

Министерство науки и высшего образования РФ  
Федеральное государственное автономное образовательное учреждение  
высшего образования  
«СИБИРСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ»



УТВЕРЖДАЮ

Проректор по учебной работе

/Д.С. Гуц/

«30» октября 2023 года

**ПРОГРАММА**  
**вступительного испытания для поступающих в аспирантуру**

**1.2 Computer Science and Informatics**

*шифр и наименование группы научных специальностей*

**1.2.3 Theoretical computer science, cybernetics**

*шифр и наименование научной специальности*

Красноярск 2023

## List of questions for the entrance test

1. Object-oriented approach in programming.
2. Theoretical basis of creating software systems. The UML programming language.
3. Mathematical logic: propositional calculus; predicate calculus; logical models; formal systems; formal grammars; algorithm theory.
4. Probability theory and mathematical statistics: probabilities, random processes, statistical estimation and hypothesis testing, statistical methods for processing experimental data.
5. Multidimensional statistical analysis.
6. Multivariate and matrix calculus
7. Matrix factorization, decomposition and approximation
8. Nonlinear optimization: theory and algorithms
9. Least-squares problems and data fitting
10. Formal and statistical approaches to NLP.
11. Statistical methods: Language Model, Hidden Markov Model, Viterbi Algorithm, Generative vs Discriminative Models
12. Linguistic essentials (tokenization, morphology, PoS, collocations, etc.).
13. Parsing (constituency and dependency parsing).
14. Processing Pipelines.
15. Lexical semantics: corpora, thesauri, gazetteers.
16. Distributional Semantics: Word embeddings, Character embeddings.
17. Deep Learning for natural language.
18. Applications: Entity recognition, Entity linking, classification, summarization.
19. Opinion mining, Sentiment Analysis.
20. Question answering, Language inference, Dialogic interfaces.
21. Statistical Machine Translation.
22. NLP libraries: NLTK, Theano, Tensorflow.
23. Computational learning tasks for predictions, learning as function approximation, generalization concept.
24. Linear models and Nearest-Neighbors (learning algorithms and properties, regularization).
25. Neural Networks (MLP and deep models, SOM).

Developer:



Канд., техн., наук, доцент каф. ИС ИКИТ СФУ  
Раскина Анастасия Владимировна