Adel Khalfallah

Associate Professor of Mathematics

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Research Profile

Complex and harmonic analysis; elliptic partial differential equations; generalized, weighted and hyperbolic harmonic functions; Poisson kernels; Schwarz–Pick estimates; Hardy, Bergman and Dirichlet spaces; sharp function-theoretic inequalities. Earlier work includes complex analytic geometry, hyperbolic complex spaces and nonstandard analysis.

Education

2001 **Ph.D., Mathematics**, Université Joseph Fourier (Grenoble I), France. Dissertation: *The moduli space of hyperbolic compact complex spaces*; supervisor: Siegmund Kosarew.

1997 **M.Sc. (DEA), Pure Mathematics**, Université Joseph Fourier (Grenoble I), France.

1996 **B.Sc., Mathematics**, Faculty of Sciences, Monastir, Tunisia.

Academic Appointments

2015–present **Associate Professor**, King Fahd University of Petroleum & Minerals (KFUPM), Saudi Arabia.

2011–2015 Assistant Professor, KFUPM, Saudi Arabia.

2010–2011 Assistant Professor, King Khalid University, Abha, Saudi Arabia.

2002–2010 Assistant Professor, Preparatory Institute for Engineering Studies, Monastir, Tunisia.

2000–2001 Lecturer / Research Assistant, Fourier Institute, Grenoble, France.

Funded Research Projects (Principal Investigator)

- **2018–2019:** Topological and algebraic theory of convex subrings of ${}^*\mathbb{R}$.
- **2017–2019:** Nonstandard approach to holomorphic generalized functions.
- **2013–2014:** Generalized nonstandard hulls of locally convex spaces and Colombeau's theory.
- **2012:** Nonstandard topologies and F-asymptotic hulls (18-month project).

Teaching

Undergraduate and graduate instruction in complex variables, functional analysis, calculus, advanced calculus, differential equations, linear algebra and data science.

Academic Service

Graduate, recruitment, research, doctoral examination and accreditation committees; Ph.D. admissions interviews; thesis examinations and course coordination.

Selected Invited Presentations

- **2024:** XIV Symposium–Mathematics and Applications, Belgrade, Serbia.
- **2024:** Congressio–Mathematica X, Olsztyn, Poland.
- **2023:** XIII Symposium–Mathematics and Applications, Belgrade, Serbia.
- **2022:** Congressio–Mathematica VIII, Olsztyn, Poland.
- **2021:** XI Symposium–Mathematics and Applications, Belgrade (online).
- **2021:** Guest research seminar, Alexander Schmitt's group, Freie Universität Berlin (online).
- **2019:** X Symposium–Mathematics and Applications, Belgrade, Serbia.
- **2018:** *Examples of new nonstandard hulls of locally convex spaces*, Microlocal and Time-Frequency Analysis, Turin, Italy.
- **2018:** *Bounded polynomials and holomorphic mappings between convex subrings of* ${}^*\mathbb{C}$, 23rd Colloquium of the Tunisian Mathematical Society, Tabarka, Tunisia.
- **2017:** *Linking complex analytic to nonstandard algebraic geometry*, Texas A&M University at Qatar, Doha, Qatar.
- **2015:** *Old and new invariant pseudo-distances defined by pluriharmonic functions*, KAWA 6, Pisa, Italy.
- **2013:** *Complex spaces and nonstandard schemes*, Ninth International ISAAC Congress, Kraków, Poland.

Selected Journal Publications (2018–2026)

Reverse chronological order. For a complete bibliography from 2002 onward, see the full academic CV.

1. A. Ahmed and **A. Khalfallah**, "Riesz–Fejér inequalities for hyperbolic harmonic functions in the unit ball," *Journal of Mathematical Analysis and Applications* **563**(2), Article 130826 (2026). *Forthcoming; issue dated 15 November 2026.* [DOI]
2. **A. Khalfallah**, "Shifted Hardy inequalities on the unit ball and polydisk," *Complex Variables and Elliptic Equations* accepted/in press (2026). [DOI]
3. **A. Khalfallah** and J. Rättyä, "Weighted Dirichlet Spaces of Hyperbolic Harmonic Functions," *Mediterranean Journal of Mathematics* **23**(3), Article 126 (2026). [DOI]
4. **A. Khalfallah** and M. Mhamdi, "Estimates of the first partial derivatives of (α, β)-harmonic functions on the unit disc," *Journal of Inequalities and Applications* **2025**, Article 109 (2025). [DOI]
5. **A. Khalfallah**, "Growth of Generalized Harmonic Functions and Radial Eigenfunctions," *Bulletin of the Malaysian Mathematical Sciences Society* **48**(6), Article 184 (2025). [DOI]
6. **A. Khalfallah** and J. C. Joo, "Radially weighted harmonic functions in the unit disc," *RACSAM* **119**(4), Article 87 (2025). [DOI]
7. **A. Khalfallah** and M. Mateljević, "Estimates of Partial Derivatives for Harmonic Functions on the Unit Disc," *Computational Methods and Function Theory* **24**(4), 883–893 (2024). [DOI]
8. **A. Khalfallah** and M. Mateljević, "Norm estimates of the partial derivatives and Schwarz lemma for α-harmonic functions," *Complex Variables and Elliptic Equations* **69**(7), 1182–1194 (2024). [DOI]
9. **A. Khalfallah** and M. Mhamdi, "Schwarz Type Lemmas for Generalized Harmonic Functions," *Bulletin of the Malaysian Mathematical Sciences Society* **47**(2), Article 53 (2024). [DOI]
10. O. Echi, **A. Khalfallah** and D. Kroumi, "Estimating the remainder of an alternating p-series using hypergeometric functions," *Journal of Mathematical Inequalities* **17**(2), 569–580 (2023). [DOI]
11. O. Echi, **A. Khalfallah** and D. Kroumi, "Sharp estimate of the remainder of some alternating series," *Mathematical Inequalities & Applications* **26**(1), 83–91 (2023). [DOI]
12. **A. Khalfallah**, F. Haggui and M. Mateljević, "A Khavinson type conjecture for hyperbolic harmonic functions on the unit ball," *Journal of Mathematical Analysis and Applications* **513**(2), Article 126241 (2022). [DOI]
13. **A. Khalfallah**, M. Mateljević and B. Purtić, "Schwarz–Pick Lemma for Harmonic and Hyperbolic Harmonic Functions," *Results in Mathematics* **77**(4), Article 167 (2022). [DOI]
14. **A. Khalfallah** and M. Mhamdi, "Hölder Continuity of Generalized Harmonic Functions in the Unit Disc," *Complex Analysis and Operator Theory* **16**(7), Article 101 (2022). [DOI]
15. O. Echi, **A. Khalfallah** and D. Kroumi, "On primitive words with non-primitive product," *RAIRO – Theoretical Informatics and Applications* **56**, Article 4 (2022). [DOI]
16. **A. Khalfallah**, M. Mateljević and M. Mhamdi, "Some Properties of Mappings Admitting General Poisson Representations," *Mediterranean Journal of Mathematics* **18**(5), Article 193 (2021). [DOI]
17. **A. Khalfallah**, F. Haggui and M. Mhamdi, "Generalized harmonic functions and Schwarz lemma for biharmonic mappings," *Monatshefte für Mathematik* **196**(4), 823–849 (2021). [DOI]
18. A. Ayache, O. Echi and **A. Khalfallah**, "Subrings of a power set and clopen topologies," *Journal of Algebra and its Applications* **20**(12), Article 2150224 (2021). [DOI]
19. M. Mateljević and **A. Khalfallah**, "On some Schwarz type inequalities," *Journal of Inequalities and Applications* **2020**, Article 164 (2020). [DOI]
20. **A. Khalfallah** and S. Kosarew, "Linking Complex Analytic to Nonstandard Algebraic Geometry," *Abhandlungen aus dem Mathematischen Seminar der Universität Hamburg* **90**(1), 1–15 (2020). [DOI]
21. O. Echi and **A. Khalfallah**, "On the prime spectrum of the ring of bounded nonstandard complex numbers," *Proceedings of the American Mathematical Society* **147**, 687–699 (2019).
22. O. Echi and **A. Khalfallah**, "Order Theoretic and Algebraic Characterizations of the Divided Spectrum of a Ring," *Bulletin of the Belgian Mathematical Society* **26**(3), 453–467 (2019).
23. **A. Khalfallah** and S. Kosarew, "Examples of new nonstandard hulls of topological vector spaces," *Proceedings of the American Mathematical Society* **146**(6), 2723–2739 (2018). [DOI]
24. **A. Khalfallah** and S. Kosarew, "Bounded polynomials and holomorphic mappings between convex subrings of ${}^*\mathbb{C}$," *Journal of Symbolic Logic* **83**(1), 372–384 (2018). [DOI]

Publication status reflects records available on 12 October 2026. The JMAA *Riesz–Fejér* issue date is 15 November 2026.