

Semi-annual report of the department of “Function Theory” for 2021

Scientific direction: Approximation by ridge functions and neural networks

Topic: “Approximation of functions of many variables by ridge functions, neural networks, linear and nonlinear superpositions”

On scientific activity

In the report period, 4 works connecting 7 executors on the theme "Approximation of functions of many variables by ridge functions, neural networks, linear and nonlinear superpositions" were conducted. 5 papers were published. These articles were published in journals indexed in the databases Clarivate Analytics "Web of Science" and "Scopus". In addition, 1 article was accepted for publication, 1 article was submitted.

About works

Work 1: Chebyshev-type theorem in the problem of approximation by a sum of algebras

(Executor: dr. math. sci. Vugar Ismailov and j.r.a. Aida Asgarova)

2 papers were published:

1. A. Kh. Askarova, V. È. Ismailov, “A Chebyshev-Type Theorem Characterizing Best Approximation of a Continuous Function by Elements of the Sum of Two Algebras”, *Mat. Zametki*, **109:1** (2021), 19–26; *Math. Notes*, **109:1** (2021), 15–20 (Clarivate Analytics SCIE)
http://www.mathnet.ru/php/archive.phtml?wshow=paper&jrnid=mzm&paperid=12736&option_lang=rus
2. Aliev R.A., Asgarova A.A., Ismailov V.E., On the representation by bivariate ridge functions, *Український математический журнал*, **73:5** (2021), 579-588 (Clarivate Analytics SCIE)
<http://umj.imath.kiev.ua/index.php/umj/article/view/263>

Work 2: Embedding theorems on the fractional grand Sobolev spaces

(Executors: dr. ph.-m. s., prof, Alik Najafov and PhD Aygun Omarova)

1 paper was published:

1. A. M. Najafov, “On some differential properties of small small Sobolev–Morrey spaces”, Eurasian Math. J., 12:1 (2021), 57–67 (Clarivate Analytics SCIE)

http://www.mathnet.ru/php/archive.phtml?wshow=paper&jrnid=emj&paperid=392&option_lang=rus

1 paper accepted for publication:

1. A.M.Najafov, A.M. Gasimova, On some differential properties functions from Lizorkin-Triebel-Morrey spaces with dominant mixed derivatives, Advances and Applications in Mathematical Sciences (Clarivate Analytics ESCI)

1 paper submitted for publication:

1. Alik M. Najafov, Rovshan F.Babayev, On some differential properties of grand fractional Sobolev-Morrey spaces.

Work 3: Investigation of the properties of singular integral operators and their discrete analogues on some functional spaces

(Executor: dr. math. sci. Rashid Aliev)

2 papers were published:

1. Aliev R.A., Ahmadova A.N., Boundedness of discrete Hilbert transform on discrete Morrey spaces, *Ufa Mathematical Journal*, **13:1 (2021)**, 99-109 (Clarivate Analytics ESCI)

<https://matem.anrb.ru/sites/default/files/files/vup49/Ahadova.pdf>

2. Aliev R.A., Asgarova A.A., Ismailov V.E., On the representation by bivariate ridge functions, *Украинский математический журнал*, **73:5 (2021)**, 579-588 (Clarivate Analytics SCIE)

<http://umj.imath.kiev.ua/index.php/umj/article/view/263>

1 abstract was published:

1. Aliev R.A., Nebiyeva Kh.I., On properties of the complex Riesz transform, *Complex analysis, Mathematical physics and Nonlinear equations*, Book of abstracts of the International conference, Bannoe Lake, Russia, March 15 - 19, p.12.

<https://matem.anrb.ru/conf/sbornik21.pdf>

Work 4: The estimate for the approximation error by RBF neural networks

(Executors: cand. ph.-m. s. Ibrahim Maharov and cand. ph.-m. s. Arzu Babayev)

Published article:

1. A.M-B. Babayev and I. K. Maharov, On the error of approximation by RBF neural networks with two hidden nodes, *Proceedings of IMM, NAS of Azerbaijan*, **47:2**, (2021) (Clarivate Analytics ESCI)

<http://proc.imm.az/inpress/pimm0200.pdf>

On scientific-organizational activity

Head of department Vugar Ismailov made a presentation on “On the Diliberto-Straus algorithm for the uniform approximation by a sum of two algebras” at the institute seminar.

In the reporting period, the chief researcher of the department, dr. math. sci. Rashid Aliev made a presentation on “Smoothness problem in representation by sums of ridge functions” at the institute seminar.

Head of department Vugar Ismailov was a reviewer of the journals: Neural Networks, Neurocomputing, Informatics in Medicine Unlocked, Turkish Journal of Mathematics.

On April 14, 2021, at a joint meeting of the departments "Functional analysis", "Theory of functions" and "Non-harmonic analysis", a junior researcher of the department Aida Khurshud kizi Asgarov, made a report on the topic "Approximation by a sum of subalgebras of the space of continuous functions".

On June 29, 2021, the junior research assistant of the department Aida Asgarova successfully defended her Ph.D. dissertation “Approximation by a sum of subalgebras of the space of continuous functions”.

Head of the department

dr.math.sc. Vugar Ismailov