abf5ba.
- 5 B. S. van Lith, P. C. Hansen, and M. E. Hochstenbach, *A twin error gauge for Kaczmarz's iterations*, SIAM J. Sci. Comp., 43 (2021), pp. S173–S199, doi: 10.1137/20M1349011.
- 6 B. Madsen, J. Huang, M. Salewski, H. Järleblad, P. C. Hansen + 19, *Fast-ion velocity-space tomography using slowing-down regularization in EAST plasmas with co- and counter-current neutral beam injection*, Plasma Physics and Controlled Fusion, 62 (2020), 115019, doi: 10.1088/1361-6587/abb79b.
- 7 N. A. B. Riis, Y. Dong, and P. C. Hansen, *Computing tomography reconstruction with uncertain view angles by iteratively updated model discrepancy*, J. Math. Imag. Vision, 63 (2021), pp. 133–143, doi: 10.1007/s10851-020-00972-7.
- 8 J. M. Bardsley and P. C. Hansen, *MCMC algorithms for computational UQ of nonnegativity constrained linear inverse problems*, SIAM J. Sci. Comput., 42 (2020), pp. A1269–1288, doi: 10.1137/18M1234588.
- 9 B. Madsen, M. Salewski, W. W. Heidbrink, L. Stagner, M. Podesta, D. J. Lin, A. Garcia, P. C. Hansen, and J. Huang, *Tomography of the positive-pitch fast-ion velocity distribution in DIII-D plasmas with Alfvén eigenmodes and neoclassical tearing modes*, Nuclear Fusion, 60 (2020), 066024, doi: 10.1088/1741-4326/ab82b5.
- 10 Y. Dong, P. C. Hansen, M. E. Hochstenbach, and N. A. B. Riis, *Fixing nonconvergence of algebraic iterative reconstruction with an unmatched backprojector*, SIAM J. Sci. Comput., 41 (2019), pp. A1822–A1839, doi: 10.1137/18M1206448.
- 11 P. C. Hansen, Y. Dong, and K. Abe, *Hybrid enriched bidiagonalization for discrete ill-posed problems*, Numer. Linear Algebra Appl., 26 (2019), e2230, doi: 10.1002/nla.2230.
- 12 S. Gazzola, P. C. Hansen, and J. G. Nagy, *IR Tools: a MATLAB package of iterative regularization methods and large-scale test problems*, Numer. Algo., 81 (2019), pp. 773–811. doi: 10.1007/s11075-018-0570-7.
- 13 Y. Dong, P. C. Hansen, and H. M. Kjer, *Joint CT reconstruction and segmentation with discriminative dictionary learning*, IEEE Trans. Computational Imaging, 4 (2018), pp. 528–536, doi: 10.1109/TCI.2018.2858139.
- 14 M. Salewski, M. Nocente, B. Madsen, I. Abramovic, M. Fitzgerald, G. Gorini, P. C. Hansen + 19, *Alpha-particle velocity-space diagnostic in ITER*, Nuclear Fusion, 58 (2018), 096019 (16pp), doi: 10.1088/1741-4326/aace05.
- 15 T. Elfving and P. C. Hansen, *Unmatched projector/backprojector pairs: perturbation and convergence analysis*, SIAM J. Sci. Comput., 40 (2018), pp. A573–A591, doi: 10.1137/17M1133828.
- 16 N. A. B. Riis, J. Frøsig, Y. Dong, and P. C. Hansen, *Limited-data X-ray CT for underwater pipeline inspection*, Inverse Problems (special issue: 100 Years of the Radon transform), 34 (2018), 034002 (16pp), doi: 10.1088/1361-6420/aaa49c.
- 17 I. G. Kazantsev, U. L. Olsen, H. F. Poulsen, and P. C. Hansen, *A spectral geometric model for Compton single scatter in PET based on the SSS approximation*, Inverse Problems (special issue: 100 Years of the Radon transform), 34 (2018), 024002 (15pp), doi: 10.1088/1361-6420/aaa05d.

- 18 V. Dahl, A. B. Dahl, and P. C. Hansen, *Computing segmentations directly from X-ray projection data via parametric deformable curves*, Measurement Science and Technology, 29 (2018), 014003, doi: 10.1088/1361-6501/aa950e. Software: <https://github.com/vedranaa/tomography-snake>.
- 19 P. C. Hansen and J. S. Jørgensen, *AIR Tools II: algebraic iterative reconstruction methods, improved implementation*, Numerical Algorithms, 79 (2018), pp. 107–137, doi: 10.1007/s11075-017-0430-x.
- 20 S. Soltani, M. S. Andersen, and P. C. Hansen, *Tomographic image reconstruction using training images*, J. Comp. Appl. Math., 313 (2017), pp. 243–258, doi: 10.1016/j.cam.2016.09.019.
- 21 M. Salewski, B. Geiger, A. Jacobsen, P. C. Hansen + 12, *High-definition velocity-space tomography of fast-ion dynamics*, Nuclear Fusion, 56 (2016), doi: 10.1088/0029-5515/56/10/106024.
- 22 T. Elfving, P. C. Hansen, and T. Nikazad, *Convergence analysis for column-action methods in image reconstruction*, Numer. Algo. 74 (2016), pp. 905–924, doi: 10.1007/s11075-016-0176-x. Erratum (Fig. 3 was incorrect), p. 925, doi: 10.1007/s11075-016-0232-6.
- 23 R. D. Kongskov, J. S. Jørgensen, H. F. Poulsen, and P. C. Hansen, *Noise robustness of a combined phase retrieval and reconstruction method for phase-contrast tomography*, J. Optical Society of America A, 33 (2016), pp. 447–454, doi: 10.1364/JOSAA.33.000447.
- 24 S. Soltani, M. E. Kilmer, and P. C. Hansen, *A tensor-based dictionary learning approach to tomographic image reconstruction*, BIT Numer. Math., 56 (2016), pp. 1425–1454, doi: 10.1007/s10543-016-0607-z.
- 25 M. Romanov, A. B. Dahl, Y. Dong, and P. C. Hansen, *Simultaneous tomographic reconstruction and segmentation with class priors*, Inverse Problems in Science and Engineering, 24 (2015), pp. 1432–1453, doi: 10.1080/17415977.2015.1124428.
- 26 J. S. Jørgensen, E. Y. Sidky, P. C. Hansen, and X. Pan, *Empirical average-case relation between undersampling and sparsity in X-ray CT*, Inverse Problems and Imaging, 9 (2015), pp. 431–446, doi: 10.3934/ipi.2015.9.431 (open access).
- 27 Y. Dong, H. Garde, and P. C. Hansen, *R³GMRES: including prior information in GMRES-type methods for discrete inverse problems*, Electronic Trans. Numerical Analysis, 42 (2014), pp. 136–146 (open access).
- 28 D. Chen, M. E. Kilmer, and P. C. Hansen, *“Plug-and-play” edge-preserving regularization*, Electronic Trans. Numerical Analysis, 41 (2014), pp. 465–477 (open access).
- 29 H. H. B. Sørensen and P. C. Hansen, *Multicore performance of block algebraic iterative reconstruction methods*, SIAM J. Sci. Comp., 36 (2014), pp. C524–C546, doi: 10.1137/130920642.
- 30 O. Borries, P. Meincke, E. Jørgensen, and P. C. Hansen, *Multilevel fast multipole method for higher order discretizations*, IEEE Trans. Antennas Propagat., 62 (2014), pp. 4695–4705.
- 31 O. Borries, E. Jørgensen, P. Meincke, and P. C. Hansen, *Adaptive grouping for the higher-order multilevel fast multipole method*, Microwave and Optical Technology Letters, 56 (2014), pp. 2451–2456.
- 32 V. Paoletti, P. C. Hansen, M. F. Hansen, and M. Fedi, *A computationally efficient tool for assessing the depth resolution in large-scale potential-field inversion*, Geophysics, 79 (2014), pp. A33–A38, doi: 10.1190/GEO2014-0017.1.
- 33 T. Elfving, P. C. Hansen, and T. Nikazad, *Semi-convergence properties of Kaczmarz’s method*, Inverse Problems, 30 (2014), doi: 10.1088/0266-5611/30/5/055007.
- 34 P. C. Hansen, J. G. Nagy, and K. Tigkos, *Rotational image deblurring with sparse matrices*, BIT Numerical Mathematics, 54 (2014), pp. 649–671, doi: 10.1007/s10543-013-0464-y.

- 35 M. S. Andersen and P. C. Hansen, *Generalized row-action methods for tomographic imaging*, Numer. Algo., 67 (2014), pp. 121–144, doi: 10.1007/s11075-013-9778-8.
- 36 P. C. Hansen, *Oblique projections and standard-form transformations for discrete inverse problems*, Numer. Lin. Alg. Appl., 20 (2013), pp. 250–258, doi: 10.1002/nla.802.
- 37 T. Elfving, P. C. Hansen, and T. Nikazad, *Semi-convergence and relaxation parameters for projected SIRT algorithms*, SIAM J. Sci. Comput., 34 (2012), A2000–A2017, doi: 10.1137/110834640.
- 38 T. L. Jensen, J. H. Jørgensen, P. C. Hansen, and S. H. Jensen, *Implementation of an optimal first-order method for strongly convex total variation regularization*, BIT Numerical Mathematics, 52 (2012), pp. 329–356, doi: 10.1007/s10543-011-0359-8.
- 39 F. Delbary, P. C. Hansen, and K. Knudsen, *Electrical impedance tomography: 3D reconstructions using scattering transforms*, Applicable Analysis, 91 (2012), pp. 737–755. doi: 10.1080/00036811.2011.598863.
- 40 P. C. Hansen and M. Saxild-Hansen, *AIR Tools – A MATLAB package of algebraic iterative reconstruction methods*, J. Comp. Appl. Math., 236 (2012), pp. 2167–2178, doi: 10.1016/j.cam.2011.09.039.
- 41 T. Elfving, T. Nikazad, and P. C. Hansen, *Semi-convergence and relaxation parameters for a class of SIRT algorithms*, Electronic Trans. on Numerical Analysis, 37 (2010), pp. 321–336 (open access).
- 42 C. Ankjærgaard, M. Jain, P. C. Hansen, and H. B. Nielsen, *Towards multi-exponential analysis in optically stimulated luminescence*, J. Phys. D: Appl. Phys., 43 (2010), 195501.
- 43 J. Dahl, P. C. Hansen, S. H. Jensen, and T. L. Jensen, *Algorithms and software for total variation image reconstruction via first-order methods*, Numer. Algo., 53 (2010), pp. 67–92.
- 44 D. E. Petersen, S. Li, K. Stokbro, H. H. B. Sørensen, P. C. Hansen, S. Skelboe, and E. Darve, *A hybrid method for the parallel computation of Green’s functions*, J. Comp. Phys., 228 (2009), pp. 5020–5039.
- 45 H. H. B. Sørensen, P. C. Hansen, D. E. Petersen, S. Skelboe, and K. Stokbro, *Efficient wave function matching approach for quantum transport calculations*, Phys. Rev. B, 79 (2009), pp. 205322–205331.
- 46 P. C. Hansen, H. O. Sørensen, Z. Sükösd, and H. F. Poulsen, *Reconstruction of single-grain orientation distribution functions for crystalline materials*, SIAM J. Imaging Sci., 2 (2009), pp. 593–613.
- 47 P. C. Hansen and T. K. Jensen, *Noise propagation in regularizing iterations for image deblurring*, Electronic Transactions on Numerical Analysis, 31 (2008), pp. 204–220 (open access).
- 48 H. H. B. Sørensen, P. C. Hansen, D. E. Petersen, S. Skelboe, and K. Stokbro, *Krylov subspace method for evaluating the self-energy matrices in electron transport calculations*, Phys. Rev. B., 77 (2008), pp. 155301–155312.
- 49 M. Fedi, P. C. Hansen, and V. Paoletti, *Ambiguity and depth resolution in potential field inversion*, Comm. SIMAI Congress, 2 (2007).
Open access: <http://cab.unime.it/journals/index.php/congress/article/view/159/159>.
- 50 D. E. Petersen, H. H. B. Sørensen, P. C. Hansen, S. Skelboe, and K. Stokbro, *Block tridiagonal matrix inversion and fast transmission calculations*, J. Comp. Phys., 227 (2008), pp. 3174–3190.
- 51 P. C. Hansen, *Regularization Tools Version 4.0 for Matlab 7.3*, Numer. Algo., 46 (2007), pp. 189–194.

- 52 P. C. Hansen and S. H. Jensen, *Subspace-based noise reduction for speech signals via diagonal and triangular matrix decompositions: survey and analysis*, EURASIP J. Advances in Signal Processing (2007).
Open access: www.hindawi.com/GetArticle.aspx?doi=10.1155/2007/92953.
- 53 M. E. Kilmer, P. C. Hansen, and M. I. Español, *A projection-based approach to general-form Tikhonov regularization*, SIAM J. Sci. Comput., 29 (2007), pp. 315–330.
- 54 T. K. Jensen and P. C. Hansen, *Iterative regularization with minimum-residual methods*, BIT, 47 (2007), pp. 103–120.
- 55 P. C. Hansen, T. K. Jensen, and G. Rodriguez, *An adaptive pruning algorithm for the discrete L-curve criterion*, J. Comp. Appl. Math., 198 (2007), pp. 483–492.
- 56 P. C. Hansen and T. K. Jensen, *Smoothing-norm preconditioning for regularizing minimum-residual methods*, SIAM J. Matrix Anal. Appl., 29 (2006), pp. 1–14.
- 57 P. C. Hansen, M. E. Kilmer, and R. H. Kjeldsen, *Exploiting residual information in the parameter choice for discrete ill-posed problems*, BIT, 46 (2006), pp. 41–59.
- 58 M. Fedi, P. C. Hansen, and V. Paoletti, *Tutorial: Analysis of depth resolution in potential-field inversion*, Geophysics, 70 (2005), pp. A1–A11.
- 59 L. Eldén, P. C. Hansen, and M. Rojas, *Minimization of linear functionals defined on solutions of large-scale discrete ill-posed problems*, BIT, 45 (2005), pp. 329–340.
- 60 P. C. Hansen and S. H. Jensen, *Prewhitening for rank-deficient noise in subspace methods for noise reduction*, IEEE Trans. Signal Proc., 53 (2005), pp. 3718–3726.
- 61 R. D. Fierro and P. C. Hansen, *UTV Expansion Pack: Special-purpose rank-revealing algorithms*, Numerical Algorithms, 40 (2005), pp. 47–66.
- 62 M. Jacobsen, P. C. Hansen, and M. A. Saunders, *Subspace preconditioned LSQR for discrete ill-posed problems*, BIT, 43 (2003), pp. 975–989.
- 63 A. Schuhmacher, J. Hald, K. B. Rasmussen and P. C. Hansen, *Sound source reconstruction using inverse boundary element calculations*, J. Acoust. Soc. Am., 113 (2003), pp. 114–127.
- 64 R. D. Fierro and P. C. Hansen, *Truncated VSV solutions to symmetric rank-deficient problems*, BIT, 42 (2002), pp. 531–540.
- 65 D. Calvetti, P. C. Hansen, and L. Reichel, *L-curve curvature bounds via Lanczos bidiagonalization*, Electronic Transactions on Numerical Analysis, 14 (2002), pp. 134–149 (open access).
- 66 P. C. Hansen, *Deconvolution and regularization with Toeplitz matrices*, Numerical Algorithms, 29 (2002), pp. 323–378.
- 67 P. C. Hansen and P. Yalamov, *Computing symmetric rank-revealing decompositions via triangular factorization*, SIAM J. Matrix Anal. Appl., 23 (2001), pp. 443–458.
- 68 P. C. Hansen and P. Yalamov, *Stabilization by perturbation of a $4n^2$ Toeplitz solver*, SIAM J. Matrix Anal. Appl., 21 (2000), pp. 849–867.
- 69 G. H. Golub, P. C. Hansen, and D. P. O’Leary, *Tikhonov regularization and total least squares*, SIAM J. Matrix Anal. Appl., 21 (2000), pp. 185–194.
- 70 P. C. Hansen, *Regularization Tools Version 3.0 for Matlab 5.2*, Numer. Algo., 20 (1999), pp. 195–196.
- 71 R. D. Fierro, P. C. Hansen, and P. S. K. Hansen, *UTV Tools: Matlab templates for rank-revealing UTV decompositions*, Numer. Algo., 20 (1999), pp. 165–194.

- 72 T. Ostromsky, P. C. Hansen, and Z. Zlatev, *A coarse-grained parallel QR-factorization algorithm for sparse least squares problems*, *Parallel Computing*, 24 (1998), pp. 937–964.
- 73 P. C. Hansen and S. H. Jensen, *FIR filter representations of reduced-rank noise reduction*, *IEEE Trans. Signal Proc.*, 46 (1998), pp. 1737–1741.
- 74 P. C. Hansen, *Rank-deficient prewhitening with quotient SVD and ULV decompositions*, *BIT*, 38 (1998), pp. 34–43.
- 75 P. C. Hansen, T. Ostromsky, A. Sameh, and Z. Zlatev, *Solving sparse linear least squares problems on some supercomputers by using large dense blocks*, *BIT*, 37 (1997), pp. 535–558.
- 76 R. D. Fierro, G. H. Golub, P. C. Hansen, and D. P. O’Leary, *Regularization by truncated total least squares*, *SIAM J. Sci. Comput.*, 18 (1997), pp. 1223–1241.
- 77 R. D. Fierro and P. C. Hansen, *Low-rank revealing UTV decompositions*, *Numerical Algorithms*, 15 (1997), pp. 37–55.
- 78 R. M. Larsen and P. C. Hansen, *Efficient implementation of the SOLA mollifier method*, *Astron. Astrophys. Suppl. Ser.*, 121 (1997), pp. 587–598.
- 79 P. C. Hansen and K. Mosegaard, *Piecewise polynomial solutions without a priori break points*, *Num. Lin. Alg. Appl.*, 3 (1996), pp. 513–524.
- 80 S. H. Jensen, P. C. Hansen, S. D. Hansen, and J. Aa. Sørensen, *Reduction of broad-band noise in speech by truncated QSVD*, *IEEE Trans. Audio Speech Proc.*, 3 (1995), pp. 439–448.
- 81 A. C. N. van Duin, P. C. Hansen, Tz. Ostromsky, H. A. G. Wijshoff, and Z. Zlatev, *Improving the numerical stability and the performance of a parallel sparse solver*, *Computers Math. Applic.*, 30 (1995), pp. 81–96.
- 82 R. D. Fierro and P. C. Hansen, *Accuracy of TSVD solutions computed from rank-revealing decompositions*, *Numer. Math.*, 70 (1995), pp. 453–471.
- 83 P. C. Hansen, *Test matrices for regularization methods*, *SIAM J. Sci. Comput.*, 16 (1995), pp. 506–512.
- 84 C. Bendtsen, P. C. Hansen, K. Madsen, H. B. Nielsen, and M. Pinar, *Implementation of QR up- and downdating on a massively parallel computer*, *Parallel Computing*, 21 (1995), pp. 49–61.
- 85 K. Gallivan, P. C. Hansen, Tz. Ostromsky, and Z. Zlatev, *A locally optimized reordering algorithm and its application to a parallel sparse linear system solver*, *Computing*, 54 (1995), pp. 39–67.
- 86 S. Christiansen and P. C. Hansen, *The effective condition number applied to error analysis of certain boundary collocation methods*, *J. Comput. Appl. Math.*, 54 (1994), pp. 15–36.
- 87 F. Lorenzelli, P. C. Hansen, T. F. Chan, and K. Yao, *A systolic implementation of the Chan/Foster RRQR algorithm*, *IEEE Trans. Signal Processing*, 42 (1994), pp. 2205–2208.
- 88 P. C. Hansen, *The Backus-Gilbert method: SVD analysis and fast implementation*, *Inverse Problems*, 10 (1994), pp. 895–904.
- 89 T. F. Chan and P. C. Hansen, *Low-rank revealing QR factorizations*, *Numerical Linear Algebra with Applications*, 1 (1994), pp. 33–44.
- 90 P. C. Hansen, *Regularization Tools: A Matlab package for analysis and solution of discrete ill-posed problems*, *Numerical Algorithms*, 6 (1994), pp. 1–35.
- 91 H. Gesmar and P. C. Hansen, *“Fast” linear prediction (FLP) and its application to NMR spectroscopy*, *J. Magnetic Resonance, Series A*, 106 (1994), pp. 236–240.

- 92 P. C. Hansen and D. P. O’Leary, *The use of the L-curve in the regularization of discrete ill-posed problems*, SIAM J. Sci. Comput., 14 (1993), pp. 1487–1503.
- 93 M. Hanke and P. C. Hansen, *Regularization methods for large-scale problems*, Surv. Math. Ind., 3 (1993), pp. 253–315.
- 94 J. Christensen-Dalsgaard, P. C. Hansen, and M. J. Thompson, *GSVD analysis of helioseismic inversions*, Mon. Not. R. Astr. Soc., 264 (1993), pp. 541–654.
- 95 P. C. Hansen and H. Gesmar, *Fast orthogonal decomposition of ill-conditioned Toeplitz matrices*, Numerical Algorithms, 4 (1993), pp. 151–166.
- 96 P. C. Hansen, *Numerical tools for analysis and solution of Fredholm integral equations of the first kind*, Inverse Problems, 8 (1992), pp. 849–872.
- 97 P. C. Hansen, *Analysis of discrete ill-posed problems by means of the L-curve*, SIAM Review, 34 (1992), pp. 561–580.
- 98 P. C. Hansen and T. F. Chan, *Algorithm 729. Fortran subroutines for general Toeplitz systems*, ACM Trans. Math. Software, 18 (1992), pp. 256–273 + 20 (1994), p. 160 (corrigendum).
- 99 P. C. Hansen, T. Sekii and H. Shibahashi, *The modified truncated-SVD method for regularization in general form*, SIAM J. Sci. Stat. Comput., 13 (1992), pp. 1142–1150.
- 100 C. H. Bischof and P. C. Hansen, *A block algorithm for computing rank-revealing QR-factorizations*, Numerical Algorithms, 2 (1992), pp. 371–392.
- 101 T. F. Chan and P. C. Hansen, *A look-ahead Levinson algorithm for general Toeplitz systems*, IEEE Trans. Signal Processing, SP-40 (1992), pp. 1079–1090.
- 102 E. Høg, U. Bastian, P. C. Hansen, F. van Leeuwen, L. Lindegren, H. Pedersen, A. B. Saust, P. Schwekendiek, K. Wagner, *Tycho astrometry calibration*, Astronomy and Astrophysics, 258 (1992), pp. 201–205.
- 103 J. L. Halbwachs, E. Høg, U. Bastian, P. C. Hansen, P. Schwekendiek, *Tycho star recognition*, Astronomy and Astrophysics, 258 (1992), pp. 193–200.
- 104 T. F. Chan and P. C. Hansen, *Some applications of the rank revealing QR factorization*, SIAM J. Sci. Stat. Comput., 13 (1992), pp. 727–741.
- 105 T. F. Chan and P. C. Hansen, *A look-ahead Levinson algorithm for indefinite Toeplitz systems*, SIAM J. Matrix Anal. Appl., 13 (1992), pp. 490–506 + 14 (1993), p. 1191 (erratum).
- 106 C. H. Bischof and P. C. Hansen, *Structure preserving and rank-revealing QR-factorizations*, SIAM J. Sci. Stat. Comput., 12 (1991), pp. 1332–1350.
- 107 P. C. Hansen, *The discrete Picard condition for discrete ill-posed problems*, BIT, 30 (1990), pp. 658–672.
- 108 H. Zha and P. C. Hansen, *Regularization and the general Gauss-Markov linear model*, Math. Comp., 55 (1990), pp. 613–624.
- 109 P. C. Hansen, *Relations between SVD and GSVD of discrete regularization problems in standard and general form*, Lin. Alg. Appl., 141 (1990), pp. 165–176.
- 110 T. F. Chan and P. C. Hansen, *Computing truncated SVD least squares solutions by rank revealing QR-factorizations*, SIAM J. Sci. Stat. Comput., 11 (1990), pp. 519–530.
- 111 P. C. Hansen, *Truncated singular value decomposition solutions to discrete ill-posed problems with ill-determined numerical rank*, SIAM J. Sci. Stat. Comput., 11 (1990), pp. 503–518.

- 112 P. C. Hansen, *Perturbation bounds for discrete Tikhonov regularization*, Inverse Problems, 5 (1989), pp. L41–L44.
- 113 P. C. Hansen, *Regularization, GSVD and truncated GSVD*, BIT, 29 (1989), pp. 491–504.
- 114 P. C. Hansen, *Computation of the singular value expansion*, Computing, 40 (1988), pp. 185–199.
- 115 P. C. Hansen, *The 2-norm of random matrices*, J. Comput. Appl. Math., 23 (1988), pp. 117–120.
- 116 P. C. Hansen, *The truncated SVD as a method for regularization*, BIT, 27 (1987), pp. 534–553.
- 117 P. C. Hansen, *Detection of near-singularity in Cholesky and LDL^T factorizations*, J. Comput. Appl. Math., 19 (1987) pp. 293–299.
- 118 P. C. Hansen and S. Christiansen, *An SVD analysis of linear algebraic equations derived from first kind integral equations*, J. Comput. Appl. Math., 12-13 (1985), pp. 341–357.
- 119 P. C. Hansen and F. H. Larsen, *Suppression of reflections by directive probes in spherical near-field measurements*, IEEE Trans. Antennas Propagat., AP-32 (1985), pp. 119–125.

Doctoral Dissertation

- P. C. Hansen, *Rank-Deficient and Discrete Ill-Posed Problems*, Doctoral Dissertation, Polyteknisk Forlag, 1996 (150 pages). Defended at the Technical University of Denmark May 13, 1996. A revised version is published by SIAM, Philadelphia.

Software Packages

- S.1 IR TOOLS. A Matlab package of iterative regularization methods and test problems for large-scale linear inverse problems. The software is submitted to Numerical Algorithms (see ref. 12 above) and will be available from Netlib. It can be viewed as a state-of-the-art version of REGULARIZATION TOOLS, and the new 2D test problems complement the outdated 1D problems from that package.
- S.2 AIR TOOLS II. A Matlab package of algebraic iterative reconstruction methods. The software is published in Numerical Algorithms (see ref. 19 above) and is available from Netlib in the directory `numeralgo/na47`. It is an improved and expanded version of the code published in J. Comp. Appl. Math. (see ref. 40 above).
- S.3 TVREG. Software for Total Variation Regularization. The accompanying paper is published in BIT (see ref. 38 above), and the software is available from `www.imm.dtu.dk/~pch/TVReg`.
- S.4 MXTV. Software for total variation image reconstruction via first-order methods. The software is published in Numerical Algorithms (see ref. 43 above) and is available from Netlib in the directory `numeralgo/na28`.
- S.5 REGULARIZATION TOOLS, VERSION 4.0. A Matlab Package for Analysis and Solution of Discrete Ill-Posed Problems, Version 4.0 for Matlab 7.3, Informatics and Mathematical Modelling, Technical Univ. of Denmark, September 2007 (126 pages). The software is published in Numerical Algorithms (see refs. 51 and 90 above) and is available from Netlib in the directory `numeralgo/na4`.
- S.6 UTV EXPANSION PACK. R. D. Fierro and P. C. Hansen, *UTV Expansion Pack: Special-purpose rank-revealing algorithms*, Version 1.0 for Matlab 7.0, Report IMM-TR-2004-6, Informatics and Mathematical Modelling, Technical Univ. of Denmark, April 2004 (68 pages). The software is published in Numerical Algorithms (see ref. 61 above) and is available from Netlib in the directory `numeralgo/na22`.

S.7 UTV TOOLS R. D. Fierro, P. C. Hansen and P. S. K. Hansen, *UTV Tools. Matlab Templates for Rank-Revealing UTV Decompositions*, Version 1.1 for Matlab 7.0, Report IMM-REP-99-2, Informatics and Mathematical Modelling, Technical Univ. of Denmark, January 1999 (97 pages). The software is published in Numerical Algorithms (see ref. 71 above) and is available from Netlib in the directory `numeralgo/na16`.

Publications in Conference Proceedings etc.

- P.1 E. Y. Sidky, P. C. Hansen, J. S. Jørgensen, and X. Pan, *Iterative image reconstruction for CT with unmatched projection matrices using the generalized minimal residual algorithm*, Proc. SPIE 12304, 7th International Conference on Image Formation in X-Ray Computed Tomography, 1230406, SPIE (2022); doi: 10.1117/12.2646511.
- P.2 P. C. Hansen, J. S. Jørgensen, and P. W. Rasmussen, *Stopping rules for algebraic iterative reconstruction methods in computed tomography*; in 21st International Conference on Computational Science and Its Applications (ICCSA), IEEE, 2021, pp. 60–70; doi 10.1109/ICCSA54496.2021.00019.
- P.3 H. M. Kjer, Y. Dong, and P. C. Hansen, *User-friendly simultaneous tomographic reconstruction and segmentation with class priors*; in *Scale Space and Variational Methods in Computer Vision – 6th International Conference, SSVM 2017, Proceedings*, F. Lauze, Y. Dong, and A. B. Dahl (Eds.), Springer, 2017.
- P.4 I. G. Kazantsev, U. L. Olsen, H. F. Poulsen, and P. C. Hansen, *A spectral geometrical model for Compton scatter tomography based on the SSS approximation*, Proc. 4th International Conference on Image Formation in X-Ray Computed Tomography, July 18–22, Bamberg, Germany, pp. 577–580.
- P.5 O. Borries, H.-H. Viskum, P. Meincke, E. Jørgensen, P. C. Hansen, and C. H. Schmidt, *Analysis of electrically large antennas using fast physical optics*, Proc. 9th European Conference on Antennas and Propagation (EuCAP 2015), IEEE, pp. 1–5.
- P.6 O. Borries, P. C. Hansen, S. B. Sørensen, P. Meincke, and E. Jørgensen, *Gaussian translation operator for multi-level fast multipole method*, Proc. 2014 IEEE Antennas and Propagation Society International Symposium, Memphis, TN, 2014; pp. 254–258.
- P.7 O. Borries, H. H. B. Sørensen, B. Dammann, E. Jørgensen, P. Meincke, S. B. Sørensen, and P. C. Hansen, *Reflector antenna analysis using physical optics on graphics processing units*, Proc. EuCAP 2014, The 8th European Conference on Antennas and Propagation, The Hague, The Netherlands, 2014. pp. 351–355.
- P.8 O. Borries, P. Meincke, E. Jørgensen, S. B. Sørensen, and P. C. Hansen, *Improved multilevel fast multipole method for higher-order discretizations* Proc. EuCAP 2014, The 8th European Conference on Antennas and Propagation, The Hague, The Netherlands, 2014. pp. 3610–3614.
- P.9 P. C. Hansen and J. H. Jørgensen, *Total variation and tomographic imaging from projections*, Thirty-sixth Conference of the Dutch-Flemish Numerical Analysis Communities, Woudschouten, Zeist, The Netherlands, October 2011.
- P.10 P. C. Hansen, *Image deblurring with Krylov subspace methods*, Thirty-sixth Conference of the Dutch-Flemish Numerical Analysis Communities, Woudschouten, Zeist, The Netherlands, October 2011.
- P.11 J. H. Jørgensen, T. L. Jensen, P. C. Hansen, S. H. Jensen, E. Y. Sidky, and X. Pan, *Accelerated gradient methods for total-variation-based CT image reconstruction*; in proceedings of 11th Fully 3D Meeting, Potsdam, Germany, July 2011.
- P.12 J. H. Jørgensen, P. C. Hansen, E. Y. Sidky, I. S. Reiser, and X. Pan, *Toward optimal X-ray flux utilization in breast CT*; in proceedings of 11th Fully 3D Meeting, Potsdam, Germany, July 2011.

- P.13 F. Delbary, P. C. Hansen, and K. Knudsen, *A direct numerical reconstruction algorithm for the 3D Calderón problem*, International Conference on Inverse Problems, 2010, Hong Kong; Journal of Physics: Conference Series, 290 (2011), 012003.
- P.14 J. Gomes and P. C. Hansen, *A study on regularization parameter choice in near-field acoustical holography*; in *Acoustics'08, Paris, 2008*.
- P.15 P. C. Hansen and M. E. Kilmer, *A parameter-choice method that exploits residual information*; in Proc. Appl. Math. Mech., 7 (2007), pp. 1021705–1021706 (2007). DOI 10.1002/pamm.200700264.
- P.16 J. Dahl, S. H. Jensen, and P. C. Hansen, *A convex programming approach to anisotropic smoothing*; in *IEEE International Conference on Image Processing (ICIP), San Antonio, TX, USA, 2007*, pp. II-101–II-104.
- P.17 P. C. Hansen and T. K. Jensen, *Large-scale methods in image deblurring*; keynote chapter in B. Kågström, E. Elmroth, J. Dongarra, and J. Waśniewski (Eds.), *Applied Parallel Computing. State of the Art in Scientific Computing*, LNCS 4699, Springer, 2007; pp. 24–35.
- P.18 R. D. Fierro and P. C. Hansen, *Recent developments in rank revealing and Lanczos methods for TLS-related problems*; in S. van Huffel and P. Lemmerling (Eds.), *Total Least Squares and Errors-in-Variables Modeling. Analysis, Algorithms and Applications*, Kluwer Academic Publishers, Dordrecht, 2002; pp. 47–56.
- P.19 P. C. Hansen and P. Yalamov, *Rank-revealing decompositions of symmetric Toeplitz matrices*; in V. Olshevsky (Ed.), *Structured Matrices in Mathematics, Computer Science, and Engineering II*, Contemporary Mathematics, Vol. 281, American Mathematical Society, 2001; pp. 163–171.
- P.20 A. P. Schuhmacher and P. C. Hansen, *Sound source reconstruction using inverse BEM*; in R. Boone (Ed.), *InterNoise 2001, The Hague, Holland, 2001*; pp. 2109–2112.
- P.21 J. K. Reid, J. M. Rasmussen, and P. C. Hansen, *The LINPACK benchmark in Co-Array Fortran*; in B. J. Jesson (Ed.), *Proc. 6th European SGI/Cray MPP Workshop*, September 2000, Manchester, UK.
- P.22 P. C. Hansen, M. Jacobsen, J. M. Rasmussen, and H. Sørensen, *The PP-TSVD algorithm for image reconstruction problems*; in P. C. Hansen, B. H. Jacobsen and K. Mosegaard (Eds.), *Methods and Applications of Inversion*, Lecture Notes in Earth Science, Vol. 92, Springer, Berlin, 2000; pp. 171–186.
- P.23 P. S. K. Hansen, P. C. Hansen, S. D. Hansen, and J. Aa. Sørensen, *Experimental comparison of signal subspace based noise reduction methods*; in *Proceedings of IEEE ICASSP-99*, Phoenix, Arizona, vol. 1 (1999); pp. 101-104.
- P.24 A.-C. Berglund and P. C. Hansen, *Constrained linear regularization*; in B. H. Jacobsen (Ed.), *Proceedings of the Interdisciplinary Inversion Workshop 6, Aarhus, 1999*, Dept. of Earth Sciences, Aarhus University (1999); pp. 46–53.
- P.25 P. S. K. Hansen, P. C. Hansen, S. D. Hansen, and J. Aa. Sørensen, *On speech enhancement algorithms based on signal subspaces*; in *IEEE Nordic Signal Processing Symposium, NORSIG-98*, Aalborg, Denmark (1998); pp. 221-224.
- P.26 G. H. Golub, P. C. Hansen and D. P. O’Leary, *Return of the TLS Regularization*; in B. H. Jacobsen (Ed.), *Proceedings of the Interdisciplinary Inversion Workshop 5, Aarhus, 1997*, Dept. of Earth Sciences, Aarhus University (1997); pp. 112–122.
- P.27 P. S. K. Hansen, P. C. Hansen, S. D. Hansen and J. Aa. Sørensen, *ULV-based signal subspace method for speech enhancement*, International Workshop on Acoustic Echo and Noise Control, Imperial College London, 1997; pp. 9–12.

- P.28 P. C. Hansen and D. P. O’Leary, *Regularization algorithms based on total least squares*; in S. Van Huffel (Ed.), *Recent Advances in Total Least Squares Techniques and Errors-in-Variables Modeling*, SIAM, Philadelphia, 1996; pp. 127–137.
- P.29 P. S. K. Hansen, P. C. Hansen, S. D. Hansen and J. Aa. Sørensen, *Noise reduction of speech signals using the rank-revealing ULLV decomposition*; in G. Ramponi, G. L. Sicuranza, S. Carrato and S. Marsi (Eds.), *Signal Processing VIII: Theories and Applications*, EUSIPCO, Trieste, Italy, 1996; pp. 967–970.
- P.30 S. H. Jensen and P. C. Hansen, *Reduced-rank noise reduction: a filter-bank interpretation*; in G. Ramponi, G. L. Sicuranza, S. Carrato and S. Marsi (Eds.), *Signal Processing VIII: Theories and Applications*, EUSIPCO, Trieste, Italy, 1996; pp. 479–482.
- P.31 J. Brown, P. C. Hansen, J. Waśniewski and Z. Zlatev, *Performance of air pollution models on massively parallel computers*, *Control and Cybernetics*, 25 (1996), 1113–1130.
- P.32 P. C. Hansen and S. H. Jensen, *Filter model of reduced-rank noise reduction*; in J. Waśniewski, J. Dongarra, K. Madsen and D. Olesen (Eds.), *Applied Parallel Computing*, Lecture Notes in Computer Science 1184, Springer, Berlin, 1996; pp. 379–387.
- P.33 P. C. Hansen (Ed.), *Proceedings of the Interdisciplinary Inversion Workshop 4, Lyngby 1996*, Dept. of Mathematical Modelling, Technical Univ. of Denmark, 1996 (120 pages).
- P.34 P. C. Hansen and K. Mosegaard, *Piecewise polynomial solutions to linear inverse problems*; in B. H. Jacobsen, K. Mosegaard and P. Sibani (Eds.), *Inverse Methods*, Lecture Notes in Earth Science 63, Springer, Berlin, 1996; pp. 284–294.
- P.35 Tz. Ostromsky, P. C. Hansen and Z. Zlatev, *A parallel sparse QR-factorization algorithm*; in J. Dongarra, K. Madsen and J. Waśniewski (Eds.), *Applied Parallel Computing*, Proceedings, Lecture Notes in Computer Science 1041, Springer, Berlin, 1996; pp. 462–472.
- P.36 J. Brown, P. C. Hansen, J. Waśniewski and Z. Zlatev, *Comparing the performance of SIMD computers by running large air pollution models*, *Supercomputer*, 64 (1996), pp. 21–35.
- P.37 J. Brown, P. C. Hansen, P. Kaae, C. Keable, W. Owczarz, J. Waśniewski and Z. Zlatev, *Comparison of parallel computers using air pollution models*; in D. H. Bailey et al., *Proceedings of the Seventh SIAM Conference on Parallel Processing for Scientific Computing*, SIAM, Philadelphia, 1995; pp. 113–118.
- P.38 S. H. Jensen, P. C. Hansen, S. D. Hansen and J. Aa. Sørensen, *Reduction of general broad-band noise in speech by truncated QSVD: implementation aspects*; in M. Moonen and B. De Moor (Eds.), *SVD and Signal Processing III—Algorithms, Architectures and Applications*, Elsevier, Amsterdam, 1995; pp. 459–466.
- P.39 R. D. Fierro and P. C. Hansen, *L-ULV(A): A low-rank revealing ULV algorithm*; in M. Moonen and B. De Moor (Eds.), *SVD and Signal Processing III—Algorithms, Architectures and Applications*, Elsevier, Amsterdam, 1995; pp. 183–190.
- P.40 P. C. Hansen and M. Hanke, *A Lanczos algorithm for computing the largest quotient singular values in regularization problems*; in M. Moonen and B. De Moor (Eds.), *SVD and Signal Processing III—Algorithms, Architectures and Applications*, Elsevier, Amsterdam, 1995; pp. 131–138.
- P.41 S. H. Jensen, P. C. Hansen, S. D. Hansen and J. Aa. Sørensen, *A signal subspace approach for noise reduction of speech signals*; in M. J. J. Holt, C. F. N. Cowan, P. M. Grant and W. A. Sandham (Eds.), *Signal Processing VII: Theories and Applications*, EURASIP, Lausanne, Switzerland, 1994; pp. 1174–1177.
- P.42 P. C. Hansen, Tz. Ostromsky and Z. Zlatev, *Two enhancements in a partitioned sparse solver*; in J. J. Dongarra and J. Waśniewski (Eds.), *Parallel Scientific Computing*, Proceedings, Lecture Notes in Mathematics 879, Springer, Berlin, 1994; pp. 296–303.

- P.43 J. Brown, P. C. Hansen, J. Waśniewski and Z. Zlatev, *Comparison of massively parallel SIMD computers using air pollution models*; in J. J. Dongarra and J. Waśniewski (Eds.), *Parallel Scientific Computing*, Proceedings, Lecture Notes in Mathematics 879, Springer, Berlin, 1994; pp. 110–126.
- P.44 P. C. Hansen, *Parallel issues of regularization problems*; in J. J. Dongarra and J. Waśniewski (Eds.), *Parallel Scientific Computing*, Proceedings, Lecture Notes in Mathematics 879, Springer, Berlin, 1994; pp. 287–295.
- P.45 R. D. Fierro, G. H. Golub, P. C. Hansen and D. P. O’Leary, *Regularization by truncated total least squares*; in J. G. Lewis (Ed.), *Proceedings of Fifth SIAM Conference on Applied Linear Algebra*, SIAM, Philadelphia, 1994; pp. 250–253. Also in P. Sibani (Ed.), *Proceedings of the Interdisciplinary Inversion Workshop 3, Odense 1994*, Fysisk Institut, Odense University (1994), pp. 85–90.
- P.46 C. Bendtsen, J. B. Hansen, P. C. Hansen, J. N. Sørensen, J. Waśniewski and Z. Zlatev, *Experience with the KSR-1 parallel computer*, Supercomputer, 58 (1994), pp. 34–43.
- P.47 P. C. Hansen, *Experience with regularizing CG iterations*; in M. Natori and T. Nodera (Eds.), *Matrix Analysis and Parallel Computing*, Keio University, 1994; pp. 48–59.
- P.48 S. M. Balle and P. C. Hansen, *A Strassen-type matrix inversion algorithm*; in I. Dimov and O. Tonev (Eds.), *Advances in Parallel Algorithms*, IOS Press, Amsterdam, 1994; pp. 22–30.
- P.49 Tz. Ostromsky, Z. Zlatev, P. C. Hansen and K. Gallivan, *Reordering of sparse matrices and application to a parallel sparse linear system solver*; in S. Markov (Ed.), *Scientific Computation and Mathematical Modelling*, DATECS Publishing, Sofia, 1993; pp. 85–89.
- P.50 P. C. Hansen, *Regularization algorithms for MPP*; in K. Mosegaard (Ed.), *Proceedings of the Interdisciplinary Inversion Workshop 2, Copenhagen, 1993*, Report, The Niels Bohr Institute for Astronomy, Physics and Geophysics, University of Copenhagen (1993), pp. 65–70.
- P.51 F. Lorenzelli, K. Yao, T. F. Chan and P. C. Hansen, *Systolic rank revealing QR algorithm*; in J. Fortes, E. Lee and T. Meng (Eds.), *Proc. Internat. Conf. on Application Specific Array Processors, Berkeley, 1992*, IEEE Computer Society Press (1992), pp. 430–444.
- P.52 J. Moth and P. C. Hansen, *Short-distance communication on the CM-200*, Supercomputer, 51 (1992), pp. 38–43.
- P.53 P. C. Hansen, *Iterative numerical regularization methods*; in B. H. Jacobsen (Ed.), *Proceedings of the Interdisciplinary Inversion Workshop 1, Aarhus, 1992*, GeoSkifter, 41 (1992), pp. 111–116.
- P.54 P. C. Hansen, *Numerical treatment of Fredholm integral equations of the first kind* (in Danish), *Normat*, 3 (1991), pp. 125–135.
- P.55 E. Høg, P. C. Hansen and L. Lindegren, *Tycho astrometry*; in *The Hipparcos Mission, Vol. III The Data Reductions*, ESA SP-1111, Noordwijk, 1989; pp. 195–204.
- P.56 P. C. Hansen, *Solution of ill-posed problems by means of truncated SVD*; in R. P. Agarwal, Y. M. Chow and S. J. Wilson, *Numerical Mathematics, Singapore 1988*, ISNM 86, Birkhäuser, Basel, 1988; pp. 179–192.
- P.57 P. C. Hansen, *Reducing the number of sweeps in Hestenes’ method*; in E. F. Deprettere (Ed.), *SVD and Signal Processing—Algorithms, Applications and Architectures*, North-Holland, Amsterdam, 1988; pp. 357–368.
- P.58 P. C. Hansen and H. B. Nielsen, *Singular value decomposition of images*; in P. Johansen and P. W. Becker (Eds.), *Proceedings of the Third Scandinavian Conference on Image Processing, Copenhagen, July 1983*, Chartwell-Bratt, Bromley, 1983; pp. 301–307.