Malik Younsi

CONTACT INFORMATION

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CITIZENSHIP

Canadian.

ACADEMIC POSITIONS

University of Hawaii, Honolulu, United States **2017 -**

- Tenure-track Assistant Professor.

University of Washington, Seattle, United States **2016 - 2017**

- Acting Assistant Professor, under the supervision of Donald Marshall.

Stony Brook University, Stony Brook, United States **2014 - 2016**

- NSERC Postdoctoral Fellow and Lecturer, under the supervision of Christopher Bishop.

RESEARCH INTERESTS

My main interests are in complex analysis, more precisely geometric function theory. This includes subjects such as removability, Koebe's conjecture, extremal problems in spaces of analytic functions (mainly analytic capacity), conformal and quasiconformal mappings, conformal welding, etc. I am also interested in holomorphic dynamics, numerical methods in complex analysis, Schramm-Loewner Evolution and potential theory.

EDUCATION

Université Laval, Québec, Canada

Ph.D. in Mathematics **2010 - 2014**

- Thesis : *Calcul de la capacité analytique et fonctions d'Ahlfors rationnelles*
- Advisor : Thomas J. Ransford.

M.Sc. in Mathematics **2008 - 2010**

- Thesis : *La méthode de renormalisation de Zalcman et ses applications*
- Advisor : Thomas J. Ransford.

B.Sc. in Mathematics **2005 - 2008**

GRANTS

- NSF Analysis Grant DMS-2050113 **2021 - 2024**
  Removability in Geometric Function Theory
  Ratings : Excellent, Excellent, Excellent/Very Good. Placed in the Highly Recommended for Funding category.

- Simons Foundation Collaboration Grants for Mathematicians 712236 **2020 - 2025**
  Removability and rigidity of circle domains

- NSF Analysis Grant DMS-1758295 (formerly DMS-1664807) **2017 - 2020**
  Removable Sets and Questions in Geometric Function Theory

Ratings : Excellent, Excellent, Excellent. Placed in the Highly Recommended for Funding category.

- Faculty Mentoring Grant for Summer Undegraduate Research and Creative Works sponsored by the UH Undergraduate Research Opportunities Program **2019**

Research Publications

Mathematics

T. Ransford, M. Younsi and W.-H. Ai, *Continuity of capacity of a holomorphic motion*, Adv. Math. 374 (2020), 107376.

D. Ntalampekos, M. Younsi, *Rigidity theorems for circle domains*, Invent. Math. 220 (2020), 129–183.

S. Pouliasis, T. Ransford and M. Younsi, *Analytic Capacity and Holomorphic Motions*, Conform. Geom. Dyn. 23 (2019), 130–134.

M. Younsi, *Peano Curves in Complex Analysis*, Amer. Math. Monthly. 126 (2019), no. 7, 635–640.

T. Richards, M. Younsi *Computing polynomial conformal models for low-degree Blaschke products*, Comput. Methods. Funct. Theory 19 (2019), no. 1, 173-182.

K. Lindsey, M. Younsi, *Fekete polynomials and shapes of Julia sets*, Trans. Amer. Math. Soc. 371 (2019), 8489–8511.

M. Younsi, *On the analytic and Cauchy capacities*, J. Anal. Math. 135 (2018), no. 1, 185–202.

M. Younsi, *Removability and non-injectivity of conformal welding*, Ann. Acad. Sci. Fenn. Math. 43 (2018), 463-473.

M. Younsi, *Analytic Capacity : computation and related problems*, The First NEAM : Conference Proceedings, Theta Ser. Adv. Math. 22 (2018), 121-152.

T. Richards, M. Younsi, *Conformal models and fingerprints of pseudo-lemniscates*, Constr. Approx. 45 (2017), no. 1, 129-141.

M. Younsi, *Removability, rigidity of circle domains and Koebe's conjecture*, Adv. Math. 303 (2016), 1300-1318.

M. Younsi, *Shapes, fingerprints and rational lemniscates*, Proc. Amer. Math. Soc. 144 (2016), 1087-1093.

M. Younsi, *On removable sets for holomorphic functions*, EMS Surv. Math. Sci. 2 (2015), no. 2, 219-254.

M. Fortier Bourque, M. Younsi, *Rational Ahlfors functions*, Constr. Approx. 41 (2015), no. 1, 157-183.

M. Younsi, T. Ransford, *Computation of analytic capacity and applications to the subadditivity problem*, Comput. Methods Funct. Theory 13 (2013), no. 3, 337–382.

Machine Learning

M. Younsi, A. Lacasse, *A combinatorial conjecture from PAC-Bayesian machine learning*, submitted.

Scholarships and Fellowships

- Research Membership for the MSRI program Analysis and Geometry of Random Shapes **2022**
- NSERC postdoctoral fellowship (45,000$ per year) **2014 - 2016**
- Vanier Canada doctoral scholarship (50,000$ per year) **2010 - 2013**
- Alexander Graham Bell NSERC masters scholarship (17,500$ per year) **2008 - 2010**
- Hydro-Québec masters scholarship (3,000$) **2008**
- Three Undergraduate Student NSERC Research Awards (5,625$ each) **2005 - 2008**
- Université Laval Admission Award (2,500$) **2005**

Travel Grants

- Travel Award from UH Office of the Vice Chancellor for Research **2018**
- Participant of the 3rd Heidelberg Laureate Forum **2015**

  The HLF is a one-week yearly event combining scientific, social and outreach activities during which the winners of the most prestigious awards in mathematics and computer science (Abel Prize, Fields Medal and Turing Award) are invited to meet and discuss with 200 selected high-potential young researchers from roughly 50 countries.
- Grant for the Summer School "Normal Families in Complex Analysis" in Würzburg **2015**
- Grant for the Doc-Course "Complex Analysis and Related Areas" in Sevilla **2013**

Awards

- Governor General's Academic Gold Medal **2015**

  Awarded to the student who achieves the highest academic standing upon graduation from a doctoral degree program at a Canadian university.
- Governor General's Academic Gold Medal **2011**

  Awarded to the student who achieves the highest academic standing upon graduation from a masters degree program at a Canadian university.
- Governor General's Academic Silver Medal **2008**

  Awarded to the student graduating with the highest average from a B.Sc. program at a Canadian university.
- Honor Roll of the Faculty of Graduate Studies (for Ph.D. Thesis) **2014**
- Faculty Award for excellence in teaching **2012, 2014**
- Honor Roll of the Faculty of Graduate Studies (for M.Sc. Thesis) **2010**
- Award for the best poster at the Université Laval Science and Research Conference **2010**
- Honor Mention for highest GPA in Mathematics **2008**

- Award for one of the three best B.Sc. project presentations in Mathematics (300$) **2008**
- Three nominations to the Department's Honor Roll **2005 - 2008**

Teaching and other Academic Experience

University of Hawaii at Manoa, Honolulu, United States

Assistant Professor **2017 -**

- MATH 633 : Functional Analysis (8 students) (Spring 2022)
- MATH 244 : Calculus IV (32 students) (Fall 2021)
- MATH 241 : Calculus I (two sections, 58 students total) (Fall 2021)
- MATH 644 : Analytic Function Theory (9 students) (Spring 2021)
- MATH 252A : Accelerated Calculus II (18 students) (Spring 2021)
- MATH 251A : Accelerated Calculus I (18 students) (Fall 2020)
- MATH 331 : Introduction to Real Analysis (18 students) (Spring 2020)
- MATH 311 : Introduction to Linear Algebra (20 students) (Spring 2020)
- MATH 649D : Topics : Complex Analysis and Riemann Surfaces (6 students) (Fall 2019)
- MATH 444 : Complex Analysis (12 students) (Spring 2019)
- MATH 241 : Calculus I (course coordinator and two sections, 30 students each) (Fall 2018)
- MATH 631 : Theory of Functions of a Real Variable (5 students) (Fall 2018)
- MATH 444 : Complex Analysis (11 students) (Spring 2018).

University of Washington, Seattle, United States

Acting Assistant Professor **2016 - 2017**

- MATH 307 : Introduction to Differential Equations (50 students) (Spring 2017)
- MATH 307 : Introduction to Differential Equations (two sections, 50 students each) (Winter 2017)
- MATH 307 : Introduction to Differential Equations (50 students) (Autumn 2016).

Stony Brook University, Stony Brook, United States

NSERC Postdoctoral Fellow and Lecturer **2014 - 2016**

- Topics in Complex Analysis : Loewner Theory, with an introduction to SLE (Spring 2016)

- MAT 200 : Logic, Language and Proof (40 students) (Fall 2015)
- MAT 550 : Real Analysis II (Graduate Course, 14 Ph.D. students) (Spring 2015).

Université Laval, Québec, Canada

Lecturer **2011 - 2014**

- MAT-1900 : Mathématiques de l'ingénieur I (165 students) (Fall 2013)
- MAT-1900 : Mathématiques de l'ingénieur I (115 students) (Fall 2011).

Teaching Assistant **2007 - 2014**

- MAT-1100 : Analyse I (Winter 2014)
- MAT-2100 : Analyse II (Fall 2010)
- MAT-2200 : Algèbre linéaire avancé (Winter 2010)
- MAT-3120 : Analyse complexe (Fall 2009 and Fall 2010)
- MAT-1310 : Mathématiques discrètes (Winter 2009 and Winter 2012)
- MAT-2310 : Théorie des nombres (Fall 2008 and Fall 2012)
- MAT-1300 : Éléments de mathématiques (Fall 2007).

Tutor in Mathematics **2007 - 2014**

- Mathematics Drop-in Tutoring Centre (CDA).

Research Assistant **2006 - 2008**

- Undergraduate research assistant supported by NSERC (Summer 2008)
  Research project : The exponential spectrum in a Banach algebra
  Supervisor : Thomas J. Ransford
- Undergraduate research assistant supported by NSERC (Summer 2007)
  Research project : Beurling-Sobolev weights and convolution algebras
  Supervisor : Thomas J. Ransford
- Undergraduate research assistant supported by NSERC (Summer 2006)
  Research project : Stochastic differential equations
  Supervisor : Hassan Manouzi.

Students

Ph.D.
- Shubham Joshi (2018 -)

Masters
- Sana Habib (2019 - 2020)

Undergraduate
- Irvin Chang (Summer 2019), funded by a Faculty Mentoring Grant from UH

- Xiao Li, Siyuan Ni and Ryan Pachauri (Winter 2017 and Spring 2017), sponsored by the Washington Experimental Mathematics Lab at UW.

Conferences and Seminars Organized

- Organizer of the UH Mathematics Colloquium (2021 -)
- Co-organizer of the UH Mathematics grad/postdoc professional development seminar
- Co-organizer of the UH analysis seminar
- Co-organizer of the session *The Geometry of Complex Polynomials and Rational Functions* at the 2020 Joint Mathematics Meeting in Denver (2020)
- Co-organizer of the session *Constructive Aspects of Complex Analysis* at the Spring Central and Western Joint AMS Sectional Meeting at the University of Hawaii (2019)
- Lead Local Organizer of the Spring Central and Western Joint AMS Sectional Meeting at the University of Hawaii (2018 - 2019)
- Organizer of the session *Complex Analysis and Applications* at the 2018 Spring Western AMS Sectional Meeting at Portland State University (2018)
- Co-organizer of the session *Complex Analysis and Applications* at the 2016 CMS Winter Meeting (2016)
- Co-organizer of the ISM Québec Student Conference at Université Laval (2010).

Reviewer for

- *Selecta Mathematica* (2021)
- *Foundations of Computational Mathematics* (2021)
- *Complex Variables and Elliptic Equations* (2020)
- *Journal of Geometric Analysis* (2020)
- *International Mathematics Research Notices* (2020)
- *Duke Mathematical Journal* (2020)
- *Canadian Mathematical Bulletin* (2020)
- *Arkiv för Matematik* (2019)
- *Comput. Methods Funct. Theory* (2018)
- *Results in Mathematics* (2018)
- *Ann. Acad. Sci. Fenn.* (2017, 2021)
- *Journal d'Analyse Mathématique* (2017)
- *Bulletin of the London Mathematical Society* (2017)

- *Matematicheskii Sbornik* (2017)
- *Journal of Mathematical Analysis and Applications* (2017)
- *The American Mathematical Monthly* (2017)
- *Mathematical Reviews/MathSciNet* (2014 -)
- Proceedings of the conference *Invariant Subspaces of the Shift Operator* (2013).

Service

- NSF grants panelist (2018, 2019)
- Ph.D. thesis committee member (Matthew Lorentz, University of Hawaii, 2021)
- Ph.D. thesis external committee member (A Arthur Bonkli Razafindrasoanaivolala, Université Laval, 2021)
- Ph.D. thesis external committee member (François Laniel, Université Laval, 2018)
- Masters thesis committee member (Kaui Yogi, UH, 2018 and Krystin Manguba-Glover, UH, 2018)
- Co-responsible for the mathematics booth at The Manoa Experience (2018, 2019)
- Co-responsible for the UH analysis qualifying exam (preparatory sessions, writing and grading)
- Member of various departmental committees, such as the curriculum committee, the tutor program committee and the graduate program committee
- Member of the jury committee for the B.Sc. project presentations in mathematics (Université Laval, 2013)
- Member of the mathematics investment fund committee (Université Laval, 2011)
- Member of the mathematics' students association executive committee (Université Laval, 2007)
- Volunteer for the organization of the Banach algebras 2007 international conference (Université Laval, 2007).

Other research work

M. Younsi, *Calcul de la capacité analytique et fonctions d'Ahlfors rationnelles*, Ph.D. Thesis (2014).

M. Fortier Bourque, M. Younsi, *Finitely connected domains, rational maps and Ahlfors functions*, 20 pages, arXiv :1309.2885 (2013).

M. Younsi, *Proof of a combinatorial conjecture coming from the PAC-Bayesian machine learning theory*, Proof of a mathematical result used by the Groupe de Recherche en Apprentissage Automatique de l'Université Laval, arXiv :1209.0824 (2012).

M. Younsi, *La méthode de renormalisation de Zalcman et ses applications*, M.Sc. thesis (2010).

M.Younsi, *Dirichlet series*, B.Sc. project in Mathematics (2008).

Invited Talks

Removability of planar sets. Plenary Lecture at the Computational Methods and Function Theory Conference, Online (January 2022).

Holomorphic motions, analytic capacity and conformal welding. American Mathematical Society Fall Western Sectional Meeting, Online (October 2021).

Holomorphic motions, capacity and conformal welding. (HYPER)Complex Analysis and Geometry, Online (July 2021).

Holomorphic motions, capacity and conformal welding. Kansas State Analsis Seminar, Online (May 2021).

Holomorphic motions, capacity and conformal welding. Canadian Mathematical Society Winter Meeting, Online (December 2020).

Holomorphic motions, capacity and conformal welding. Quasiworld Seminar, Online (September 2020).

Holomorphic motions, conformal welding and analytic capacity. CRM Montreal/Quebec Analysis Seminar, Online (May 2020).

Fekete Polynomials and Shapes of Julia Sets. Joint Mathematics Meeting, Denver, United States (January 2020).

Peano Curves in Complex Analysis. Analysis Seminar, Université Laval, Québec, Canada (July 2019).

Removability, rigidity of circle domains and Koebe's conjecture. Analysis and Geometry of Random Shapes workshop, IPAM, Los Angeles, United States (January 2019).

Analytic Capacity and Holomorphic Motions. Canadian Mathematical Society Winter Meeting, Vancouver, Canada (December 2018).

Conformal rigidity of circle domains. New Developments in Complex Analysis and Function Theory, University of Crete, Heraklion, Greece (July 2018).

Conformal rigidity of circle domains. Complex Analysis and Spectral Theory, Université Laval, Québec, Canada (May 2018).

Removability, rigidity of circle domains and Koebe's conjecture. Joint Caltech/UCLA Analysis Seminar, Caltech, Los Angeles, United States (May 2018).

Sur la non-injectivité de la soudure conforme. Analysis Seminar, Université Laval, Québec, Canada (December 2017).

The Gaussian Free Field. Workshop on Analysis and Probability, Montana State University, Bozeman, United States (August 2017).

Shapes of Julia sets. XX-th ISM Québec Student Conference, Trois-Rivières, Canada (May 2017).

Removability and Koebe's uniformization conjecture. University of Chicago Dynamics Seminar, Chicago, United States (May 2017).

Removability in Conformal Welding and Koebe's Uniformization Conjecture. University of Hawaii

Department Colloquium, Honolulu, United States (February 2017).

Conformal removability and Koebe's uniformization conjecture. University of Washington Rainwater Seminar, Seattle, United States (October 2016).

Removability, rigidity of circle domains and Koebe's conjecture. American Mathematical Society Spring Eastern Sectional Meeting, Stony Brook, United States (March 2016).

Ensembles effaçables, capacité analytique et transformée de Cauchy. Analysis Seminar, Université Laval, Québec, Canada (March 2016).

Conformal removability. University of Toronto Mathematics Department Colloquium, Toronto, Canada (January 2016).

Constructive approximation by Julia sets. Canadian Mathematical Society Winter Meeting, Niagara Falls, Canada (December 2016).

Removability, rigidity of circle domains and Koebe's conjecture. Canadian Mathematical Society Winter Meeting, Montréal, Canada (December 2015).

On the analytic and Cauchy capacities. University of Connecticut Analysis and Probability Seminar, Storrs, United States (March 2015).

Analytic capacity and the subadditivity problem. New York State Regional Graduate Mathematics Conference, Syracuse, United States (April 2014).

Rational Ahlfors functions. Syracuse University Analysis Seminar, Syracuse, United States (April 2014).

Analytic capacity and rational Ahlfors functions. Universitat Autònoma de Barcelona Analysis Seminar, Barcelona, Spain (February 2014).

Analytic capacity and the subadditivity problem. Workshop in Complex and Harmonic Analysis, Málaga, Spain (March 2013).

Computation of analytic capacity and applications to the subadditivity problem. Canadian Mathematical Society Winter Meeting, Montréal, Canada (December 2012).

Other Presentations

Removable sets for analytic functions. Analysis seminar, University of Hawaii, Honolulu, United States (February 2020).

Peano curves in complex analysis. Analysis Seminar, University of Hawaii, Honolulu, United States (April 2018).

Removable sets, analytic capacity and the Cauchy transform. Analysis Seminar, University of Hawaii, Honolulu, United States (February 2018).

Universality of the Riemann zeta function and zero-free polynomial approximation. Joint Analysis and Number Theory Seminar, University of Hawaii, Honolulu, United States (November 2017).

Conformal welding homeomorphisms. Analysis Seminar, University of Hawaii, Honolulu, United States (October 2017).

What are the possible shapes of polynomial Julia sets ? Analysis Seminar, University of Hawaii,

Honolulu, United States (September 2017).

Ensembles conformément effaçables et conjecture de Koebe. Analysis Seminar, Université Laval, Québec, Canada (January 2016).

Analytic capacity and rational Ahlfors functions. Stony Brook University Dynamics Learning Seminar, Stony Brook, United States (October 2014).

Capacité analytique et fonctions d'Ahlfors rationnelles. Analysis Seminar, Université Laval, Québec, Canada (January 2014).

La capacité analytique et le problème de la sous-additivité. Analysis Seminar, Université Laval, Québec, Canada (October 2012).

On some estimates for analytic capacity. XV-th ISM Québec Student Conference, Montréal, Canada (June 2012).

Spectre, pseudospectre et comportement de matrices. Poster presentation. Université Laval Science and Research Conference (February 2010).

Normal families and the renormalization lemma. XIV-th ISM Québec Student Conference, Montréal, Canada (May 2009).

The exponential spectrum in a Banach algebra. Canadian Undergraduate Mathematics Conference (CUMC), Toronto, Canada (July 2008).

Beurling-Sobolev weights. Waterloo Symposium in Undergraduate Mathematics (WATSUM), Waterloo, Canada (August 2007).

Les nombres premiers et la fonction zeta de Riemann. Université Laval Math Club, Québec, Canada (October 2012).

La théorie analytique des nombres et l'analyse complexe. Cégep F.-X. Garneau Math Club, Québec, Canada (April 2012).

Languages and Skills

- Languages : French (native), English (fluent), Spanish (basic)
- Computer : C, Matlab, Maple, LaTeX, Unix/Linux, Windows.

Other

- Black belt in Karate
- Member of the United States Chess Federation.