

MINISTRY OF SCIENCE AND HIGHER EDUCATION
RUSSIAN FEDERATION
Federal State Autonomous Educational Institution
higher education
NORTH CAUCASIAN FEDERAL UNIVERSITY

I APPROVE

Dean of the Faculty of Mathematics
and computer science named after
Professor N.I. Chervyakov,
Candidate of Physical and Mathemat-
ical Sciences, Associate Professor
Grobova T.A.

ASSESSMENT TOOLS FUND FOR DISCIPLINE

Machine Learning Theory / Теория машинного обучения

Direction of training	02.04.01 Mathematics and Computer Science
Directionality (profile)	Training Program for Electronic Information
Year of commencement of studies	2026
Form of study	full-time
Implemented in a semester	2

Preface

1. The purpose of this course is to conduct ongoing monitoring of academic performance and midterm assessment in the discipline " **Machine Learning Theory / Теория машинного обучения** "

2. FOS is an appendix to the program of the discipline "**Machine Learning Theory / Теория машинного обучения**"

3. Developer: Maria Vasilievna Valueva – Associate Professor of the Department of Computational Mathematics and Cybernetics, Candidate of Technical Sciences.

4. An examination of the FOS was carried out

Members of the expert group:

Chairman:

Poddubnaya N.A. – Chairman of the Teaching and Methodological Committee of the Faculty of Mathematics and Computer Science named after Professor N.I. Chervyakov

Members of the commission:

Gladkov A.V. – member of the teaching and methodological committee of the Department of Computational Mathematics and Cybernetics;

Andrukhiv L.V. – member of the teaching and methodological committee of the Department of Mathematical Modeling;

Kopytkova L.B. – member of the teaching and methodological committee of the department of mathematical analysis, algebra and geometry.

Representative of the employer organization: Lapin V.G. – Head of the Automated Control System Department of the Stavropol Regional Clinical Consultative and Diagnostic Center.

Expert opinion: the assessment tool fund is recommended for assessing the level of development of competencies during ongoing monitoring of academic performance and midterm assessment of students in the discipline “ **Machine Learning Theory / Теория машинного обучения** ” .
« 15 » April 2026

5. The validity period of the FOS is determined by the period of implementation of the educational program.

1. Description of the criteria for assessing competence at various stages of its development, description of assessment scales

Competence (ii), indicator (s)	Levels of development competence (s),			
	Minimum level not achieved (unsatisfactory) 2 points	Minimum level (satisfactorily) 3 points	Average level (Fine) 4 points	High level (excellent) 5 points
OPK-1 Able to find, formulate and solve current and significant problems in applied and computer mathematics				
Learning outcomes for the discipline: <i>Indicator:</i> ID-1 _{OPK-1} Finds and formulates significant problems of applied and computer mathematics. ID-2 _{OPK-1} Knows and uses methods for solving significant problems of applied and computer mathematics	significant problems of applied and computer mathematics at a good level using methods to solve significant problems in applied and computer mathematics at a good level	significant problems of applied and computer mathematics at a good level using methods to solve significant problems in applied and computer mathematics at a good level	significant problems of applied and computer mathematics at a good level using methods to solve significant problems in applied and computer mathematics at a good level	Able to effectively apply significant problems in applied and computational mathematics Able to effectively apply methods to solve significant problems in applied and computer mathematics
PC-5 Able to present and adapt mathematical knowledge, programming methods and information technology in various ways, taking into account the level of the audience				
Learning outcomes for the discipline: <i>Indicator:</i> ID-1 _{PC-5} Assesses the level of preparation of listeners during their public speeches ID-2 _{PC-5} Adapts the presentation of mathematical knowledge and programming methods to the level of the students	Unable to apply machine learning tools, models, and methods to solve professional problems	Partially able to apply machine learning tools, models, and methods to solve professional problems	Able to apply machine learning tools, models, and methods to solve professional problems at a high level	Able to effectively apply machine learning tools, models, and methods to solve professional problems

The assessment of the level of development of competence in the discipline is carried out on the basis of the "Regulations on the current monitoring of academic performance and mid-term assessment of students in higher education programs - bachelor's degree programs , specialist programs , master's degree programs - at the federal state autonomous educational institution of higher education " North Caucasus Federal University" in the current version.

ASSESSMENT TOOLS FOR CHECKING THE LEVEL OF DEVELOPMENT OF COMPETENCIES

Task number	Correct answer	Contents of the question	Competence
		Semester 2	
1.	b	Which type of machine learning task involves predicting continuous values? a) Classification b) Regression c) Clustering d) Association rules	PC-1
2.	V	Which type of problem involves grouping data based on their similarity? a) Regression b) Classification c) Clustering d) Time series	PC-1
3.	V	What type of problem is used to predict categories based on input data? a) Clustering b) Regression c) Classification d) Association rules	PC-1
4.	Time series	What type of machine learning problem involves analyzing sequences of data over time?	PC-1
5.	G	Which of the following methods can be used for multi-class classification? a) Logistic regression b) Multilayer perceptron c) Support vector machine d) All of the above	PC-1
6.	V	Which of the following classifiers is based on distance metric? a) Decision tree b) Logistic regression c) k-nearest neighbors (k-NN) method d) Neural network	PC-1
7.	A	Which of the following disadvantages is characteristic of the k-NN method?	PC-1

		a) High computational complexity in prediction b) Inability to work with continuous data c) Difficulty in interpreting results d) All of the above	
8.	G	Which of the following algorithms is a distance-based clustering method? a) K-means b) Hierarchical clustering c) DBSCAN d) All of the above	PC-1
9.	K-means	Which clustering algorithm attempts to minimize the intra-cluster distance?	PC-1
10.	Hierarchical clustering	Which clustering algorithm builds a cluster tree?	PC-1
11.	A	Which of the following methods is used to evaluate the quality of clustering? a) Silhouette coefficient b) Cross- validation c) Principal component analysis d) Linear regression	PC-1
12.	V	Which of the following methods is an example of a linear classifier? a) Decision tree b) Support vector machine c) Logistic regression d) K-nearest neighbors	PC-1
13.	When a model is too complex and performs well on training data but poorly on test data	What is "overfitting" in the context of decision trees?	PC-1
14.	V	Which of the following algorithms is an example of an ensemble method? a) Decision tree b) Logistic regression c) Random Forest d) K-nearest neighbors	PC-1
15.	Find the optimal separating hyperplane for classification	What is the main task of a perceptron ?	PC-1
16.	Applies an activation function	How does a perceptron process input data?	PC-1

	to a linear combination of input data		
17.	b	What is the basic idea behind Support Vector Machine (SVM)? a) Increase the number of classes b) Find the maximum separating hyperplane between the classes c) Minimize the number of classification errors d) Use ensemble methods	PC-1
18.	A model inspired by the human brain, consisting of interconnected neurons	What is a neural network?	PC-1
19.	A function that determines how a neuron responds to input data	What is an activation function in a neural network?	PC-1
20.	Training using multilayer neural networks	What is deep learning?	PC-1
21.	A	Which of the following optimization algorithms is commonly used in deep neural networks? a) Gradient descent method b) Least squares method c) K-means algorithm d) Support vector machine	PC-1
22.	Training a model on a random subset of data at a time	batch learning? training)?	PC-1
23.	V	Which of the following types of activation functions is often used in the output layer for classification problems? a) Sigmoid function b) Tanh c) Softmax d) ReLU	PC-1
24.	The process used to update the network weights during training	is backpropagation ?	PC-1
25.	b	What is regression analysis?	PC-1

		a) Method for classifying data b) A method for predicting dependent variables based on independent ones c) Method for data clustering d) Method for estimating time series	
26.	A measure of how well a model predicts the dependent variable	What is the coefficient of determination (R^2) in regression analysis?	PC-1
27.	A situation where independent variables are highly correlated with each other	What is "multicollinearity" in the context of regression analysis?	PC-1
28.	The difference between the predicted and actual values of the dependent variable	What are "residuals" in regression analysis?	PC-1
29.	b	Which of the following methods can be used to test the assumptions of normality of residuals? a) Scatter plot Wilk test c) Cross-validation d) Principal component analysis	PC-1
30.	A point that significantly changes the parameters of a model if it is excluded	What is an "influential point" in regression analysis?	PC-1

2. Description of the rating scale

Under the rating system, student performance in each discipline is assessed through ongoing assessments and midterm assessments. The rating system for assessing student knowledge is based on a set of assessment activities (checkpoints) optimally spaced throughout the course. The principles of the rating system for assessing student knowledge are based on the requirements described in the Regulation on the Organization of the Educational Process Based on the Rating System for Assessing Student Knowledge at North Caucasus Federal University.

3. Competency assessment criteria

"excellent" grade if they are able to effectively apply machine learning tools, models, and methods to solve professional problems. Competencies OPK-1 and PC-5 are mastered to the maximum level.

"good" grade if they are able to effectively apply machine learning tools, models, and methods to solve professional problems. Competencies OPK-1 and PC-5 are mastered at an intermediate level.

"satisfactory" grade if they are partially capable of applying machine learning tools, models, and methods to solve professional problems. Competencies OPK-1 and PC-5 are mastered to a minimum level.

a grade of **"unsatisfactory"** if they are unable to apply machine learning tools, models, and methods to solve professional problems. The competencies of OPK-1 and PC-5 are not mastered to the minimum level.