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AIRCRAFT DESIGN

The use of innovative methods and tools for new air vehicles and cabin interiors design provides benefits in terms of reduced lead time and increased performance.

Research in Aircraft design covers the preliminary design of new aircraft configurations and the design and simulation of innovative human machine interfaces in the cockpit and in the cabin interior environments.

The research of the University of Bologna covers a wide range of issues:
- Virtual and Augmented Reality for interactive visualization of virtual large scale mock-ups
- Human Centered Design for cabins and cockpits
- Study of New Configurations: analytical methods to estimate the impact of the newly conceived configurations
- Cockpit interface design: Virtual Prototyping of Innovative Cockpit Interfaces
- Propeller design: design and testing of preliminary propellers
- Aircraft piston and Wankel engine design and automotive conversions: design of new engines and the conversion of automotive engines to aircrafts and helicopters

HIGHLIGHTS

V-Lab (Virtual Reality and Simulation Lab)
Established in 2001, V-Lab is equipped with Virtual Reality, Reverse Engineerng and Rapid Prototyping facilities. It includes a CAVE (Cave Automatic Virtual Environment).

The University of Bologna is member of Clean Sky 2 Joint Undertaking as member of the CASTLE **(CAbin Systems design Toward passenger welLbEing) Core Partner Consortium.**

The University of Bologna participated to **RAISE - Reliable Aircraft electrical Insulation System sElection, Clean Sky 2.** The project comprehends the analysis and the experimental assessment of state-of-the-art insulation materials and systems used in aircraft applications.

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AUTONOMOUS VEHICLES

The urgent need for autonomous vehicles is due to safety and energetic demands. The technology is being developed and it is almost available: its application to semi- and fully-autonomous vehicles could save thousands of lives and significantly improve life quality in urban areas.

The research of the University of Bologna covers a wide range of issues:

- Vehicle Informatics and Connectivity, including secure application platforms for vehicular applications, Intelligent vehicle
- Vehicle Human Machine Interface and Infotainment systems
- Gamification for Improving Driver Behavior and policy enforcement
- Vehicular networks, Vehicular Sensors and Big Data for Mobility
- Automatic and Autonomous Drive
- Connectivity for V2I- Vehicle to Infrastructure, V2V – Vehicle to Vehicle and V2G – Vehicle to smart Grid interfacing
- Data Analytics and Advanced Prediction Models
- Augmented reality, computer vision, object identification, ranging and context analysis in computer assisted and autonomous vehicles

HIGHTLIGHTS

Vehicular network protocols (V2V and V2I) design and tuning, analysis of critical scenarios.

Software and sensors development for intelligent and autonomous vehicles.

Product safety and product liability issues related to autonomous vehicles.

PhD Course in Automotive Engineering for Intelligent Mobility.
In collaboration with University of Modena and Reggio Emilia and University of Parma, to train highly qualified personnel with multidisciplinary skills, able to direct the development and research, also in the industrial field, of innovative vehicles, creating a meeting point in the third level of education between mechanical, industrial, electronics, telecommunications, controls, electrical, IT, logistics and civil engineering.

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EFFICIENCY AND RESOURCES OPTIMIZATION

Research in energy and transport is vital to ensure a sustainable future and a low-carbon society. The main objective is to make energy more secure, affordable and sustainable, and foster sustainable and efficient transport.

The research in this field is studying forms of mobility that are sustainable, energy-efficient and respectful for the environment. Technical innovations such as electric vehicles, intelligent transport systems and smart grids, will contribute to achieving this goal. Alternative fuels like biofuels, synthetic fuels, and non-polluting energy vectors, such as hydrogen, are also pathways towards a more sustainable mobility. 'Decarbonisation' has been identified as a priority target for the development of a sustainable transport system, and circular economy shall also be investigated as an enabling technology.

The research of the University of Bologna on transport-related energy resources and efficiency optimization covers a wide range of issues:

- Renewable, low-carbon advanced fuels, for reducing well-to-wheel CO_2 emissions
- Second life / recycling and recuperation of materials including energy balance
- New battery and convenient charging opportunities for different use cases: urban charging, high power charging, power transfer technologies
- Analysis of possible solutions to integrate renewable energy sources into the power grid
- Investigation on grid interoperability with ICT and transport systems.

HIGHTLIGHTS

Design and optimization of small scale plug and play Liquefied Natural Gas (LNG) production processes taking advantage of renewable sources for naval or road transport.

Integrated systems for ZEF2 (zero emissions fuels) production (synthetic H2 or CH4) exploiting renewable non programmable sources and captured CO_2.

The University of Bologna participated to **E4-SHARE PROJECT** - Models for Ecological, Economical, Efficient, Electric Car-Sharing. Advanced methods and strategies for optimized planning and for effectively operating different variants of e-car sharing systems to best meet both customer needs and economic effectiveness of the system.

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FLIGHT MECHANICS AND FLIGHT CONTROL SYSTEMS

The improvement of existing and new tools for aircraft performance analysis and control system design represents one of the main challenges of current research in aerospace.

Flight Mechanics research addresses the performance analysis, stability, and control system design of atmospheric vehicles, providing a valuable answer to multiple requirements (sustainable design, environmentally friendly, high energy efficiency).

The research of the University of Bologna covers a wide range of issues:

- Development analytical tool for electrical powered aircraft design and performance analysis
- Remotely Piloted Aircraft System (RPAS) operations for remote sensing, ground monitoring, precision farming and aerial photography
- Avionic systems (autopilots and telemetry) and aid-to-piloting devices design and prototyping
- Aircraft simulation, system identification and flight testing
- Formation flight, cooperative control of multiple aircraft, swarm and fleet management for security, search and rescue and environmental protection
- Economic/environmental evaluation and risk analysis of integrated scenarios where RPAS are used within General and Aviation and Airliners
- Robust Control of Unmanned Aerial Vehicles

HIGHLIGHTS

High performance/high endurance drone design and prototyping.

Modeling, simulation, and control system design, prototyping and Hardware-in-the Loop validation.

Aerial photography and 3D photogrammetry by means of Remotely Piloted Aircraft Systems.

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FLUID DYNAMICS
AND AERODYNAMICS

Efficiency is a parameter of fundamental importance in transport systems. In this respect the possibility to reduce and/or control aerodynamic drag has the potential to significantly reduce costs and emissions. The development of new and more accurate computational and experimental tools allows us to advance our understanding of basic physical turbulent processes and to develop passive and active control methods and new design tools.

Thanks to a world-leading experimental laboratory CICLoPE (Centre of International Cooperation in Long Pipe Experiments) located in Predappio, the University of Bologna attracts numerous international and multi-disciplinary collaborations. The outcome of this research is used to improve numerical models and to design innovative solutions for ground vehicles and aircrafts.

The University of Bologna issues:

- Measurement and assessment of fundamental parameters and scaling laws of turbulent boundary layers to validate and improve CFD numerical models
- Development and validation of control strategies for reducing skin-friction and drag
- Development and validation of new sensors and measurement techniques specific for aerospace applications
- Design of experimental facilities for aerodynamic test
- Development of new estimation and/or corrections methods to extract relevant information from incomplete aerodynamic measurements
- Development of new techniques for laminar-turbulent transition and separation control in boundary layers (roughness or plasma actuated wings)
- Direct Numerical Simulation and Large Eddy simulations of Turbulent flows
- Turbulence modulation and control
- CFD analysis of ground vehicles

HIGHLIGHTS

The *Long Pipe* **CICLoPE** located in the tunnels of former Caproni's industries in Predappio is a unique **large-scale** pipe flow experimentthat allows **fully-resolved** measurements of wall-turbulence at high-Reynolds number. Is one of the key infrastructures of the European consortium **Eu-HIT**.

The Applied Aerodynamic laboratory includes an open loop wind tunnel and a jet facility used to develop and validate innovative aerodynamic components for ground vehicles and aircrafts, and includes collaborations with numerous industries.

Wind tunnel design and support to manufacturing

Design of wind tunnels or apparatus for experimental analysis in fluids mechanics, customized following specifications and requirements provided by the commissioner. The research group provides the aerodynamic and detailed design and may support the construction phase and the following set-up of the apparatus.

Dual Degree with KTH- Royal Institute of Technology of Stockholm: an integrated study programme providing exchange of students for one academic year, granting a degree as equivalent of a 2nd cycle Degree. Students benefit from financial aid provided by the Erasmus+ mobility programme 2018-19.

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INTELLIGENT TRANSPORTATION SYSTEMS AND MONITORING

The transport systems have improved since the advent of pervasive ICT technologies, advanced and integrated monitoring functions, Artificial Intelligence and Big Data analytics realizing Intelligent Transportation Systems and related services. Monitoring of weather and road conditions, accidents, congestion, vehicular flows dynamics, mobility matrix of people and goods have impacts towards transport safety and efficiency.

Advanced monitoring is made possible by the adoption and integration of a number of sensing technologies, including image analysis and pervasive sensing, and vehicular and roadside infrastructures for communications. The advent of Intelligent Transportation Systems is leading the transport systems and their management to realize autonomous and supervised actions towards improved safety and efficiency of transport for people and goods.

Research at the University of Bologna covers a wide range of issues:

- Development of methodologies, platforms and tools for distributed data collection, advanced data analysis, and decision support systems towards transport efficiency, e.g. crowd-based and infrastructure-based traffic monitoring and control systems, optimization of network utilization and resources or bottlenecks
- Methodologies and systems for automatic detection of risks and real-time alerting systems for improving traffic safety, emergency call, emergency response
- Methodologies and paradigms for congestion detection, forecasting (including external factors and access to multi-factorial open data) and control, network equalization and user services for optimization of users' experience
- Advanced service platforms for user awareness and user acceptance, policy enforcement and paradigm shift towards sustainable mobility , e.g. electric mobility, multi-modal public transport, fleet management
- Advanced warning and monitoring against rule infringement in transport and abuse of accesses to controlled traffic areas
- Economic and environmental evaluation of risks and opportunities, analysis of integrated scenarios where multiple transport systems and energy resources are mixed towards safe and sustainable transport

HIGHLIGHTS

Advanced monitoring, data analysis, multi-factorial optimization methodologies and services for traffic safety and transport network efficiency, including crowd-sensing systems, image analysis, open and big data analytics, resources and network optimization.

Advanced modeling and simulation of transport systems and networks, including bottlenecks and energy resources (e.g. electric grid) and variable traffic and road conditions. Pre-deployment analysis and decision support for planning of transport systems, resources and infrastructures based on traffic and mobility demand data in defined contexts.

Pervasive applications and advanced added value services for mobility users, policy enforcement, abuse elimination, fleet monitoring and multi-factorial optimization of transport services.

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LIGHTWEIGHT STRUCTURES
AND MATERIALS

The synergistic use of innovation in Material Science, Structural Design, and Production Technologies is a key enabler for the production of fully optimized lightweight structures.

The research of the University of Bologna covers a wide range of issues:

Damage Tolerance (DT) of metallic and composite structures

- LEAF: an analytical tool for the assessment of the DT proprieties of stiffened panels
- Fatigue crack propagation models underneath bonded stiffeners
- Delamination growth analytical and numerical models
- Experimental test of crash behavior in carbon fiber reinforced plastic (CFRP) components
- Numerical modeling of progressive damage in CFRP structures

Laser Shock Peening (LSP)

- LSP treatment of aluminum specimens to increase their fatigue life
- Residual stress measurement
- Numerical models for the prediction of residual stress profiles in LSP treated components

Additive Manufacturing (AM)

- Use of additive manufacturing technologies for rapid tooling
- Design of optimized components fabricated through Additive Manufacturing technologies

HIGHLIGHTS

Research addresses the damage tolerance properties of aeronautical structures, providing solutions for the improvement of fatigue life and the design of fully optimized structures, in order to enable the aerospace products of tomorrow to meet rising performance demands. Furthermore, the design of fully optimized structures is tightly constrained by the manufacturing processes in use. The introduction of advanced additive manufacturing technologies leads to the production of near-net complex shapes with potential savings in terms of weight.

Static and fatigue test on composite materials.

Structural Health Monitoring of aerospace structures. Fiber Bragg Grating sensing systems are used to evaluate the stress and strain field in composite and metallic structures.

Damage tolerance analysis of advanced aerospace structures. Numerical and analytical simulations of crack growth in aerospace stiffened structures are performed.

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LOGISTICS AND FREIGHT TRANSPORTATION

The design, optimization, management, and control of the flow of materials is one of the most critical and challenging issues in global production systems and supply chains. The aim is the development and application of integrated technologies, models and methods to move materials during the whole product life cycle, including reverse logistics and waste management.

Research on logistics and freight transportation aims to measure, control and optimize multiple performance indicators, e.g., the service cost, the customer service level, the safety and quality of the product for the final user/customer, and the environmental impacts, thanks to a multi-disciplinary approach and methodologies.

Research at the University of Bologna covers a wide range of issues:

- Supply chain design and management
- Storage and warehousing systems, including handling solution and automation, e.g. autonomous vehicles
- Order picking systems (OPS), including logistics in B2C
- Distribution system and network design, including multi-modal transportation, vehicle loading and routing
- Urban mobility and intermodal solutions
- Reverse logistics, waste collection and treatment logistics
- Sustainable supply chain and life cycle assessment (LCA) in logistics
- Perishability in logistics, including food supply chain and pharma supply chain
- Traceability (solutions and technologies for track and trace)
- Computerized decision support systems (DSS) for logistics and freight transportation
- Physical & environmental stress monitoring and simulation in storage and international shipments
- Packaging and packing (primary, secondary and tertiary) & containment design
- Logistics in manufacturing and assembly systems
- Ergonomics & safety in handling and transportation
- Humanitarian logistics
- Big data and data analytics for logistics and operations
- Electric, hybrid and autonomous vehicles in logistics

HIGHLIGHTS

Warehousing Center – advanced decision support systems (DSS) for the design, management and optimization of warehousing systems and order picking systems.

Food supply chain Center – laboratory for the monitoring and simulation of the physical and environmental stresses affecting products and packaging during their life-cycle including storage and international shipment.

Laboratory on Optimization of Operations Management (LOOM) – development of advanced models and algorithms for the optimization of freight distribution logistics, industrial packing and loading and waste logistics.

Logistics in the automotive industry, including the management of flow of materials within production systems (handling and automated solutions), assembly line part feeding, human digitalization for production and ergonomics improvement, etc.

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PROPULSION
AND POWERTRAINS

The development of innovative propulsion systems and cleaner, more efficient powertrains for passenger vehicles is one of the main challenges of the next decades for the EU.

The research activity in the automotive and mobility sector is facing a great challenge in the powertrain area. Electrification, hybridization, development of advanced combustion systems, use of electronic-horizon information for energy management are just some examples that involve several technological areas, and different disciplines and competencies.

Research at the University of Bologna covers a wide range of issues:

- Modeling, development and testing of hybrid, electric, and ICE-based advanced powertrain systems
- Highly-efficient combustion systems: CFD-based design, testing, modeling and control system development (4 fully-automated test cells for ICEs research and development projects)
- Electric propulsion systems: electric drives modeling, testing and control, advanced inverter technologies development, EVs concepts development
- Advanced technologies for innovative components design and manufacturing: 3D printing, virtual design, additive manufacturing, laser welding
- Energy storage systems: modeling, design and testing of innovative solutions for high-voltage batteries, BMS, and electronic components

HIGHLIGHTS

Electric and electronic components design, development and testing for HEVs and EVs applications. Modeling, testing, and control of advanced internal combustion engines and hybrid powertrain systems. Advanced laser welding technologies for high-voltage batteries.

PhD Course in Automotive Engineering for Intelligent Mobility, with the collaboration of University of Modena and Reggio Emilia and University of Parma: to train highly qualified personnel with multidisciplinary skills, able to direct the development and research, also in the industrial field, of innovative vehicles, creating a meeting point in the third level of education between mechanical, industrial, electronics, telecommunications, controls, electrical, IT, logistics and civil engineering.

Green Mobility Research Lab (GMRL) is a joint initiative of the University of Bologna and FEV Italy to develop new solutions for a more efficient, cleaner and safer mobility. The focus is on connectivity and the associated benefits. By exploiting the related enabled technologies, the research is oriented towards a fully predictive and optimal management of the most important features associated to mobility.

TECHNOLOGIES FOR AIR TRAFFIC CONTROL

Researches in Air Traffic Control domain include a variety of experimental studies of solutions to deal with the dramatically growing traffic and its complexity with a focus on safety and efficiency.

Technologies in Air Traffic control involve different disciplines, such as Human Machine Interface Design, Virtual Reality, Augmented Reality, Human Factors, Operational Research, RPAS integration in manned traffic. Researches in this domain are aligned with the Single European Sky Programme, setting the future features of Air Traffic Management.

The research of the University of Bologna covers a wide range of issues:

- Design and development of Virtual and Augmented Reality systems for enhanced visualization and interaction in operative scenarios
- Prototyping of innovative concepts of Human Machine Interfaces for future ATM (Air Traffic Management) systems
- Definition of long term future Automation Scenarios and Concept of Operations
- Experimental platforms for Air Traffic Control simulations
- Integration of RPAS in manned Air Traffic Control
- Optimization networks for Air Traffic Control
- Policy making, Legal and regulatory aspects in Air Traffic Management, including studies on the introduction of automated technologies and standardised and interoperable systems

HIGHLIGHTS

In Horizon 2020 the University of Bologna has been granted for the following projects in the SESAR Exploratory Research Framework:

- **The University of Bologna is involved in the project PJ05-W2 DTT - Digital Technologies for Tower.** The project investigates a SESAR solution called "HMI Interaction modes for Airport Tower" that addresses the development of new human machine interface (HMI) interaction modes and technologies at the Controller Working Position.

- **Coordinated by the University of Bologna: RETINA - *Resilient Synthetic Vision for Advanced Control Tower Air Navigation* project.** The increasing interest in Synthetic Vision (SV) and Augmented Reality (AR) technologies has led various analysts to positively esteem the adoption of new tools enabling pilots and controllers to seamlessly operate under Visual Meteorological Conditions and Instrument Meteorological Conditions.For the RETINA Project, the University of Bologna has been awarded with the prestigious Jane's Award for the best Enabling Technology for ATC in 2018.

- **The University of Bologna participated to DOMINO - Novel tools to evaluate ATM systems coupling under future deployment scenarios, SESAR.** The overall objective of Domino is to develop a set of tools, a methodology and a platform to assess the coupling of ATM systems from a flight and a passenger perspective.

- **The University of Bologna participated to MINIMA -** *MItigating Negative Impacts of Monitoring high levels of Automation.* The MINIMA project will help to understand and mitigate OOTL (Out Of The Loop) phenomena of air traffic controllers in highly automated environments by means of physiological measurements. The Experimental phase of MINIMA took place at the Virtual Reality Lab of the University of Bologna.

- **The University of Bologna participated to AUTOPACE -** *Automation Pace H2020-SESAR.* The project performs fundamental research on psychological modelling to predict how future automation would impact on air traffic controllers (ATCo) performance and to identify competences and training to cope with the effects of automation on humans.

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TRANSPORT INFRASTRUCTURES

Research in this field aims to build smarter, greener and integrated infrastructures able to respond to the post-crisis scenarios.

Transportation infrastructures are one of the key elements of mobility, facing urgent and important expectations towards the goals proposed on a global and European scale. The growth of new mobility scenarios requires infrastructures are able to keep the pace of innovation from the vehicle and user perspectives.

Thus, modern infrastructures should aim to smarter and more sustainable solutions that allows an integrated green mobility.

Research at the University of Bologna covers a wide range of issues:

- Advanced Intelligent Transportation Systems that should be part of the construction and maintenance processes
- Transversal commitment of research groups towards more integrated design approaches at a European level
- Pervasive mode-integration and modal shift towards reduced carbon footprint transport enhancing the quality of life
- New low impact technologies for the production and construction phases
- Context-sensitive design solutions for the entire service life of the infrastructure
- Focus on the reduction of infrastructure pressure towards the loss of biodiversity and fragmentation
- Attention to the challenging forms of pollution such as noise and GHG
- Wider perspectives for the selection and qualification of consistent-performance construction materials
- Intense activities on the use of recycled materials against non-renewable resources: faster and more reliable testing procedures
- The Circular Economy approach with concerns on the local scale economies

HIGLIGHTS

Sustainable, Accessible, Safe, Resilient and Smart Urban Pavements is one of the key on-going researches at the H2020 level in the University of Bologna. The MSCA-ITN-ETN project SAFERUP fosters the role of urban traffic surfaces and spaces as means for the creation of more liveable cities.

The **BICY research project** on the bicycles infrastructures aims to achieve a modal shift towards cycling and walking to improve the quality of life and reduce pollution. Improving bicycle mobility starts from adequate bike infrastructures and design comprehensive mobility plans that focus on cycling.

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TRANSPORT
SAFETY

Safety in the field of transportation has today become a primary objective. The loss of equilibrium within the mobility system causes accidents and fatalities. Research has to focus on the new trends of mobility to keep the system stable.

Safety in transports aims to the protection of lives and assets through regulation, management and technology development of all modes of transportation. At a European level, research wants to reconcile the growing mobility needs with improved transport fluidity, through innovative solutions for continuous, inclusive, affordable, safe, secure and robust transport systems that make full use of modern information and communication technologies (ICT) capabilities.

Research at the University of Bologna covers a wide range of issues:
- Study of transport safety across transport modes towards the goals set by the Transport White Paper on close to zero road fatalities by 2050
- Focus on the human factors as the largest cause of accidents across all transport modes
- Understand the way in which humans interact with the road or rail vehicles, vessels or aircraft to improve safety by decreasing the human element
- Promote the modal-shift towards cycling by means of increased and perceptible users safety
- Foster the acceptance of technological and social change within the transportation infrastructure users and practitioners
- Identification of new (and currently unknown) risk factors which might arise in the conversion towards increasing automation in transportation

HIGHLIGHTS

H2020 project [X-Cycle,](#) Advanced measures to reduce cyclists' fatalities and increase comfort in the interaction with motorised vehicles. Road safety urgently requires innovative and efficient advanced safety measures to reduce the number of accidents, often of high severity, involving cyclists in interaction with motorised vehicles. In fact, cyclists suffer a disproportionate share of serious injuries and fatalities, and indeed in recent years that disadvantage has been growing. New technologies are needed to improve active and passive detection of cyclists, systems informing both drivers and cyclists of an hazard at junctions, effective methods of presenting information in vehicles and on-site and cooperation systems aimed at reducing collisions with cyclists.

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TRANSPORT SERVICES, PLATFORMS AND APPLICATIONS

The transport of people and goods is receiving a great innovation through the design, realization and use of advanced value added services, platforms and pervasive applications dealing with reduction of costs and emissions, multi-modal transport, energy efficiency and user centric approach.

A number of innovation factors in transport services, platforms and applications have a great impact in how the transport of people and goods deals with objectives like green and clean energy transportation, low emissions, multi-modal integration of transport networks, improvement of utilization of resources, satisfaction of user needs.

Research at the University of Bologna covers a wide range of issues:

- Development of methodologies and tools for impact assessment and planning of transport service platforms, benchmarking and tuning in mixed simulation/operational, and man-in-the-middle environments
- Methodologies and standards for data collection, semantic data representation, analysis and querying in big data/open data, cloud services and multiple layered information services for transport
- Methodologies for traffic modeling, analysis, forecasting, demand/response analytics, and validation of service assumptions and service platforms for transport
- Transport optimization via data monitoring, analysis, traffic management, control, bottleneck reduction, flows equalization
- Fleet management, logistics support services and pervasive monitoring, security/safety/alert applications for transport
- Economic/environmental evaluation of transport policies, user enforcement, gamification, mobile applications, sharing economy applications in transport

HIGHLIGHTS

Modeling and Simulation of transport in realistic network models, transportation engineering, what-if analysis, optimization, pre-deployment analysis (e.g. electric vehicles' support, transport infrastructures).

Transport monitoring, data collection, semantic data integration platforms, data science and analytics applied to transport data.

Smart transport services, innovative mobile applications and services for transportation of people and goods, user centric value added services and platforms for transport.
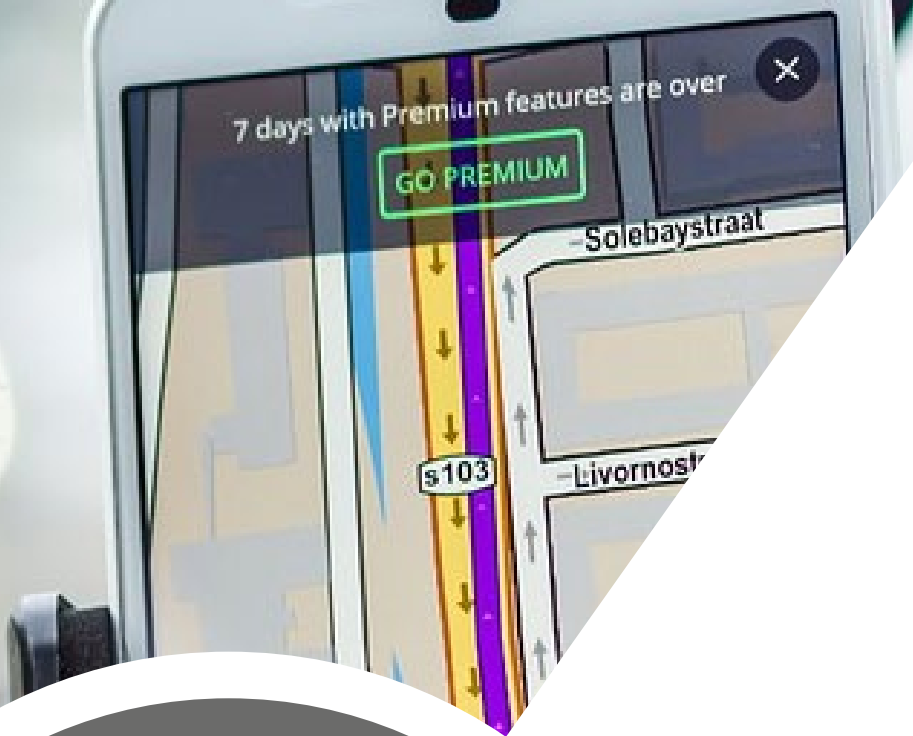
TRANSPORT SYSTEMS

The design, realization and integration of advanced and innovative Transport Systems have a great impact in the achievement of strategic objectives ranging from the satisfaction of economically affordable users' needs, up to the reduction of congestion, energy, fatalities or risks and clean emissions.
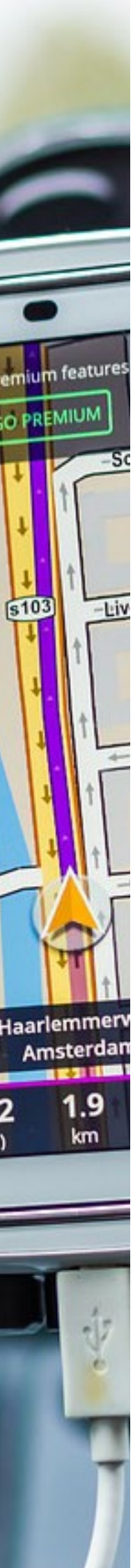
Transport Systems research addresses the performance analysis, performance engineering, systems design and prototypical realization, integration and management of transport systems, in a tradeoff of ideal transport services' support and their sustainability. Transport systems should be safe, environmentally and economically sustainable, scalable, integrated, efficient and socially accessible.

Research at the University of Bologna covers a wide range of issues:
- Development of methodologies and tools for sustainable transportation systems' engineering and performance planning and analysis
- Integration of multi-modal and heterogeneous transport networks for people and goods. New approaches for design, support and integration of sustainable and scalable transport systems, involving multiple networks, new technologies, new paradigms and new resources
- Scalable transport systems, dynamic demand/supply, scalable green energy sources, services' customization and adaptation towards environmental impact reduction and economic sustainability
- Financial and social impact analysis and design support of transport systems, including micro/macroscopic impacts, models, costs/opportunities, accessibility/availability, accidents/fatalities, efficiency, value added services, user awareness and acceptance
- Safety engineering in transport systems and emergency response, from design to operation. Transport systems risk analysis, safety requirements, (critical) infrastructure monitoring, emergency response, etc
- Intelligent Transport Systems, through pervasive ICT-based technologies, monitoring and Big Data, services and solutions

HIGHLIGHTS

Advanced methodologies and tools for design, modeling, planning and evaluation of transportation systems, from their engineering and performance planning to operative environment.

Intelligent Transportation Systems, ICT-based systems for advanced services' support, connected vehicles (V2V and V2I).

Environmental impact analyses of transport systems.