


Data:	SMLCV MA. / Examination number: 22606	Version: 16.06.2025 	Start Year: SoSe 2026
Module Name:	Sensors, Machine Learning and Computer Vision		
(English):			
Responsible:	Heitmann, Johannes / Prof. Dr.		
Lecturer(s):	Gloaguen, Richard / Dr.		
Institute(s):	Helmholtz Institute Freiberg Institute of Applied Physics		
Duration:	1 Semester(s)		
Competencies:	Students acquire in-depth knowledge of the principles and possible applications of imaging sensor technologies and gain insights into current developments in the field of computer vision (CV) and machine learning (ML). Students learn the practical application of basic image processing techniques. They develop an understanding of the possible applications and limitations of imaging technologies for scientific questions. They are able to discuss more complex methods of imaging and image processing and to implement them cooperatively in the context of a current scientific problem.		
Contents:	<p>The module teaches the basics of imaging and image processing and takes an excursion into current developments in computer vision and machine learning. Practical examples and supervised exercises are used to teach important aspects of image creation, calibration and processing, e.g.:</p> <ul style="list-style-type: none"> - Sensor technology and image acquisition - Camera calibration and corrections - Feature detection and co-registration - Data fusion and classification <p>Subsequently, important current publications in the fields of image processing and computer vision are discussed and potential fields of application are developed.</p> <p>Examples of topics are:</p> <ul style="list-style-type: none"> - Pattern and object recognition - 3D reconstruction from image data and active 3D imaging (light field, lidar, structured light) - Multidimensional imaging (multi-/hyperspectral data) - Motion detection and object tracking - Image restoration (inpainting, denoising) - Machine learning / deep learning for segmentation <p>The students then independently implement a sensor approach for a current scientific problem as part of small group work (co-operative project work). Project progress and results are recorded in a project report and presented at the end in a scientific lecture.</p>		
Literature:	<p>Hartley, R., & Zisserman, A. (2004). Multiple View Geometry in Computer Vision (2nd ed.). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511811685</p> <p>Howse, J. & Minichino, J. (2020). Learning OpenCV 4 Computer Vision with Python 3. Packt Publishing</p>		
Types of Teaching:	<p>S1 (SS): Lectures (2 SWS)</p> <p>S1 (SS): Seminar (2 SWS)</p>		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains:		

	<p>AP*: report of a co-operative project work AP*: oral presentation</p> <p>* In modules requiring more than one exam, this exam has to be passed or completed with at least "ausreichend" (4,0), respectively.</p>
Credit Points:	5
Grade:	<p>The Grade is generated from the examination result(s) with the following weights (w): AP*: report of a co-operative project work [w: 2] AP*: oral presentation [w: 1]</p> <p>* In modules requiring more than one exam, this exam has to be passed or completed with at least "ausreichend" (4,0), respectively.</p>
Workload:	The workload is 150h. It is the result of 60h attendance and 90h self-studies.