Junehyuk Jung

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Positions

Brown University, Department of Mathematics   **Providence, RI**
Associate Professor of Mathematics   *7/2022–*

Google DeepMind   **Mountain View, CA**
Visiting Researcher   *4/2024–*

Brown University, Department of Mathematics   **Providence, RI**
Assistant Professor of Mathematics   *7/2020–6/2022*

Texas A&M University, Department of Mathematics   **College Station, TX**
Assistant Professor   *8/2017–6/2020*

KAIST, Department of Mathematical Science   **Daejeon, South Korea**
Researcher   *6/2013–7/2016*

Visiting Positions

University of California Berkeley, Department of Mathematics   **Berkeley, CA**
Visitor   *7/2023–7/2024*

Rice University, Department of Mathematics   **Houston, TX**
Adjunct Assistant Professor   *7/2019–3/2020*

Yale University, Department of Mathematics   **New Haven, CT**
Visitor   *4/2017–6/2017*

University of California Berkeley, Department of Mathematics   **Berkeley, CA**
Visitor   *2/2017–3/2017*

Northwestern University, Mathematics Department   **Evanston, IL**
Visitor   *10/2016–11/2016*

Institute for Advanced Study, School of Mathematics   **Princeton, NJ**
Member   *9/2014–12/2015*

Northwestern University, Mathematics Department   **Evanston, IL**
Visiting Postdoctoral Fellow   *9/2013–12/2013*

Education

Princeton University   **Princeton, NJ**
Doctor of Philosophy   *9/2008–6/2013*
Mathematics
Advisor: Peter C. Sarnak

University of Chicago   **Chicago, IL**
Master of Science   *9/2006–8/2008*
Mathematics

University of Chicago   **Chicago, IL**
Bachelor of Arts   *9/2005–8/2008*
Mathematics with Honors

Honors and Awards

Simons Fellows in Mathematics
Awarded   *7/2023–6/2024*

National Science Foundation grant
Awarded, DMS-1900993   *7/2019–6/2023*

Sloan Research Fellowship
Awarded, $ 70,000   *7/2019–8/2023*

Posco TJ Park Science Fellowship
Awarded, $ 35,000 per year   *3/2014–2/2016*

Samsung Scholarship for Graduate Studies
Awarded, $ 50,000 per year   *9/2008–6/2013*

Paul R. Cohen Memorial Prize
Awarded   *6/2008*

Kwanjeong Scholarship for College Students
Awarded, $ 50,000 per year   *9/2005–8/2008*

Korea Science and Engineering Foundation Scholarship for Undergraduate Studies
Gratefully declined in order to observe institutional regulation   *2005*

William Lowell Putnam Mathematics Competition
One of three representatives of University of Chicago   *2005–2007*
Honorable Mention, Team Rank 5, and Top 24 Individuals in 2005, 2006, and 2007

International Mathematical Olympiad
Gold Medal   *7/2003*

Publications

Published/Accepted

[**19**]: "2-nodal domain theorems for higher dimensional circle bundles"
(with Steve Zelditch)
J. Spectr. Theory 14 (2024), no. 4, pp. 1451–1474.

[**18**]: "Intersecting geodesics on the modular surface"
(with Naser T. Sardari)
Algebra Number Theory 17 (2023), no. 7, 1325–1357.

[**17**]: "Non-vanishing of symmetric cube L-functions"
(with Jeff Hoffstein and Min Lee)
J. Lond. Math. Soc. (2) 107 (2023), no. 1, 153–188.

[**16**]: "Embedding closed totally geodesic surfaces in Bianchi orbifolds"
(with Alan Reid)
arXiv:2003.05427 [math.NT], to appear *Math. Res. Lett.*

[**15**]: "Topology of the nodal set of random equivariant spherical harmonics on $\mathbb{S}^3$"
(with Steve Zelditch)
Int. Math. Res. Not. IMRN(2021), no. 11, 8521–8549.

[**14**]: "Asymptotic trace formula for the Hecke operators"
(with Simon Marshall and Naser T. Sardari)
Math. Ann. 378 (2020), no. 1-2, 513–557.

[**13**]: "Boundedness of the number of nodal domains for eigenfunctions of generic Kaluza–Klein 3-folds"
(with Steve Zelditch)
Ann. Inst. Fourier (Grenoble) 70 (2020), no. 3, 971–1027.

[**12**]: " Bounding the number of nodal domains of eigenfunctions without singular points on the square"
Israel J. Math. 238 (2020), no. 1, 1–11.

[**11**]: "On the growth of the number of totally geodesic surfaces in some hyperbolic 3-manifolds"
J. Number Theory 202 (2019), 160–175.

[**10**]: "Sign Changes of the Eisenstein Series on the Critical Line"
(with Matthew Young)
Int. Math. Res. Not. IMRN(2019), no. 3, 641–672.

[**9**]: "Discrete behavior in information-constrained tracking problems and portfolio choice"
(with Jeong-ho Kim, Filip Matejka, and Christopher A. Sims)
Rev. Econ. Stud. 86 (2019), no. 6, 2643–2667.

[**8**]: "On tiling the integers with 4-sets of the same gap sequence"
(with Ilkyoo Choi and Minki Kim)
Discrete Math. 341 (2018), no. 4, 957–964.

[**7**]: "Quantum unique ergodicity and the number of nodal domains of eigenfunctions"
(with Seung uk Jang)
J. Amer. Math. Soc. 31 (2018), no. 2, 303–318.

[**6**]: "On sparsity of positive-definite automorphic forms within a family"
(Appendix A by Junehyuk Jung and Sug Woo Shin)
J. Anal. Math. 129 (2016), 105–138.

[**5**]: "Quantitative quantum ergodicity and the nodal domains of Maass-Hecke cusp forms "
Comm. Math. Phys. 348 (2016), no. 2, 603–653.

[**4**]: "Number of nodal domains and singular points of eigenfunctions of negatively curved surfaces with an isometric involution"
(with Steve Zelditch)
J. Differential Geom. 102 (2016), no. 1, 37–66.

[**3**]: "Number of nodal domains of eigenfunctions on non-positively curved surfaces with concave boundary"
(with Steve Zelditch)
Math. Ann. 364 (2016), no. 3-4, 813–840.

[**2**]: "Sharp bounds for the intersection of nodal lines with certain curves "
J. Eur. Math. Soc. (JEMS) 16 (2014), no. 2, 273–288.

[**1**]: "Pretentiously detecting power cancellation"
(with Robert J. Lemke Oliver)
Math. Proc. Cambridge Philos. Soc. 154 (2013), no. 3, 481–498.

Selected Preprints

[**1**]: "Linnik problem for Maass–Hecke cusp forms and effective multiplicity one theorem"
(with Min Lee)
preprint.

Talks and lecture series

Panelist

12/14/2024: 4th MATH-AI Workshop at NeurIPS'24
Vancouver Convention Centre, Vancouver, BC, Canada

Invited Talks

01/22/2024: "Zelditch's trace formula and effective Bowen's theorem"
Analytic Number Theory Seminar
Stanford University, Palo Alto, CA, USA

12/19/2023: "Zelditch's trace formula and effective Bowen's theorem"
Conference: Hyperbolic Geometry of Numbers

KIAS, Seoul, South Korea

11/07/2023: "Zelditch's trace formula and effective Bowen's theorem"
Arizona Algebra and Number Theory Seminar
University of Arizona, Tucson, AZ, USA

10/14/2023: "Zelditch's trace formula and effective Bowen's theorem"
Spectral Theory and Applications
Texas A&M University, College Station, TX, USA

09/25/2023: "On the sparsity of positive-definite automorphic forms"
Arithmetic Geometry and Number Theory RTG Seminar
University of California, Berkeley, Berkeley, CA, USA

09/25/2023: "Background on automorphic forms, L-functions, and equidistribution. "
Arithmetic Geometry and Number Theory RTG Seminar: Pre-talk
University of California, Berkeley, Berkeley, CA, USA

09/18/2023: "Nodal domains of equivariant eigenfunctions on Kaluza-Klein 3-folds"
Analysis & PDE Seminar
University of California, Berkeley, Berkeley, CA, USA

05/23/2023: "Chaos and the geometry of the nodal set of eigenfunctions of the Laplacian"
PDT Research Colloquium
PDT Partners, New York, NY, USA

05/19/2023: "The arithmetic of totally geodesic surfaces on Bianchi orbifolds"
Dynamics, Rigidity and Arithmetic in Hyperbolic Geometry
ICERM, Providence, RI, USA

03/23/2023: "Equidistribution problems of closed geodesics on hyperbolic surfaces"
QVNTS
Concordia University, Montreal, Quebec, Canada

02/28/2023: "The arithmetic of totally geodesic surfaces on Bianchi orbifolds"
Algebra and Number Theory seminar
Dartmouth College, Hanover, NH, USA

10/27/2022: "Ergodicity and the number of nodal domains of eigenfunctions of the Laplacian"
Brandeis-Harvard-MIT-Northeastern Joint Mathematics Colloquium
Brandeis University, Waltham, MA, USA

01/27/2020: "Ergodicity and the number of nodal domains of eigenfunctions of the Laplacian"
Special Colloquium
Brown University, Providence, RI, USA

12/13/2019: "Ergodicity and the number of nodal domains of eigenfunctions of the Laplacian"
Colloquium
Rice University, Houston, TX, USA

10/11/2019: "Nodal domains of equivariant eigenfunctions on Kaluza-Klein 3-folds"
Analysis and Mathematical Physics Seminar Series
Institute for Advanced Study, Princeton, NJ, USA

10/02/2019: "Classification of embedded closed totally geodesic surfaces in Bianchi 3-folds"
Topology Seminar
Korea Institute for Advanced Study (KIAS), Seoul, South Korea

09/25/2019: "Topology of the nodal set of spherical harmonics on S^3"
Dynamics and Number Theory Seminar
Seoul National University, Seoul, South Korea

05/21/2019: "On the sparsity of positive-definite automorphic forms"
Heilbronn Number Theory Seminar
University of Bristol, Bristol, UK

02/19/2019: "Nodal geometry of Maass–Hecke eigenforms on compact arithmetic hyperbolic triangles"
Algebraic Geometry and Number Theory Seminar
Rice University, Houston, TX, USA

01/15/2019: "Large discrepancy in the vertical Sato-Tate theorem"
Analytic Number Theory Seminar
Stanford University, Stanford, CA, USA

01/07/2019: "Distribution of Hecke eigenvalues: large discrepancy"
Korea University Algebra Seminar
Korea University, Seoul, South Korea

12/28/2018: "Counting immersed totally geodesic surfaces via arithmetic means"
Contemporary Number Theory Workshop
KAIST, Daejeon, South Korea

12/27/2018: "Distribution of Hecke eigenvalues: large discrepancy"
Contemporary Number Theory Workshop
KAIST, Daejeon, South Korea

12/21/2018: "Nodal counting of eigenfunctions of Laplace–Beltrami operator on a principal S^1-bundle with Kaluza–Klein metrics"
CMC Seminar
KIAS, Seoul, South Korea

12/14/2018: "Ergodicity and nodal counting of eigenfunctions on 3-manifolds"
Geometry, Topology & Dynamics Seminar
Seoul National University, Seoul, South Korea

07/23/2018: "Ergodicity and the number of nodal domains of Laplacian eigenfunctions"
Analytic Number Theory and Quantum Chaos Workshop
Queen Mary University of London, London, UK

07/17/2018: "Boundedness of the number of nodal domains of eigenfunctions"
18w5002 Around Quantum Chaos
BIRS, Banff, Canada

07/04/2018: "Quantum Unique Ergodicity and the number of nodal domains of automorphic forms"
Analytic Number Theory Seminar
EPFL, Laussane, Switzerland

04/11/2018: "Quantum Unique Ergodicity and the number of nodal domains of automorphic forms"
Number Theory Seminar
University of Wisconsin - Madison, Madison, WI, USA

01/24/2017: "On nodal domains of eigenfunctions in chaotic quantum systems"
Colloquium
Texas A&M University, College Station, TX, USA

01/09/2017: "Quantitative Quantum Ergodicity on the modular surface and its applications"
Number Theory Seminar
Stanford University, Stanford, CA, USA

11/14/2016: "Eigenfunctions on arithmetic hyperbolic surfaces"
Analysis Seminar
Northwestern University, Evanston, IL, USA

07/12/2016: "On nodal domains of eigenfunctions in chaotic quantum system"
Second French-Korean Conference in Mathematics
Université de Bordeaux, Bordeaux, France

03/16/2016: "Nodal domains of eigenfunctions on chaotic billiards"
SNU Geometry and Topology Seminar
Seoul National University, Seoul, South Korea

02/15/2016: "On arithmetic quantum chaos: introduction and recent progress"
The 5th Number Theory Festival
Kyungnam University, Changwon, South Korea

08/27/2015: "Quantum Unique Ergodicity and the number of nodal domains of eigenfunctions"
East Asia Number Theory Conference
Elysian Gangchon Resort, Chuncheon, South Korea

06/21/2015: "Quantum Ergodicity and the number of nodal domains of eigenfunctions"
ASARC Number Theory Workshop
Tongyeong Marina Resort, Tongyeong, South Korea

06/04/2015: "Quantum Ergodicity and the number of nodal domains of eigenfunctions"
Montreal Analysis Seminar
McGill University, Montréal, QC, Canada

04/07/2015: "Quantum ergodicity and the number of nodal domains of eigenfunctions"
TAMU number theory seminar
Texas A&M University, College Station, TX, USA

02/21/2015: "Quantum ergodicity and the number of nodal domains of eigenfunctions"
Special day on Complex Geometry and Analysis on real analytic Riemannian manifolds
Northwestern University, Evanston, IL, USA

08/05/2014: "An upper bound for intersection of nodal lines with a fixed horocycle"
Pan Asia Number Theory 2014
Postech, Pohang, South Korea

03/03/2014: "Nodal Domains and Eigenfunctions of Negatively Curved Surfaces"
Quantum Monday
Institute for Basic Science, Pohang, South Korea

02/28/2014: "Nodal Domains and Eigenfunctions of Negatively Curved Surfaces"
Lecture Series on Geometry and Analysis
Korea Institute for Advanced Study (KIAS), Seoul, South Korea

02/22/2014: "Lindelof Hypothesis on average for triple product L-functions and its application"
Number Theory Festival
KAIST, Daejeon, South Korea

01/22/2014: "On the sparsity of positive-definite automorphic forms within a family"
East Asia Number Theory Conference
Nishijin Plaza, Fukuoka, Japan

01/17/2014: "Zero density estimates for families of automorphic L-functions of GL_1 and GL_2 over $\mathbb{Q}$"
Applications of homotopy method in number theory
Yonsei University, Seoul, South Korea

12/16/2013: "Nodal Domains and Eigenfunctions of Negatively Curved Surfaces"
The 17th Midrasha Mathematicae
Israel Institute for Advanced Studies (IIAS), Jerusalem, Israel

11/25/2013: "Nodal Domains and Eigenfunctions of Negatively Curved Surfaces"
Algebra Seminar
Brown University, Providence, RI, USA

10/29/2012: "An upper bound for intersection of nodal lines with a fixed horocycle"
NU Number Theory Seminar
Northwestern University, Evanston, IL, USA

07/26/2012: "On the sparsity of positive-definite automorphic forms within a family"
Number Theory Seminar
Korea Institute for Advanced Study (KIAS), Seoul, South Korea

Contributed Talks

10/20/2022: "Non-vanishing of symmetric cube automorphic L-functions"
2022 Global KMS International Conference
Online

05/02/2022: "The arithmetic of totally geodesic surfaces on Bianchi orbifolds"
Brown Algebra Seminar
Brown University

08/12/2021: "Boundedness of the number of nodal domains of equivariant eigenfunctions"
International Workshop on Operator Theory and its Applications 2021 Special Session 5
Online

02/01/2021: "Intersecting geodesics on the modular surface"
Brown Algebra Seminar
Brown University

12/08/2020: "Intersections of geodesics on the modular surface"
2020 CMS Winter Meeting Scientific Session on Equidistribution on Arithmetic Manifolds
Online

09/21/2020: "On the sparsity of positive-definite automorphic forms"
Brown Algebra/Number Theory Seminar
Brown University

09/03/2020: "Geometry and analytic number theory"
Meet the faculty!
Brown University

01/16/2020: "On the sparsity of positive-definite automorphic forms"
AMS Special Session on Analytic Theory of Automorphic Forms and L-Functions, I
Colorado Convention Center, Denver, CO, USA

09/15/2019: "Bounding the dimension of a joint eigenspace of Laplacian and finitely many Hecke operators"
AMS Sectional Meeting-Automorphic Forms and L-Functions, III
University of Wisconsin-Madison

05/03/2018: "Boundedness of the number of nodal domains of eigenfunctions"
Mathematical Physics and Harmonic Analysis Seminar
Texas A&M University

10/18/2017: "Counting immersed totally geodesic surfaces via arithmetic means"
Number Theory Seminar
Texas A&M University

01/30/2017: "Quantum Unique Ergodicity and the number of nodal domains of eigenfunctions"
Group actions and Dynamics seminar
Yale University

01/08/2016: "Quantum unique ergodicity and the number of nodal domains of eigenfunctions"
AMS Special Session on Global Harmonic Analysis
Washington State Convention Center, Seattle, WA, USA

03/16/2015: "Quantum ergodicity and the number of nodal domains of eigenfunctions"
IAS Spectral Geometry Seminar
Institute for Advanced Study, Princeton, NJ, USA

03/03/2015: "Quantum ergodicity and the number of nodal domains of eigenfunctions"
Berkeley Harmonic Analysis and Differential Equation Student Seminar
University of California, Berkeley, Berkeley, CA, USA

09/25/2014: "Counting the nodal domains of the Laplacian eigenfunctions on surfaces"
Short talks by postdoctoral members
Institute for Advanced Study, Princeton, NJ, USA

05/26/2014: "Automorphic L-functions and conjectures"
Colloqium for undergraduate students
KAIST, Daejeon, South Korea

10/22/2013: "Number of Nodal Domains of Eigenfunctions of Negatively Curved Surfaces with an Isometric Involution"
ASARC Seminar
KAIST, Daejeon, South Korea

06/28/2013: "Restricted L^p estimates and the zero set of Maass forms"
ASARC Seminar
KAIST, Daejeon, South Korea

Lecture Series

03/2021: 'Equidistribution problems of closed geodesics on hyperbolic surfaces (part 1&2)"
Geometry, Topology & Dynamics Seminar
Korea Institute for Advanced Study (KIAS), Seoul, South Korea

03/2019: "Counting primitive totally geodesic submanifolds 1&2"
Number Theory Lecture Series
Korea Institute for Advanced Study (KIAS), Seoul, South Korea

06/2016: "Recent theory on arithmetic quantum chaos"
Number Theory Lecture Series
Korea Institute for Advanced Study (KIAS), Seoul, South Korea

05/2015: "Introduction to quantum ergodicity and the number of nodal domains of eigenfunctions"
Colloquium
Korea University, Seoul, South Korea

07/2014: "Spectral theory of hyperbolic surfaces: arithmetic surfaces and Selberg's eigenvalue conjecture"
PMI Intensitve Lecture series in Number Theory
Postech, Pohang, South Korea

05/2014–06/2014: "Spectral theory of hyperbolic surfaces: arithmetic surfaces and Selberg's eigenvalue conjecture"
Special Lecture Series
Yonsei University, Seoul, South Korea

Public Lectures

02/08/2020: "Aggieland Saturday"
Texas A&M University, College Station, TX, US

08/17/2018: "Summer Educational Enrichment in Math (SEE-Math)"
Texas A&M University, College Station, TX, US