



Pavel Rybin

senior researcher

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PERSONAL STATEMENT

A committed, knowledgeable and capable Senior Researcher. Extensively published in the fields of coding and communication theory. Highly experienced in industrial project and fundamental research. A confident presenter and teacher, able to impart complex information to audiences of all levels.

EDUCATION

<i>Ph.D.</i>	Institute for Information Transmission Problems n.a. A. Kharkevich	2010-2012
<i>Specialist</i>	Moscow State Technical University n.a. N.E. Bauman	2004-2010

SCIENTIFIC INTERESTS

Information theory, coding theory, binary low-density parity-check (LDPC) codes, generalized concatenated code (GCC) constructions, generalized error-locating (GEL) codes, wireless communication, satellite and space communication, optical communication and networking, communication theory, modulations and coding, algorithms and complexity.

PUBLICATION EXPERIENCE

H-index: 7	Publications: 56
	WoS: 33
	Scopus: 33

INDUSTRIAL PROJECTS AND FUNDAMENTAL RESEARCH EXPERIENCE

HUAWEI TECHNOLOGIES CO. LTD

Head of the Project	Project YBN2020055117 (2020-2021)
Lead Researcher	Project YBN2017120002 (2018-2019)
Lead Researcher	Project YBN2017080005/3765-R (2017-2018)
Lead Researcher	Project HF2016050014 (2016-2017)
Lead Researcher	Project YB2014120127 (2014-2015)

RUSSIAN SCIENCE FOUNDATION

Lead Researcher	18-19-00673 "Development of random multiple access methods for massive machine type communications" (2018 – 2020)
Researcher	14-50-00150 "Digital technologies and their applications" (2015 – 2018)

RUSSIAN FOUNDATION FOR BASIC RESEARCH

Head of the grant	18-07-01409 "Signal-code constructions development for telecommunication systems with non-orthogonal resource sharing" (2018-2020)
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Head of the grant	14-07-31197 "High-rate code constructions development for 5th- and 6th-generation telecommunication systems" (2014-2015)
Researcher	20-07-00652 "Combinatorial and information-theoretic problems of DNA sequence analysis" (2020-2021)
Researcher	19-01-00364 "Development of error-correcting codes for information transmission in the presence of additional restrictions" (2019-2020)
Researcher	18-37-00319 "Research and development of coded modulation schemes for communication channels with dynamically changing characteristics" (2018-2019)
Researcher	14-01-93108 "Discrete compressed sensing problem and error-correcting codes" (2014-2015)
Researcher	13-01-12458 "Problems of constructability and complexity in information theory" (2013-2015)

RUSSIAN PRESIDENT SCHOLARSHIP

Head of the project	"Research and development of high-rate constructions of generalized concatenated codes and low-density parity-check codes of 5th generation"
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TEACHING EXPERIENCE

Skolkovo Institute of Science and Technology (Skoltech)	Lecturer	"Modern Application of Information Theory"
Moscow Institute of Physics and Technology (MIPT)	Lecturer	"Modern Methods of Coding Theory"
Higher School of Economics (HSE)	Lecturer	"Elements of Modern Coding Theory"

PROFESSIONAL MEMBERSHIPS

- Vice-chair of IEEE Information Theory Society (Russian Chapter) (2016-pres.)
- Reviewer of "IEEE Wireless Communications Letters" journal
- Reviewer of "IEEE Access" journal
- Reviewer of "Problems of Information Transmission" journal

AWARDS AND ACHIEVEMENTS

- Russian President Scholarship
- Head of RFBR grant "Research and development of high-rate code constructions for the communication systems of the next generation"
- Head of RFBR grant "Signal-code constructions development for telecommunication systems with non-orthogonal resource sharing"
- Laureate of the contest of young scientists for participation in conferences and seasonal schools in the field of computer science of the Dynasty fund
- Best student paper award for the paper "On the Analysis of T-Fold Coded Slotted ALOHA for a Fixed Error Probability" at the 11th International Congress on Ultra Modern Telecommunications (ICUMT)

SKILLS

<i>Languages</i>	Russian (native), English (fluent)
<i>Programming</i>	MatLab, C/C++, Python, Perl, bash
<i>IDE</i>	MatLab, MS VisualStudio, Qt Creator, Eclipse, CodeBlocks
<i>Version control</i>	CVS, SVN, Mercurial, Git
<i>OS</i>	Windows, UNIX

WORK EXPERIENCE

Senior Researcher	Skolkovo Institute of Science and Technology	2017-pres.
	<p><u>Responsibilities:</u> <i>fundamental scientific research in the area of telecommunications and error correcting coding.</i></p> <p><u>Main results:</u></p> <ul style="list-style-type: none"> • <i>capacity bound for T-fold coded slotted ALOHA for a fixed error probability;</i> • <i>efficient concatenated same codebook construction for the random access Gaussian MAC;</i> • <i>efficient graph-based error-reducing code constructions;</i> • <i>unified concatenated code construction for optical lines;</i> • <i>LDPC code constructions optimized for LDPC code based massive random access scheme for the Gaussian multiple access channel and its achievability bounds;</i> • <i>estimation of decoding radius realized by low-complexity decoded non-binary irregular LDPC codes;</i> • <i>distributions for coded T-fold slotted ALOHA for the finite length regime.</i> 	
Senior Researcher	Institute for Information Transmission Problems n.a. A. Kharkevich	2007-pres.
	<p><u>Responsibilities:</u> <i>fundamental research and development of error correcting codes and their encoding and decoding algorithms.</i></p> <p><u>Main results:</u></p> <ul style="list-style-type: none"> • <i>estimation on the error and erasure fractions guaranteed corrected by generalized low-density parity-check (LDPC) codes and graph-based LDPC codes under the low-complexity bit-flipping and erasure correcting algorithms correspondingly;</i> • <i>concatenated-like construction of LDPC code and low-complexity concatenated-like decoding algorithm of this code, for which the estimation on the error exponent was obtained and was shown that channel capacity is achieved under this low-complexity decoding algorithm;</i> • <i>erasure inserting hard-decision decoding algorithm of LDPC code that outperforms original bit-flipping algorithm;</i> • <i>new decoding algorithm of Tail-Biting Unit-Memory (TB-UM) LDPC codes;</i> • <i>new construction of Generalized Error-Locating (GEL) codes based on LDPC codes and its low-complexity decoding algorithm;</i> • <i>method of GEL codes construction optimization to achieve the given output frame error rate with the highest code rate.</i> 	
Consultant	Huawei Technologies Co. Ltd.	2013-2015
	<p><u>Responsibilities:</u> <i>research and development of signal-code constructions for Mobile Wireless Transmission of 5G</i></p> <p><u>Main results:</u></p> <ul style="list-style-type: none"> • <i>implementation of simulation platform for LDPC codes over channel with Additive White Gaussian Noise (AWGN);</i> • <i>optimization of LDPC code performance with modifications of its construction and Min-Sum (MS) decoding algorithm;</i> • <i>optimization of non-uniform quantization;</i> • <i>optimization of Tail-Biting LDPC code construction and decoding algorithm.</i> 	

MAIN PUBLICATIONS

1. P. Rybin, K. Andreev, V. Zyablov, Error Exponents of LDPC Codes under Low-Complexity Decoding // Entropy, vol. 23, no. 2, 253, 2021, pp. 1-16.
2. K. Andreev, P. Rybin, A. Frolov, Reed-Solomon Coded Compressed Sensing for the Unsourced Random Access // 2021 17th International Symposium on Wireless Communication Systems (ISWCS), 2021, pp. 1-5.
3. G. Balitskiy, A. Frolov, P. Rybin, Linear Programming Decoding of Non-Linear Sparse-Graph Codes // 2021 XVII International Symposium "Problems of Redundancy in Information and Control Systems" (REDUNDANCY), 2021, pp. 149-154.
4. L. Medova, P. Rybin, I. Sidorenko, On the Performance Slope of Short LDPC codes // The 12th International Congress on Ultra Modern Telecommunications and Control Systems (ICUMT), on-line, October 5-7, 2019, pp. 67-72.
5. D. Ustinova, P. Rybin, A. Frolov, On the Analysis of T-Fold Coded Slotted ALOHA for a Fixed Error Probability // The 11th International Congress on Ultra Modern Telecommunications and Control Systems (ICUMT), Dublin, Ireland, October 28-30, 2019, pp. 1-5.
6. D. Ustinova, A. Glebov, P. Rybin, A. Frolov, Efficient Concatenated Same Codebook Construction for the Random Access Gaussian MAC // 2019 IEEE 90th Vehicular Technology Conference (VTC), Honolulu, HI, USA, September 22-25, 2019, pp. 1-5.
7. F. Ivanov, P. Rybin, V. Afanassiev, On the Performance of Slotted Vector-Disjunctive Channel // 16th Canadian Workshop on Information Theory (CWIT), Hamilton, Ontario, Canada, June 2-5, 2019, pp. 1-5.
8. P. Rybin, A. Frolov, On the Decoding Radius Realized by Low-Complexity Decoded Non-Binary Irregular LDPC Codes // 2018 the International Symposium on Information Theory and Its Applications (ISITA), Singapore, October 28-31, 2018, pp. 384-388.
9. A. Glebov, L. Medova, P. Rybin, A. Frolov, On LDPC Code Based Massive Random-Access Scheme for the Gaussian Multiple Access Channel // Internet of Things, Smart Spaces, and Next Generation Networks and Systems. NEW2AN 2018, ruSMART 2018. Lecture Notes in Computer Science, vol 11118, pp. 162-171, 2018.
10. P. Rybin, A. Frolov, On the Error Exponents of Capacity Approaching Construction of LDPC Code // 2018 10th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), Moscow, November 5-9, 2018, pp. 197-201.
11. Frolov A., Rybin P., Ivanov F. On Iterative LDPC-Based Joint Decoding Scheme for Binary Input Gaussian Multiple Access Channel // In Proc. of the XV International Symposium on Problems of Redundancy in Information and Control Systems (RED), September 26-29, 2016, St. Petersburg, Russia.
12. Rybin P.S., Zyablov V.V. Asymptotic Bounds on the Decoding Error Probability for Two Ensembles of LDPC Codes // Problems of Information Transmission. 2015. Vol. 51. No. 3. PP. 205-216.
13. Zhilin I., Rybin P., Zyablov V. High-Rate Codes for High-Reliability Data Transmission // In Proc. of IEEE International Symposium on Information Theory (ISIT). 2015. PP. 256-260.
14. Zhilin I., Rybin P., Ivanov F., Zyablov V., On the Decoding of Tail-Biting UM-LDPC Codes // In Proc. of Fourteenth International Workshop on Algebraic and Combinatorial Coding Theory. 2014. PP. 336-341.
15. Rybin P., Zyablov V., On the Upper Bound on Undetected Error Probability for LDPC Code // In Proc. of IEEE International Symposium on Information Theory (ISIT). 2014. PP. 3160-3164.
16. Rybin P., On the Error-Correcting Capabilities of Low-Complexity Decoded Irregular LDPC Codes // In Proc. of IEEE International Symposium on Information Theory (ISIT). 2014. PP. 3165-3169.
17. Zhilin I., Ivanov F., Rybin P., Zyablov V. GEL codes based on binary LDPC codes // In Proc. of Information Technology and Systems Conference. 2013. PP. 485-489.
18. Zyablov V.V., Rybin P.S. Analysis of the relation between properties of LDPC codes and the Tanner graph // Problems of Information Transmission. 2012. Vol. 48. No. 4. PP. 297-323.

19. Rybin P., Zyablov V. On the Error Exponent of Low-Complexity Decoded LDPC Codes with Special Construction // In Proc. of Thirteen International Workshop on Algebraic and Combinatorial Coding Theory. 2012. PP. 287-292.
20. Rybin P.S. Thesis on the Asymptotic Estimation of Error Correcting Capabilities and Decoding Complexity of Binary Low-Density Parity-Check Codes. 2012.
21. Zyablov V.V., Rybin P.S. Estimation of the Exponent of the Decoding Error Probability for a Special Generalized LDPC Code // Journal of Communications Technology and Electronics. 2012. Vol. 57. No. 8. PP. 84-97.
22. Rybin P., Zyablov V. Asymptotic Estimation of Error Fraction Corrected by Binary LDPC Code // In Proc. of IEEE International Symposium on Information Theory (ISIT). 2011. PP. 351-355.
23. Zyablov V., Rybin P., Frolov V. Decoding Algorithm with Erasure Insertion for LDPC Codes constructed under GF(q) // Information-Control Systems. 2011. Vol. 50. No. 1. PP. 62-68.
24. Zyablov V.V., Rybin P.S. Erasure correction by low-density codes // Problems of Information Transmission. 2009. Vol. 45. No. 3. PP. 204-220.
25. Zyablov V., Loncar M., Johannesson R., Rybin, P. On the Asymptotic Performance of Low-Complexity Decoded LDPC Codes with Constituent Hamming Codes // In Proc. of 5th International Symposium on Turbo Codes and Related Topics. 2008. PP. 174-179.