Sabir Umarov: Curriculum Vitae

(updated on November, 2022)

- **Affiliation:** University of New Haven

- **Position:** FULL PROFESSOR

- **Address:** Department of Mathematics, University of New Haven,
  300 Boston Post Road, West Haven, CT 06516

- **Tel:** 1-203-479-4122;

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- **Research fields: Partial Differential Equations, Probability Theory, Mathematical Modeling:**

  ◇ Pseudo-differential operators and equations with singular symbols,

  ◇ Stochastic differential equations,

  ◇ Applied stochastic processes (in finance, cell biology, signaling, filtering, e.t.c.);

  ◇ Fractional calculus,

  ◇ Continuous time random walk,

  ◇ Complex variable differential equations,

  ◇ Spectral theory and applications,

  ◇ Fractional, distributed, and variable order differential equations, ,

  ◇ Nonextensive statistical mechanics.

- **Service:**

  ◇ Editor-in-Chief of the journal "Fractional Differential Calculus",

  ◇ Associated Editor of the journal "Fractional Calculus and Applied Analysis",

  ◇ Member of the Editorial Board of the journal "Fractal and Fractional",

  ◇ Member of the Editorial Board of the "Uzbek Mathematical Journal",

  ◇ Member of the Editorial Board of the journal "Progress in Fractional Differentiation and Applications",

  ◇ Reviewer of Mathematical Reviews, Zentralblatt MATH, and several journals.

- **Supervised:** 4 PhD dissertations; 2 postdocs; over 20 masters.

- **Courses taught: 1. Basic courses:**

  ◇ Precalculus, Calculus I, II, III, Complex Analysis, Functional analysis, Linear algebra; Analytic geometry, Ordinary differential equations, Partial differential equations, Numerical analysis, Mathematical modeling, Probability theory, Stochastic processes, Mathematical statistics, Mathematics for Engineering

  2. Specialized courses:

  ◇ Contemporary methods of mathematical physics and differential equations, Fractional order differential equations and applications, Spectral theory of linear pseudo-differential operators, Random walk models and anomalous diffusion processes (math biology oriented), Fractional calculus, Advanced probability, Stochastic differential equations, Financial mathematics (Black-Scholes equation, option pricing), Fokker-Planck equations and their applications

- **Seminars organized:**

  ◇ Bi-weekly Probability Seminar at Tufts university, 2007–2012,
  ◇ Financial Mathematics, weekly seminar at the University of New Mexico, 2006–2007,
  ◇ Mathematical Physics, weekly seminar at National University of Uzbekistan, 1993–2005.

- **Publications:** List of Publications is attached. Authored 3 books (published by Springer and World Scientific), 1 book chapter (published by De Gruyter), over 80 papers in peer reviewed math and physics journals.

- **Employment record:**

  ◇ 2017– up todate, University of New Haven, Full Professor
  ◇ 2014–2017, University of New Haven, Associate Professor
  ◇ 2012–2014, University of New Haven, Assistant Professor
  ◇ 2007–2012, Tufts University, Assistant Professor
  ◇ 2005–2007, University of New Mexico, Visiting Professor,
  ◇ 1993–2005, National University of Uzbekistan, Full Professor,
  ◇ 1987–1993, National University of Uzbekistan, Associate Professor (Docent)
  ◇ 1983–1986, Moscow Power Engineering Institute, PhD Student (Aspirantura, Supervisor: Prof. Dubinskii, Yu. A.),
  ◇ 1980–1982, Cybernetics Institute of the Academy of Science of Uzbekistan, Engineer.

- **Professional Societies:**

  ⋄ American Mathematical Society (AMS), since 1987,

  ⋄ Uzbek Mathematical Society (UMS),

  ⋄ International Society for Analysis, its Applications and Computation (ISAAC), since 2003 (lifetime member).

- **Grants, awards, honors:**

  ⋄ 2013 UNH Award "Excellence in Research and Creative Activity",

  ⋄ 2013–2016 UNH Grant "University Research Scholar",

  ⋄ 2011–2013 Grant "Nonlinear filtering design", Tufts-Raytheon, UNH-Raytheon,

  ⋄ 2005 Dec–2006 Apr, 2007 (Jun-Aug) NIH STMC Grant P20 GM067594,

  ⋄ 2005 (Feb–Nov), UNM, Albuquerque, Grant of the Fulbright Program

  ⋄ 2003–2004 and 1999–2000 Free University of Berlin, Berlin, DAAD,

  ⋄ 1998 Pacific Resource Exchange Center, Japan, Japan International Cooperation Agency,

  ⋄ 1994–1995 NSF international research grant (grant # Z1000),

  ⋄ 1992 Individual NSF grant,

  ⋄ 1990–1993 Academy of Sciences of Uzbekistan,

  ⋄ 1983–1986 Moscow Power Engineering Institute (Technical University), Moscow.

- **International Conferences participated as an Invited or Plenary Speaker:**

  ⋄ International Conference "Nonclassical Problems of Differential Equations", January 2021, Almaty, Kazakhstan.

  ⋄ International Conference "Contemporary Methods of Mathematical Physics", National University of Uzbekistan, November 2020, Tashkent, Uzbekistan.

  ⋄ International Conference on Fractional Calculus, June 9-10, 2020, Ghent University, Belgium.

  ⋄ The 2nd USA-Uzbekistan International Conference in Mathematics, August 8-12, 2017, Khiva, Uzbekistan.

  ⋄ International Conference "Complex systems", CBPF, October 29 - November 2, 2013, Rio de Janeiro, Brazil.

  ⋄ International Symposium on Fractional PDE: Theory, Numerics, and Applications. Brown University, June 3–5, 2013, Salve Regina University, Newport RI (USA),

- ◇ Joint meeting of the Boston Chapter of the American Statistical Association and the New Hampshire Chapter of the IEEE Communications and Signal Processing (October 2010, Nashua, New Hampshire, USA),

- ◇ International Conference "Complexity, Metastability and Nonextensivity", Catania, Italy, July 1–5, 2007,

- ◇ Los-Alamos Days, Tucson, AZ, USA, February 9–10, 2007,

- ◇ International Conference "Dynamical Systems and Statistical Mechanics", Durham, UK, July 3–13, 2006,

- ◇ International Symposium on Fractional Calculus, Dunedin, New Zealand, January 9–13, 2006,

- ◇ International Conference "Differential and Difference Equations", Melbourne, FL, 2005, USA,

- ◇ The IV International Conference on High Dimensional Probability, Santa Fe, NM, USA, June 20–24, 2005,

- ◇ International Conference "Silk Road Quantum Mechanics", Tashkent, Uzbekistan, September 28 – October 3, 2003,

- ◇ International Conference "Mimetic discretizations in mechanics", San Diego, CA, USA, July, 2003,

- ◇ International Conference on Computer Algebra and Scientific Computation, Samarkand, Uzbekistan, October, 2003,

- ◇ International Conference "Degenerate Equations; and Equations of Mixed Type", Tashkent, Uzbekistan, 1994,

- ◇ International Conference "Qualitative Methods in the Theory of Boundary Value Problems", Voronezh, Russia, May, 4–8, 1992,

- ◇ International Conference "Differential Equations", Joint Meeting of Moscow State University and Moscow Mathematical Society Moscow, Russia, 1991,

- ◇ International conference "Actual Problems of Complex Analysis", Tashkent, Uzbekistan, 1989,

- ◇ International conference "Functional Methods in Mathematical Physics", Tashkent, Uzbekistan, 1988,

- ◇ International Conference "Differential Equations", Joint Meeting of Moscow State University and Moscow Mathematical Society Moscow, Russia, 1985.

Sabir Umarov: List of Publications

- **Published:**

- *Books:*

  ◇ (with Tsallis C.) Mathematical Foundations of Nonextensive Statistical Mechanics. World Scientific, 2022.
    (https://www.worldscientific.com/worldscibooks/10.1142/12499)

  ◇ (with Hahn M. and Kobayashi K.) Beyond the triangle - Brownian motion, Ito stochastic calculus, and Fokker-Planck equation: fractional generalizations. World Scientific, 2018.
    (https://www.worldscientific.com/worldscibooks/10.1142/10734)

  ◇ Sabir Umarov. Introduction to Fractional and Pseudo-Differential Equations with Singular Symbols. Developments in Mathematics, 41. Springer, 2015.
    (https://link.springer.com/book/10.1007/978-3-319-20771-1)

- *Book Chapters:*

  ◇ Sabir Umarov. Fractional Duhamel principle. Handbook of Fractional Calculus with Applications. DeGruyter, Berlin/Munich/Boston, 383-410. 2019.

- *Papers:*

  ◇ (with R. Ashurov) An inverse problem of determining orders of systems of fractional pseudo-differential equations. Fract Calc Appl Anal (2022).
    https://doi.org/10.1007/s13540-021-00006-y

  ◇ (with R. Ashurov, Y.Q. Chen) On a method of solution of systems of fractional order pseudo-differential equations. FCAA, 24 (1), 2021, 254–277.

  ◇ (with Y.Q. Chen, at all) Epidemiological analysis and persistent forecast of COVID-19 by a fractional order epidemic model using SLDO. ISA Transactions (submitted)

  ◇ (with Y.Q. Chen, at. all) A COVID-19 epidemic model with heterogeneity and mobility factors for re-opening study. ISA Transactions. (submitted)

  ◇ (with R. Ashurov) Determination of the order of fractional derivative for subdiffusion equations. FCAA, 23 (6), 2020.

  ◇ (with S. Dzhamalov, R. Ashurov) On unique solvability of a nonlocal boundary value problem for a loaded multidimensional Chapligin's equation in the Sobolev space. Lobachevski journal of mathematics. 41 (1), 7-14, 2020.

  ◇ (with K. Nelson and M. Kon) Use of the geometric mean as a statistic for the scale of the coupled Gaussian distributions. Physica A: Statistical Mechanics and Applications, 2019, 515, 248–256.

⋄ (with F. Daum and K. Nelson) Fractional generalizations of Zakai equation and some solution methods. Frac. Calc. Appl. Anal. (2018), 21 (2), 336–353.

⋄ Sabir Umarov. Fractional Fokker-Planck-Kolmogorov equations associated with stochastic differential equations in a bounded domain. Frac. Calc. Appl. Anal., (2017), 20 (5), 1281–1304.

⋄ (with Nelson K., Kon M.) On the average uncertainty for systems with nonlinear coupling. Physica A: Statistical Mechanics and Applications, 2016, 30–43.

⋄ (with Tsallis C.) The limit distribution in the q-CLT for $q \geq 1$ is unique and can not have a compact support. Journal of Physics A: Mathematical and Theoretical, (2016), 49, 415204 (14pp).

⋄ Sabir Umarov. Continuous time random walk models for fractional space-time diffusion equations. Frac. Calc. Appl. Anal., (2015), 18 (3), 821–837.

⋄ Sabir Umarov. Pseudo-differential operators with meromorphic symbols and systems of complex differential equations. Complex Variables and Elliptic Equations, (2015), 60 (6), 829-863.

⋄ (with Daum F., Nelson K.) Fractional generalizations of filtering problems and their associated fractional Zakai equations. Frac. Calc. and Appl. Anal., (2014), 17 (3), 745–764.

⋄ (with Jiang X., Hahn M.) On Generalized Leibniz Triangles and q-Gaussians. Physics Letters A, (2012) 376 (36), 2447–2450.

⋄ Sabir Umarov. On fractional Duhamel's principle and its applications. Journal of Differential Equations, (2012) 251 (10), 5217–5234.

⋄ (with Shinaliyev K., Turmetov B.) A fractional operator algorithm method for construction of solutions of fractional order differential equations. Frac. Calc. and Appl. Anal., (2012), 15 (2), 267–281.

⋄ (with Hahn M., Kobayashi K.) SDEs driven by a time-changed Lévy process and their associated time-fractional order pseudo-differential equations. Journal of theoretical probability, (2012) 25, 262–279.

⋄ (with Hahn M., Kobayashi K., Ryvkina E.) On time-changed Gaussian processes and their associated Fokker-Planck-Kolmogorov equations. Electronic Communications in Probability, (2011) 16, 150–164.

⋄ (with Hahn M.) Fractional Fokker-Plank-Kolmogorov type equations and their associated stochastic differential equations. Fractional Calculus and Applied Analysis, (2011), 14 (1), 56–79.

⋄ (with Hahn M., Kobayashi K.) Fokker-Planck-Kolmogorov equations associated with time-changed fractional Brownian motion. Proceedings of the American Mathematical Society, (2011) 139 (2), 691–705.

⋄ (with Hahn M., Jiang X.) On q-Gaussians and exchangeability. Journal of Physics A: Mathematical and Theoretical, V 43 (2010).

⋄ (with Silvio Duarte Queiros.) Functional-differential equations for the q-Fourier transform of q-Gaussians, Journal of Physics A: Mathematical and Theoretical. V 43 (2010) 095202 (15pp).

⋄ (with Nelson K.) Nonlinear statistical coupling. Physica A: Statistical Mechanics and its Applications. (2010).

⋄ (with Tsallis C., Gell-Mann M. and Steinberg. S) Generalization of symmetric alpha-stable distributions for $q > 1$. Journal of Mathematical Physics. V 51 (3) (2010).

⋄ (with Steinberg S.) Variable order differential equations with piecewise constant order-function and diffusion with changing modes. Zeitschrift für Analysis und ihre Anwendungen, 2009, V 28, 4, 131–150.

⋄ (with Tsallis C.) On a representation of inverse Fq-transform. Physics Letters A. 2008, V 372, 29, 4874–4876.

⋄ (with Tsallis C. and Steinberg S.) A generalization of the central limit theorem consistent with nonextensive statistical mechanics. Milan Journal of Mathematics, 2008, 76(1), 307–328.

⋄ (with Tsallis C.) On multivariate generalizations of the q-central limit theorem consistent with nonextensive statistical mechanics. Proceedings of International Conference Complexity, Metastability and Nonextensivity, Italy, Catania, 34–42, 2007.

⋄ (with Saydamatov E.M.) A generalization of the Duhamel principle for fractional order differential equations. Doclady Ac. Sci. Russia, 2007, 412, 4, 463–465 (English Translation: Doklady Mathematics, 2007, Vol. 75, No. 1, pp. 94-96).

⋄ (with Andries E., Steinberg S.) Monte Carlo Random Walk Simulations Based on Distributed Order Differential Equations with Applications in Cell Biology, FCAA, (2006) V 9, N 4, 351–369. Extended preprint version: [ArXiv: math.DS/0606797].

⋄ (with Saydamatov E.M.) A fractional analog of the Duhamel principle. FCAA, V 9, (2006), No 1, p. 57–70.

⋄ (with Steinberg S.) Random walk models associated with distributed fractional order differential equations. IMS Lecture Notes - Monograph Series. High Dimensional Probability. V. 51, (2006), 117–127.

⋄ (with Gorenflo R.) The Cauchy and nonlocal multipoint problems for distributed order fractional differential equations, Part 1. Zeitschrift für Analysis und ihre Anwendungen, V.24 (2005), No 3, p. 449–466.

⋄ (with Gerenflo R.) On multi-dimensional symmetric random walk models approximating fractional diffusion processes. Fractional Calculus and Applied Analysis,

V. 8 (2005) No 1, p.73–88. Preprint version: Preprint Nr A 04-03, 2004, 16 p. (http://www.math.fu-berlin.de/publ/preprints/2004/Pr-A-04-03.html).

⋄ Multidimensional random walk model approximating fractional diffusion processes. Docl. Ac. Sci. of Uzbekistan, 2003.

⋄ (with Saydamatov E.M.) On the spectrum of general pseudo-differential operators. Fractional Calculus and Applied Analysis, Vol. 4, No. 3, 2001, 327–341.

⋄ (with Gorenflo R. and Luchko Yu) On boundary value problems for pseudo-differential equations with boundary operators of fractional order. Fractional calculus and Applied analysis. Vol. 3, No. 4, 2000, 454–468. Preprint version: Preprint Nr. A 00-06, 2000, 16 p. (http://www.math.fu-berlin.de/publ/preprints/2000/Pr-A-00-06.html).

⋄ (with Gorenflo R. and Luchko Yu) On the Cauchy and multi-point problems for partial pseudo-differential equations of fractional order. Fractional Calculus and Applied Analysis. Vol. 3, No 3, 2000, p 250–275. Extended preprint version: Preprint Nr. A-5-2000, Free University of Berlin, 2000, 36 p. (http://www.math.fu-berlin.de/publ/preprints/2000/Pr-A-00-05.html).

⋄ (with Saydamatov E.M.) On a well-posed solvability of boundary value problems for pseudo-differential equations. Izvestia Vuzov RUz. no. 1-2, (2000), 67–73.

⋄ (with Saydamatov E.M.) On well-posedness of general inhomogeneous boundary value problems for pseudo-differential equations. Uzbek Mathematical Journal, No 5, (1999), pp. 53–60 (in Russian).

⋄ Nonlocal boundary value problems for pseudo-differential and differential-operator equations II. Differential Equations, V.34, no. 3, 1998, p 375–382.

⋄ Non-local boundary value problems for pseudo-differential and differential-operator equations I. Differential Equations, V.33, no. 6, 1997, p 827–836.

⋄ (with Saydamatov E.M.) Conditions for the discreteness of the spectrum of a general pseudo-differential operator. Differential Equations, V.33, no 1, 1997, 133–135.

⋄ (with Nazarova M.Kh.) On weak well-posedness of certain boundary value problems generated by a singular Bessel operator. Uzbek math. Journal, No 3, 1997, 63–70.

⋄ (with Saydamatov E.M.) (1995) On correctness of inhomogeneous boundary value problems for pseudo-differential equations. Proc. Of Inst.Math. and Comp.Techn. Ashgabad, V.5, 1995, 81–83.

⋄ On some boundary value problems for elliptic equations with boundary operator of fractional order. Docl. of Ac. Sci. of Russia, V 333, no 6, 1993, 708–710.

⋄ (with Turmetov B.Kh.) On a boundary value problem for equations of fractional order. Docl. of Ac. Sci. of Russia, V 333, no 4, 1993, 446–448.

⋄ On well-posedness of boundary value problems for pseudo-differential equations with analytic symbols. Docl. of Ac. Sci. of Russia, V 322, no 6, 1992, 1036–1039.

⋄ On fractional derivatives of harmonic functions with given trace. Docl. Ac. Sci. of Uzbekistan, no. 10-11, 1992, 17–19.

⋄ On solvability of boundary value problems for normal systems of complex pseudo-differential equations of arbitrary order. Docl. Ac. Sci. of Uzbekistan, no. 8-9, 1992, 12–14.

⋄ On well-posedness of systems of pseudo-differential equations with variable analytic symbols. Docl. of Ac. Sci. of Russia, V 318, no 4, 1991, 835–839.

⋄ Algebra of pseudo-differential operators with variable analytic symbols and well-posedness of corresponding equations. Differential Equations, V. 27, no. 6, 1991, p 1056–1063.

⋄ On a representation of exponential functionals. Docl. Ac. Sci. of of Uzbekistan, no. 4, 1990, p 8–10.

⋄ (with Naimzhanov A.) Fourier transform in the space of analytic functions, Math. Anal., Algebra and Geom., Tashkent St. Univ., (1990), 69–72.

⋄ Solvability of Cauchy and Cauchy-Dirichlet problems for non-linear differential equations of infinite order. Izv. Ac. Sci of Republic of Uzbekistan, no. 5 (1989) 33–38.

⋄ On the local well-posedness of boundary value problems for pseudo-differential equations. Docl. Ac.Sci of Uzbekistan, no.11 (1989) , 7–9.

⋄ On well-posedness of systems of pseudo-differential equations with analytic symbols. Docl. Ac. Sci. of Uzbekistan (1989), no. 9, 9–10.

⋄ A non-triviality criterion of spaces of infinitely differentiable vectors of an operator with empty spectrum. Docl. Ac. Sci. of Uzbekistan (1988) , No. 1, 11–13.

⋄ Boundary value problems for differential-operator and pseudo-differential equations. Izv. Ac.Sci. of Uzbekistan (1986), no. 4, 38–42.

⋄ On the theory of non-linear differential equations of infinite order. In "Functional methods in mathematical physics", Tashkent, (1988) , 64–65.

⋄ On some spaces of infinite order and their applications to operator equations. Soviet math. Doclady (1984) , V 275, no. 2 513–517.

⋄ On the Cauchy problem for differential - operator equations, Moscow, MPEI (1984), no. 45, 123–127.

⋄ On the Cauchy problem for partial differential equations on torus. Doclady Ac.Sci of Uzbekistan (1983) , no.1, 5–6.

⋄ On the improvement of the accuracy of rectangular cubature formula by the asymptotic expansion method. Problems of computational and applied mathematics, (1981) , 66, 60–71.

- **Contributions to Conferences**

  ◇ Fractional generalizations of Fokker-Planck-Kolmogorov equations and their applications. Second USA-Uzbekistan International Conference in Analysis and Mathematical Physics. August 8 – August 12, 2017, Urgench, Uzbekistan.

  ◇ Beyond the triangle - Brownian motion, Ito stochastic calculus, and Fokker-Planck equation: fractional generalizations. Conference "Complex systems", CBPF, October 29 – November 2, 2013, Rio de Janeiro, Brazil.

  ◇ Fractional filtering problem and associated fractional Zakai equation. International Symposium on Fractional PDE: Theory, Numerics, and Applications. Brown University, June 3 – 5, 2013 Salve Regina University, Newport RI, USA.

  ◇ Fractional differential equations and some of their applications. In "Silk Road Quantum Mechanics, 2003, September–October, Tashkent.

  ◇ (with Turmetov B.Kh.) On a problem for differential equation of fractional order. In "Degenerate equations and equations of mixed type", Tashkent, (1994), 174.

  ◇ Non-local boundary value problems for differential operator equations. In "Qualitative methods in theory of boundary value problems". Voronezh, (1992), May, 4–8, 108.

  ◇ On a critical value of order of boundary operators of elliptic boundary problems. International Conference on Differential Equations, Moscow, Published in Uspekhi matematicheskikh nauk (Soviet math. Survey), v.46, (1991), no. 6 , 201.

  ◇ A spectral problem for pseudo-differential equations with complex arguments. In "Actual problems of complex analysis", Tashkent, (1989), 122.

  ◇ On certain spaces generated by spectral operators and their applications. International Conference on Differential Equations, Moscow, Published in Uspekhi matematicheskikh nauk (Soviet math. Survey) (1985) , v.40, no. 5 , 215.

- **Preprints**

  ◇ (with Tsallis C., Gell-Mann M., Steinberg S.) Symmetric (q, α)-Stable Distributions. Part I: First Representation [ArXiv: cond-mat: 0606038].

  ◇ (with Tsallis C., Gell-Mann M., Steinberg S.) Symmetric (q, α)-Stable Distributions. Part II: Second Representation [ArXiv: cond-mat: 0606040].

  ◇ (with Andries E., Steinberg St.) Motion in Cell Membranes, General Random Walks and Anomalous Diffusion [http://math.unm.edu/ stanly/prints/AnomalousWalks.pdf].

  ◇ (with Nelson K.) The relationship between Tsallis statistics, the Fourier transform, and nonlinear coupling. [arXiv:0811.3777v1].