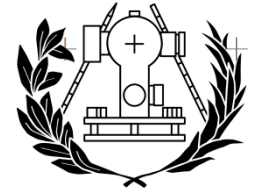




UNIVERSITAT
POLITÈCNICA
DE VALÈNCIA



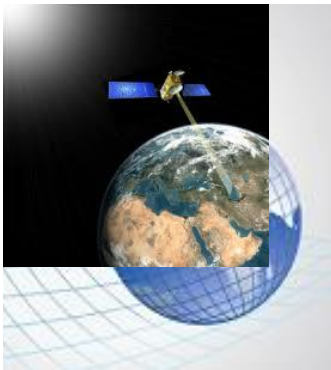
ESCUELA TÉCNICA SUPERIOR
DE INGENIERÍA GEODÉSICA
CARTOGRÁFICA Y TOPOGRÁFICA



MASTER'S PROGRAMME IN GEOMATICS ENGINEERING AND GEOINFORMATION



- **Branch:** IT / Engineering/ Architecture
- **Implementation year:** Academic year 2010/11
- **Aimed at** graduates who want to deepen their insight in Geomatics:
 - Graduates in Geomatics and Surveying Engineering
 - Other engineering
- **GEOMATICS:** Discipline devoted to collecting, storing, processing and visualising of georeferenced information (geo-information) using multiple techniques:



Remote Sensing

Photogrammetry

Cartography

Geographic Information Systems

Geostatistics

3D modelization

Global Navigation Satellite Systems (GPS, Galileo...)

...

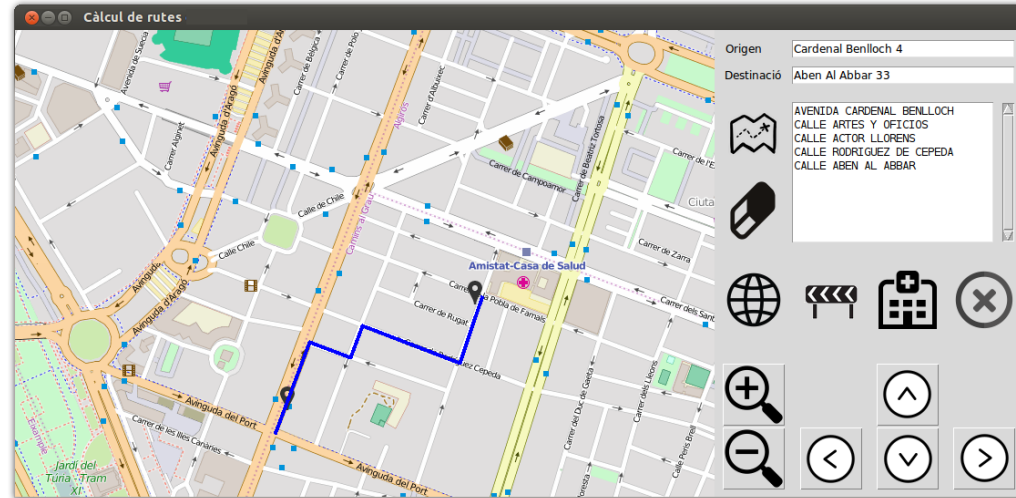
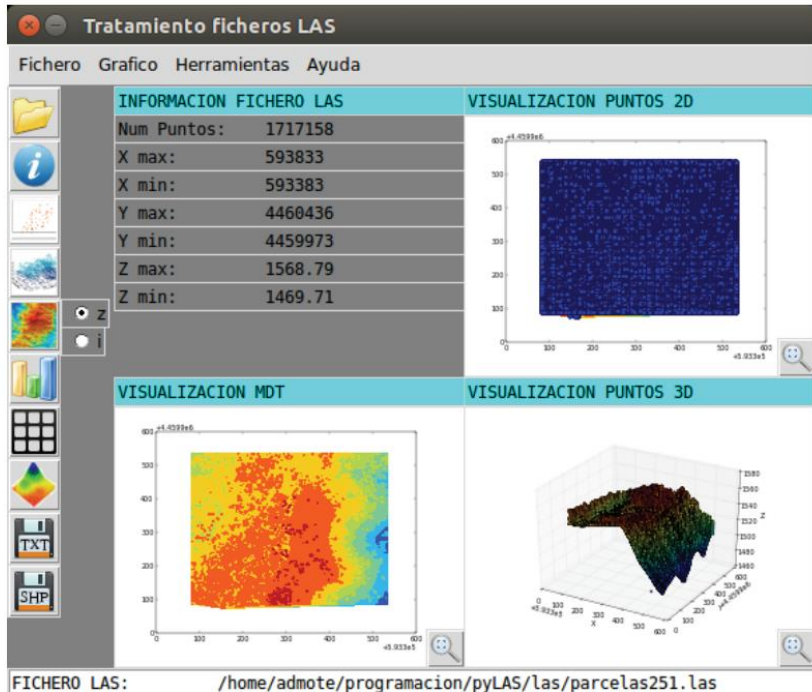
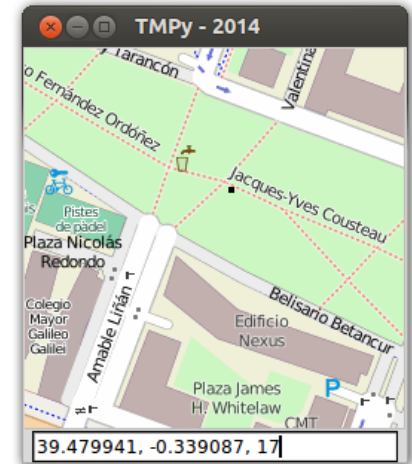
SYLLABUS (EF)

**120 ECTS
4 SEMESTERS**

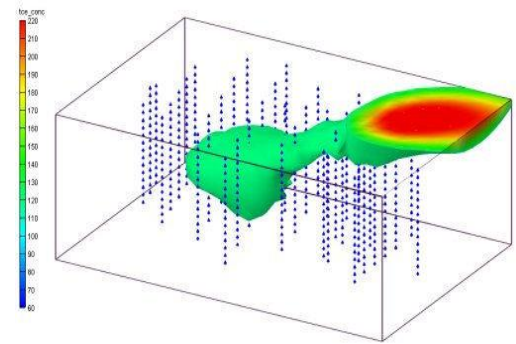
FIRST YEAR					
Semester A			Semester B		
Subject	ECTS	Category	Subject	ECTS	Category
Programming for Geospatial Applications	EF 6	Compulsory	Web Development and Geoportals	EF 6	Compulsory
Geostatistics and Multivariate Analysis	EF 6	Compulsory	Distribution of Spatial Information	EF 6	
Urban Planning and Cadastre	EF 6	Compulsory	GIS Application Development	EF 6	
Geomatic Applications in Geomarketing	EF 6	Elective	Positioning	EF 6	
Big Data/ Data Mining	EF 6	Elective	Geospatial Content Managers and Smart Cities Completely in English.	6	Elective
SECOND YEAR					
Semester C			Semester D		
Subject	ECTS	Category	Subject	ECTS	Category
Remote Sensing and Cartographic Updating	EF 6	Compulsory	Instrumentation for Spatial Data Acquisition	6	Elective
Environmental Mapping and Modelling	EF 6		Geovisualisation y 3D Modelling	EF 6	
Techniques for Heritage and Architectural Documentation	EF 6		Work Placement	EF 6	
Sensor Georeferencing and Navigation	EF 6		Master Thesis	EF 18	Compulsory
Geospatial Apps in Mobile Devices	EF 6				

EF → English Friendly (doubts and tutorial classes, exams and presentations).

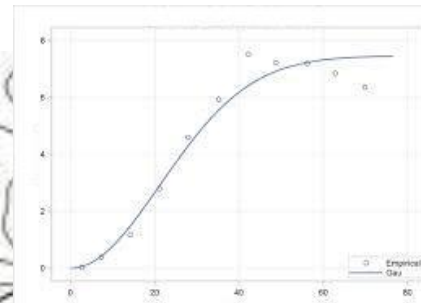
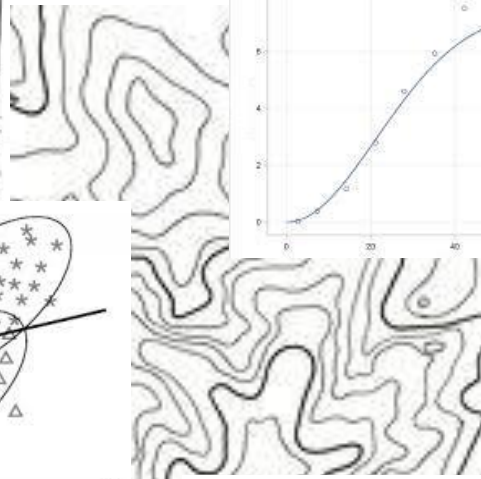
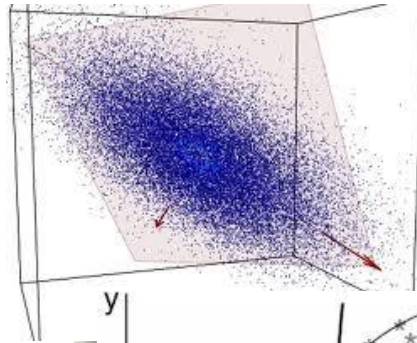
PROGRAMMING FOR GEOSPATIAL APPLICATIONS



GEOSTATISTICS AND MULTIVARIATE ANALYSIS

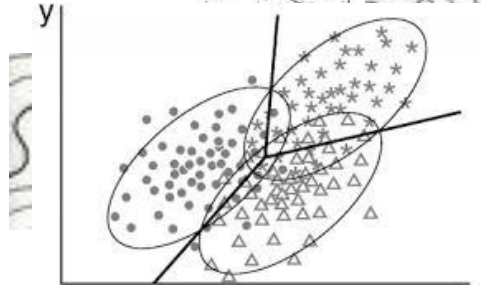


Correlations



Semivariogram

PCA



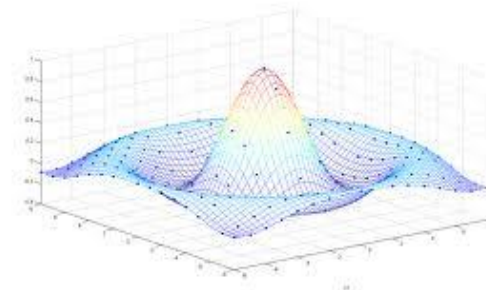
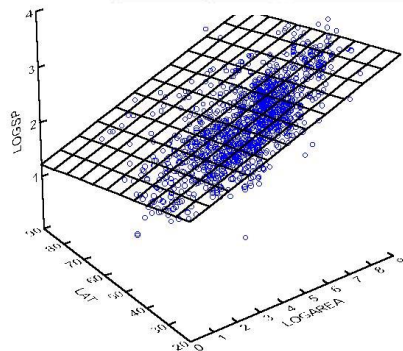
Kriging

Discriminant Analysis



Cokriging

Multiple Regression



Interpolation

URBAN PLANNING AND CATASTRE



URBAN PLANNING

- Spanish Regulations in Urban Planning and Management
- Urban Plan Typologies
- Cartography in Urban Planning

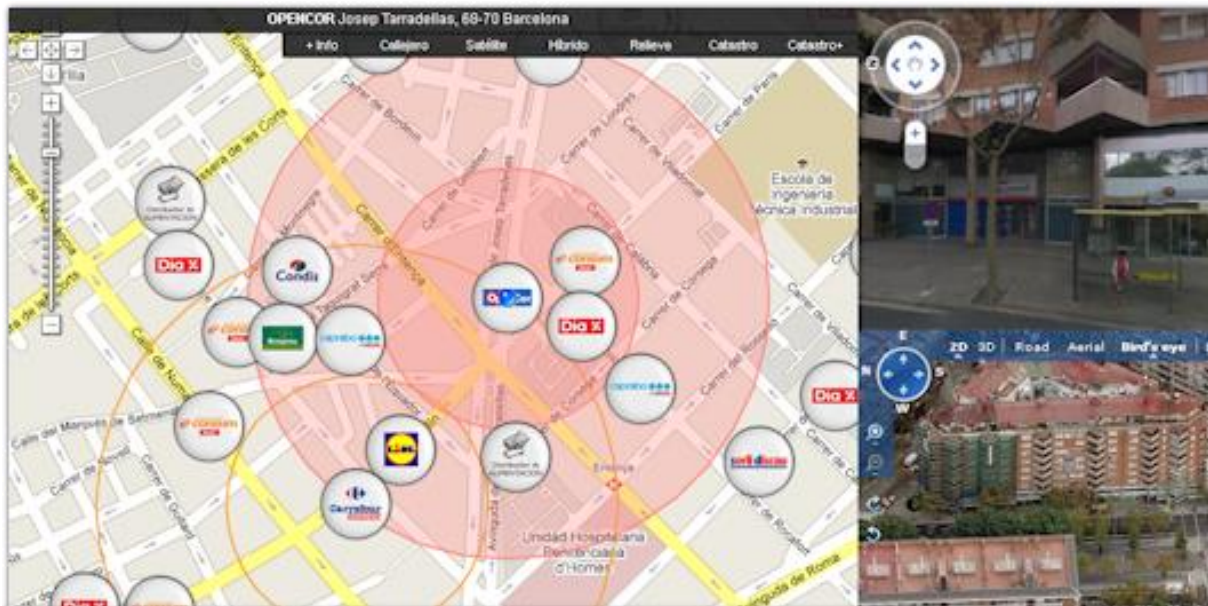
CADASTRE

- Cadastre and Land Registry Coordination
- Cadastral Regularisation
- International Cadastre Models. Géomètre Expert
- The Land Administration Domain Model (LADM)

GEOMATIC APPLICATIONS IN GEOMARKETING



- Geomarketing provides information for making business decisions based on spatial localization.
- Analysis of a business through the exact location of customers, points of sale, branches, etc., locating them on a map through symbols and personalized colors to make profitable commercial actions.





BIG DATA / DATA MINING

1. STORAGE
2. ANALYSIS TOOLS
3. DATA MINING

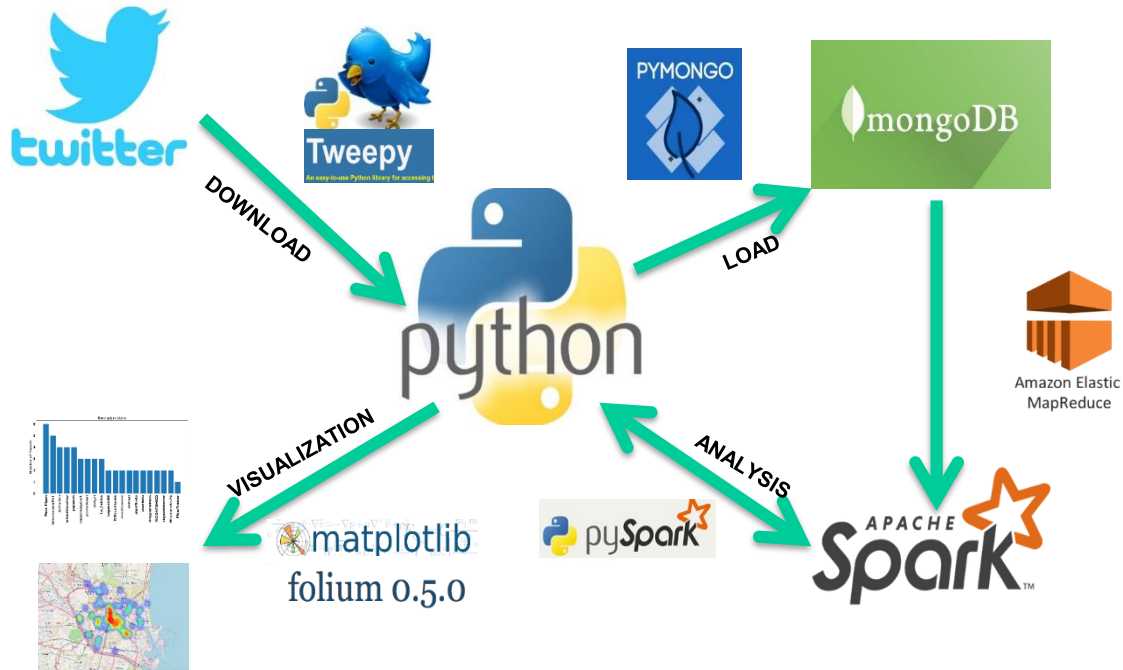
Machine Learning

Supervised

- Classification
 - Naïve Bayes
 - SVM
 - Random Decision Forests
- Regression
 - Linear
 - Logistic

Unsupervised

- Clustering
 - K-means
- Dimensionality reduction
 - Principal Component Analysis
 - SVD

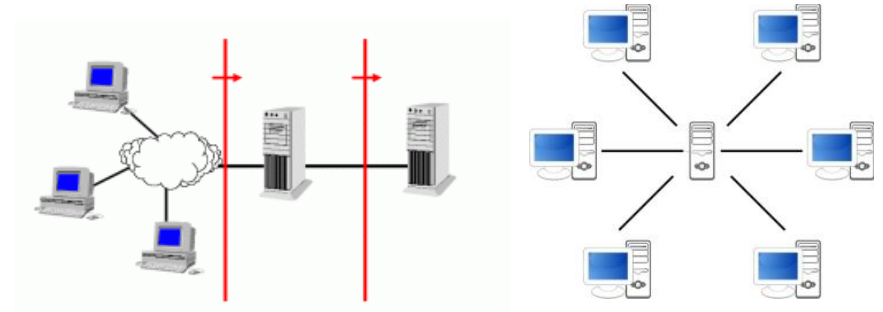


WEB DEVELOPMENT AND GEOPORTALS



Information Architectures:
Web and Client-Server

Languages



Frameworks:



Advanced Geoportal

Geoservices OGC
Server Programming



DISTRIBUTION OF SPATIAL INFORMATION



REGULATIONS

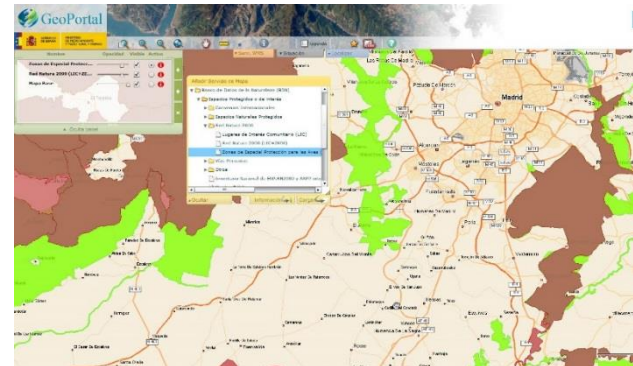


LISIGE

SPECIFICATIONS

- Hydrography
- Land Use
- Transportation Networks
- Urban Areas

...



METADATA



Spatial analysis tools

DATA MODELS MANAGEMENT

GIS APPLICATION DEVELOPMENT

Development language: **Python**



Programming Environments:

Arcpy (ArcGIS)

PyQGIS (Quantum GIS)



POSITIONING



Computation Algorithms Software and Techniques Applications



GNSS multiconstellation

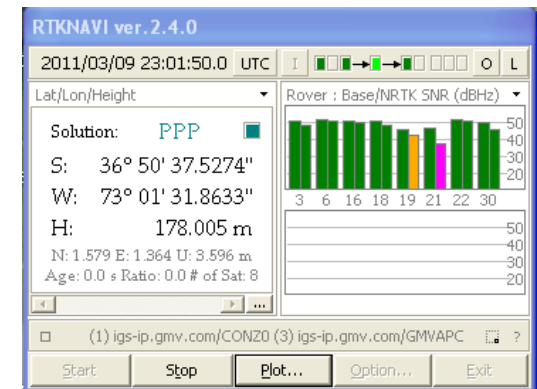
Positioning Equations: programming

PPP: Precise Point Positioning

Atmosphere, Ionosphere (Galileo), Troposphere (Climate)

Wide Area DGPS

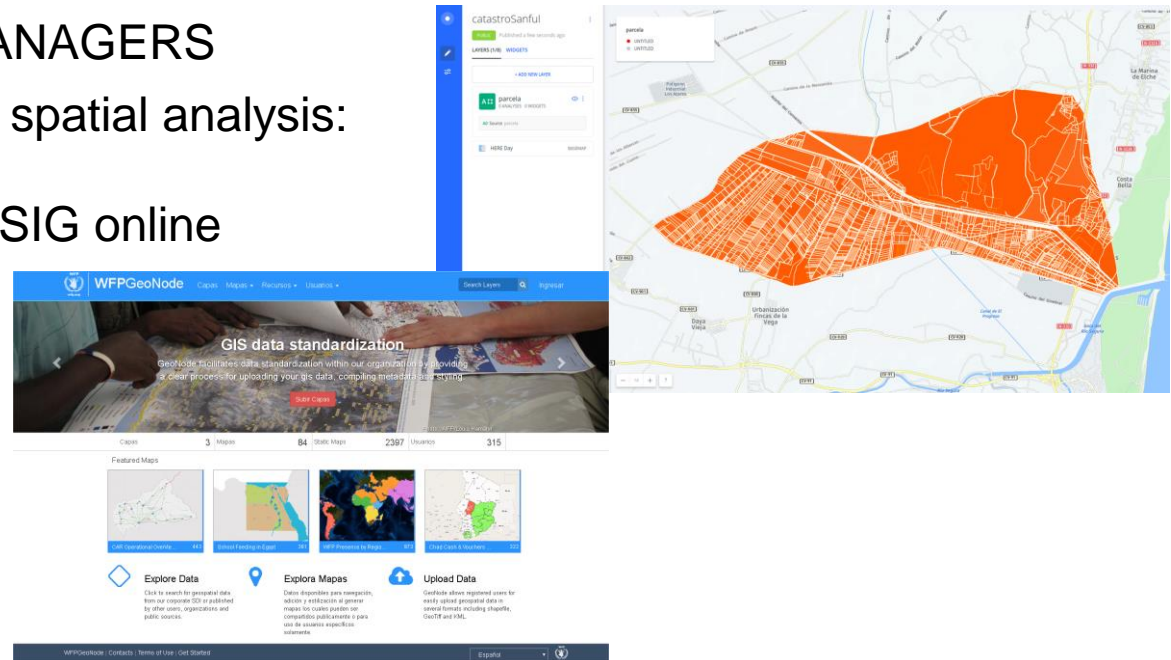
Kinematic GPS RTK (Agriculture)



GEOSPATIAL CONTENT MANAGERS AND SMART CITIES

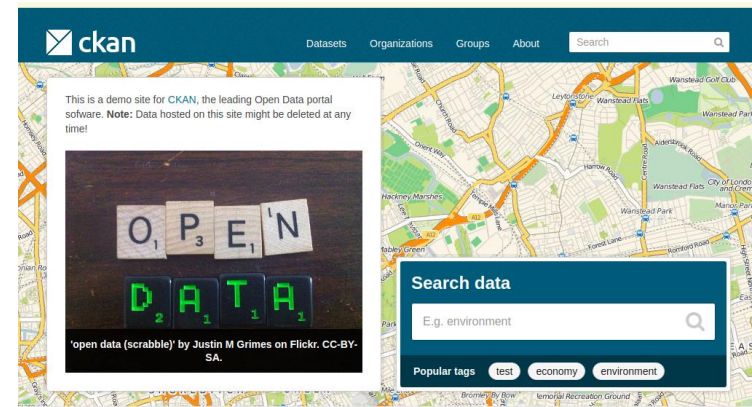
1. GEOSPATIAL CONTENT MANAGERS

- Web mapping and online spatial analysis: CartoDB, Geocloud
- GeoNode, Geoshape, gvSIG online
- OpenData: CKAN.

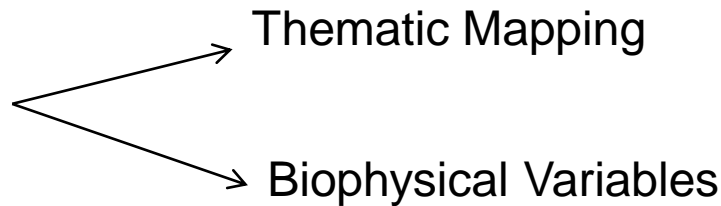
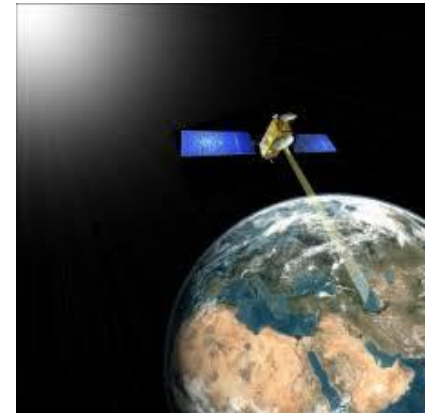


2. SMART CITIES

CKAN: <http://docs.ckan.org/en/latest/>



REMOTE SENSING AND GEODATABASE UPDATING



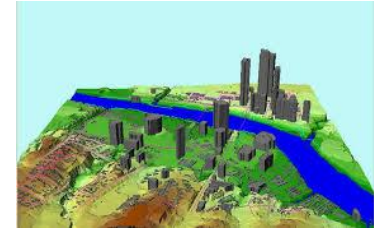
Earth Observation Programmes
Soil Use Databases



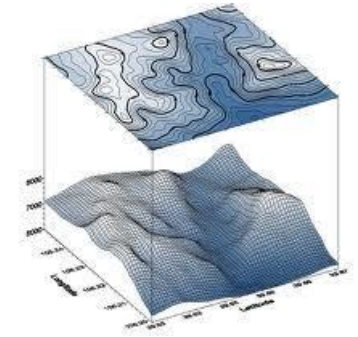
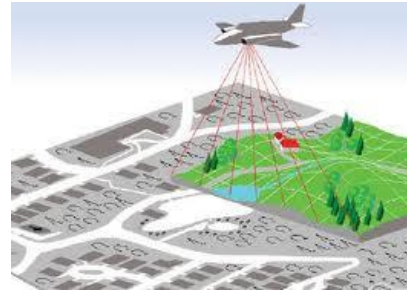
Image Segmentation
Feature Extraction
Variable Selection
Classification Methods
Sampling
Morphologic Filters

Database Updating

ENVIRONMENTAL MAPPING AND MODELLING



DIGITAL ELEVATION MODELS



INTEGRATION WITH GEOSPATIAL DATASETS

Climate
Geology
Satellite images...

Geomorphologic Analysis
River and Coast Dynamics
Fire Ecology
Risk Analysis



TECHNIQUES FOR HERITAGE AND ARCHITECTURAL DOCUMENTATION



Capture / Processing / Analysis

Visible / Thermal / Multispectral



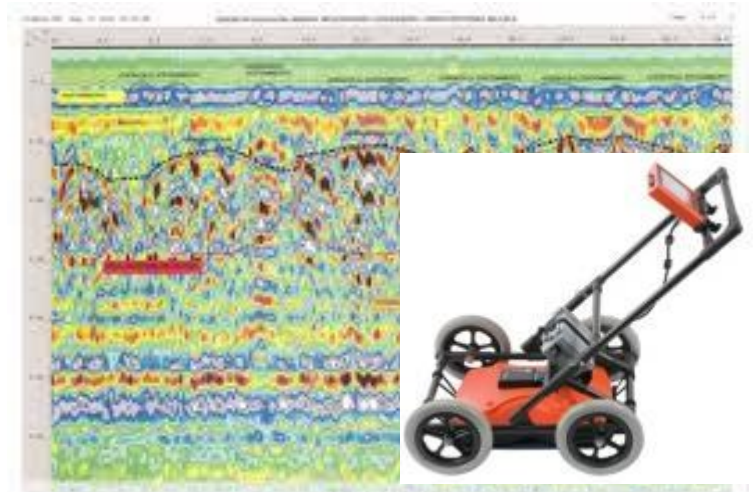
Laser Scanner

Georadar



Monitoring / Diagnosis

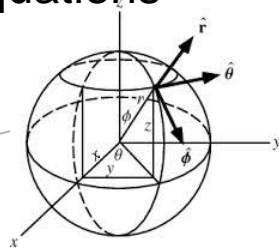
APPLIED PROJECT



SENSOR GEOREFERENCING AND NAVIGATION



Coordinate Systems
Navigation Equations



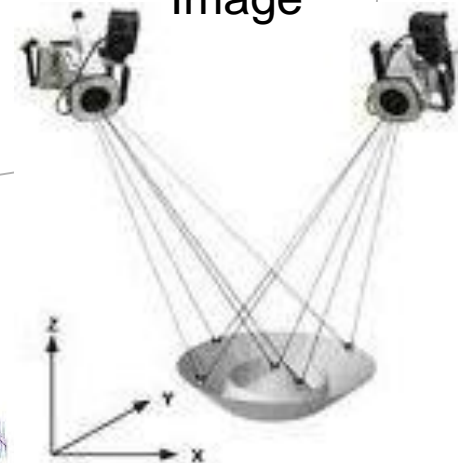
INS



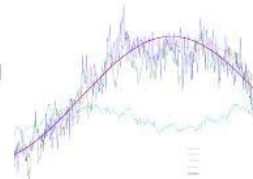
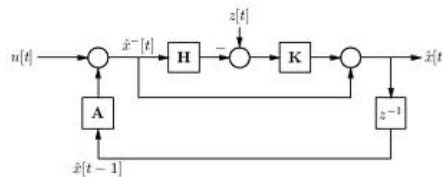
GNSS



Image



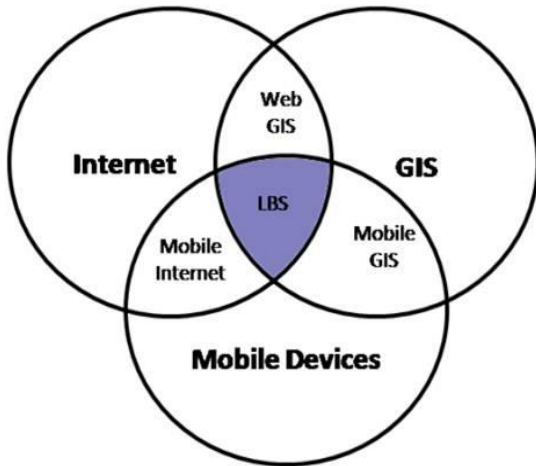
Integration
Kalman Filters



GEOSPATIAL APPS IN MOBILE DEVICES



Location Based Services (LBS)



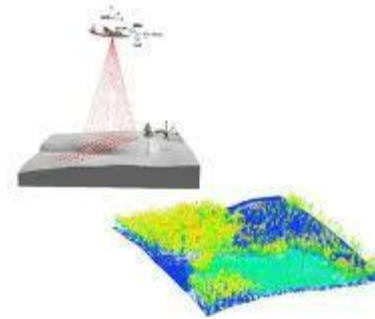
Smart Cities



INSTRUMENTATION FOR SPATIAL DATA ACQUISITION

Geomatics project using multiple collection techniques

Laser Scanner



LIDAR

GNSS



GPR

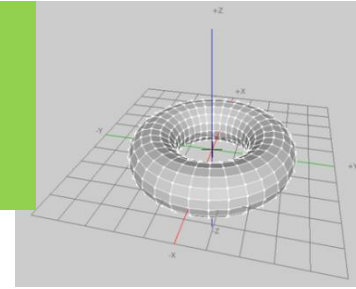


UAV



Close-Range Photogrammetry

GEOVISUALISATION AND 3D MODELLING



Principles of visualisation

2D, 3D and 4D techniques



3D modelling in archaeology, landscape,...

Augmented reality





DOUBLE DEGREES



École Spéciale des Travaux Publics
Paris (France)



University of Applied Sciences
Karlsruhe (Germany)

**Warsaw University
of Technology**

Warsaw University of Technology
Warsaw (Poland) Available 2022/2023



Methodology

Combination of **theory** and **practical applications**

Seminars and **workshops**

Work placements (elective)

Visits to private companies and public institutions and talks by experienced professionals from the different fields of Geomatics



INSTITUT
CARTOGRÀFIC
VALENCIÀ

INSTITUTO
GEOGRÀFICO
NACIONAL





Partners



European Space Agency



AJUNTAMENT DE VALÈNCIA



JARDINERÍA Y MEDIOAMBIENT



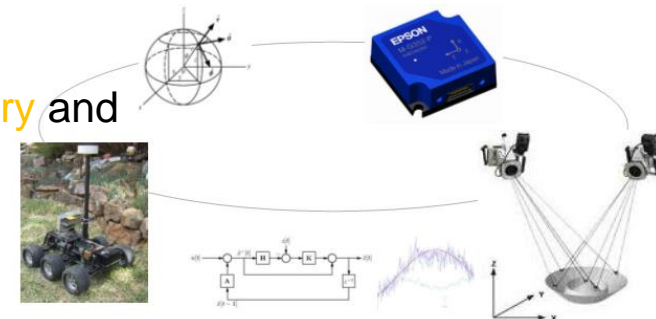
GRUPO AGUAS DE VALÈNCIA





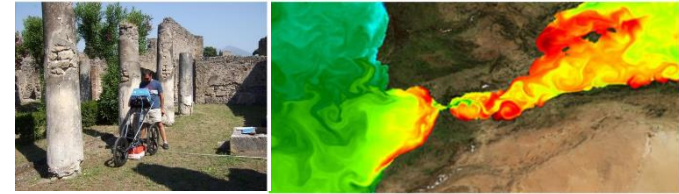
Geomatics students will learn to...

- Work with data collected with different **Global Navigation Satellite Systems** (GPS, Galileo, GLONASS, etc.)
- Develop **mapping applications for mobile devices** (*smartphones, tablets, etc.*)
- **Integrate Sensors** for navigation purposes (using GNSS, inertial sensors and imagery)
- Work with **cartographic models** for **environmental and natural hazard** studies.
- Manage resources using **Geographic Information Systems (GIS)**.
- Set up **map servers** and **geoportals**.
- Use **multispectral satellite images** for updating cartographic databases.
- Manage **3D data** obtained by **LiDAR or laser scanner**.
- Apply the methodology for **heritage documentation**.
- Manage databases for **cadastral information, real state registry and territory**.





Graduate employability



Our graduates develop highly valued skills and abilities both in the **public** (mapping agencies, environment or transportation departments, etc) and **private sectors** (construction companies, consulting firms, service providers, etc)

CAREERS AND RECRUITMENT

Mapping opportunities



Scientists who can combine geographic information systems with satellite data are in demand in a variety of disciplines.

©2004 Nature Publishing Group

NATURE | VOL.427 | 22 JANUARY 2004 | www.nature.com/nature

2013 OXERA report for Google on the economic impact of geoservices





DOCTORATE PROGRAMME IN GEOMATIC ENGINEERING BY THE UNIVERSITAT POLITÈCNICA DE VALÈNCIA AND THE UNIVERSIDAD POLITÉCNICA DE MADRID



3 years in a consolidated group working in competitive and funded Research and Development projects

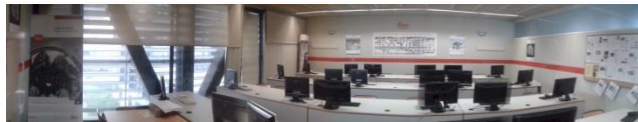


Current business partners:





- **LABORATORIES AND SEMINARS**
- **With last generation instruments and sensors**
 - GNSS receivers (Topcon, Trimble and Leica)
 - Total stations
 - Laser Scanner Scanstation2
 - Georadar GPR gssi 3000
 - Seismograph
 - Data processing and analysis software (Bernese, CAD/ArcGIS/ENVI)
 - 2 UAVs





• Training for employment

- Employment forum
- Business days
- Sponsored rooms: Topcon and Leica
- Entrepreneurship formation:
 - Start-UPV space
- Work placements in international companies
- Students visits to prestigious companies (ESA, IGN, ICC, ICV, GMV...)

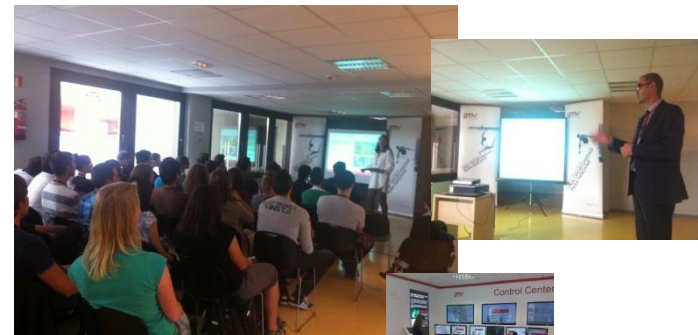
Foro de empleo en la UPV



ESA. 2013



IGN. 2014



GMV. 2015



Further information:

<http://www.upv.es/entidades/ETSIGCT/infoweb/euittop/info/880897normali.html>

<https://geomaticaupv.webs.upv.es/master-en-ingenieria-geomatica-y-geoinformacion/>



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MASTER'S PROGRAMME IN GEOMATICS ENGINEERING AND GEOINFORMATION

2021-2022