

## FACULTY OF ENGINEERING STUDY COURSE DESCRIPTION

Course Title:	INTRODUCTION TO MACHINE LEARNING AND NEURAL NETWORKS							
Course code (VAIS):	DatZ6004							
Study programme:	Virtual Reality and Smart Technologies							
Level of Study programme:		1st level	professional	higher education				
		Professio	onal Bachelor					
	$\boxtimes$	Professio	onal Master					
Type of Study programme:								
		Professio	onal specializ	ation courses (Part	B, compulsory)			
					ses (Part B, optional)			
		Elective	courses (Part					
Course Workload:	(	Credits	ECTS	Academic hours	Contact hours	Independent work hours		
Course workidau;		2	3	80	24	56		
	Sarı	2 3 80 24 56 Sarma Cakula						
Course Author/ Tutor:		. Ph.D.						
			@va.lv					
	Sarma.cakula@va.lv Consultation: according to the schedule for each semester							
Course Form:		time						
Study year, semester:		1 <sup>st</sup> year, 2 <sup>nd</sup> semester						
Language:	-	ian, Engli						
Prerequisites for the Course:	- Dut V	iun, Engli	511					
Trerequisites for the course.	The	aim of th	is course is	to give practical a	nd theoretical knowled	due about the basic		
	The aim of this course is to give practical and theoretical knowledge about the basic principles of machine-learning, to give introduction for the most popular machine-							
		ciples of						
	prine	-	machine-lear	ning, to give intr	oduction for the most	t popular machine-		
Course Summary:	prino learr	ning algor	machine-lear ithms and th	ning, to give intr eir use cases, as	oduction for the most well as, provide an in	popular machine- nsight into artificial		
Course Summary:	prino learr neur	ning algor al networl	machine-lear ithms and th ks, their struc	ning, to give intr eir use cases, as ture and use cases	oduction for the most well as, provide an ir The students will gai	t popular machine- nsight into artificial n practical skills by		
Course Summary:	prine learr neur deve	ning algor al networl eloping a c	machine-lear ithms and th ks, their struc	ning, to give intr eir use cases, as ture and use cases	oduction for the most well as, provide an in	t popular machine- nsight into artificial n practical skills by		
	prind learr neur deve prob	ning algor al network cloping a c clem.	machine-lear ithms and th ks, their struc course project	ning, to give intr leir use cases, as ture and use cases t that will use an an	oduction for the most well as, provide an ir The students will gai tificial neural network	t popular machine- nsight into artificial n practical skills by to solve a practical		
Course Methods:	prind learr neur deve prob	ning algor ral network eloping a c olem. ures, pract	machine-lear ithms and th ks, their struc course project tical activities	ning, to give intr leir use cases, as ture and use cases t that will use an an	oduction for the most well as, provide an ir The students will gai	t popular machine- nsight into artificial n practical skills by to solve a practical		
	prind learr neur deve prob	ning algor al network cloping a c clem.	machine-lear ithms and th ks, their struc course project tical activities	ning, to give intr leir use cases, as ture and use cases t that will use an an	oduction for the most well as, provide an ir The students will gai tificial neural network	t popular machine- nsight into artificial n practical skills by to solve a practical		
Course Methods:	prind learr neur deve prob Lect Fina	ning algor al networl cloping a c lem. ures, pract l group pr	machine-lear ithms and th ks, their struc course project tical activities oject	ning, to give intr leir use cases, as sture and use cases t that will use an an s, workshops, theor	oduction for the most well as, provide an ir The students will gai tificial neural network	t popular machine- nsight into artificial n practical skills by to solve a practical		
Course Methods:	prind learn neur deve prob Lect Fina	ral network cloping a c clem. ures, pract l group pro- assed each	machine-lear ithms and th ks, their struc course project tical activities oject lecture's prac	ning, to give intr leir use cases, as ture and use cases t that will use an an	oduction for the most well as, provide an ir The students will gai tificial neural network	t popular machine- nsight into artificial n practical skills by to solve a practical		
Course Methods: Assessment:	prind learr neur deve prob Lect Fina 1. Pa 2. Pa	ing algor al networl cloping a c lem. ures, pract l group pr assed each assed pract	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test	ning, to give intr leir use cases, as trure and use cases t that will use an an s, workshops, theor ctical activity	oduction for the most well as, provide an ir The students will gai tificial neural network	t popular machine- nsight into artificial n practical skills by to solve a practical		
Course Methods:	prind learr neur deve prob Lect Fina 1. Pa 2. Pa 3. C	al networl al networl cloping a c clem. ures, pract l group pr assed each assed pract ompleted f	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as	ning, to give intr leir use cases, as trure and use cases t that will use an an s, workshops, theor ctical activity	oduction for the most well as, provide an ir The students will gai tificial neural network y tests, final assessmen	t popular machine- nsight into artificial n practical skills by to solve a practical t etc.		
Course Methods: Assessment:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The	al networl al networl cloping a c clem. ures, pract l group pr assed each assed pract ompleted f final grade	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised	ning, to give intr leir use cases, as ture and use cases t that will use an an s, workshops, theor ctical activity ssignment d in the following v	oduction for the most well as, provide an ir The students will gai tificial neural network y tests, final assessmen yay: 20% from the prac	t popular machine- nsight into artificial n practical skills by to solve a practical t etc.		
Course Methods: Assessment:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The durin	ing algor al network cloping a c lem. ures, pract l group pro- assed each assed pract ompleted f final grade ng lectures	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from th	ning, to give intr eir use cases, as sture and use cases t that will use an an s, workshops, theor ctical activity signment d in the following w	oduction for the most well as, provide an ir The students will gai tificial neural network y tests, final assessmen yay: 20% from the prace 1 50% from the final gr	t popular machine- nsight into artificial n practical skills by to solve a practical t etc.		
Course Methods: Assessment:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The durin If all	ing algor al network cloping a c lem. ures, pract l group pre- assed each assed pract ompleted final grade final grade ng lectures l requirem	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from the ents are not n	ning, to give intr leir use cases, as sture and use cases t that will use an an s, workshops, theor ctical activity signment d in the following w he practical test and net on time, student	oduction for the most well as, provide an ir The students will gai tificial neural network y tests, final assessmen y tests, final assessmen y ay: 20% from the prace 1 50% from the final gr is not allowed to pass	t popular machine- nsight into artificial n practical skills by to solve a practical t etc.		
Course Methods: Assessment:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The durin If all delay	ning algor al networl cloping a c lem. ures, pract l group pr assed each assed pract ompleted final grade final grade ng lectures l requirem yed exam	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from the ents are not m requirements,	ning, to give intr leir use cases, as sture and use cases t that will use an an s, workshops, theor ctical activity ssignment d in the following w he practical test and net on time, student , max score is decre	oduction for the most well as, provide an ir The students will gai tificial neural network y tests, final assessmen vay: 20% from the prace to 50% from the final gr is not allowed to pass eased.	t popular machine- nsight into artificial n practical skills by to solve a practical t etc.		
Course Methods: Assessment:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The durin If all delay Mac	ing algor al networl cloping a c lem. ures, pract l group pr assed each assed pract ompleted final grade ng lectures l requirem yed exam hine-learn	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from the ents are not n requirements, ing. Machine	ning, to give intr leir use cases, as sture and use cases t that will use an an s, workshops, theor ctical activity signment d in the following v he practical test and net on time, student , max score is decre -learning theory an	oduction for the most well as, provide an ir The students will gai tificial neural network y tests, final assessmen yay: 20% from the prace 1 50% from the final gr is not allowed to pass eased. d approaches.	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For		
Course Methods: Assessment:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The durin If all delay Mac Deci	al networl al networl cloping a c dem. ures, pract l group pr assed each assed pract ompleted f final grade ng lectures l requirem yed exam hine-learn ision tree.	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from the ents are not nor requirements, ing. Machine Support Vect	ning, to give intr leir use cases, as ture and use cases that will use an an s, workshops, theor ctical activity signment d in the following w he practical test and net on time, student , max score is decre -learning theory an or Machines. Deep	oduction for the moss well as, provide an in The students will gai tificial neural network y tests, final assessmen yay: 20% from the prace 1 50% from the final gr is not allowed to pass eased. d approaches. Learning. Artificial No	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For		
Course Methods: Assessment: Requirements for Credits:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. C The durin If all delay Mac Deci Strue	ing algor al networl cloping a c lem. ures, pract l group pr assed each assed pract ompleted f final grade ng lectures l requirem yed exam hine-learn ision tree. cture of ar	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from tl ents are not n requirements, ing. Machine Support Vect tificial neural	ning, to give intr leir use cases, as sture and use cases t that will use an an s, workshops, theor ctical activity signment d in the following w he practical test and net on time, student , max score is decre -learning theory an or Machines. Deep networks. Percept	oduction for the moss well as, provide an in The students will gai tificial neural network y tests, final assessmen yay: 20% from the prace 1 50% from the final gr is not allowed to pass eased. d approaches. Learning. Artificial No	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For		
Course Methods: Assessment:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. C The durin If all delay Mac Deci Strue Teac	al networl al networl cloping a c lem. ures, pract l group pr assed each assed pract ompleted f final grade ng lectures l requirem yed exam hine-learn asion tree. cture of ar ching an an	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from the ents are not nor requirements, ing. Machine Support Vect	ning, to give intra teir use cases, as sture and use cases t that will use an an s, workshops, theor ctical activity signment d in the following whe practical test and net on time, student , max score is decre- learning theory an or Machines. Deep networks. Percept l network.	oduction for the moss well as, provide an in The students will gai tificial neural network y tests, final assessmen yay: 20% from the prace 1 50% from the final gr is not allowed to pass eased. d approaches. Learning. Artificial No	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For		
Course Methods: Assessment: Requirements for Credits:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. C The durin If all delay Mac Deci Strud Teac Con	ing algor al networl cloping a c lem. ures, pract l group pr assed each assed pract ompleted final grade final grade final grade ng lectures l requirem yed exam hine-learn ision tree. cture of ar ching an ar voluted ar	machine-lear ithms and the ks, their struct course project tical activities oject lecture's prac- tical test final group as e is comprised s, 30% from the ents are not not requirements, ing. Machine Support Vect tificial neural tificial neural	ning, to give intr leir use cases, as sture and use cases t that will use an an s, workshops, theor ctical activity signment d in the following v he practical test and net on time, student , max score is decre -learning theory an or Machines. Deep networks. Percept l network. networks.	oduction for the moss well as, provide an in The students will gai tificial neural network y tests, final assessmen yay: 20% from the prace 1 50% from the final gr is not allowed to pass eased. d approaches. Learning. Artificial No	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For		
Course Methods: Assessment: Requirements for Credits:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The durin If all delay Struct Com Back	ing algor al networl cloping a c lem. ures, pract l group pr assed each assed pract ompleted f final grade ng lectures l requirem yed exam hine-learn asion tree. cture of ar ching an ar voluted ar k-propagat	machine-lear ithms and th ks, their struc course project tical activities oject lecture's prac- tical test final group as e is comprised s, 30% from the ents are not n requirements, ing. Machine Support Vect tificial neural tificial neural conal artificial	ning, to give intr ter use cases, as sture and use cases t that will use an an s, workshops, theor ctical activity signment d in the following whe practical test and the practical test and met on time, student , max score is decre -learning theory an or Machines. Deep networks. Percept l network. networks. al neural networks.	oduction for the most well as, provide an ir The students will gai tificial neural network y tests, final assessmen yay: 20% from the prace 1 50% from the final gr is not allowed to pass eased. d approaches. Learning. Artificial Ne- ron.	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For eural Networks.		
Course Methods: Assessment: Requirements for Credits:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The durin If all delay Mac Deci Strud Teac Com Bacl Prac	ing algor al networl cloping a c lem. ures, pract l group pr assed each assed pract ompleted final grade ng lectures l requirem yed exam hine-learn asion tree. cture of ar ching an an voluted art k-propagat tical appli	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from the ents are not n requirements, ing. Machine Support Vect tificial neural tificial neural tificial neural cation of artifi	ning, to give intr leir use cases, as sture and use cases t that will use an an s, workshops, theor ctical activity signment d in the following v he practical test and the practical test and met on time, student , max score is decre -learning theory an or Machines. Deep networks. Percept l network. networks. and neural networks.	oduction for the moss well as, provide an in The students will gai tificial neural network y tests, final assessmen yay: 20% from the prace 1 50% from the final gr is not allowed to pass eased. d approaches. Learning. Artificial No	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For eural Networks.		
Course Methods: Assessment: Requirements for Credits: Course Contents:	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The durin If all delay Mac Deci Strud Teac Com Bacl Prac	ing algor al networl cloping a c dem. ures, pract l group pr assed each assed pract ompleted f final grade ng lectures l requirem yed exam hine-learn ision tree. cture of ar ching an ar voluted art c-propagat tical appli neworks for	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from the ents are not n requirements, ing. Machine Support Vect tificial neural tificial neural tificial neural cation of artifi	ning, to give intra eir use cases, as sture and use cases that will use an an s, workshops, theor ctical activity signment d in the following w he practical test and net on time, student , max score is decre -learning theory an or Machines. Deep networks. Percept l networks. al neural networks. ficial neural networks, thei	boduction for the most well as, provide an ir The students will gai tificial neural network y tests, final assessmen y tests, final assessmen body from the prace 1 50% from the final gr is not allowed to pass eased. d approaches. Learning. Artificial Ne- ron.	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For eural Networks.		
Course Methods: Assessment: Requirements for Credits: Course Contents: Learning Outcomes; the	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. C The durin If all delay Mac Deci Strue Teac Com Bacl Prac Fran	ing algor al networl cloping a c dem. ures, pract l group pr assed each assed pract ompleted f final grade ng lectures l requirem yed exam hine-learn ision tree. cture of ar ching an ar voluted art c-propagat tical appli neworks for	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from th ents are not n requirements, ing. Machine Support Vect tificial neural tificial neural tificial neural cional artificia cation of artifi or artificial neural	ning, to give intra eir use cases, as sture and use cases that will use an an s, workshops, theor ctical activity signment d in the following w he practical test and net on time, student , max score is decre -learning theory an or Machines. Deep networks. Percept l networks. al neural networks. ficial neural networks, thei	boduction for the moss well as, provide an in The students will gai tificial neural network y tests, final assessmen y tests, final assessment y tests, f	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For eural Networks.		
Course Methods: Assessment: Requirements for Credits: Course Contents: Learning Outcomes; the evaluation methods and	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. C The durin If all delay Mac Deci Strue Teac Com Bacl Prac Fran	al networl al networl eloping a c dem. ures, pract l group pr assed each assed pract ompleted f final grade ng lectures l requirem yed exam hine-learn asion tree. cture of ar ching an ar voluted art k-propagat tical appli neworks for <b>L</b> a weledge	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from tl ents are not n requirements, ing. Machine Support Vect tificial neural tificial neural tificial neural iconal artificial cation of artifi or artificial neural	ning, to give intra eir use cases, as sture and use cases that will use an an s, workshops, theor ctical activity signment d in the following w he practical test and net on time, student , max score is decre- learning theory an or Machines. Deep networks. Percept l network. networks. d neural networks. d neural networks, thei comes	boduction for the moss well as, provide an in The students will gai tificial neural network y tests, final assessmen yay: 20% from the prace 1 50% from the final gr is not allowed to pass eased. d approaches. Learning. Artificial Ne ron. ks and ethics of such us r application and how t	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For eural Networks.		
Course Methods: Assessment: Requirements for Credits: Course Contents: Learning Outcomes; the	prind learn neur deve prob Lect Fina 1. Pa 2. Pa 3. Cu The durin If all delay Struct Com Back Prac Fran <b>Kno</b>	ing algor al networl cloping a c lem. ures, pract l group pr assed each assed pract ompleted f final grade ng lectures l requirem yed exam hine-learn ision tree. cture of ar ching an ar voluted art c-propagat tical appli neworks for <b>wledge</b>	machine-lear ithms and th ks, their struc course project tical activities oject lecture's pra- tical test final group as e is comprised s, 30% from th ents are not n requirements, ing. Machine Support Vect tificial neural tificial neural tificial neural cional artificia cation of artifi or artificial neural	ning, to give intr leir use cases, as a sture and use cases t that will use an an s, workshops, theor ctical activity signment d in the following w he practical test and the practical test and the practical test and the or time, student , max score is decre -learning theory an or Machines. Deep networks. Percept I network. networks. al neural networks. ficial neural networks, their comes	boduction for the moss well as, provide an in The students will gai tificial neural network y tests, final assessmen y tests, final assessment y tests, f	t popular machine- nsight into artificial n practical skills by to solve a practical t etc. etical activities oup project. the exam. For eural Networks.		



	their structure and learning.				
	Knowledge about convoluted neural networks, their structure and use.	Classroom test.			
	Knowledge about back-propagational neural networks, their structure and use.	Classroom test.			
	Skills				
	Skills to choose appropriate machine- learning algorithm for problems.	Completed workshop.			
	Skills to train and configure artificial neural networks.	Completed workshop.			
	Competency				
	Use an artificial neural network framework to solve a practical problem.	Submitted group project.			
Course Compulsory literature:	Neural Networks and Deep Learning - http://neuralnetworksanddeeplearning.com/index.html				
Course additional literature:	-				
Course confirmation date:	08.12.2017.				
Date of course description update:					

## **Study Course Plan:**

		Academ	ic hours	
Date	Theme	Contact hours	Independent work hours	Study Form
	Introduction to machine-learning. Machine-learning theory and approaches.	4	8	Theoretical lecture. Classroom test.
	Artificial intelligence. Decision tree. Support Vector Machines. Deep learning and artificial neural networks.	4	8	Theoretical lecture. Classroom test.
	Structure of artificial neural networks. Teaching an artificial neural network. Perceptron.	4	8	Theoretical lecture. Classroom test.
	Convoluted neural networks. Back-propagational neural networks.	4	8	Theoretical lecture. Classroom test.
	Use of artificial neural networks for practical applications. Ethical responsibilities of the use of such data.	4	12	Theoretical lecture.
	Artificial neural network frameworks and their applications. Tensorflow.	4	12	Theoretical lecture. Workshop. Preparation for final group project.
	Total:	24	56	