

Gianluca Pepe

Mechanical engineering research



Contract lecturer and researcher at the faculty of Engineering, Sapienza University of Rome ING-IND/13 with 7 years of experiences teaching on autonomous vehicles and mechatronics systems. Awarded teaching qualification “*Abilitazione Scientifica Nazionale Settore Concorsuale: 09/A2, Fascia: 2*”, supervised seventy master thesis and co-supervised five Ph.D dissertations. Published over 50 publications in international journals, conference proceedings, and patents. Co-managed and organized numerous industrial and research projects designing marine drones and mechatronics devices. Supervisor of Vehicle Dynamic and Mechatronics Lab of Cisterna di Latina and designer of AutoSapiens, the first autonomous car of Sapienza.

Professional appointments

2014 - 2021

Professor under contract

Sapienza University of Rome

2015-2021

Department of Computer, Control, and Management Engineering Antonio Ruberti

Vehicle System Dynamics

Master's degree course for control and mechanical engineers on the design of self-driving vehicles and mechatronic systems

2019-2021

Department of Mechanical and Aerospace Engineering

Lab of Vehicle Dynamics

Master's degree laboratory for the design and simulation of automated drones

2016-2017

Department of Juridical and Economic Studies

Robotics, Ethics and Law

Lecturer of a master module in Law on Computer Science

2015-2016

Department of Mechanical and Aerospace Engineering

Mechatronic designing

Lecturer of a master module in Master of Inventive Engineering

2014-2015

Department of Mechanical and Aerospace Engineering

Lab of Mechanical Vibration

Master's degree laboratory for the vibration sensing and control

2014 - 2020

Research Assistant

Department of Mechanical and Aerospace Engineering, Sapienza University of Rome

Postdoctoral research fellow

Study of innovative systems for sensorization and control of mechanical systems

Research activity:

- Design and realization of AutoSapiens: the first autonomous car of Sapienza University
- Gaits optimization of quadrupedal robots
- Design of obstacles avoidance algorithms for autonomous driving vehicles
- Development of nonlinear feedback controllers based on variational calculus
- Design and prototyping of an innovative magneto-rheological suspension car patented
- Experimental setup for a real-time grip tire measurement
- Development of new optimal control logic for semi-active nonlinear control systems

Supervisor of Vehicle Dynamic and Mechatronics Lab of Cisterna di Latina

Design, construction and testing of aerial, marine and land drones

Project activities

- | | |
|-----------|--|
| 2019-2021 | <i>PON - Programma Operativo Nazionale with CNR et al.</i>
Autonomous Robotics for the Extended Ship
Design and test of a launch and recovery system for an autonomous surface vehicle and an autonomous underwater vehicle |
| 2019-2021 | <i>Industrial project with FINCANTIERI, SULTAN s.r.l. et al.</i>
Water Control System
Development of an automated system for the dichlorination process of drinking water |
| 2017-2019 | <i>MIT - Ministero delle Infrastrutture e i Trasporti with FINCANTIERI, CNR et al.</i>
Secure Platform
Design and realization of an autonomous safe robot boat |
| 2017-2018 | <i>Industrial project with BASF s.p.a.</i>
Smart Bar of Glass Fibre Reinforced Polymer
Realization and test of a smart material with optical strain sensor embedded in glass fibre bar |
| 2014-2015 | <i>Industrial project with OCTO TELEMATICS s.p.a.</i>
GLOBSENS
Development of an integrated sensorization system and algorithm implementation for identifying micro car accident through black box |
| 2010-2013 | <i>Regione Lazio for requalification of research laboratories</i>
SeaLab
Analysis, design and prototyping of an innovative high-speed marine vehicle |

Education

2010 - 2013

Ph.D in Theoretical and Applied Mechanics

Department of Mechanical and Aerospace Engineering, Sapienza University of Rome

Analysis, design and prototyping of an autonomous high-speed marine vehicle on the project SeaLab. The vehicle, thanks to a smart suspension system patented, can jump

through the waves reaching high-speed with rough sea. The hull is based on natural fibres with the embedding of strain sensors FBG for self-monitoring.

2013

Advanced training courses

- **Management, development, and transfer of research results**
Master RED Research enhancement & development SSAS (School for Advanced Studies of Sapienza) *Sapienza University of Rome*
- **Vehicle Dynamics Control**
Course for doctoral candidates, SIDRA 2013, *Bertinoro, Italy*
- **Active and Passive Vibration Control of Structures**
Course for doctoral candidates, CISM 2013, *Udine, Italy*
- **Applied Research: from university to industry**
Summer school course for doctoral candidates, *Santander, Spain*
- **The leadership of the newcomer**
Participation to the course RYLA, Rotary Club of West *Rome*

2011

Member of the Order of Engineers

Member of the Order of Engineers of Rome (Industrial Section A n.33674)

2006 - 2010

Mechanical Engineering master's degree

Sapienza University of Rome

2001 - 2006

Mechanical Engineering bachelor's degree

Sapienza University of Rome

1995 - 2001

High school scientific diploma

Liceo Scientifico, Istituto Montessori of Rome

Personal skills

- Managing students by providing guidance and feedback to help them strengthen their skills and knowledge base
- Excellent time management skills to ensure targets are met and plans completed efficiently
- **Upper-intermediate English level B2**
- **Computer skills and competences**
Matlab™, Ansys™, Mathematica™, Arduino™, Pascal™, AutoCAD™, SolidWorks™, Rhinoceros™, Vray™, PhotoShop™ and Office™ tools

Publications and patents

Pepe G., Paifelman E., Carcaterra A., Aeroelastic dynamic feedback control of a Volterra's airfoil, Second International Nonlinear Dynamics Conference NODYCON 2021, Rome, Italy 2021

Mezzani F., Pepe G., Roveri N., Carcaterra A., Mine clearance through an artificial intelligence flying drone, Second International Nonlinear Dynamics Conference NODYCON 2021, Rome, Italy 2021

Pinto M., Roveri N., Pepe G., Carcaterra A., A new approach for structural health monitoring: damage detection on large structures through a swarm of moving sensors, Second International Nonlinear Dynamics Conference NODYCON 2021, Rome, Italy 2021

Laurenza M., Pepe G., Carcaterra A., Identification of robot quadrupeds' gait by genetic algorithm, Second International Nonlinear Dynamics Conference NODYCON 2021, Rome, Italy 2021

Pepe G, Elena Paifelman, Antonio Carcaterra, Optimal feedback control law for viscoelastic materials with memory effects, EUROODYN 2020, XI International Conference on Structural Dynamics, Streamed from Athens, Greece 2020

Mezzani F., Pepe G., Roveri N., Carcaterra A., Solferini S., Demining war scenarios: a project based on new technologies, EUROODYN 2020, XI International Conference on Structural Dynamics, Streamed from Athens, Greece 2020

Laurenza M., Pepe G., Carcaterra A.; Auto-sapiens, an experimental autonomous driving system; EUROODYN 2020, XI International Conference on Structural Dynamics, Streamed from Athens, Greece 2020

Roveri, N., Milana, S., Culla, A., Conte, P., Pepe, G., Mezzani, F., and Carcaterra, A., 'Machine learning and sensor swarm for structural health monitoring of a bridge', ISMA2020, Leuven, Belgium, 2020

Mesbahi, S., Milana, S., Culla, A., Pepe, G., Roveri, N., and Carcaterra, A., 'Inertial properties control by variable damping actuators and application to automotive suspensions', ISMA2020, Leuven, Belgium, 2020

Pepe G; Paifelman E; Carcaterra A; Volterra models of magnetorheological dampers and their application to vibrating systems, ISMA2020, Leuven, Belgium, 2020

Laurenza, M., Pepe, G., Carcaterra, A.; Auto-sapiens autonomous driving vehicle; VEHITS 2020 - Proceedings of the 6th International Conference on Vehicle Technology and Intelligent Transport Systems, 2020, pp. 361–369

Pepe G, Mezzani F, Carcaterra A, Cedola L, Rispoli F, Variational Control Approach to Energy Extraction from a Fluid Flow, *Energies* 2020, 13, 4913; doi:10.3390/en13184913

Roveri, N., Carcaterra, A., Molinari, L., Pepe, G. Safe and secure control of swarms of vehicles by small-world theory (2020) *Energies*, 13 (5), art. no. 1043

Roveri, N., Pepe, G., Mezzani, F., Carcaterra, A., Culla, A., Milana, S. OPTYRE—Real time estimation of rolling resistance for intelligent tyres (2019) *Sensors (Switzerland)*, 19 (23), art. no. 5119

Laurenza, M., Pepe, G., Antonelli, D., Carcaterra, A. Car collision avoidance with velocity obstacle approach: Evaluation of the reliability and performance of the collision avoidance maneuver (2019) 5th International Forum on Research and Technologies for Society and Industry: Innovation to Shape the Future, RTSI 2019 - Proceedings, art. no. 8895525, pp. 465-470.

Pepe, G., Laurenza, M., Antonelli, D., Carcaterra, A. A new optimal control of obstacle avoidance for safer autonomous driving (2019) 2019 AEIT International Conference of Electrical and Electronic Technologies for Automotive, AEIT AUTOMOTIVE 2019, art. no. 8804549

Nesi, L., Pepe, G., Bibuli, M., Zereik, E., Carcaterra, A., Caccia, M. A new tow maneuver of a damaged boat through a swarm of autonomous sea drones (2019) *IFAC-PapersOnLine*, 52 (21), pp. 360-366.

G. Pepe, N. Roveri, A. Carcaterra, Experimenting Sensors Network for Innovative Optimal Control of Car Suspensions, *Sensors*, MDPI, 2019

Pinto M., Pepe G., Roveri N., Carcaterra A., Swarm of robot attacking an acoustic source: detection and trapping, 48th International Congress and Exhibition on Noise Control Engineering, INTER-NOISE 2019, MADRID, Spain, 2019

Antonelli D., Nesi L., Pepe G., Carcaterra A., A novel control strategy for autonomous cars, American Control Conference ACC 2019, Philadelphia, USA, 2019

E. Paifelman, G. Pepe, A. Carcaterra, "An optimal indirect control of underwater vehicle", *International Journal of Control*, 2019

Paifelman E., Pepe G., Carcaterra A., Optimal control with memory effects: theory and application to wings, 17th European Control Conference (ECC19), Naples, Italy, 2019

Antonelli D., Nesi L., Pepe G., Carcaterra A., A novel approach in Optimal trajectory identification for Autonomous driving in racetrack, 17th European Control Conference (ECC19), Naples, Italy, 2019

M. Pinto, N. Roveri, G. Pepe, A. Carcaterra, A theory of swarm of sensors for vibration monitoring of large structures, Nodycon 2019, Rome, Italy, 2019

L. Nesi, D. Antonelli, G. Pepe, A. Carcaterra, Fast moving of a population of robots through a complex scenario, Nodycon 2019, Rome, Italy, 2019

D. Antonelli, G. Pepe, L. Nesi, A. Carcaterra, Feedback local optimality principle applied to rocket vertical landing VTVL, Nodycon 2019, Rome, Italy, 2019

Pinto M., Roveri N., Pepe G., Nicoletti A., Balconi G., Carcaterra A., "Extraction of the beam elastic shape from uncertain FBG strain measurement points", *Mechanisms and Machine Science*, Italy 2018

Antonelli, D., Nesi, L., Pepe, G., and Carcaterra, A., "Mechatronic control of the car response based on VFC", ISMA2018, Leuven, Belgium, 2018

Pepe, G., Antonelli, D., Nesi, L., and Carcaterra, A., 'Flop: feedback local optimality control of the inverse pendulum oscillations', ISMA2018, Leuven, Belgium, 2018

Pinto, M., Roveri, N., Pepe, G., Nicoletti, A., Balconi, G., and Carcaterra, A., 'Embedded optical sensors for vibration monitoring of large structures', ISMA2018, Leuven, Belgium, 2018

Paifelman, E., Pepe, G., La Gala, F., and Carcaterra, A., 'Control of fluctuations of a tethered unmanned-underwater-vehicle', ISMA2018, Leuven, Belgium, 2018

Culla A., Pepe G., Carcaterra, A., "Nonlinear unsteady energy analysis of structural systems", *The Journal of the Acoustical Society of America*, 2017

S. Pensalfini, F. Coppo, F. Mezzani, G. Pepe, A. Carcaterra, "Optimal control theory based design of elasto-magnetic metamaterial", *Eurodyn*, Rome, Italy 2017

F. Coppo, G. Pepe, N. Roveri, A. Carcaterra, "A Multisensing setup for the intelligent tire monitoring", *Sensors*, 2017

N. Roveri, G. Pepe, F. Coppo and A. Carcaterra, "Rolling Tyre: Real-Time Detection of Patch-Contact and Dissipation", ISMA2016, Leuven, Belgium, 2016

A. Carcaterra, G. Pepe and N. Roveri, "Energy Exchange between Nonlinear Oscillators: An Entropy Foundation", ISMA2016, Leuven, Belgium, 2016

G. Pepe, N. Roveri and A. Carcaterra, "Prototyping a new car semi-active suspension by Variational Feedback Controller", ISMA2016, Leuven, Belgium, 2016

G. Pepe and A. Carcaterra, "VFC – Variational Feedback Controller and its application to semi-active suspensions," *Mechanical Systems and Signal Processing*, 2016

A. Carcaterra and G. Pepe, "Variational Control Approach to Energy Extraction from a Fluid Flow " presented at the Offshore Wind and other marine renewable Energies in Mediterranean and European Seas- OWEMES 8th Ed, 2015

N. Roveri, G. Pepe, and A. Carcaterra, "OPTYRE – A new technology for tire monitoring: Evidence of contact patch phenomena," *Mechanical Systems and Signal Processing*, 2015

G. Pepe, I. Giorgio, A. Carcaterra, D. Del Vescovo, and A. Sestieri, "Semiactive vibration control via VFC-Variational Feedback by piezoelectric actuation," in NOVEM2015, 2015

G. Pepe and A. Carcaterra, "VFC - Variational Feedback Control applied to semi-active car suspensions," in NOVEM2015, 2015

G. Pepe and A. Carcaterra, "A new semi-active variational based damping control," in MESA 2014 - 10th IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications, Conference Proceedings, 2014

G. Pepe, A. Carcaterra, I. Giorgio, and D. Del Vescovo, "Variational Feedback Control for a nonlinear beam under an earthquake excitation," *Mathematics and Mechanics of Solids*, 2014

A. Carcaterra, N. Roveri, G. Pepe, "Fractional dissipation generated by hidden wave-fields" *Mathematics and Mechanics of Solids*, 2014

Pepe, G., Carcaterra, A. Semi-active damping by variational control algorithms , *Proceedings of the International Conference on Structural Dynamic EURODYN 2014*, pp. 1721-1727, 2014

N. Roveri, G. Pepe, A. Carcaterra, "Hilbert-Huang analysis of semi-active controllers", *Eurodyn*, Porto, Portugal 2014

G. Pepe, A. Carcaterra "Experimental results of real car suspensions using new damper controllers", *Eurodyn*, Porto, Portugal 2014

A. Carcaterra, G. Pepe, "Architecture of a new semi-active suspension system and associated control logic" Patent number: RM2014A000040, 2014

A. Calabria, R. Capata, M. Di Veroli, G. Pepe, "Testing of the ultra-micro gas turbine devices (1 – 10 kw) for portable power generation at UDR1: the test bench facility and first tests results", *Scientific Research, Engineering*, 2013

G. Pepe, A. Carcaterra, "High speed fluttering skids with elastic suspensions", NAV2012, Napoli, Italy, 2012

G. Pepe, A. Carcaterra, "Fluttering skid phenomena in high speed marine vehicles", ISMA2012, Leuven, Belgium, 2012

A. Carcaterra, A. Scorrano, G. Pepe, A. Sestieri, "SEALAB: Aero-hydro mechanics of an extreme-speed marine vehicle", AIMETA, Bologna, Italy, 2011

G. Pepe, A. Carcaterra, A. Scorrano, A. Sestieri, "Stability analysis of a three-wings high-speed craft", AIMETA, Bologna, Italy, 2011

A. Carcaterra, A. Scorrano, G. Pepe , "SEALAB: Aero-hydro mechanics of a three-wings jumping vehicle", *International Symposium on High Speed Marine Vehicles*, Napoli, Italy, 2011

Date 02/02/2021