

# Curriculum Vitae

Borislav Radkov Draganov

## Work Address

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## Education

- Mar 1999-Nov 2002: Ph.D. Computational Mathematics, Department of Mathematics and Informatics, Sofia University "St. Kliment Ohridski", Sofia, Bulgaria, Feb 2004  
Dissertation Title: A new method for characterization of  $K$ -functionals and its application in approximation theory  
Thesis Advisor: Prof. Kamen G. Ivanov;
- Oct 1993-Jul 1998: M.Sc. Mathematics, Department of Mathematics and Informatics Sofia University "St. Kliment Ohridski", Sofia, Bulgaria  
Thesis Title: Several approximation processes in  $C[0,1]$  and  $L_p[0,1]$ ,  $1 \leq p < \infty$   
Thesis Advisor: Prof. Kamen G. Ivanov;
- Sep 1988-May 1993: First English Language School, Sofia.

## Research Interests

I carry out research mostly in the field of Approximation Theory. I have been particularly interested in establishing precise and useful characterizations of the rate of convergence of approximation processes generated either by linear operators or by non-linear such as best approximation by algebraic or trigonometric polynomials in various function spaces.

My research includes (generalized) Fourier expansions, orthogonal polynomials, multipliers, application of Fourier Analysis in Approximation Theory.

I am also interested in history of mathematics, philosophy of science, and physics.

## Professional Experience

- Since Oct 2011: **Associate Professor** of Mathematical Analysis, Department of Mathematics and Informatics, Sofia University "St. Kliment Ohridski", Sofia, Bulgaria; Teaching experience: lectures on Calculus, Real Analysis, Measure Theory and Integration, Theory of Extremal Problems;
- Since Jul 2012: **Associate Professor**, Section of Mathematical Modelling and Numerical Analysis (previously, Section of Mathematical Modelling), Institute of Mathematics and Informatics, Bulgarian Academy of Sciences;
- Dec 2002-Sep 2011: **Assistant Professor**, Department of Mathematics and Informatics, Sofia University "St. Kliment Ohridski", Sofia, Bulgaria; Teaching experience: exercise courses in Numerical Analysis, Calculus and Real Analysis.
- Jun 2007-May 2012: **Researcher/Assistant Professor**, Section of Mathematical Modelling, Institute of Mathematics and Informatics, Bulgarian Academy of Sciences;
- Feb 2004-May 2007: **Mathematician**, Section of Mathematical Modelling, Institute of Mathematics and Informatics, Bulgarian Academy of Sciences.

## List of Publications

1. A new modulus of smoothness for trigonometric polynomial approximation, *East J. Approx.* **8** (2002), 4, 465-499.
2. A new modulus of smoothness for trigonometric polynomial approximation, *Constructive Theory of Functions*, Varna, 2002. Proc. Ed. B. Bojanov, Darba, Sofia, 2003, 245-250.
3. The trigonometric analogue of the Taylor's formula and its application, *Annuaire Univ. Sofia Fac. Math. Inform.* **96** (2004), 141-154.
4. (with Kamen G. Ivanov) A new characterization of weighted Peetre  $K$ -functionals, *Constr. Approx.* **21** (2005), 113-148.
5. (with Kamen G. Ivanov) A Characterization of Weighted  $L_p$  Approximations by the Gamma and the Post-Widder Operators, Proc. intern. conf. "Constructive Theory of Functions, Varna 2005", Ed. B. Bojanov, Marin Drinov Academic Publishing House, Sofia, 2006, 80-87.
6. (with Kamen G. Ivanov) Characterizations of Weighted  $K$ -Functionals and Their Application, Proc. intern. conf. "Constructive Theory of Functions, Varna 2005", Ed. B. Bojanov, Marin Drinov Academic Publishing House, Sofia, 2006, 88-97.
7. (with Kamen G. Ivanov) A new characterization of weighted Peetre  $K$ -functionals (II), *Serdica Math. J.* **33** (2007), 59-124.

8. (with Kamen G. Ivanov) A characterization of weighted approximations by the Post-Widder and the Gamma operators, *J. Approx. Theory* **146** (2007), 3-27.
9. (with Kamen G. Ivanov) Equivalence between  $K$ -functionals based on continuous linear transforms, *Serdica Math. J.* **33** (2007), 475-494.
10. Simultaneous approximation of functions by Fejér-type operators in a generalized Hölder norm, *East J. Approx.* **14** (2008), 439-449.
11. Exact estimates of the rate of approximation of convolution operators, *J. Approx. Theory* **162** (2010), 952-979.
12. (with Kamen G. Ivanov) A Characterization of Weighted Approximations by the Post-Widder and the Gamma Operators (II), *J. Approx. Theory* **162** (2010), 1805-1851.
13. On the approximation by convolution operators in homogeneous Banach spaces of periodic functions, *Math. Balkanica* **25** (2011), 39-59.
14. (with Parvan E. Parvanov) On estimating the rate of best trigonometric approximation by a modulus of smoothness, *Acta Math. Hungar.* **131** (2011), 360-379
15. Estimating the rate of best trigonometric approximation in homogeneous Banach spaces by moduli of smoothness, Proc. intern. conf. "Constructive Theory of Functions", Sozopol 2010: In Memory of Borislav Bojanov, Eds. G. Nikolov and R. Uluchev, Marin Drinov Academic Publishing House, Sofia, 2012, 80-92.
16. An improved Jackson inequality for best trigonometric approximation, *Ukr. Mat. Zhurn.* **65** (2013), 1219-1226 and *Ukrainian Math. J.* **65** (2014), 1354-1362; a preprint: A sharp Jackson inequality for best trigonometric approximation, *CRM Preprint Series* **1101**, 2012.
17. Upper estimates of the approximation rate of combinations of iterates of the Bernstein operator, *Annuaire Univ. Sofia Fac. Math. Inform.* **101** (2013), 95-104.
18. (with Kamen G. Ivanov) A generalized modulus of smoothness, *Proc. Amer. Math. Soc.* **142** (2014), 1577-1590.
19. On simultaneous approximation by iterated Boolean sums of Bernstein operators, *Results Math.* **66** (2014), 21-41.
20. (with Kamen G. Ivanov) Natural weights for uniform approximation by the Szász-Mirakjan operator, Proc. intern. conf. "Constructive Theory of Functions", Sozopol 2013: Dedicated to Blagovest Sendov and to the memory of Vasil Popov, Eds. Kamen Ivanov, Geno Nikolov and Rumén Uluchev, Prof. Marin Drinov Academic Publishing House, Sofia, 2014, 57-82.
21. On the approximation by convolution operators in homogeneous Banach spaces on  $\mathbb{R}^d$ , *Math. Balkanica* **28** (2014), 9-36.
22. Strong estimates of the weighted simultaneous approximation by the Bernstein and Kantorovich operators and their iterated Boolean sums, *J. Approx. Theory* **200** (2015), 92-135; **252** (2020) 105321.
23. (with Ivan Gadjev) Direct and converse Voronovskaya estimates for the Bernstein operator, *Results Math.* **73**:11 (2018).
24. An exact strong converse inequality for the weighted simultaneous approximation by the Bernstein operator, Proc. intern. conf. "Constructive Theory of Functions", Sozopol 2016, Eds. Kamen Ivanov, Geno Nikolov and Rumén Uluchev, Prof. Marin Drinov Academic Publishing House, Sofia, 2018, 75-97.
25. (with Kamen G. Ivanov) A New Characterization of Weighted Peetre  $K$ -Functionals (III), Proc. intern. conf. "Constructive Theory of Functions", Sozopol 2016, Eds. Kamen

- Ivanov, Geno Nikolov and Rumen Uluchev, Prof. Marin Drinov Academic Publishing House, Sofia, 2018, 99-141.
26. Strong converse inequalities for the weighted multivariate Bernstein-Durrmeyer operator on the simplex via multipliers, *Ann. Sofia Univ., Fac. Math and Inf.* **105** (2018), 55-73.
  27. Simultaneous approximation by Bernstein polynomials with integer coefficients, *J. Approx. Theory* **237** (2019), 1-16.
  28. (with I. Gadjev) Approximation of functions by the Szasz-Mirakjan-Kantorovich Operator, *Numer. Funct. Anal. Optim.* **40** (2019), 803-824.
  29. Shape preserving properties of the Bernstein polynomials with integer coefficients, *Ann. Sofia Univ., Fac. Math and Inf.* **109** (2019), 79-100.
  30. Converse estimates for the simultaneous approximation by Bernstein polynomials with integer coefficients, Proc. intern. conf. "Constructive Theory of Functions", Sozopol 2019, Eds. Borislav Draganov, Kamen Ivanov, Geno Nikolov and Rumen Uluchev, Prof. Marin Drinov Academic Publishing House, Sofia, 2020, 39-51.
  31. Direct estimates of the weighted simultaneous approximation by the Baskakov operator, *Results Math.* **75**, 156 (2020).
  32. Strong converse inequalities for the weighted simultaneous approximation by the Szasz-Mirakjan operator, *Serdica Math. J.* **46** (2020), 261-286.
  33. Direct estimates of the weighted simultaneous approximation by the Szasz-Mirakjan operator, *Period. Math. Hungar.* **83** (2021), 88-109.
  34. (with Tuncer Acar) A strong converse inequality for generalized sampling operators, *Ann. Funct. Anal.* **13**:36 (2022).
  35. A strong converse inequality for the iterated Boolean sums of the Bernstein operator, *Stud. Univ. Babes-Bolyai Math.* (to appear).

## List of Talks

1. A new modulus of smoothness for trigonometric polynomial approximation, International Conference Constructive Theory of Functions, Varna, Bulgaria, Jun 19-23, 2002.
2. Characterizations of Weighted K-Functionals and Their Application, International Conference Constructive Theory of Functions, Varna, Bulgaria, Jun 1-7, 2005.
3. On the rate of approximation of convolution operators in homogeneous Banach spaces on  $\mathbb{R}^d$  or  $\mathbb{T}^d$ , I Jaen Conference on Approximation, Ubeda, Spain, Jul 4-9, 2010.
4. Estimating the rate of best trigonometric approximation in homogeneous Banach spaces by moduli of smoothness, International Conference Constructive Theory of Functions, In memory of Borislav Bojanov, Sozopol, Bulgaria, Jun 3-10, 2010.
5. On a Method for Establishing Direct and Converse Error Estimates, ICREA Conference on Approximation Theory and Fourier Analysis, Bellaterra, Barcelona, Spain, Dec 12-16, 2011.
6. Equivalence Between K-functionals Based on Continuous Linear Transforms and Applications, Interdisciplinary Workshop on Approximation Theory, Numerical Analysis and Symbolic Computation, Sozopol, Bulgaria, Aug 31-Sep 5, 2012.

7. Weighted uniform approximation by the Szasz-Mirakjan operator, International Conference Constructive Theory of Functions, Dedicated to Blagovest Sendov and to the memory of Vasil Popov, Sozopol, Bulgaria, Jun 9-15, 2013.
8. On Estimating the Approximation Error of L-spline, International Conference on New Trends in Splines and Approximation Theory, Rennes, France, Jun 19-21, 2013.
9. On a type of generalized moduli of smoothness and their application, 9th International ISAAC Congress, Krakow, Poland, Aug 5-9, 2013.
10. Simultaneous Approximation by the Bernstein and Kantorovich Operators, Workshop on Approximation Theory, CAGD, Numerical Analysis, and Symbolic Computation, Sozopol, Bulgaria, Aug 25-31, 2014.
11. Simultaneous Approximation by the Bernstein and Kantorovich Operators, Jubilee Conference "125 years Mathematics and Natural Sciences in Sofia University "St. Kliment Ohridski", Sofia, Bulgaria, Dec 5-7, 2014 (in Bulgarian).
12. Estimates of the simultaneous approximation by the Bernstein and Kantorovich operators, Conference on Harmonic Analysis and Approximation Theory, Bellaterra, Barcelona, Spain, Jun 6-10, 2016.
13. Estimates of the simultaneous approximation by the Bernstein and Kantorovich operators, International Conference Constructive Theory of Functions, Sozopol, Bulgaria, Jun 11-17, 2016.
14. On a Method for Estimating the Rate of Approximation of Linear Operators, Workshop on Approximation Theory, CAGD, Numerical Analysis, and Symbolic Computation 2016, Sofia, Bulgaria, Sep 6-11, 2016.
15. Approximation by Bernstein polynomials with integer coefficients, 9th International Conference on Curves and Surfaces, Arcachon, France, Jun 28-Jul 4, 2018 (mini-symposium talks by invitation only).
16. Direct and converse Voronovskaya estimates for the Bernstein operator, IX Jaen Conference on Approximation Theory, Ubeda, Spain, Jul 8-13, 2018.
17. Direct and converse estimates for Bernstein polynomials with integer coefficients, Computational Mathematics and APPROXIMATION Theory, Sozopol, Bulgaria, Sep 2-8, 2018.
18. Simultaneous approximation by Bernstein polynomials and their integer forms, International Conference Constructive Theory of Functions, Dedicated to the memory of Blagovest Sendov, Sozopol, Bulgaria, Jun 2-8, 2019.
19. Simultaneous approximation by Bernstein polynomials and their integer forms, First Analysis Mathematica International Conference, Budapest, Hungary, Aug 12-17, 2019.
20. Shape preserving properties of the Bernstein polynomials and their forms with integer coefficients, 8th CMAPT Workshop, Strobl/St. Wolfgang, Austria, Aug 24-28, 2019.
21. Simultaneous approximation by operators, International Online Workshop on Approximation Theory, Ivano-Frankivsk, Ukraine, Mar 19-21, 2021 (invited plenary lecture).

## Awards and Grants

- **Marin Drinov Prize in Mathematics** for 2008 (Bulgarian Academy of Sciences);
- European Operational program HRD through contract BGO051PO001/07/3.3-02/53 with the Bulgarian Ministry of Education, 2008-2010 (team member);
- Grant DDVU 02/30 of the Fund for Scientific Research of the Bulgarian Ministry of Education and Science; Project theme: Contemporary Methods in Approximation Theory, 2011-2013 (team member);
- Grant DN 02/14 of the Fund for Scientific Research of the Bulgarian Ministry of Education and Science, Project theme: Contemporary Methods in Constructive Theory of Functions, 2016-2019 (team member);
- Grants No. 22/2006, 103/2007, 105/2008, 49/2009, 179/2010, 150/2011, 133/2012 and 184/2013 of the Fund for Scientific Research of Sofia University, Project theme}: Abstract Analysis in Banach Spaces (team member);
- Grant No. 088/2014 of the Fund for Scientific Research of Sofia University; Project theme: Research on analytic concepts used in approximation theory, differential equations, and optimization (team member);
- Grant No. 80.10-120/2017 and 80-10-13/2018 of the Fund for Scientific Research of Sofia University; Project theme: Research on analytical concepts used in approximation theory and functional analysis (team leader);
- **Scholarship** for outstanding students, Foundation Evrika, Bulgaria, 1997.

## Editorial Work

- Member of the Editorial Board of *Serdica Math. J.* (since 2019);
- Member of the Editorial Board of *Constr. Math. Anal.* (since 2020);
- Member of the Editorial Board of *Res. Math.* (since 2021);
- Proc. intern. conf. "Constructive Theory of Functions", Sozopol 2019, Dedicated to the memory of Blagovest Sendov (B. Draganov, K. Ivanov, G. Nikolov and R. Uluchev, Eds.), Prof. Marin Drinov Publishing House of BAS, Sofia, 2020;
- Referee: *J. Approx. Theory*, *Constr. Approx.*, *Results Math*, *Anal. Math.*, *Mediterr. J. Math.*, *Serdica Math. J.*, *Annual of Sofia University "St. Kliment Ohridski"*, Faculty of Mathematics and Informatics, *Demonstr. Math.*, *Math. Nachr.*, *Adv. Oper. Theory*, and others;
- Reviewer for AMS Mathematical Reviews (since May 2005).