Module name	**Computer Vision**
Module number	CMS-TRK-CV
Senior Lecturer	Prof. Dr. Bjoern Andres bjoern.andres@tu-dresden.de
Qualification objectives	Students know basic linear and non-linear operators of image analysis and are able to implement and apply them themselves. They understand the problems of image classification, image segmentation, object detection and object tracking in their mathematical formulation. They know local search algorithms for these problems and are able to implement them themselves and apply them to image data. Students know and understand the mathematical concept of the artificial neural network and the folding network. They know and understand the forward and backward prediction algorithm for machine learning of deep artificial neural networks and are able to apply these algorithms to the problem of image classification. You can present technical results in English.
Contents	The content of the module includes colour spaces, elementary linear and non-linear image analysis operators, the problem of image classification, artificial neural networks, folding networks, foward and backward prediction algorithm, image segmentation as an optimisation problem, local search algorithms for image segmentation, object detection as an optimisation problem, local search algorithms for object detection, object tracking as an optimisation problem, and local search algorithms for object tracking.
Forms of teaching and learning	The module includes lectures of 2 SWS, exercises of 2 SWS and self-study. The language of the lectures and exercises will be English.

Eligibility for participation	Skills in algorithms and data structures, basics of theoretical informatics, analysis of univariate and multivariate functions, linear algebra, probability calculation and statistics at bachelor level are required. The following literature is suitable for preparation: 1. 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, 2. Analysis 1. Konrad Königsberger. Springer Berlin Heidelberg, 2004. ISBN: 978-3-540-40371-5. DOI: 10.1007/978-3-642-18490-1, 3. Analysis 2. Konrad Königsberger. Springer Berlin Heidelberg, 2013. ISBN: 978-3-662-05699-8. DOI: 10.1007/978-3-662-05699-8, 4. Linear algebra. Gerd Fischer. Springer Spektrum Wiesbaden, 2014, ISBN: 978-3-658-03945-5. DOI 10.1007/978-3-658-03945-5, 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. 6. Theoretical informatics. Lutz Priese, Katrin Erk. Springer Vieweg Berlin Heidelberg, 2018. ISBN: 978-3-662-57408-9. DOI: 10.1007/978-3-662-57409-6.
Usability	In the Computational Modeling and Simulation Masters Course, the module is a compulsory voting module in Track Visual Computing, Track Computational Engineering, Track Applied Artificial Intelligence, Track Computational Mathematics, Track Computational Life Science and Track Computational Environmental Science and Engineering, to be selected in accordance with Annex 2 to the Specific Test Rules. The module cannot be chosen in the Master's Course Computational Modeling and Simulation if this or a module with substantially the same content from a Course with which the entry conditions under § 3 of the Studienordnung have been met has already been completed. The module provides the pre-requisites for the modules it designates under the pre-requisites for participation.
Conditions for the award of credits	Credits are awarded when the module test is passed. The module test consists of a 90-minute away day. The language of the test will be English.
Credits and marks	The module allows 5 credit points to be obtained. The module score corresponds to the test performance score.
Frequency of the module	The module is offered every winter semester.
Workload	The total workload is 150 hours.
Duration of the module	The module covers 1 semester.