Training Program

Fall Short e-course on Drone (UAV) Vision and Deep Learning with focus on drone vision/perception, imaging, surveillance, infrastructure inspection,

You are welcomed to register in this **Fall Short e-course on Drone (UAV) Vision and Deep Learning with focus on drone vision/perception, imaging, surveillance, infrastructure inspection, media production and cinematography.** It will take place on 18-19th November 2020 as an e-course (due to COVID-19 circumstances), hosted by the Aristotle University of Thessaloniki (AUTH), Thessaloniki, Greece, providing a series of live lectures delivered through a tele-education platform. They will be complemented with on line video recorded lectures and lecture pdfs, to facilitate international participants having time difference issues and to enable you to study at own pace.

You can also self-assess your CVML knowledge before/after the course by filling appropriate questionnaires (one per lecture). You will be provided programming exercises to improve your CVML programming skills.

The short e-course consists of 16 1-hour lectures organized in two parts (one per day):
Part A lectures (8 hours) provide an in-depth presentation to drone systems, mission planning/control and imaging. First, an introduction to multiple drone systems is presented. Then, drone mission planning and control is overviewed, to be complemented by a lecture on drone mission simulations. After reviewing image acquisition, camera geometry (mapping the 3D world on a 2D image plane) and camera calibration, stereo and multi-view imaging systems are presented for recovering 3D world geometry from 2D images. This is complemented by Structure from Motion (SfM) towards Simultaneous Localization and Mapping (SLAM) for vehicle and/or target localization and visual object tracking and 3D localization. Finally, drone communications are overviewed, focusing on drone2ground multiple drone LTE communications, notably on multiple source video compression and streaming.

Part B lectures (8 hours) provide first an in-depth presentation of drone computational cinematography that are useful in many applications, besides media production. Then, an introduction to neural networks, provides rigorous formulation of the optimization problems for their training, starting with Perceptron. It continues with Multilayer perceptron training through Back propagation, presenting many related problems, such as over-/under-fitting and generalization. Deep neural networks, notably Convolutional NNs are the core of this domain nowadays and they are overviewed in great detail. Their application on deep learning for object detection is well presented, as it is a very important issue as well, complemented with a presentation of deep semantic image segmentation. As embedded computing is such an important issue, CVML software development tools and their use in drone imaging is overviewed. This part is concluded with an extremely important drone imaging application, notably, UAV infrastructure inspection.

You can use the following link for course registration:
http://icarus.csd.auth.gr/cvml-for-autonomous-systems/

Lecture topics, sample lecture ppts and videos, self-assessment questionnaires and programming exercises can be found therein.

For questions, please contact: Ioanna Koroni <koroniioanna@csd.auth.gr>

The short course is organized by Prof. I. Pitas, IEEE and EURASIP fellow, Chair of the IEEE SPS Autonomous Systems Initiative, Director of the Artificial Intelligence and Information analysis Lab (AIIA Lab), Aristotle University of Thessaloniki, Greece, Coordinator of the European Horizon2020 R&D project Multidrone. He is ranked 249-top Computer Science and Electronics scientist internationally by Guide2research (2018). He is head of the EC funded AI doctoral school of Horizon2020 EU funded R&D project AI4Media (1 of the 4 in Europe). He has 31600+ citations to his work and h-index 85+.

AUTH is ranked 153/182 internationally in Computer Science/Engineering, respectively, in USNews ranking.

Relevant links:
1) Prof. I. Pitas: https://scholar.google.gr/citations?user=lWmGADwAAAAJ&hl=el

2) Horizon2020 EU funded R&D project Aerial-Core: https://aerial-core.eu/
3) Horizon2020 EU funded R&D project Multidrone: https://multidrone.eu/
4) Horizon2020 EU funded R&D project AI4Media: https://ai4media.eu/
5) AIIA Lab: https://aiia.csd.auth.gr/

Course description 'Deep Learning and Computer Vision for Autonomous Systems: Focus on drone vision, imaging, surveillance and cinematography'

Part A (8 hours)
1. Introduction to multiple drone systems
2. Drone mission planning and control
3. Image acquisition, camera geometry
4. Stereo and Multiview imaging
5. Localization and mapping
6. Object tracking and 3D localization
7. Drone communications
8. Drone mission simulations

Part B (8 hours)
1. Drone cinematography
2. Introduction to neural networks, Perceptron
3. Multilayer perceptron. Backpropagation
4. Deep neural networks. Convolutional NNs
5. Deep learning for object/target detection
6. Deep Semantic Image Segmentation
7. CVML software development tools
8. UAV infrastructure inspection

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Post scriptum: To stay current on CVMl matters, you may want to register to the CVML email list, following instructions in https://lists.auth.gr/sympa/info/cvml