

MYUNG-SIN SONG

Associate Professor
Department of Mathematics and Statistics,
Campus Box 1653,
Southern Illinois University Edwardsville,
Edwardsville, Illinois 62026, USA.

Phone: +1 (618) 650-2580
Fax: +1 (618) 650-3771
E-mail: msong@siue.edu
<http://www.siue.edu/~msong>

Country of Citizenship: Republic of Korea

US Permanent Resident

EDUCATION

- Ph.D. in Mathematics, at The University of Iowa, July 2005
Dissertation Title: “*Wavelet Image Compression*”
Dissertation Advisor: Professor Palle E.T. Jorgensen
- B.S. in Mathematics, minor in Computer Science with departmental honors
at University of Kentucky, May 1999

RESEARCH INTERESTS

Functional and harmonic analysis of wavelets, the application of wavelet transform on image processing, using computer programming language, and connection of the engineering of image processing, using wavelet transform and mathematics of it. Mathematics behind the entropy encoding in wavelet image compression and also frame application in it. Fractal analysis and its application in image processing. Fractional Brownian motion, Karhunen-Loeve transform (principal component analysis) and spectral theory. Lifting scheme, sampling theory and quantization. Sampling theory.

PUBLICATIONS

1. M.-S. Song, “*Wavelet Image Compression*” *Operator Theory, Operator Algebras, and Applications*, Contemp. Math., **414**: 41-73, AMS, Providence 2006.
2. P. E. T. Jorgensen and M.-S. Song, “*Entropy Encoding, Hilbert Space and Karhunen-Loeve Transforms*” *J. Math. Phys.*, **48** 103503, 2007.
3. P. E. T. Jorgensen and M.-S. Song, “*Comparison of Discrete and Continuous Wavelet Transforms*” *Springer Encyclopedia of Complexity and Systems Science*, Springer, 2008.
4. M.-S. Song, “*Entropy Encoding in Wavelet Image Compression*” *Representations, Wavelets and Frames A Celebration of the Mathematical Work of Lawrence Baggett* (Editors Palle E.T. Jorgensen, Kathy D. Merrill and Judith A. Packer), 293—311, Springer, 2007.
5. K. Kim, K. H. Leem, G. Pelekanos and M.-S. Song, “*Algebraic Multigrid Preconditioner for a Finite Element Method in TM Electromagnetic Scattering*” *Journal of Computational Analysis and Applications*, **11**, No 4:597-605, Eudoxus Press, 2009.
6. P. E. T. Jorgensen and M.-S. Song, “*Optimal Decompositions of Translations of L^2 - Functions*” *Complex Analysis and Operator Theory*, **3**, No 2: 449-478, Birkhauser, 2008.
7. P. E. T. Jorgensen and M.-S. Song, “*Analysis of Fractals, Image Compression, Entropy Encoding and Karhunen-Loeve Transforms*” *Acta Applicandae Mathematicae*, **108**, 5:498-508, Springer, 2009.

8. P. E. T. Jorgensen and M.-S. Song “*Spectral Theory of Discrete Processes*” Cent. Eur. J. Phys. **8**(3):340-363, Springer, 2010.
9. P. E. T. Jorgensen and M.-S. Song “*An Extension of Wiener Integration with the Use of Operator Theory*” J. Math. Phys. **50**, 103502, 2009.
10. P. E. T. Jorgensen and M.-S. Song “*Scaling, Image Compression and Encoding*” Analysis for Science, Engineering and Beyond, Springer, 2011.
11. P. E. T. Jorgensen and M.-S. Song, “*Matrix Factorization and Lifting*,” Sampling Theory in Signal and Image Processing, **9**: 167-197, Sampling Publishing, 2010.
12. P. E. T. Jorgensen, M.-S. Song and C. M. Traub, “*A Sampling Theory for Infinite Weighted Graphs*,” in preparation, 2011.
13. P. E. T. Jorgensen and M.-S. Song, “*Irregular Sampling Boundaries*,” in preparation, 2011.

TALKS

1. *Matrix Factorization and Lifting*, AMS Special Session on Wavelets, Tilings, and Iterated Function Systems, Joint Mathematics Meetings, New Orleans, Louisiana, Jan 7, 2011
2. *Matrix Factorization and Lifting*, Workshop on Harmonic Analysis and Integral Geometry, Louisiana State University, Baton Rouge, Louisiana, Jan 4, 2011.
3. *Scaling, Image Compression and Encoding*, From Banach Spaces to Frame Theory and Applications conference, Norbert Wiener Center, University of Maryland, College Park, Maryland, May 20, 2010
4. *Analysis of Fractals, Image Compression and Entropy Encoding*, Workshop on Fractals and Tilings, Strobl, Austria, July 10, 2009
5. *Spectral Theory of Discrete Processes*, Strobl09 Conference on Time-Frequency, Strobl, Austria, June 18, 2009
6. *Analysis of Fractals, Image Compression and Entropy Encoding*, Fractal connections: wavelets, tilings, measures, and self-similar analysis workshop, the University of Iowa, Iowa City, Iowa, Jun 28, 2008
7. *Analysis of Fractals, Image Compression and Entropy Encoding*, Illinois/Missouri Applied Harmonic Analysis Seminar, Illinois Wesleyan University, Bloomington, Illinois, Apr 19, 2008
8. *Entropy Encoding using Karhunen Loeve Transform*, Functional Analysis II class, The University of Iowa, Iowa City, Iowa, Mar 10, 2008
9. *The Mathematics in the Wavelet Image Compression*, GAUSS Seminar, The University of Iowa, Iowa City, Iowa, Mar 10, 2008
10. *Wavelet Image Compression*, Pizza Seminar, Southern Illinois University Edwardsville, Feb 6, 2008
11. *Entropy Encoding using Karhunen Loeve Transform in Wavelet Image Compression*, AMS Special Session on Wavelet Sets and Tilings on R^n , Joint Mathematics Meetings, San Diego, California, Jan 8, 2008
12. *Entropy Encoding using Karhunen Loeve Transform*, Summer School “New Trends and Directions in Harmonic Analysis, Approximation Theory, and Image Analysis,” Inzell, Germany, Sept 17, 2007
13. *Entropy Encoding using Karhunen Loeve Transform*, Operator Theory Seminar, Department of Mathematics, Seoul National University, Seoul, Korea, Jun 1, 2007
14. *Entropy Encoding in Wavelet Image Compression*, Department of Mathematical Sciences, Division of Applied Mathematics, Korea Advanced Institute of Science & Technology, Daejeon, Korea, May 18, 2007
15. *Entropy Encoding in Wavelet Image Compression*, Harmonic and Geometric Analysis Application workshop, Louisiana State University, Baton Rouge, Louisiana, Jan 4, 2007

16. *Entropy Encoding in Wavelet Image Compression*, Operator methods in fractal analysis, wavelets and dynamical systems workshop, Banff International Research Station, Banff, Canada, Dec 6, 2006
 17. *Entropy Encoding in Wavelet Image Compression*, Wavelet Seminar, Department of Mathematics, Washington University, Saint Louis, Missouri, Nov 17, 2006
 18. *Wavelet Image Compression*, Analysis Seminar, Department of Mathematics, Saint Louis University, Saint Louis, Missouri, Oct 10, 2006
 19. *Hilbert Space Geometry in Wavelet Image Compression Algorithms*, Functional Analysis class, Department of Mathematics, The University of Iowa, Iowa City, Iowa, Sept 22, 2006
 20. *Hilbert Space Geometry in Wavelet Image Compression Algorithms*, International Conference Harmonic Analysis and Applications, San Luis, Argentina, Aug 4, 2006
 21. *The Mathematical Insights of Wavelet Image Compression* (Poster), Wave 2006, Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland, Jul 13, 2006
 22. *The Mathematical Insights of Wavelet Image Compression*, The 3rd International Workshop for Korean Women in Mathematics, Korea University, Seoul, Korea, Jun 26, 2006
 23. *The Connection between Wavelet Image Compression and Operator Theory*, Operator Theory Seminar, Department of Mathematics, Seoul National University, Seoul, Korea, Jun 2, 2006
 24. *Hilbert Space Geometry in Wavelet Algorithms*, Great Plains Operator Theory Symposium, The University of Iowa, Iowa City, Iowa, May 24, 2006
 25. *Wavelet Image Compression*, Current Trends in Harmonic Analysis and Its Applications: Wavelets and Frames, University of Colorado at Boulder, Boulder, Colorado, May 20, 2006
 26. *Curvelets and Shearlets*, Topics in Applied Mathematics, Department of Mathematics, The University of Iowa, Iowa City, Iowa, Apr 21, 2006
 27. *Wavelet Transform*, Topics in Applied Mathematics, Department of Mathematics, The University of Iowa, Iowa City, Iowa, Mar 10, 2006
 28. *Mathematical Insights of Wavelet Image Compression*, Workshop on Harmonic Analysis and Fractal Geometry, Louisiana State University, Baton Rouge, Louisiana, Feb 24, 2006
 29. *Wavelets and Image Compression*, Topics in Applied Mathematics, Department of Mathematics, The University of Iowa, Iowa City, Iowa, Feb 3, 2006
 30. *Wavelets and Images*, GAUSS Seminar, Department of Mathematics, The University of Iowa, Iowa City, Iowa, Apr 20, 2005
 31. *Wavelets and Images*, Operator Theory Seminar, Department of Mathematics, The University of Iowa, Iowa City, Iowa, Apr 19, 2005
 32. *Mathematics Insight of Wavelet Image Processing*, Topics and Applied Mathematics, Department of Mathematics, The University of Iowa, Iowa City, Iowa, Mar 29, 2005
 33. *Wavelets and Images*, Industrial Engineering Seminar, Department of Industrial Engineering, The University of Iowa, Iowa City, Iowa, Mar 3, 2005
 34. *Wavelets and Images*, Topics and Applied Mathematics, Department of Mathematics, The University of Iowa, Iowa City, Iowa, Feb 22, 2005
 35. *Color Image Compression Using Wavelet Transform*, Advanced Image Processing, Department of Electrical and Computer Engineering, The University of Iowa, Iowa City, Iowa, Mar 30, 2004
 36. *Wavelets*, MSRI workshop in Mathematical Graphics, Reed College, Portland, Oregon, Jul 25, 2003
 37. *Wavelets and Multiresolution Analysis*, Topics in Analysis, Department of Mathematics, The University of Iowa, Iowa City, Iowa, May 7, 2003
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TEACHING EXPERIENCE

The University of Iowa

Fall 1999 to Spring 2005: Worked as a graduate teaching assistant leading discussion sections, teaching my own class and tutoring at the math tutorial lab.

Southern Illinois University Edwardsville

Fall 2005

Math 125 Pre-calculus with Trigonometry

Math 355 Engineering Mathematics

Spring 2006

Math 305 Differential Equations

Fall 2006

Math 150 Calculus I

Math 462 Engineering Numerical Analysis

Spring 2007

Math 350 Introduction to Analysis

Math 321 Linear Algebra I - for six weeks

Math 451 Introduction to Complex Analysis -
for six weeks

Fall 2007

Math 305 Differential Equations

Math 321 Linear Algebra I

Math 421 Linear Algebra II

Spring 2008

Math 150 Calculus I

Math 223 Logic and Mathematical Reasoning

Fall 2008

Math 152 Calculus II

Math 305 Differential Equations

Math 321 Linear Algebra I

Spring 2009

Math 120 College Algebra

Math 305 Differential Equations

Fall 2009

Math 150 Calculus I

Math 305 Differential Equations

Math 321 Linear Algebra I

Spring 2010

Math 125 Pre-calculus with Trigonometry

Math 223 Logic and Mathematical Reasoning

Fall 2010

Math 305 Differential Equations

Math 355 Engineering Mathematics

Spring 2011

Math 223 Logic and Mathematical Reasoning

Math 305 Differential Equations

Math 502 Advanced Calculus for Engineers

Fall 2011 (on leave)

Spring 2012

Math 120 College Algebra

Math 125 Pre-calculus with Trigonometry

AWARDS and GRANTS

- Fall 1999-Spring 2001, Fall 2001-Spring 2002, Fall 2002-Spring 2003, Fall 2003 and Fall 2004 Graduate Teaching Assistantship
 - Spring 2004 Graduate Research Assistantship
 - Summer 2003 and Summer 2004 Summer Research Fellowship
 - Travel Grant Award from WavE 2006 Wavelets and Applications Conference, Ecole Polytechnique Federale de Lausanne Bernoulli Center July 2006.
 - NSF grant Collaborative Research: RUI: Analysis of Fractals, Image Compression, Entropy Encoding, Karhunen-Loeve Transforms and Applications, PIs: Myung-Sin Song and Palle E. T. Jorgensen – declined 2008
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OTHER ACTIVITIES

● Conferences and Workshops Attended/Hosted

1. Illinois/Missouri Applied Harmonic Analysis Seminar, University of Illinois, Urbana-Champaign, Illinois, Oct 16, 2010.
 2. Illinois/Missouri Applied Harmonic Analysis Seminar, Northern Illinois University, DeKalb, Illinois, Apr 24, 2010.
 3. Illinois/Missouri Applied Harmonic Analysis Seminar, Saint Louis University Saint Louis, Missouri, Nov 14, 2009
 4. Illinois/Missouri Applied Harmonic Analysis Seminar, University of Illinois, Urbana-Champaign, Illinois, Mar 27, 2009.
 5. Hosted Illinois/Missouri Applied Harmonic Analysis Seminar, Southern Illinois University Edwardsville, Sept 27 2008.
 6. February Fourier Talks, The Norbert Wiener Center for Harmonic Analysis and Applications, University of Maryland, College Park, MD, Feb 21-22, 2008.
 7. Illinois/Missouri Applied Harmonic Analysis Seminar, Washington University, Saint Louis, Missouri, Apr 28, 2007.
 8. Illinois/Missouri Applied Harmonic Analysis Seminar, University of Illinois, Urbana-Champaign, Illinois, Dec 2, 2006.
 9. Mini-workshop on Wavelets, Frames and Operator Theory, Vanderbilt University, Nashville, Tennessee, Apr 28-30, 2006.
 10. AMS-MAA Joint National Meeting, Atlanta, Georgia, January 2005.
 11. Wavelet Workshop, Washington University, Saint Louis, Missouri, Apr 3-7, 2006
 12. Hosted Korean Science Teachers Workshop in Wavelets with Prof. Palle Jorgensen at the University of Iowa, Iowa, Jun 27-Jul 14, 2005.
 13. MSRI Workshop for Women in Mathematics: Introduction to Image Analysis at MSRI, Berkeley, California, Jan 21-22, 2005.
 14. MSRI Workshop in Mathematical Graphics (PostScript and Java) at Reed College, Portland, Oregon, Jul 14-25, 2003.
- Associate editor for Sunway Academic Journal, Volume 3 (2006).
 - Referee for Iranian Journal of Electrical and Computer Engineering (2007, 2008).
 - Referee for Acta Applicandae Mathematicae, Springer Verlag (2007-).
 - Referee for Journal of Mathematical Physics, American Institute of Physics (2008-).
 - Reviewer for Mathematical Reviews (MR), American Mathematical Society (2009-).
 - Referee for Complex Analysis and Operator Theory, Birkhauser (2009-).
 - Reviewer for Central European Journal of Mathematics, Versita/Springer Verlag (2009-).
 - Reviewer for 53rd the Institute of Electrical and Electronics Engineers (IEEE) International Midwest Symposium on Circuits and Systems (2010).
 - Reviewer for Journal of Applied Mathematics and Computing, Springer (2010).
 - Reviewer for International Journal of Modelling and Simulation, Acta Press (2010-).

TECHNOLOGIES

Platforms: Windows 95/98/NT/2000/XP/7, LINUX, UNIX, Solaris, Mac OS X

Programming Language: C/C++, Java, Pascal, PostScript

Markup Language: HTML, LaTeX

Others: MATLAB, Mathematica, Maple, Lindo, Microsoft Office Power Point, Excel, Word, Dreamweaver MX, Adobe Photoshop CS3, Adobe Illustrator CS3

PROFESSIONAL MEMBERSHIPS

- AMS (2000 – current)
 - SIAM-Imaging Science (2003 – current)
 - IEEE – Signal Processing Society (2005 – 2008, 2011),
Information Theory Society (2006 – 2008, 2011)
Communications Society (2007 – 2008)
 - Women in Information Theory Society (2010 – current)
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SERVICE**University Committee:**

- Honorary Degree Committee (Fall 2009 – present.)
- Program Review Committee for Graduate Program in Arts and Design (Fall 2009 – Spring 2010.)
- Advisor for Korean Student Association (Spring 2007 – present.)

Departmental Committee:

- Peer Review Committee (Spring 2011 – present.)
 - Instructor Search Committee (Spring 2011.)
 - Colloquium Committee (Spring 2010 – present.)
 - Graduate Program Committee (Spring 2008 – Fall 2009.)
 - Math125 Proficiency Exam (Spring 2007– present.)
 - Textbook Selection Committee (2006)
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LANGUAGES

- Korean – Native
 - English – Fluent
 - Chinese (Mandarin) – Fluent
 - Malay – Basic
 - German (Reading) – Basic
 - Japanese – Basic
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