



ORARIO LEZIONE/ LESSON TIME

VENERDI/ FRIDAY:
14:00 - 20:00

SABATO/ SATURDAY:
8:30 - 14:00

Introduction
Sensing
Communication and Cyber-physical systems
Data management and analytics
Computing
Application systems
Application scenarios
Ethics
Business Innovation

gen-25	Venerdì 10 Kick-off Introduction to ICT/Agrifood Process	Sabato 11 Introduction to ICT / Agrifood process	Venerdì 17 Architetture per la raccolta dati Cyber-physical systems	Sabato 18 Robotics	Venerdì 24 Use of aerial and terrestrial drones Energy aspects of IOT	Sabato 25 RFID technologies TBD	Venerdì 31 Wireless networks
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feb-25	Sabato 1 Overview and introduction to the module: images and their representation Presentation of the framework used in the tutorials	Venerdì 7 Short introduction on commercial boards for IoT The case of arduino: motherboard, analog digital interface, and commercial sensors Input output from external sensors	Sabato 8 Developing a sketch for gathering and storing data Connecting the board to the external world	Venerdì 14 Server-client communications: the publisher subscriber paradigm through Mqtt Deploying an instance of NodeRed for data presentation	Sabato 15 Presenting specific IoT hardware developed for agriculture scenarios Connecting to the external gateway Deploying specific sensors for agriculture	Venerdì 21 Data from sensors: scenarios and agricultural indexes An agricultural dashboard based on NodeRed for visualization and automating tasks Setting rules on Nodered for connecting external services (e.g. weather forecast)	Sabato 22 Blockchains and their applications in digital agriculture
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mar-25	Venerdì 7 Blockchains and their applications in digital agriculture	Sabato 8 Blockchains and their applications in digital agriculture- hands on Infrastructures, cloud, fog and edge computing	Venerdì 14 Infrastructures, cloud, fog and edge computing- hands on	Sabato 15 Big data analytics Parallel Computation basic concepts and Map Reduce Theory	Venerdì 21 Spark and SparkSQL SparkMLlib (Machine learning Library) and SparkStreaming	Sabato 22 Big data analytics - hands on
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apr-25	Venerdì 4 Case Study and Students Project Implementation AI and machine learning	Sabato 5 AI and machine learning - hands-on	Venerdì 11 Case studies, decision support system in digital agriculture	Sabato 12 Basics of image processing and analysis (geometric transformations; filtering; image enhanceent; image registration; image segmentation; all topics accompanied by tutorials using open source software)	Venerdì 18 Basics of image processing and analysis (geometric transformations; filtering; image enhanceent; image registration; image segmentation; all topics accompanied by tutorials using open source software)	Sabato 19 Basics of computer vision and artificial intelligence (clustering; image classification; object detection; all topics accompanied by tutorials using open source software) Computer vision and artificial intelligence in agriculture - sample applications and lesson learnt
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mag-25	Venerdì 9 Computer vision and artificial intelligence in agriculture - sample applications and lesson learnt	Sabato 10 Overview and introduction to the module: UAVs and their use in sustainable and precision agriculture	Venerdì 16 UAV designs & regulatory aspects Sensing payload for UAV; flight modalities & mission planning	Sabato 17 In-field test with UAV - mission planning, actual survey, data processing and report preparation	Venerdì 23 Overview and introduction to the module: imaging sensors in agritech, image analysis and photogrammetry Imaging sensors - the range of imaging modalities and examples of sensors Imaging sensors - physics pills on image acquisition and formation	Sabato 24 Photogrammetry - scope and principles; 2d/3d processing; how to plan of photogrammetric survey Photogrammetry - hands-on (with real data already available)
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LEZIONI IN PRESENZA (IN CAMPO O LABORATORIO PRESSO SEDE DI PISA E/O MACERATA)

giu-25	Venerdì 6 Photogrammetry - hands-on (including data acquisition from handheld devices; integration of marker; metric scaling and georeferencing) Sensors - hands-on session (including sensors calibration and data acquisition on the ground)	Sabato 7 Testimonials	Venerdì 13 Testimonials	Sabato 14 Principles of precision viticulture and olive growing: farmers needs, digital solutions and field zoning in a climate change scenario Automation and robotics in agriculture Automation and robotics in weed control and plant protection Automation and robotics in tree and specialty crops and other scenarios Automation and robotics in landscape management	Venerdì 20 Site Specific Weed Management: theory and tool-box SSWM: a case study	Sabato 21 VRA of fertilizers from satellite data Developing smart tools for livestock pest monitoring (stable files and tabanids): trap development and hands on data analysis Sensors in livestock farming systems: architecture, technical characteristics, functioning and importance in monitoring animal welfare, behaviour and performance	Venerdì 27 Variable Rate Application of fertilizers: theory and tool-box VRA of fertilizers: a case-study Laboratory of VRA machines, agricultural robots for landscape management and weed control and tarjectories tracking On farm visits and live demonstration	Sabato 28 Data acquisition in vineyards and olive orchard using UAVs, field sensors and manual sampling procedures: plant water and nutritional status and canopy biomass Laboratory analysis of collected field data: berries and olives quality parameters, leaves analyses Data analysis: correlation between data obtained from remote and proximal sensing and data collected in the field; improve field zoning by including farmers' knowledge and perception, Understanding the agronomic meaning of digital information: how farmers can concretely translate digital information into practices aimed at increasing the quality of wine and oil?
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lug-25	Venerdì 11 Bioinspired and smart tools for behavioral research in insect science Lab activity: biocontrol agent tracking and sublethal effect detection with hands on data analysis Developing smart tools for livestock pest monitoring (stable files and tabanids): trap development and hands on data analysis	Sabato 12 Introduction to advanced technologies for Plant Pathology Vegetation spectroscopy to early detect and monitor plant diseases; decision support systems to forecast plant diseases (online) Data analysis by open source statistical software to develop spectral models to predict plant functional traits and discriminate health status (online) Use of light intensity and quality for improving the plant growth and the quality of crop production.	Venerdì 18 The influence of the climate parameters on the plant development and growth (temperature, Vapour Pressure Deficit and carbon dioxide) DSS in protected cultivation: how to model plant growth and climate? Traditional approach DSS in protected cultivation: how to model plant growth and climate? Artificial intelligence approach, Carbon dioxide enrichment and greenhouse climate computer	Sabato 19 Hands-on development and calibration of the feed-back and feed-forward IDSS Agrohydrological sensors and models for soil and plant water status monitoring Soil-specific calibration of TDR- and FDR-based soil moisture sensors	Venerdì 25 Case study (ILMAF): how to manage light quality and quantity in greenhouse Case study (ILMAF): practical application of models and sensors to improve irrigation in soil and soilless system of horticultural crops Development and validation of a decision support system to forecast plant diseases, based on environment (weather station), host (multispectral camera) and pathogen (Auto spore sampler) data. Visiting experimental trials at the Horticulture and Floriculture Lab (ILMAF + VINSTEIN project)	Sabato 26 Soil EMI- and ERT-based zoning to study the best topology of the SM-WSN Hands-on development and calibration of the feed-back and feed-forward IDSS
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set-25	Venerdì 12 Introduction to analysis of data collected with sensors and hand portable devices, data analysis with data sample collected; generation of exemplary dataset, data editing, data mining and data analysis Uses and interpretation of output of data analysis	Sabato 13 Introduction to AI ethics Introduction to Data Governance Use Cases on AI Ethics, Use Cases on Data Governance	Venerdì 19 Theory of Interactive Innovation Identification of a challenge: needs, expectations, impact Socio-technical systems Organization of the AKIS
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