

# Sungwook Lee

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## Current position

Associate Professor, Department of Mathematics, University of Southern Mississippi

## Primary areas of research

Differential Geometry and Mathematical Physics

## Secondary areas of research

Quantum Computing

## Appointments held

- 7/12-6/14 Interim-Chair, Department of Mathematics, University of Southern Mississippi
- 9/11-6/12 Math Zone (<http://www.math.usm.edu/mathzone/>) Director, University of Southern Mississippi (Math Zone is a Virginia Tech's Math Emporium type math learning facility at USM where we offer Intermediate Algebra and College Algebra)
- 6/11-8/11 Math Zone Interim-Director, University of Southern Mississippi
- 8/07-present Tenured Associate Professor, Department of Mathematics, University of Southern Mississippi
- 8/01-7/07 Tenure-Track Assistant Professor, Department of Mathematics, University of Southern Mississippi

## Education

- 2002 PHD in Mathematics (Differential Geometry), University of Connecticut  
1993 MSc in Mathematics (Universal Algebra), Keimyung University, South Korea

## Awards

- 2007 Aubrey K. and Ella Ginn Lucas Award, College of Science and Technology Excellence in Teaching, The University of Southern Mississippi  
2006 Outstanding Faculty Teaching Award, College of Science and Technology, The University of Southern Mississippi

## Publications

### JOURNAL ARTICLES

- 2017 “Maximal spacelike surfaces in a certain homogeneous Lorentzian 3-manifold”. Preprint is available at arXiv:1503.06305. The manuscript was conditionally accepted in a journal with a minor revision requested by the reviewer. I eventually have decided not to publish the manuscript.
- 2017 “Minimal Timelike Surfaces in a Certain Homogeneous Lorentzian 3-Manifold”, *Tohoku Mathematical Journal* (2) 69 (2017), no. 4, 621-635.
- 2016 “Minimal timelike surfaces in a certain homogeneous Lorentzian 3-manifold II”, *Differential Geometry - Dynamical Systems*, Volume 18 (2016), 58-71.
- 2016 with Jun-ichi Inoguchi and Marianty Ionel, “Flat Lorentz Surfaces in Anti-de Sitter 3-Space and Gravitational Instantons”, *International Journal of Geometric Methods in Modern Physics*, Volume 13 (2016), no. 2, 1650012, 19pp.
- 2015 with Jacob Martin, “Timelike Surfaces of Revolution with Constant Mean Curvature in de Sitter 3-Space”, *International Electronic Journal of Geometry*, Volume 8 (2015), No. 1, 116-127.
- 2015 “Spacelike Surfaces of Revolution with Constant Mean Curvature in de Sitter 3-Space”, *Differential Geometry - Dynamical Systems*, Volume 17 (2015), 81-96.
- 2014 with Kinsey Zarske, “Surface of Revolution with Constant Mean Curvature in Hyperbolic 3-Space”, *Differential Geometry - Dynamical Systems*, Volume 16 (2014), 203-218.
- 2009 with J. Inoguchi, “Lightlike surfaces in Minkowski 3-space”, *International Journal of Geometric Methods in Modern Physics* 6: 267-283.
- 2008 with J. Inoguchi, “Null curves in Minkowski 3-space”, *International Electronic Journal of Geometry* 1: 40-83.
- 2008 “Maximal surfaces in a certain 3-dimensional homogeneous spacetime”, *Differential Geometry and Its Applications* 26: 536-543.
- 2008 with J. Inoguchi, “A Weierstrass type representation for minimal surfaces in Sol”, *Proc. Amer. Math. Soc.* 136: 2209-2216.
- 2008 “Weierstrass representation for timelike minimal surfaces in Minkowski 3-space”, *Communications in Mathematical Analysis* Conf. 01: 11-19.

- 2007 with C. S. Chen and C.-S. Huang, “Derivation of particular solutions using Chebyshev polynomial based functions”, *International Journal of Computational Methods* 4: 15-32. Although I am listed as a coauthor, I made no contribution to the paper. So it shouldn’t count as a part of my publications.
- 2007 with J. H Varnado, “Timelike constant mean curvature surfaces of revolution in Minkowski 3-space”, *Differential Geometry - Dynamical Systems* 9: 82–102.
- 2006 with J. H Varnado, “Spacelike constant mean curvature surfaces of revolution in Minkowski 3-space”, *Differential Geometry - Dynamical Systems* 8: 144–165.
- 2006 with S.-D. Yang, “Spacelike constant mean curvature 1 trinoids with singularities in de Sitter 3-space”, *Osaka Journal of Mathematics* 43: 641-663.
- 2006 “Timelike surfaces of constant mean curvature one in anti-de Sitter 3-space”, *Annals of Global Analysis and Geometry* 29: 355–401.
- 2005 “Spacelike surfaces of constant mean curvature one in de Sitter 3-space”, *Illinois Journal of Mathematics* 49: 63-98.
- 2005 “Spacelike CMC 1 surfaces in de Sitter 3-space: their construction and some examples”, *Differential Geometry - Dynamical Systems* 7: 49-73.

## Grants

- 2020 A recipient of OER (Open Education Resources) grant (\$4,000) from the William  
2019 and Flora Hewlett Foundation through the University of Mississippi. A recipient  
of OER (Open Education Resources) grant (\$4,000) from the William and Flora  
Hewlett Foundation through the University of Mississippi.

## Teaching

### UNDERGRADUATE COURSES TAUGHT

Intermediate Algebra, College Algebra, Trigonometry, Precalculus, Business Calculus, Calculus for Biological Sciences, Calculus (all series including Multivariable Calculus), Discrete Mathematics, Linear Algebra, Ordinary Differential Equations, Partial Differential Equations, Special Functions (created by me), Modern Algebra (Group Theory), Advanced Calculus, Functions of a Complex Variable, Number Theory, General Topology, Modern Geometry (Differential Geometry of Curves and Surfaces)

### GRADUATE COURSES TAUGHT

Complex Analysis, Differential Geometry (Differentiable Manifolds, Lie Groups, Lie Algebras, Homology, Cohomology, Complex Manifolds, Fibre Bundles, Gauge Theory), Fourier Analysis, Functional Analysis, General Topology, Harmonic Analysis, Topics in Algebra (Semi-Simple Lie Algebras)

### UNDERGRADUATE RESEARCH DIRECTED

2014

Kinsey Zarske (math/physics double major at USM), “Surface of Revolution with Constant Mean Curvature in Hyperbolic 3-Space”, published in *Differential Geometry - Dynamical Systems*, Volume 17: 81-96. Kinsey is currently in Physics Ph.D. program at Georgia Tech.

2007 J. H Varnado (math/physics double major at USM), “Timelike constant mean curvature surfaces of revolution in Minkowski 3-space”, published in *Differential Geometry and Dynamical Systems* 9: 82–102.

2006 J. H Varnado (math/physics double major at USM), “Spacelike constant mean curvature surfaces of revolution in Minkowski 3-space”, published in *Differential Geometry and Dynamical Systems* 8: 144–165.

#### RESEARCH WITH A HIGH SCHOOL STUDENT

2015 Jacob Martin (senior at Oak Grove High School), “Timelike Surfaces of Revolution with Constant Mean Curvature in de Sitter 3-Space”, published in *International Electronic Journal of Geometry*, Volume 8, No. 1: 116-127. Jacob became a math major at Massachusetts Institute of Technology.

#### MASTER’S THESES DIRECTED

2015 Jamie Patrick Lambert, “Lorentz Invariant Spacelike Surfaces of Constant Mean Curvature in Anti-de Sitter 3-Space”, Master’s in Mathematics, University of Southern Mississippi. Jamie is now a mathematics instructor at Copiah-Lincoln Community College in Mississippi.

2010 Joseph L. Emfinger, “Quantum Mechanics as a Gauge Theory”, Master’s in Mathematics, University of Southern Mississippi.

#### Other Recent Activities

2017-2018 Have participated in MD5/CMI2 (formely TKX), a DOD funded project of USM School of Computing.

2017 Participated in PIC Math Data Analytics Workshop at Brigham Young University.

#### Service

##### SERVICE TO THE PROFESSION

2005-present Refereed articles on behalf of prestigious journals including *Differential Geometry and Its Applications*, *Pacific Journal of Mathematics*, *Canadian Mathematical Bulletin*, *Il Nuovo Cimento B*, *Advances in Mathematical Physics*, and *Journal of Mathematical Analysis and Applications*, and *International Journal of Geometric Methods in Modern Physics*, etc.

2018 Served on NSF Graduate Research Fellowship Program Panel.

2010 Served on an NSF grant proposal review panel.

2005 Served as a senior research mentor of UConn REU on Computational Topology and Geometry of Surfaces.

## SELECTED SERVICE TO THE INSTITUTION

- 2014-2017 Have served on USM SMIT (Sexual Misconduct Investigative Team) as an investigator. Trained on Title IX a number of times.
- 2011-present Have served as the Linux system administrator of the mathematics department at USM. Responsible for maintaining Linux servers for computing, math department web server, SAGE server, WeBWork server and mail server. Have supported computing needs of faculty members and graduate students with both proprietary and open source technology solutions.

## Skills with Technologies

### COMPUTER OPERATING SYSTEMS

Linux (Debian, Fedora, Scientific Linux, Ubuntu) and Unix (FreeBSD) system administration

### MATHEMATICS SOFTWARE

Maple, Mathematica, Matlab, Maxima, Sage

### COMPUTER PROGRAMMING LANGUAGES

Python, R