Name: Image and Vision Computing

Background: This course is provides a foundation in computer vision concepts. It will provide a basis for more advanced related courses including Advanced Vision and Computer Graphics, and provide the vision knowledge necessary for vision-based robotics in conjunction with RSS. It aggregates introductory material currently in AV, CG and the vision material in RSS.

Details:
Year: **5,** Level: 11, Points: 10, Semester: S1.
Subject area: *Informatics*

Programme Collections:
Computer Science, Software Engineering, Artificial Intelligence

Brief Course Description
This module provides a first course in computer vision, and is suitable for computer science, AI, and informatics majors to acquire necessary skill set for processing data obtained in the form of images or video.
It will cover vision topics including image representations (interest point and holistic features), and all of the main problem categories within vision: detection, matching, tracking and recognition. The coursework includes practice of programming a practical computer vision application.

Objectives

1. Students are expected to be able to use basic image processing techniques, image descriptors, and machine learning methods to solve simple problems in detection, matching, tracking and recognition.

Teaching and Assessment Number of Lectures
Number of Tutorials or Lab Sessions: 16 lectures in total, two 1-hour lecture per week.
Written Examination (50%). Assessed Coursework (50%) *(Can we do 100% coursework?)*

Interactions: Linear algebra, probability. Recommended CoReq: Intro to machine learning.

Syllabus

1. Introduction to image processing. Nature of images and relation to physics of scenes and cameras. Basic operations: Convolution, segmentation, thresholding. Edge detection. (Projects/exercises: Background subtraction.)
2. HOG + SIFT descriptors. SIFT-based matching. RANSAC. (Projects/exercises: Image alignment, image matching)
3. Bag of words. BOW-based recognition. (Projects/exercises: Face/object/scene recognition)
4. Sliding-widow based detection. Non-max suppression. (Projects/exercises: Person/face detection, object counting)
5. Particle filter tracking. (Projects/exercises: Person/vehicle tracking)