# Study plan

# Name of study plan: Open Informatics - Computer Vision and Image Processing

Faculty/Institute/Others: Faculty of Electrical Engineering

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch: Program of study: Open Informatics Type of study: Follow-up master full-time

Required credits: 85

Elective courses credits: 35 Sum of credits in the plan: 120

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 49

The role of the block: P

Code of the group: 2018\_MOIDIP Name of the group: Diploma Thesis

Requirement credits in the group: In this group you have to gain 25 credits Requirement courses in the group: In this group you have to complete 1 course

Credits in the group: 25 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BDIP25	Diploma Thesis	Z	25	22s	L	Р

Characteristics of the courses of this group of Study Plan: Code=2018\_MOIDIP Name=Diploma Thesis

BDIP25	Diploma Thesis	Z	25					
Independent final comp	Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will							
he specified by branch	department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehen	neive final evaming	ation					

Code of the group: 2018\_MOIP

Name of the group: Compulsory subjects of the programm

Requirement credits in the group: In this group you have to gain 24 credits

Requirement courses in the group: In this group you have to complete 4 courses

Credits in the group: 24 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
B4M35KO	Combinatorial Optimization Zden k Hanzálek Zden k Hanzálek (Gar.)	Z,ZK	6	3P+2C	L	Р
B4M33PAL	Advanced algorithms  Marko Genyk-Berezovskyj, Daniel Pr ša, Ond ej Drbohlav Daniel Pr ša  Daniel Pr ša (Gar.)	Z,ZK	6	2P+2C	Z	Р
B4MSVP	Software or Research Project Ivan Jelínek, Jaroslav Sloup, Ji í Šebek, Martin Šipoš, Drahomíra Hejtmanová, Jana Zichová, Petr Pošík, Martin Hlinovský, Katarína Žmolíková, Ivan Jelínek Ivan Jelínek (Gar.)	KZ	6		Z,L	Р
B4M01TAL	Theory of Algorithms Marie Demlová, Natalie Žukovec Marie Demlová Marie Demlová (Gar.)	Z,ZK	6	3P+2S	L	Р

Characteristics of the courses of this group of Study Plan: Code=2018\_MOIP Name=Compulsory subjects of the programm

## B4M35KO Combinatorial Optimization The goal is to show the problems and algorithms of combinatorial optimization (often called discrete optimization; there is a strong overlap with the term operations research). Following

the courses on linear algebra, graph theory, and basics of optimization, we show optimization techniques based on graphs, integer linear programming, heuristics, approximation algorithms and state space search methods. We focus on application of optimization in stores, ground transportation, flight transportation, logistics, planning of human resources, scheduling in production lines, message routing, scheduling in parallel computers

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B4M33PAL	Advanced algorithms	Z,ZK	6
Basic graph algorithms	and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - pattern m	atching.	
B4MSVP	Software or Research Project	KZ	6
B4M01TAL	Theory of Algorithms	Z,ZK	6

The course brings theoretical background of the theory of algorithms with the focus at first on the time and space complexity of algorithms and problems, secondly on the correctness of algorithms. Further it is dealt with the theory of complexity; the classes P, NP, NP-complete, PSPACE and NPSPACE are treated and properties of them investigated. Probabilistic algorithms are studied and the classes RP and ZZP introduced.

Name of the block: Compulsory courses of the specialization

Minimal number of credits of the block: 36

The role of the block: PO

Code of the group: 2018 MOIPO5

Name of the group: Compulsory subjects of the branch

Requirement credits in the group: In this group you have to gain 36 credits

Requirement courses in the group: In this group you have to complete 6 courses

Credits in the group: 36 Note on the group.

Note on the gr	oup.					
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
B4M33DZO	Digital image Ond ej Drbohlav, Daniel Sýkora Daniel Sýkora (Gar.)	Z,ZK	6	2P+2C	Z,L	РО
B4M33GVG	Geometry of Computer Vision and Graphics Torsten Sattler, Viktor Korotynskiy, Tomáš Pajdla Tomáš Pajdla Tomáš Pajdla (Gar.)	Z,ZK	6	2P+2C	L	РО
B4M33MPV	Computer Vision Methods  Jan ech, Georgios Tolias, Ji í Matas, Dmytro Mishkin Ond ej Drbohlav Ji í Matas (Gar.)	Z,ZK	6	2P+2C	L	РО
BE4M33SSU	Statistical Machine Learning  Jan Drchal, Vojt ch Franc Vojt ch Franc (Gar.)	Z,ZK	6	2P+2C	Z	РО
B4M33TDV	Three-dimensional Computer Vision Radim Šára Radim Šára Radim Šára (Gar.)	Z,ZK	6	2P+2C	Z	РО
B4M39VG	Computational Geometry Petr Felkel Petr Felkel (Gar.)	Z,ZK	6	2P+2S	Z	РО

## Characteristics of the courses of this group of Study Plan: Code=2018 MOIPO5 Name=Compulsory subjects of the branch

B4M33DZO Digital image 7.7K This course presents an overview of basic methods for digital image processing. It deals with practical techniques that have an interesting theoretical basis but are not difficult to

implement. Seemingly abstract concepts from mathematical analysis, probability theory, or optimization come to life through visually engaging applications. The course focuses on fundamental principles (signal sampling and reconstruction, monadic operations, histogram, Fourier transform, convolution, linear and non-linear filtering) and more advanced editing techniques, including image stitching, deformation, registration, and segmentation. Students will practice the selected topics through six implementation tasks, which will help them learn the theoretical knowledge from the lectures and use it to solve practical problems

B4M33GVG Geometry of Computer Vision and Graphics Z.ZK We will explain fundamentals of image and space geometry including Euclidean, affine and projective geometry, the model of a perspective camera, image transformations induced

by camera motion, and image normalization for object recognition. The theory will be demonstrated on practical task of creating mosaics from images, measuring the geometry of objects by a camera, and reconstructing geometrical properties of objects from their projections. We will build on linear algebra and optimization and lay down foundation for other subjects such as computational geometry, computer vision, computer graphics, digital image processing and recognition of objects in images.

### B4M33MPV Computer Vision Methods

Z.ZK The course covers selected computer vision problems: search for correspondences between images via interest point detection, description and matching, image stitching, detection,

recognition and segmentation of objects in images and videos, image retrieval from large databases and tracking of objects in video seguences. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.

## Statistical Machine Learning

The aim of statistical machine learning is to develop systems (models and algorithms) for learning to solve tasks given a set of examples and some prior knowledge about the task.

This includes typical tasks in speech and image recognition. The course has the following two main objectives 1. to present fundamental learning concepts such as risk minimisation, maximum likelihood estimation and Bayesian learning including their theoretical aspects, 2. to consider important state-of-the-art models for classification and regression and to show how they can be learned by those concepts.

### Three-dimensional Computer Vision B4M33TDV

This course introduces methods and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and their essence well enough to be able to build variants of simple systems for reconstruction of 3D objects from a set of images or video, for inserting virtual objects to video-signal source, or for computing ego-motion trajectory from a sequence of images. The labs will be hands-on, the student will be gradually building a small functional 3D scene reconstruction system and using it to compute a virtual 3D model of an object of his/her choice

Z,ZK

B4M39VG Computational Geometry

Z,ZK

6

The goal of computational geometry is analysis and design of efficient algorithms for determining properties and relations of geometric entities. The lecture focuses on geometric search, point location, convex hull construction for sets of points in d-dimensional space, searching nearest neighbor points, computing intersection of polygonal areas, geometry of parallelograms. New directions in algorithmic design. Computational geometry is applied not only in geometric applications, but also in common database searching problems.

Name of the block: Elective courses
Minimal number of credits of the block: 0

The role of the block: V

Code of the group: 2018\_MOIH

Name of the group: Humanities subjects

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
B0M16FIL	Peter Zamarovský Peter Zamarovský Peter Zamarovský (Gar.)	Z,ZK	5	2P+2S	Z,L	V
B0M16HVT	History of science and technology 2 Marcela Efmertová, Jan Mikeš Marcela Efmertová (Gar.)	Z,ZK	5	2P+2S	Z,L	V
B0M16HSD1	History of economy and social studies  Marcela Efmertová	Z,ZK	5	2P+2S	Z,L	V
B0M16PSM	Psychology Jan Fiala Jan Fiala (Gar.)	Z,ZK	5	2P+2S	Z,L	V
B0M16TEO	Theology Vladimír Sláme ka Vladimír Sláme ka (Gar.)	Z,ZK	5	2P+2S	Z,L	V

Characteristics of the courses of this group of Study Plan: Code=2018 MOIH Name=Humanities subjects

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B0M16FIL						Z,ZK	5	
B0M16HVT	History of science and t	echnology	/ 2			Z,ZK	5	

This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers

B0M16HSD1	History of	economy ar	nd social	studies
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Z,ZK 5

This subject deals with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethnical groups in the Czech countries.

B0M16PSM	Psychology	Z,ZK	5
B0M16TEO	Theology	Z,ZK	5

This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which graws our civilization up.

Code of the group: MTV

Name of the group: Physical education

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
TVV	Physical education	Z	0	0+2	Z,L	V
A003TV	Physical Education Ji i Drnek	Z	2	0+2	L,Z	V
TV-V1	Physical education	Z	1	0+2	Z,L	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TVKLV	Physical Education Course	Z	0	7dní	L	V
TVKZV	Physical Education Course	Z	0	7dní	Z	V

Characteristics of the courses of this group of Study Plan: Code=MTV Name=Physical education

TVV	Physical education	Z	0
A003TV	Physical Education	Z	2

TV-V1	Physical education	Z	1
TVV0	Physical education	Z	0
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0

Code of the group: 2018\_MOIVOL Name of the group: Elective subjects Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

~The offer of elective courses arranged by departments can be found on the website https://fel.cvut.cz/en/education/volitelne-predmety.html\\

# List of courses of this pass:

A003TV Physical Education Z.ZK 5 BOM16HSD1 History of economy and social studies Z.ZK 5 BOM16HSD1 History of the Czech society in the 12th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and cevisitence of the various ethnical groups in the Czech countries.  BOM16HVT History of Science and technology 2 History of Science and technology 2 Richards subject traces historical developments in electrical engineering branches in the vortal and in the Czech Lands. Its ultimate goal is to stimulate students interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers of the subject is subject to stimulate students in the social and cultural developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers of the subject is subject in subject in subject in subject in subject in determined not only to believer students who want to group the reliable theretogy grounding but also above all to ones who want to get know Christianty are grown through. The subject is determined not only to believer students who want to know the reliable theretogy grounding but also above all to ones who want to get know Christianty are grown by the subject is determined not only to believer students who want to know the reliable theretogy grounding but also above all to ones who want to get know Christianty are grown by the subject is determined not only to believer students who want to know the reliable theretogy grounding but also above all to ones who want to get know Christianty are grown by the subject is determined not only to believer students who want to know the reliable theretogy grounding but also above all to ones who want to grown by a subject is determined to the subject in the subject in	Code	Name of the course	Completion	Credits			
BOM16HSD1	A003TV	Physical Education	Z	2			
This subject deals with the history of the Czech society in the 19th -21th centuries, It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethnical groups in the Czech countries.  BOM16HVT History of Science and technology 2  If the subject varies historical developments in electrical engineers  BOM16PSM Psychology Z,ZK 5  BOM16PSM Psychology Z,ZK 5  BOM16PSM Psychology Z,ZK 5  BOM16TEO This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which graws our civilization up.  B4M01TAL Theory of Algorithms  Theory of Algorithms  Theory of Algorithms  Theory of Algorithms  B4M33DZO This outper provides to students with the theory of algorithms with the tower students and the classes RP and ZZP introduced.  Digital image  B4M33DZO This outper provides to student with the theory of complexity, the classes P, NP. NP-complexity, probabilistic algorithms are studied and the classes RP and ZZP introduced.  Digital image  B4M33DZO This outper provides to share the theory of basic methods for digital image processing I, I deals with practical techniques that have an interesting theoretical basis but are not difficult to implement Semingly abstract concepts from mathematical analysis, probabilistic and the classes RP and ZZP introduced.  B4M33DZO This outper provides to complexity the classes RP and ZZP introduced.  B4M33DZO This outper provides to complexity the classes RP and ZZP introduced.  B4M33DZO This outper provides to complexity the classes RP and ZZP introduced.  B4M33DZO This outper provides to complexity the classes RP and ZZP introduced.  B4M33DZO This outper provides to	B0M16FIL		Z,ZK	5			
the social and cultural development and coexistence of the various ethnical groups in the Czech countries.    BOM16HVT	B0M16HSD1	History of economy and social studies	Z,ZK	5			
BOM16HVT	This subject deals w	with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims a	ind achieved result	s as well as			
This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers  BOM16FSM  Psychology  Psychology  Z,ZK 5 This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which graves our civilization up.  B4M01TAL  Theory of Algorithms  Theory of Algorithms		the social and cultural development and coexistence of the various ethnical groups in the Czech countries.					
BOM16PSM Psychology Z,ZK 5 BOM16TEO Psychology Z,ZK 5 BOM16TEO Theology The subject to reduce the subject with the subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which graws our civilization up.  B4M01TAL Theology Theology Algorithms Theory of By Theory of B	B0M16HVT	History of science and technology 2	Z,ZK	5			
BOM16PSM Psychology Z,ZK 5 BOM16TEO Theology Theology Z,ZK 5 BOM16TEO Theology Theology Z,ZK 5 BOM16TEO Theology The subject to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which graws our civilization up.  B4M01TAL Theory of Algorithms B4M01TAL Theory of Algorithms B4M01TAL Theory of Algorithms B4M01TAL Theory of Algorithms B4M03DZO Theology B4M03DZO This course presents an overview of basic methods for digital image processing. It deals with practical techniques that have an interesting theoretical basis but are not difficult to implement. Seemingly abstract concepts from mathematical analysis, probability theory, or optimization come to life through visually engaging applications. The course forces for fundamental principles (signal sampling and reconstruction, monadic operations, histogram, Fourier transform, convolution, linear and non-linear filtering) and more advanced editing techniques, including image stitching, deformation, registration, and segmentation. Suctions will practical problems  B4M33GVG Geometry of Computer Vision and Graphics  B4M33MPV The model of a perspective camera, image transformation induced by camera motion, and image normalization for object recognition. The theory will be demonstrated on practical task of creating mosaics from images, measuring the geometry objects by a camera, and reconstructing geometrical properties of objects from their projections. We will build on linear algebra and optimization a		· · · · · · · · · · · · · · · · · · ·		•			
BOM16PSM Psychology 7.2,ZK 5 BOM16TEO Theology 7.2,ZK 5 BOM16TEO Theology 7.2,ZK 5 BOM16TEO Theology 7.2,ZK 5 BOM16TEO Theology 3.2,ZK 5 BOM16TEO This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disophines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which graws our colivitazion up.  B4M01TAL Theory of Algorithms and space complexity of algorithms and problems, secondly on the correctness of algorithms. Further it is dealt with the theory of complexity, the classes P. NP. NP-complete, PSPACE and NPSPACE are treated and properties of them investigated. Probabilistic algorithms are studied and the classes RP and ZZP introduced.  B4M33DZO Digital image processing, it deals with practical techniques that have an interesting theoretical basis but are not difficult to implement. Seemingly abstract concepts from mathematical analysis, probability theory, or optimization come to life through visually engaging applications. The course focuses on much admental principles (signal sampling and reconstruction, monadic operations, histogram, Fourier transform, convolution, linear and non-linear filtering) and more advanced editing techniques, including image strictning, deformation, registration, and segmentation. Students will practice the selected topics through six implementation tasks, which will help them learners and the course of the lectures and use it to solve practice interesting problems in the decrease of the lectures and user it to solve pra	traditions of the sub		and the influence	of technical			
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B4M01TAL Theory of Algorithms	B0M16TEO	Theology	Z,ZK	5			
B4M01TAL The course brings theoretical background of the theory of algorithms with the focus at first on the time and space complexity of algorithms and problems, secondly on the correctness of algorithms. Further it is dealt with the theory of algorithms with the focus at first on the time and space complexity of algorithms and problems, secondly on the correctness of algorithms. Further it is dealt with the theory of complexity; the classes RP NP-Complete, PSPACE and NPSPACE are treated and properties of them investigated. Probabilistic algorithms are studied and the classes RP and ZZP Introduced.  B4M33DZO Digital image  Digital image  Digital image  Digital image  This course presents an overview of basic methods for digital image processing, It deals with practical techniques that have an interesting theoretical basis but are not difficult to implement. Seemingly abstract concepts from mathematical analysis, probability theory, or optimization come to life through visually engaging applications. The course focuses on fundamental principles (signal sampling and reconstruction, monadic operations, histogram, Fourier transform, convolution, linear and non-linear filtering) and more advanced editing techniques, including image stitching, deformation, registration, and segmentation. Students will practice the selected topics through six implementation tasks, which will help them learned the interestical knowledge from the lectures and use it to soft practical problems  B4M33GVG Geometry of Computer Vision and Graphics Z,ZK 6  We will explain fundamentals of image and space geometry including Euclidean, affine and projective geometry, the model of a perspective camera, image transformations induced by camera motion, and image normalization for object recognition. The theory will be demonstrated on practical task of creating mosaics from images, measuring the geometry objects by a camera, and reconstructing geometry computer vision may be computer vision problems. Search for correspondences between images via int	This subject provid	es to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture	he basic theologic	disciplines			
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The course brings theoretical background of the theory of algorithms with the focus at first on the time and space complexity of algorithms and problems, secondly on the correctness of algorithms. Further it is dealt with the theory of complexity; the classes P, NP, NP-complete, PSPACE and NPSPACE are treated and properties of them investigated. Probabilistic algorithms are studied and the classes RP and ZZP introduced.  B4M33DZO   Digital image  This course presents an overview of basic methods for digital image processing. It deals with practical techniques that have an interesting theoretical basis but are not difficult to implement. Seemingly abstract concepts from mathematical analysis, probability theory, or optimization come to life through visually engaging applications. The course focuses on fundamental principles (signal sampling and reconstruction, monadic operations, histogram, Fourier transform, convolution, linear and non-linear filtering) and more advanced editing techniques, including image stitiching, deformation, registration, and segmentation. Students will practice beselected topics through six implementation tasks, which will help them learn the theoretical knowledge from the lectures and use it to solve practical problems  B4M33GVG Geometry of Computer Vision and Graphics  B4W33BVB Geometry of Computer Vision and Graphics  We will explain fundamentals of image and space geometry including Euclidean, affirie and projective geometry, the model of a perspective camera, image transformations induced by camera motion, and image normalization for object recognition. The theory will be demonstrated on practical task of creating mosaics from images, measuring the geometry of objects by a camera, and reconstructing geometrical properties of objects from their projections. We will build on linear algebra and optimization and lay down foundation for other subjects by a camera, and reconstruction geometrical properties of objects from their projections. We will build on linear algebra and optimization		- religion from which graws our civilization up.					
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algorithms and state space search methods. We focus on application of optimization in stores, ground transportation, flight transportation, logistics, planning of human resources,	the courses on lin	near algebra, graph theory, and basics of optimization, we show optimization techniques based on graphs, integer linear programmir	ıg, heuristics, appr	oximation			
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scheduling in production lines, message routing, scheduling in parallel computers.							

B4M39VG	Computational Geometry	Z,ZK	6		
The goal of computational geometry is analysis and design of efficient algorithms for determining properties and relations of geometric entities. The lecture focuses on geometric search,					
point location, convex hull construction for sets of points in d-dimensional space, searching nearest neighbor points, computing intersection of polygonal areas, geometry of parallelograms.					
New di	rections in algorithmic design. Computational geometry is applied not only in geometric applications, but also in common database se	earching problems			
B4MSVP	Software or Research Project	KZ	6		
BDIP25	Diploma Thesis	Z	25		
Independent final	Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will				
be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.					
BE4M33SSU	Statistical Machine Learning	Z,ZK	6		
The aim of statistical machine learning is to develop systems (models and algorithms) for learning to solve tasks given a set of examples and some prior knowledge about the task.					
This includes typical tasks in speech and image recognition. The course has the following two main objectives 1. to present fundamental learning concepts such as risk minimisation,					
maximum likelihood estimation and Bayesian learning including their theoretical aspects, 2. to consider important state-of-the-art models for classification and regression and to show					
how they can be learned by those concepts.					
TV-V1	Physical education	Z	1		
TVKLV	Physical Education Course	Z	0		
TVKZV	Physical Education Course	Z	0		
TVV	Physical education	Z	0		
TVV0	Physical education	Z	0		

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