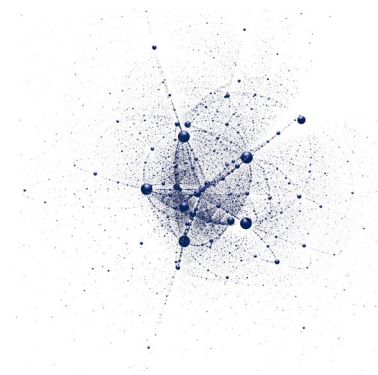


David Dumas

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Academic Positions

- *Professor*, University of Illinois at Chicago, 2016-
- *Associate Professor*, University of Illinois at Chicago, 2011-2016
- *Assistant Professor*, University of Illinois at Chicago, 2008-2011
- *Tamarkin Assistant Professor/NSF Postdoctoral Fellow*, Brown University, 2005-2008
- *NSF Postdoctoral Fellow*, Rice University, 2004-2005

Visiting Positions

- *Program Organizer & Research Fellow*, ICERM, Fall 2019
- *Simons Visiting Professor*, MSRI, Spring 2015
- *Research Fellow*, ICERM, Fall 2013
- *Professeur Invité*, Université Paris-Sud 11, June 2009
- *Member*, MSRI, Fall 2007

Education

- Ph.D. in Mathematics, Harvard University, June 2004. Advisor: Curtis T. McMullen
- B.S. in Mathematics and in Physics, Pennsylvania State University, May 1999

Research Interests

- Geometric structures on manifolds, Teichmüller theory, character varieties
- Mathematical visualization and computer experiments in geometry

Awards and Grants

External research support

- NSF Research Grant, PI, DMS-1709877, 2017-2021
- NSF CAREER Award, PI, DMS-0952869, 2010-2016
- NSF Research Grant, PI, DMS-0805525, 2008-2011
- NSF Postdoctoral Research Fellowship, 2004-2008
- NSF Graduate Research Fellowship, 1999-2004

Internal research support

- UIC College of Liberal Arts and Sciences Undergraduate Research Initiative, Fall 2017
- UIC College of Liberal Arts and Sciences Award for Faculty of Science, co-PI, 2015-2016
- UIC College of Liberal Arts and Sciences Award for Faculty of Science, co-PI, 2012-2013

Conference grants

- NSF Conference Grant, PI, DMS-1822457, for the 2018 Graduate Student Topology and Geometry Conference, April 7-8, 2018
- GEAR Research Network workshop grant for “Dynamics on Moduli Spaces” at MSRI, April 13-17, 2015

Teaching awards

- UIC Teaching Recognition Program recipient, 2017
- UIC MSCS Teaching Award, 2016

Research Articles

In preparation

- *Anosov representations, locally homogeneous complex manifolds, and deformation theory* (with Andrew Sanders).
- *Rays of conformally thick convex real projective surfaces* (with Michael Wolf).
- *Experiments with skinning maps* (with Autumn Kent).

Submitted

- *Opers and nonabelian Hodge: numerical studies* (with Andrew Neitzke). 56pp. Preprint, 2020.

Accepted

- *Geometry of compact complex manifolds associated to generalized quasi-Fuchsian representations* (with Andrew Sanders). To appear in *Geometry & Topology*. Accepted October 2019.

Published

- *Coarse and fine geometry of the Thurston metric* (with Anna Lenzhen, Kasra Rafi, and Jing Tao). *Forum of Mathematics, Sigma* 8 (2020), e28.
- *Asymptotics of Hitchin's metric on the Hitchin section* (with Andrew Neitzke). *Communications in Mathematical Physics* 367 (2019), no. 1, 127-150.
- *Holonomy limits of complex projective structures*. *Advances in Mathematics* 315 (2017), 427-473.
- *Polynomial cubic differentials and convex polygons in the projective plane* (with Michael Wolf). *Geometric and Functional Analysis* 25 (2015), no. 6, 1734-1798.
- *Skinning maps are finite-to-one*. *Acta Mathematica* 215 (2015), no. 1, 55-126.
- *Grafting rays follow travel Teichmüller geodesics* (with Young-Eun Choi & Kasra Rafi). *International Mathematics Research Notices* 2012 (2012), 2445-2492.
- *Bers slices are Zariski dense* (with Autumn Kent). *Journal of Topology* 2 (2009), 373-379.
- *Complex projective structures* (survey). In *Handbook of Teichmüller Theory, Volume II* (EMS, 2009). 58pp.
- *Slicing, skinning, and grafting* (with Autumn Kent). *American Journal of Mathematics* 131 (2009), 1419-1429.
- *Projective structures, grafting, and measured laminations* (with Michael Wolf). *Geometry & Topology* 12 (2008), 351-386.
- *Distribution of intersection lengths of a random geodesic with a geodesic lamination* (with Martin Bridgeman). *Ergodic Theory and Dynamical Systems* 27 (2007), 1055-1072.
- *The Schwarzian derivative and measured laminations on Riemann surfaces*. *Duke Mathematical Journal* 140 (2007), 203-243.
- *Grafting, pruning, and the antipodal map on measured laminations*.

Journal of Differential Geometry 74 (2006), 93-118.
Erratum. Ibid., 77 (2007), 175-176.

- *Complex projective structures, grafting, and Teichmüller theory*.
PhD Thesis, Harvard University, 2004

Other Publications

- *Replication Data for: Opers and nonabelian Hodge: numerical studies*. (with Andrew Neitzke). Dataset, 2020. <https://doi.org/10.7910/DVN/W0V4D9>
- *Maryam Mirzakhani: 1977–2017*. (with S. Kennedy, H. Barcelo, R. Beheshti, C. Vafa, I. Coskun; L. DeMarco, R. Takloo-Bighash, E. Lindenstrauss, P. Sarnak, Y. Tabesh, A. Eskin, D. Rasooly, E. Sapir, H. Masur, and D. Eisenbud). Notices of the American Mathematical Society 65 (2018), no. 10, 1221-1247.
- *Geometry Labs United: An Invitation* (with Jayadev Athreya, William Goldman, Sergey Grigorian, Rosemary Guzman, Philipp Hieronymi, Sean Lawton, Anton Lukyanenko, Jeremy Tyson, and Aaron Wilson). Notices of the American Mathematical Society 65 (2018), no. 9, 1088-1094.

Software and Visualization Projects

- stokes-numeric (2020), with Andrew Neitzke
 - Python programs to compute Stokes data of polynomial opers and Higgs bundles, Hitchin's hyperkähler metric, and the predictions of the Twistorial Riemann-Hilbert Conjecture of Gaiotto-Moore-Neitzke.
 - <https://github.com/neitzke/stokes-numeric/> (source)
- SL(View) (2019)
 - WebGL application to visualize Fuchsian groups and other subsets of $PSL(2, \mathbb{R})$ in the solid torus model, including a library of arithmetic and non-arithmetic lattice examples.
 - <http://dumas.io/slview/> (application)
 - <http://github.com/daviddumas/slview> (source)
- GenusLab (2018), with Alexander Adrahtas, Alexander Guo, and Gregory Schamberger
 - Virtual reality tool for drawing on a genus two surface and its universal cover, co-developed with undergraduate research team. Derived from GenusView.
 - <https://github.com/uicmcl/genuslab-vr/>
- GenusView (2018)
 - 3D graphics tool for simultaneous drawing on a genus two surface and its universal cover. Provides an interactive visualization of the universal covering and aspects of hyperbolic geometry.
 - <https://github.com/daviddumas/genusview/>
- Balanced Ideal Enumeration (2018), with Florian Stecker
 - Finds all balanced ideals in the Weyl group of a semisimple Lie group. These correspond to cocompact domains of discontinuity in flag varieties.
 - <https://florianstecker.de/balancedideals/>
- ManifoldBall (2017), with Horalia Armas, Brandon Reichman, and Hai Tran.
 - Virtual reality game illustrating the geometry of multiply-connected manifolds and orbifolds. Joint project with team of graduate and undergraduate

researchers.

- <https://github.com/uicmcl/manifoldball>
- As discussed in *Nature* (<https://dx.doi.org/10.1038/543473a>) and *Scientific American* blog (<https://blogs.scientificamerican.com/roots-of-unity/ping-pong-for-introverts/>)
- Bubble Wrap (2016), with Ellie Dannenberg, Kimberly Kim, and Jacob Lewis.
 - GUI application and Python library for exploring complex projective structures on compact surfaces admitting circle packings. Joint project with team of graduate and undergraduate researchers.
 - <https://github.com/daviddumas/bubble-wrap/>
- The fence conjecture for polygonal affine spheres (2014), with Michael Wolf
 - Images and animations illustrating numerical experiments that led to a conjecture about affine spheres over convex polygons in the projective plane
 - <http://dumas.io/fence-conjecture/>
- The PML visualization project (2012), with François Guéritaud
 - Images, animations, and open source software for visualizing Thurston's embedding of the space of projective measured laminations on a surface
 - <http://dumas.io/PML/>
- RandomChord (2006)
 - Java applet for exploration of random chords in a hyperbolic ideal triangle
 - <http://dumas.io/applets/RandomChord/>
- Bear (2004)
 - Open source software for exploring Bers slices and other aspects of the representation variety of punctured torus groups
 - <http://bear.sourceforge.net/>

Selected Presentations

2020

- *Coarse and fine geometry of the Thurston metric*
 - Workshop “Geometric Structures and Representation Varieties”, National University of Singapore
 - Workshop “Frontiers in Analysis and Geometry of Teichmüller Spaces”, Tsinghua Sanya International Mathematics Forum

2019

- *Visualizing Fuchsian Groups*
 - Special Interest Seminar, ICERM
- *Visualization of PML*
 - Math+Art panel, ICERM
- *Experimental study of a meromorphic analogue of Teichmüller space*
 - Dynamics and Geometry Seminar, Harvard University
 - Geometry and Topology Seminar, Brown University
 - Conference “Combinatorial and algebraic aspects of geometric structures”, Chiang Mai University, Thailand

- *Opers on Riemann surfaces*
 - Graduate mini-course (4 lectures) at “Winter school on geometric structures”, Université de Nice Sophia Antipolis

2018

- *Compact complex manifolds associated to surface group representations*
 - Geometry Seminar, University of Virginia
- *Asymptotics of Hitchin's metric on Teichmüller space*
 - Conference “Representation varieties and geometric structures in low dimensions”, University of Warwick
 - Conference “The Mathematical Legacy of Maryam Mirzakhani”, Stanford University

2017

- *Geometric limits of convex \mathbf{RP}^2 structures and cubic differentials*
 - Conference “Surface Group Representations and Geometric Structures”, International Center for Theoretical Sciences, Bangalore
 - Informal Geometry and Topology Seminar, Stanford University
 - Geometry, Groups, and Dynamics / GEAR Seminar, University of Illinois at Urbana-Champaign
 - Conference “Higgs Bundles and Related Topics”, Laboratoire J.A. Dieudonné, Université Nice Sophia Antipolis
- Python for mathematical visualization: A four-dimensional case study
 - PyCon 2017, Portland, Oregon
- Geometry and topology of complex Anosov domain quotients
 - Topology Seminar, Yale University

2016

- *Coarse and fine geometry of the Thurston metric*
 - Geometry and Topology Seminar, California Institute of Technology
- *Geometry and topology of complex Anosov domain quotients*
 - Workshop “Chicago Action Now”, University of Chicago
- *Surface group representations in $SL(3)$: An invitation to higher Teichmüller theory*
 - Workshop “Analytic Aspects of Higher Teichmüller theory”, Rutgers-Newark
- *Complex deformations of n -Fuchsian representations*
 - Workshop “Moduli Spaces of Geometric Structures”, Institute for Mathematical Sciences, National University of Singapore
- *Visualizing PML*
 - Conference “Illustrating Mathematics”, ICERM
- *Representations of surface groups in higher-rank complex Lie groups*
 - Colloquium, Rutgers University, Newark

2015

- *Complex deformations of n -Fuchsian representations*
 - Conference “Differentialgeometrie im Grossen”, Oberwolfach
- *From polynomials to polygons via affine differential geometry*

- Colloquium, University of California, Berkeley
- Colloquium, University of Southern California
- *The moduli space of convex real projective structures*
 - Geometry/Topology Seminar, University of Chicago
 - Research Seminar, “Dynamics on moduli spaces of geometric structures”, MSRI

2014

- *Polygons, polynomials, fences, and flows*
 - Workshop “Geometry, topology and physics of moduli spaces of Higgs bundles”, Institute for Mathematical Sciences, National University of Singapore
- *Computing the image of Thurston's skinning map*
 - Workshop “Teichmüller theory and surfaces in 3-manifolds”, Pisa
- *Complex projective structures and theory holonomy limits*
 - Mini-course at the GEAR Junior Retreat, University of Michigan

2013

- *Skinning maps and Lagrangian intersections*
 - Geometric Group Theory and Topology Seminar, Tufts University
- *Examples of moduli spaces*
 - Undergraduate Colloquium, College of the Holy Cross
 - Public Lecture, Jawaharlal Nehru University, New Delhi
- *Computing the image of Thurston's skinning map*
 - Conference “Exotic Geometric Structures”, ICERM
 - Complex dynamics seminar, CUNY Graduate Center
- *Polygons in RP^2 and the Hitchin component of the complex plane*
 - Conference “Algebraic Geometry and Hyperbolic Geometry—New Connections”, Cabo Frio, Rio de Janeiro
- *Convex polygons, complex polynomials, and hyperbolic affine spheres*
 - Dynamics and Geometry Seminar, Harvard University
 - Conference “Advances in Teichmüller theory”, ESI, Vienna

2012

- *Osculation in complex projective and hyperbolic structures*
 - GEAR Research Network Retreat, University of Illinois at Urbana-Champaign
- *Polynomial Pick forms and polygons*
 - Research Seminar, Institut Henri Poincaré
 - AMS Special Session, University of Kansas

2011

- *Real and complex boundaries in the character variety*
 - Wasatch Topology Conference
 - Geometry and Topology Seminar, University of Wisconsin, Madison
- *Floyd's theorem and Λ -trees*
 - William Rowan Hamilton Geometry and Topology Workshop, Trinity College, Dublin

- *Holonomy of projective structures and flat surfaces in hyperbolic space*
 - Conference “Aspects of hyperbolicity in geometry, topology, and dynamics”, University of Warwick
- *Intersections in the character variety*
 - Topology/Geometry Seminar, Stanford University
 - Geometry/Topology Seminar, University of California, Davis
 - Geometry and Topology Seminar, California Institute of Technology
- *Skinning maps are finite-to-one*
 - Conference “Analysis, Geometry, and Surfaces”, Autrans, France
- *Kähler structures on ML and applications*
 - Center for Dynamics and Geometry Seminar, Pennsylvania State University

2010

- *Kähler structures on ML and applications*
 - Geometry Seminar, Indiana University
- *Complex projective structures and character varieties*
 - Colloquium, University of Illinois at Urbana-Champaign
 - Colloquium, Indiana University
- Lecture series: *Complex projective structures and their holonomy representations*
 - Summer school on “Geometry, Topology and Dynamics of Character Varieties”, Institute for Mathematical Sciences, National University of Singapore
- *Skinning maps are finite-to-one*
 - Special session, V Iberoamerican Congress on Geometry, Pucón, Chile
 - AMS Special Session, Albuquerque, New Mexico
- *Rigidity and skinning maps*
 - Topology Seminar, Ohio State University

2009

- *Rigidity and skinning maps*
 - Geometry-Analysis Seminar, Rice University
- *Kähler structures on ML*
 - Geometry and Topology Seminar, University of Warwick
 - Dynamics Seminar, Université Paris-Sud 11
- *Epstein surfaces, trees, and bubbles*
 - AMS Special Session, University of Illinois at Urbana-Champaign
 - UIC Geometry, Topology, and Dynamics Seminar
- *Bers slices are Zariski dense*
 - AMS-MAA Joint Meetings, Special Session, Washington, DC

2008

- *Complex projective structures on surfaces*
 - Karcher Colloquium, University of Oklahoma
- *Holonomy limits of complex projective structures*
 - Seminar, Indiana University
 - Seminar, University of Illinois at Urbana-Champaign

- *Grafting and the Teichmüller metric*
 - The Fourth Ahlfors-Bers Colloquium, Rutgers University, Newark
 - Seminar, University of Chicago
 - Seminar, Brown University
- *Complex projective structures and applications*
 - Colloquium, Queens College (CUNY)
 - Colloquium, University of Connecticut
 - Colloquium, University of California, Riverside
 - Colloquium, University of California, Santa Cruz
 - Colloquium, Lehman College (CUNY)

2007

- *Complex projective structures and applications*
 - Colloquium, University of Illinois at Chicago
 - Colloquium, University of Massachusetts, Amherst
 - Seminar, Johns Hopkins University
- *The Zariski closure of a Bers slice*
 - Conference “Topics in Teichmüller Theory and Kleinian Groups”, MSRI
- *Slicing, skinning, and grafting*
 - Conference “Hyperbolic structures on 3-manifolds and large scale geometry of Teichmüller space”, University of Warwick
- *Slicing, skinning, and grafting*
 - Conference “Geometry and Dynamics in Surfaces and 3-Manifolds”, Brown Univ.
 - Seminar, Johns Hopkins University
- *Shapes of polygons*
 - Brown Symposium for Undergraduates in the Mathematical Sciences
- *Skimming maps are never constant*
 - Seminar, University of Pennsylvania

2006

- *Grafting coordinates for Teichmüller space*
 - Seminar, University of Michigan
 - Seminar, California Institute of Technology
 - AMS Special Session, University of Connecticut
 - Seminar, University of Maryland
- *Analysis and geometry of \mathbb{CP}^1 structures on surfaces*
 - Conference “Teichmüller Theory, Classical and Quantum”, Oberwolfach
 - Georgia Topology Conference, University of Georgia
 - Conference “Teichmüller Theory and Moduli Problems”, Harish-Chandra Research Institute, Allahabad, India

2002-2005

- *The Schwarzian derivative and measured laminations on surfaces*
 - Seminar, Brown University, 2005
- *Grafting, the Schwarzian derivative, and \mathbb{CP}^1 structures on surfaces*

- “The Third Ahlfors Bers Colloquium”, University of Michigan, 2005
- Grafting, pruning, and the Teichmüller geodesic involution
 - “Hyperbolic Geometry and Geometric Analysis”, Wesleyan University, 2004
- *The geometry of complex projective Riemann surfaces*
 - Colloquium, Wesleyan University, 2004
 - Seminar, Brown University, 2004
- *Grafting and complex projective Riemann surfaces*
 - Seminar, University of Minnesota, 2004
- *Grafting of Riemann surfaces and limits of complex projective structures*
 - Seminar, Yale University, 2003
 - Seminar, University of Maryland, 2003
- *Complex projective structures and the Bers embedding*
 - Program “Spaces of Kleinian Groups”, Isaac Newton Institute, Cambridge, 2003
- *Projective structures with quasi-Fuchsian holonomy*
 - Seminar, Wesleyan University, 2002
- *Projective structures and quasi-Fuchsian groups*
 - Colloquium, Oklahoma State University, 2002

Teaching at UIC (2008-)

- Math 550: Differentiable Manifolds II, Spring 2019
- Math 445: Introduction to Topology I, Spring 2019
- Math 320: Linear Algebra I, Fall 2018
- Math 445: Introduction to Topology I, Spring 2018
- Math 549: Differentiable Manifolds I, Fall 2017
- Math 210: Calculus III, Fall 2017
- Math 569: Representations of surface groups, Spring 2017
- Math 180: Calculus I, Fall 2016
- Math 320: Linear Algebra I, Fall 2016
- Math 535: Complex Analysis I, Spring 2016
- Math 445: Introduction to Topology I, Fall 2015
- Math 210: Calculus III, Fall 2015
- Math 550: Differentiable Manifolds II, Fall 2014
- Math 180: Calculus I, Fall 2014
- MCS 481: Computational Geometry, Spring 2014
- Math 180: Calculus I, Spring 2014
- Math 215: Introduction to Advanced Mathematics, Spring 2013
- Math 570: Teichmüller Theory and Geometric Structures, Spring 2013
- MCS 481: Computational Geometry, Spring 2012
- Math 180: Calculus I, Fall 2011 (two sections)
- MCS 481: Computational Geometry, Spring 2011
- Math 442: Differential Geometry of Curves and Surfaces, Fall 2010
- Math 535: Complex Analysis I, Spring 2010
- Math 180: Calculus I, Fall 2009

- Math 442: Differential Geometry of Curves and Surfaces, Spring 2009
- Math 210: Multi-variable Calculus, Fall 2008
- Supervised reading courses:
 - Complex projective structures and asymptotic value theory (Spring 2016)
 - Hyperbolic surfaces and Teichmüller spaces (Fall 2015 – Spring 2016)
 - Harmonic Maps and Teichmüller Theory (Spring 2013)
 - Riemann Surfaces (Fall 2012)
 - Teichmüller Theory (Spring 2010)
 - Lie Groups and Riemannian Geometry (Spring 2010)
 - Differential Geometry (Fall 2009)
- Supervised undergraduate research projects:
 - Interactive configuration spaces (Spring 2019)**
 - Destructive Topology: Slicing Surfaces in VR (Fall 2018)
 - Visualizing the fourth dimension with VR (Fall 2017)
 - Hyperbolic racquetball (Spring 2017)*
 - Tangle toy moduli (Fall 2016)
 - Immersive visualization of 3-sphere data sets (Fall 2015, Summer 2016)
 - Circle packing visualization (Summer 2016)*

* Project run jointly with graduate assistant
 ** Project primarily supervised by graduate student

Teaching at Brown University (2005-2008)

- Math 520: Introduction to Linear Algebra, Spring 2008
- Math 18: Multi-variable Calculus, Fall 2007
- Math 104: Fundamental Problems in Geometry, Spring 2006
- Math 52: Introduction to Linear Algebra, Fall 2005

Teaching at Harvard University (1999-2004)

- Math Xb: Functions and Calculus II, Spring 2003
- Groups of Möbius Transformations, Summer 2002
- QR26: Decisions, Games, and Negotiation, Fall 2001
- Hyperbolic Geometry in Two and Three Dimensions, Summer 2001
- Other teaching:
 - SESAME: Weekend enrichment for secondary school teachers, Fall 2002
 - Substitute mathematics teaching, West Roxbury, MA, Spring 2002

Advising

- Former graduate students
 - Keaton Quinn (2020 PhD)
 - Charles Alley (2019 PhD)
 - Ellie Dannenberg (2017 PhD)
 - Jonah Gaster (2014 PhD)
- Former postdoctoral advisees
 - Andrew Sanders (2013-2016 NSF Postdoctoral Fellow)

Service

- Department level
 - Mathematical Computing Laboratory, Director (2018-2019), founder and board member (2015-)
 - Current committees (2019-2020 academic year):
 - Information Technology (since 2012)
 - Previous committees:
 - Advisory (2015-2017 and 2011-2013, as chair 2012-2013), Visitors Fund (2012-2013), Tenure-Track Hiring (2011-2012), Postdoctoral Hiring (2012-2015, 2017-2018), Calculus (2009-2011), Undergraduate studies (2010-2011, 2014-2015), Undergraduate Advising (2012-2014), Colloquium (2009-2011, 2014-2015), Graduate admissions (2008-2009, 2018-2019)
 - Other department service:
 - Faculty advisor to the Undergraduate Math Club (2009-2014)
 - Calculus coordinator (Fall 2011, Fall 2009)
- University level
 - UIC Faculty Senate (2011-2014)
- Event organization
 - Semester program
 - *Illustrating Mathematics*, Semester Program at ICERM. Fall 2019. Program organizer.
 - Annual events
 - *Undergraduate Mathematics Symposium at UIC*. Founder and organizer since 2010.
 - Conferences
 - *Illustrating Geometry and Topology*, Workshop at ICERM. September 16-20, 2019. Organizer.
 - *Workshop on Geometry of Teichmüller Space*, Fields Institute, August 27-31, 2018. Organizer.
 - *Graduate Student Topology & Geometry Conference*. April 7-8, 2018. Organizer.
 - *Dynamics on Moduli Spaces*, MSRI workshop. April 2015. Lead organizer.
 - *Workshop in Dynamics at UIC*. May 17-21, 2010. Organizer.
 - Upcoming conferences
 - *Geometry of Discrete Actions*, Workshop at ICTP Trieste, August 24-September 4, 2020. Organizer.
- Peer review activities
 - Editor, *Conformal Geometry and Dynamics* (2018-)
 - Editor, *Geometriae Dedicata* (2013-2019)
 - NSF panelist (3 times since 2008)
 - Referee for journals including *Inventiones Mathematicae*, *Duke Mathematical Journal*, *Geometry & Topology*, *Geometriae Dedicata*.

Version

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