Stanford

Lexing Ying

Professor of Mathematics

Curriculum Vitae available Online

Bio

ACADEMIC APPOINTMENTS

- Professor, Mathematics
- Member, Institute for Computational and Mathematical Engineering (ICME)

Teaching

COURSES

2023-24

- Computational Methods of Applied Mathematics: CME 306, MATH 220B (Win)
- Introduction to Scientific Computing: CME 108 (Aut)
- Topics in Applied Math II: MATH 275B (Win)

2022-23

- Linear Algebra, Multivariable Calculus, and Modern Applications: MATH 51 (Win)
- Numerical Solution of Partial Differential Equations: CME 306, MATH 226 (Spr)

2021-22

- Basic Probability and Stochastic Processes with Engineering Applications: CME 298, MATH 158 (Spr)
- Numerical Solution of Partial Differential Equations: CME 306, MATH 226 (Spr)
- Topics in Applied Math I: MATH 275A (Aut)

2020-21

- Applied Matrix Theory: MATH 104 (Aut)
- Basic Probability and Stochastic Processes with Engineering Applications: CME 298, MATH 158 (Spr)
- Numerical Solution of Partial Differential Equations: CME 306, MATH 226 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Daniel Paul Kunin, Rahul Sarkar

Doctoral Dissertation Advisor (AC)

Rajat Dwaraknath, Yinuo Ren, Xun Tang

Doctoral Dissertation Co-Advisor (AC)

Ya-Chi Chu, Milo Marsden

Publications

PUBLICATIONS

- **Meta-learning pseudo-differential operators with deep neural networks** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Feliu-Faba, J., Fan, Y., Ying, L.
  2020; 408

- **Solving electrical impedance tomography with deep learning** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Fan, Y., Ying, L.
  2020; 404

- **Hessian transport gradient flows** *RESEARCH IN THE MATHEMATICAL SCIENCES*
  Li, W., Ying, L.
  2019; 6 (4)

- **BCR-Net: A neural network based on the nonstandard wavelet form** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Fan, Y., Bohorquez, C., Ying, L.
  2019; 384: 1–15

- **A multiscale neural network based on hierarchical nested bases** *RESEARCH IN THE MATHEMATICAL SCIENCES*
  Fan, Y., Feliu-Faba, J., Lin, L., Ying, L., Zepeda-Nunez, L.
  2019; 6 (2)

- **Simple, direct and efficient multi-way spectral clustering** *INFORMATION AND INFERENCE-A JOURNAL OF THE IMA*
  Damle, A., Minden, V., Ying, L.
  2019; 8 (1): 181–203

- **Fast algorithms for integral formulations of steady-state radiative transfer equation** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Fan, Y., An, J., Ying, L.
  2019; 380: 191–211

- **Sparsifying preconditioner for the time-harmonic Maxwell's equations** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Liu, F., Ying, L.
  2019; 376: 913–23

- **CONVEX RELAXATION APPROACHES FOR STRICTLY CORRELATED DENSITY FUNCTIONAL THEORY** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*
  Khoo, Y., Ying, L.
  2019; 41 (4): B773–B795

- **Numerical methods for Kohn-Sham density functional theory** *ACTA NUMERICA*
  Lin, L., Lu, J., Ying, L.
  2019; 28: 405–539

- **SWITCHNET: A NEURAL NETWORK MODEL FOR FORWARD AND INVERSE SCATTERING PROBLEMS** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*
  Khoo, Y., Ying, L.
  2019; 41 (5): A3182–A3201

- **SPARSIFY AND SWEEP: AN EFFICIENT PRECONDITIONER FOR THE LIPPMANN- SCHWINGER EQUATION** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*
  Liu, F., Ying, L.
  2018; 40 (2): B379–B404

- **AN ENTROPIC FOURIER METHOD FOR THE BOLTZMANN EQUATION** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*
  Cai, Z., Fan, Y., Ying, L.
  2018; 40 (5): A2858–A2882

- **SCDM-k: Localized orbitals for solids via selected columns of the density matrix** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Damle, A., Lin, L., Ying, L.
  2017; 334: 1-15
- **ADAPTIVELY COMPRESSED POLARIZABILITY OPERATOR FOR ACCELERATING LARGE SCALE AB INITIO PHONON CALCULATIONS** *MULTISCALE MODELING & SIMULATION*
  Lin, L., Xu, Z., Ying, L.
  2017; 15 (1): 29-55
- **COMPUTING LOCALIZED REPRESENTATIONS OF THE KOHN-SHAM SUBSPACE VIA RANDOMIZATION AND REFINEMENT** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*
  Damle, A., Lin, L., Ying, L.
  2017; 39 (6): B1178–B1198
- **TENSOR NETWORK SKELETONIZATION** *MULTISCALE MODELING & SIMULATION*
  Ying, L.
  2017; 15 (4): 1423–47
- **Hierarchical Interpolative Factorization for Elliptic Operators: Differential Equations** *COMMUNICATIONS ON PURE AND APPLIED MATHEMATICS*
  Ho, K. L., Ying, L.
  2016; 69 (8): 1415-1451
- **Hierarchical Interpolative Factorization for Elliptic Operators: Integral Equations** *COMMUNICATIONS ON PURE AND APPLIED MATHEMATICS*
  Ho, K. L., Ying, L.
  2016; 69 (7): 1314-1353
- **Sparsifying preconditioner for soliton calculations** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Lu, J., Ying, L.
  2016; 315: 458-466
- **RECURSIVE SWEEPING PRECONDITIONER FOR THE THREE-DIMENSIONAL HELMHOLTZ EQUATION** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*
  Liu, F., Ying, L.
  2016; 38 (2): A814-A832
- **A TECHNIQUE FOR UPDATING HIERARCHICAL SKELETONIZATION-BASED FACTORIZATIONS OF INTEGRAL OPERATORS** *MULTISCALE MODELING & SIMULATION*
  Minden, V., Damle, A., Ho, K. L., Ying, L.
  2016; 14 (1): 42-64
- **ADDITIVE SWEEPING PRECONDITIONER FOR THE HELMHOLTZ EQUATION** *MULTISCALE MODELING & SIMULATION*
  Liu, F., Ying, L.
  2016; 14 (2): 799-822
- **Low-rank one-step wave extrapolation for reverse time migration** *GEOPHYSICS*
  Sun, J., Fomel, S., Ying, L.
  2016; 81 (1): S39-S54
- **Compression of the electron repulsion integral tensor in tensor hypercontraction format with cubic scaling cost** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Lu, J., Ying, L.
  2015; 302: 329-335
- **Quantitative Canvas Weave Analysis Using 2-D Synchrosqueezed Transforms Application of time-frequency analysis to art investigation** *IEEE SIGNAL PROCESSING MAGAZINE*
  Yang, H., Lu, J., Brown, W. P., Daubechies, I., Ying, L.
  2015; 32 (4): 55-63
- **Compressed Representation of Kohn-Sham Orbitals via Selected Columns of the Density Matrix.** *Journal of chemical theory and computation*
  Damle, A., Lin, L., Ying, L.

2015; 11 (4): 1463-9

- **Compressed Representation of Kohn-Sham Orbitals via Selected Columns of the Density Matrix** *JOURNAL OF CHEMICAL THEORY AND COMPUTATION*
  Damle, A., Lin, L., Ying, L.
  2015; 11 (4): 1463-1469
- **A fast algorithm for 3D azimuthally anisotropic velocity scan** *GEOPHYSICAL PROSPECTING*
  Hu, J., Fomel, S., Ying, L.
  2015; 63 (2): 368-377
- **A FAST ALGORITHM FOR THE ENERGY SPACE BOSON BOLTZMANN COLLISION OPERATOR** *MATHEMATICS OF COMPUTATION*
  Hu, J., Ying, L.
  2015; 84 (291): 271-288
- **DIRECTIONAL PRECONDITIONER FOR 2D HIGH FREQUENCY OBSTACLE SCATTERING** *MULTISCALE MODELING & SIMULATION*
  Ying, L.
  2015; 13 (3): 829-846
- **CRYSTAL IMAGE ANALYSIS USING 2D SYNCHROSQUEEZED TRANSFORMS** *MULTISCALE MODELING & SIMULATION*
  Yang, H., Lu, J., Ying, L.
  2015; 13 (4): 1542-1572
- **SPARSIFYING PRECONDITIONER FOR THE LIPPMANN-SCHWINGER EQUATION** *MULTISCALE MODELING & SIMULATION*
  Ying, L.
  2015; 13 (2): 644-660
- **BUTTERFLY FACTORIZATION** *MULTISCALE MODELING & SIMULATION*
  Li, Y., Yang, H., Martin, E. R., Ho, K. L., Ying, L.
  2015; 13 (2): 714-732
- **FAST DIRECTIONAL COMPUTATION OF HIGH FREQUENCY BOUNDARY INTEGRALS VIA LOCAL FFTs** *MULTISCALE MODELING & SIMULATION*
  Ying, L.
  2015; 13 (1): 423-439
- **SPARSIFYING PRECONDITIONER FOR PSEUDOSPECTRAL APPROXIMATIONS OF INDEFINITE SYSTEMS ON PERIODIC STRUCTURES** *MULTISCALE MODELING & SIMULATION*
  Ying, L.
  2015; 13 (2): 459-471
- **A MULTISCALE BUTTERFLY ALGORITHM FOR MULTIDIMENSIONAL FOURIER INTEGRAL OPERATORS** *MULTISCALE MODELING & SIMULATION*
  Li, Y., Yang, H., Ying, L.
  2015; 13 (2): 614-631
- **SWEEPING PRECONDITIONERS FOR ELASTIC WAVE PROPAGATION WITH SPECTRAL ELEMENT METHODS** *ESAIM-MATHEMATICAL MODELLING AND NUMERICAL ANALYSIS-MODELISATION MATHEMATIQUE ET ANALYSE NUMERIQUE*
  Tsuji, P., Poulson, J., Engquist, B., Ying, L.
  2014; 48 (2): 433-447
- **A fast nested dissection solver for Cartesian 3D elliptic problems using hierarchical matrices** *JOURNAL OF COMPUTATIONAL PHYSICS*
  Schmitz, P. G., Ying, L.
  2014; 258: 227-245
- **A PARALLEL BUTTERFLY ALGORITHM** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*
  Poulson, J., Demanet, L., Maxwell, N., Ying, L.
  2014; 36 (1): C49-C65
- **POLE EXPANSION FOR SOLVING A TYPE OF PARAMETRIZED LINEAR SYSTEMS IN ELECTRONIC STRUCTURE CALCULATIONS** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*

Damle, A., Lin, L., Ying, L.
2014; 36 (6): A2929-A2951

- **A PARALLEL DIRECTIONAL FAST MULTIPOLE METHOD** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*
  Benson, A. R., Poulson, J., Tran, K., Engquist, B., Ying, L.
  2014; 36 (4): C335-C352
- **SYNCHROSQUEEZED CURVELET TRANSFORM FOR TWO-DIMENSIONAL MODE DECOMPOSITION** *SIAM JOURNAL ON MATHEMATICAL ANALYSIS*
  Yang, H., Ying, L.
  2014; 46 (3): 2052-2083
- **A fast butterfly algorithm for generalized Radon transforms** *GEOPHYSICS*
  Hu, J., Fomel, S., Demanet, L., Ying, L.
  2013; 78 (4): T141-T151
- **Synchrosqueezed Wave Packet Transform for 2D Mode Decomposition** *SIAM JOURNAL ON IMAGING SCIENCES*
  Yang, H., Ying, L.
  2013; 6 (4): 1979-2009
- **Wave atoms and time upscaling of wave equations** *NUMERISCHE MATHEMATIK*
  Demanet, L., Ying, L.
  2009; 113 (1): 1-71
- **A FAST BUTTERFLY ALGORITHM FOR THE COMPUTATION OF FOURIER INTEGRAL OPERATORS** *MULTISCALE MODELING & SIMULATION*
  Candes, E., Demanet, L., Ying, L.
  2009; 7 (4): 1727-1750
- **Wave atoms and sparsity of oscillatory patterns** *APPLIED AND COMPUTATIONAL HARMONIC ANALYSIS*
  Demanet, L., Ying, L.
  2007; 23 (3): 368-387
- **Curvelets and wave atoms for mirror-extended images** *Conference on Wavelets XII*
  Demanet, L., Ying, L.
  SPIE-INT SOC OPTICAL ENGINEERING.2007
- **Fast computation of Fourier integral operators** *SIAM JOURNAL ON SCIENTIFIC COMPUTING*
  Candes, E., Demanet, L., Ying, L.
  2007; 29 (6): 2464-2493
- **Fast discrete curvelet transforms** *MULTISCALE MODELING & SIMULATION*
  Candes, E., Demanet, L., Donoho, D., Ying, L.
  2006; 5 (3): 861-899