

Only the german version of the module description as part of the study regulations is legally binding.

Module name	Computer Vision
Module number	INF-25-Ma-FVC-CV
Responsible lecturer	Prof. Dr. Bjoern Andres bjoern.andres@tu-dresden.de
Qualification objectives	Students know elementary linear and non-linear operators of image analysis and are able to implement and apply them. They understand the problems of image classification, image segmentation, object recognition and object tracking in their mathematical formulation. They know local search algorithms for these problems and are able to implement and apply them to image data. Students know and understand the mathematical concept of the artificial neural network and the convolutional network. They know and understand the forward and backward propagation algorithm for machine learning of deep artificial neural networks and are able to apply these algorithms to the problem of image classification. They can present technical results in English.
Content	Contents of the module are color spaces, elementary linear and non-linear operators of image analysis, the problem of image classification, artificial neural networks, convolutional networks, the forward and backward propagation algorithm, image segmentation as an optimization problem, local search algorithms for image segmentation, object recognition as an optimization problem, local search algorithms for object recognition, object tracking as an optimization problem and local search algorithms for object tracking.
Teaching and learning methods	The module comprises lectures of 2 SWS, exercises of 2 SWS, projects of 20 hours and self-study. The language of instruction for the lectures, exercises and projects is English.
Prerequisites for participation	In the Diploma degree course in Computer Science, the competencies to be acquired in the modules INF-25-Ba-AuD Algorithms and Data Structures, INF-25-Ba-Ma1 Linear Algebra and Analysis and INF-25-Ba-Ma4 Probability Theory and Statistics are assumed. Knowledge of algorithms and data structures, analysis of univariate functions and multivariate functions, linear algebra, probability theory and statistics at Bachelor's level is required for the Master's degree course in Computer Science. The following literature is suitable for preparation: Algorithms and Data Structures, Kurt Mehlhorn, Peter Sanders. Springer Berlin Heidelberg, 2008. ISBN: 978-3-540-77977-3. DOI: 10.1007/978-3-540-77978-0, Analysis 1, Konrad Königsberger. Springer Berlin Heidelberg, 2004. ISBN: 978-3-540-40371-5. DOI: 10.1007/978-3-642-18490-1, Analysis 2, Konrad Königsberger. Springer Berlin Heidelberg, 2013. ISBN: 978-3-662-05699-8. DOI: 10.1007/978-3-662-05699-8 Linear algebra, Gerd Fischer. Springer Spektrum Wiesbaden, 2014, ISBN: 978-3-658-03945-5. DOI 10.1007/978-3-658-03945-5,

	Introduction to Probability Theory and Statistics, Ulrich Krengel. Vieweg+Teubner Wiesbaden, 2013. ISBN: 978-3-322-93581-6. DOI: 10.1007/978-3-322-93581-6.
Applicability	The module is a compulsory elective module in the Diplom degree program in Computer Science in the main course in the subject area Visual Computing and Machine Learning, which must be selected in accordance with Annex 2 to the examination regulations. In the Master's degree program in Computer Science, the module is a compulsory elective module in the open track in the subject area Visual Computing and Machine Learning as well as the supplement, which must be selected in accordance with Appendix 2 to the examination regulations. The module can only be chosen once in the Master's degree program in Computer Science. The module cannot be chosen in the Master's degree program in Computer Science if this module or a module with essentially the same content from a degree program with which the admission requirements according to § 3 of the study regulations were fulfilled has already been completed. The module creates the prerequisites for the modules listed under prerequisites for participation.
Requirements for earning credit points	The credit points are earned if the module examination is passed. The module examination consists of a written examination lasting 90 minutes. The examination language is English.
Credit points and grades	6 credit points can be earned through the module. The module grade corresponds to the grade of the examination.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 180 hours.
Module duration	The module comprises one semester.