Dr. Silvio Simani
CURRICULUM VITAE

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PERSONAL DATA

SURNAME AND NAME	Simani Silvio
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Nationality	Italian
Birth date	21/04/1971

ITALIAN NATIONAL SCIENTIFIC QUALIFICATION (from 2012, National Scientific Habilitation)

- **Academic Field:** Automatic Control and Systems Engineering
- **Level:** Associate Professor

WORKING, EDUCATION AND TRAINING

- 2002 – today. Full time Assistant Professor of Automatic Control and Systems Engineering. University of Ferrara, Department of Engineering Via Saragat 1E, 44122 Ferrara (FE). Italy
- 1997 – 1999. Ph.D. in Information Sciences (Automatic Control and Systems Engineering) at the University of Modena and Reggio Emilia, Modena, Italy.
- 1992 – 1996. Master of Science's Degree – Electronic Engineering. Faculty of Engineering, University of Ferrara. Italy

SCIENTIFIC RESEARCH ACTIVITY

The research activities developed by Dr. Simani are mainly oriented to problems regarding the supervision, diagnosis and fault tolerant control for dynamic systems, as well as the modelling and identification for dynamic processes. These research topics present both theoretical and application characteristics, which can be structured as follows:

- *Modelling, Identification of Dynamic Systems*. This topic concerns the study of methodologies and tools for the modelling and the identification of nonlinear dynamic systems by means of:

    - affine or piecewise linear prototypes;
    - fuzzy models
    - neural networks;

These models are oriented to the design of an output predictor for the model under investigation, which should allow the detection and the isolation of faults regarding actuator, components, and sensors of dynamic processes.

- *Supervision, fault diagnosis, and fault tolerant control for dynamic systems*. These research issues have been oriented to the synthesis of algorithms for the fault diagnosis, detection, isolation, and controller

accommodation with application to dynamic processes. These techniques, developed from the analytic redundancy principle, have been based on:

- linear or hybrid models identified using the data acquired from the process under diagnosis;
- state, output observers, Kalman filters, particle filters;
- neural networks and nonlinear adaptive filters for the fault function identification;
- residual generators designed via polynomial methods, nonlinear geometric approach, which allow the optimisation of the fault sensitivity and the minimisation of the uncertainty effects;
- nonlinear tools for the design of nonlinear residual generators or fault function nonlinear approximators (nonlinear geometric approach and adaptive filtering);
- hybrid models;

these tools have been designed and applied to different systems:

- industrial gas turbines;
- civil aerial vehicles, and UAS (Unmanned Aerial Systems);
- aerospace systems;
- industrial and power processes;
- chemical reactors;
- manufacturing systems;
- wind turbines.

COORDINATION OF RESEARCH & TECHNOLOGY TRANSFER PROJECTS

- 2015 – 2018. PRIA2015 - Interdisciplinary research project: “Design of innovative solutions to improve physical and mobility impairment in frailty and elderly”. Project funded by the University of Ferrara. Research support gained: 100.000 Euro.

- 2013 – 2014. UnifeCUP 2014. Principal Investigator of the Air Energy Project (Business Plan Competition of the University of Ferrara): development of the business idea and business plan with reference to the project entitled “Road Wind – The use of the turbulent air generated by moving vehicles as source of sustainable and green energy”, project funded by the University of Ferrara and the Chamber of Commerce of Ferrara. Research support gained: 5.000 Euro.

- 2012 – 2013. ROAD WIND. PI of the “Road Wind” Project – The use of the turbulent air generated by moving vehicles as source of sustainable and green energy, project funded by the University of Ferrara and the Chamber of Commerce of Ferrara. Research support gained: 50.000 Euro.

- 2008 – 2012. PRIN 2008 (Project of National Interest funded by the Italian Ministry of University and Research, 2008 – 2012): Title: “Development of a technological demonstrator of a CUAV (Civil Unmanned Aerial Vehicle) for testing novel guidance and fault tolerant control schemes for patrolling and rescue missions in harsh environment”. Dr. Simani, local coordinator. Research support gained: 50.000 Euro.

- 2005 – 2008. PRIN 2005: National Interest Research Project entitled "Object-oriented methods with application to the modelling of mechatronic systems", project Funded by the MIUR, Ministry of the University and Scientific Research. National coordinator Prof. Cesare Fantuzzi, University of Modena and Reggio. Silvio Simani, local coordinator. Research support gained: 30.000 Euro.

- 2002 – 2005. COFIN 2002: National Interest Research Project entitled "Fault detection and diagnosis, control reconfiguration: methodologies and tools for the supervision of industrial automation systems" funded by MIUR, Ministry of the University and Scientific Research.

National coordinator, Prof. Edoardo Mosca. Local coordinator Prof. Claudio Bonivento, University of Bologna. Research support gained: 20.000 Euro.

- 2011 – 2013. SPINNER 2011. PI of the Regional Project within the SPINNER 2011 programme that aimed at preparing young people to research and technological innovation activities. The initiative was devoted to the development of industrial mobile robots with trajectory optimisation and energy consumption reduction. The project involved several companies (e.g. VM Motors, Cento, Italy), and the Universities of Modena, Reggio Emilia, Bologna and Ferrara. The industrial research project regarded issues of experimental development, technology transfer; organizational, managerial and financial innovations. The project was finally approved within the SPINNER 2011 programme (Ref. No. 062/11-dott).

- 2006 - 2007. PRRIITT 2006. Technology Transfer Project regarding the development of a system for the supervision and control of a hybrid vehicle with advanced capabilities. This activity was developed within the Regional Project PRRIITT Mis. 3.1.A n491 cod PR04AWEXJU, in cooperation with the Department of Engineering of the University of Ferrara, and the company EnerBLU S.r.l., Modena, Italy. Scientific coordinators: Prof. Giorgio Vannini (Dean of ENDIF UNIFE), Dr. Silvio Simani, and Dr. Marcello Bonfè. Research support gained: 25.000 Euro.

- 2006 - 2012. Technology Transfer Project entitled: "Towards the virtual motor thermal-fluid-dynamic modelling of advanced diesel engines via software tools, practical experiments, and test rigs" (application nr. DM28633, Art.12EMec). The project concerned the modelling the diesel engine subsystems, together with the design of the control strategies of the Electronic Control Unit. The design is oriented to the reduction of both the fuel consumptions and the pollution emissions. Cooperation among Consorzio Ferrara Ricerche (CFR), the Department of Engineering of the University of Ferrara (scientific coordinator Dr. Silvio Simani), and the local company VM Motors S.p.A, Cento (FE), Italy. Research support gained: 26.000 Euro.

- 2006 - 2008. SiGeVAMA 2006. Industrial research, innovation and technology transfer within the Regional Programme PRRIITT 2006 Project entitled: SiGeVAMA 2006 System for the management of multipurpose vehicles with airport applications (local coordinator Dr. Silvio Simani). Laboratory for the management of the aircraft traffic, funded by the Region Emilia Romagna. The project regarded the management of multipurpose vehicle systems, with application to airports. Research support gained: 250.000 Euro.

- 2004 - 2006: Consultancy and technology transfer project with the University of Hull (UK), Coordinator Prof Ron J. Patton, EADS - Astrium ESTEC (Toulouse, France, Dr. Bernard Polle) and ESA (European Aerospace Agency, Holland, Dr. Denis Fertin) with the title: "Robust Estimation for Failure Detection", Ref: EAA.TCN.89079.ASTR. The main aim of the project was the development of a supervision module with application to the aerospace system. The system under investigation consisted of the MARS EXPRESS satellite model, which represents a distributed system, in the presence of uncertainty and disturbance. In particular, the main point was the design of a comprehensive methodology that allows the supervision, the fault detection and isolation of the gyroscopes and thrusters of the Mars Express Satellite.

- 2003 - 2004: Technology Transfer Project on design and result analysis of a model prototype for the estimation and 36 hours ahead prediction of the gas consumption in the northeast Italy. Cooperation funded by the Society GECO System (Geographical Environmental Consulting) and the Regional Company HERA (Holding Energy Resources environmentAl) FC, Cesena. Research support gained: 2.500 Euro.

PRIZES & AWARDS

- 2013 - 2014. UnifeCUP 2014 (Business Plan Competition of the University of Ferrara): award for the best business idea and business plan with reference to the project entitled “Road Wind – The use of the turbulent air generated by moving vehicles as source of sustainable and green energy”, project funded by the University of Ferrara and the Chamber of Commerce of Ferrara.

- 2014. 3rd place for the best software solution to the FDI and FTC problem in the "Competition on Fault Detection and Fault Tolerant Control for Wind Farms". Award sponsored by kk-electronic a/s (Denmark) and MathWorks (USA) during the 19th World Congress of the International Federation of Automatic Control – IFAC'14, vol. 19, (Cape Town, South Africa), IFAC & South Africa Council for Automation and Control, IFAC, 24–29 August 2014. The solution was described in the conference paper [141].

- 2012. 3rd place for the best software solution to the FTC problem in the "Competition on Fault Detection and Fault Tolerant Control for Wind Turbines". Award sponsored by kk-electronic a/s (Denmark) and MathWorks (USA) 8th SAFEPROCESS, IFAC International Symposium on Fault Detection, Supervision and Safety for Technical Processes. Mexico City, Mexico, 29 - 31 August 2012. The solutions were described in the conference papers [122] and [123].

- 2011. Finalist for one of the best software solutions to the FDI problem in the "Competition on Fault Detection and Fault Tolerant Control for Wind Turbines" Award sponsored by kk-electronic a/s (Denmark) and MathWorks (USA) 18th IFAC World Congress, August 29 to September 2, 2011, Milano, Italy. The solutions were described in the conference papers [114] and [115].

INTERNATIONAL REPUTATION & SCIENTIFIC COMMUNITY PROFESSIONAL ACTIVITY

- Since 2016, Associate Editor of the International Journal Energies (IF 2.072; http://www.mdpi.com/journal/energies)

- Since 2015, Subject Editor of the International Journal of Adaptive Control and Signal Processing, John Wiley & Sons. ISSN: 1099-1115. http://onlinelibrary.wiley.com/

- Since 2014, Subject Editor of the International Journal of Robust and Nonlinear Control, John Wiley & Sons. ISSN: 1099-1239. http://onlinelibrary.wiley.com/

- Since 2010, Associate Editor of the International Journal of Applied Mathematics and Computer Science – AMCS. Owner/Publisher: University of Zielona Góra & Lubuskie Scientific Society. ISSN: 1641-876X (print), 2083-8492 (online). https://www.amcs.uz.zgora.pl

- Since 2010, coordinator of the Erasmus Project between the Department of Engineering of the University of Ferrara and the Higher Vocational School in Glogow, Poland (Prof. Marcin Witczak).

- Since 2008, coordinator of the Erasmus Project between the Department of Engineering of the University of Ferrara and the IZMIR Institute of Technology, (IZMIR, Turkey).

- Since 2008, member and vice-chair of the Steering Committee of the Intelligent Control and Diagnosis working group, which organises the European Advanced Control and Diagnosis (ACD) annual workshops and the International triennial Conferences on Control and Fault-Tolerant Systems (SysTol) (http://www.icd.cran.uhp-nancy.fr/home.html, http://www.icd.cran.uhp-nancy.fr/who.html).

- Since 2006, IEEE Senior Member, The Institute of Electrical and Electronics Engineers, Inc. http://www.ieee.org/membership_services/membership/senior/index.html.

- Since 2002, Coordinator of the Department of Engineering at the University of Ferrara for the Excellence Network MONET on the issues "Model Based Systems and Qualitative Reasoning". Department of Computer Science, University of Wales, United Kingdom.

- Since 1998, Member of the IEEE Institute of Electrical & Electronic Engineers

- Since 2000, Member of the IFAC Technical Committee SAFEPROCESS (Fault Detection, Supervision and Safety of Technical Processes) "Technical Committee", chairman, Prof. Thomas Parisini, Working Group "Soft Computing Approaches to Fault Diagnosis and Identification". http://tc.ifac-control.org/6/4/members.

TEACHING ACTIVITY

- Academic Calendar Years 2015/16 and 2013/14. Course module of "Control Techniques and Fault Diagnosis". For the master students of Automatic Control, Informatics, Telecommunications and Electronics Engineering Students. Department of Engineering, University of Ferrara. 60 hours.
- Academic Calendar Year 2010/2011. Course module of "Automatic Fault Diagnosis Techniques" and "Model-Based Approaches to Automatic Fault Diagnosis for Dynamic Systems". For the master students of Automatic Control, Informatics, Telecommunications and Electronics Engineering Students. Department of Engineering, University of Ferrara. 60 hours.
- Academic Calendar Year 2010/2011. Course module of "Nonlinear Control Techniques". For the master students of Automatic Control, Informatics, Telecommunications and Electronics Engineering Students. Department of Engineering, University of Ferrara. 60 hours.

- Academic Calendar Years 2015/16, 2014/15, 2013/14, 2012/13, and 2011/12. Course module of "Digital Control Systems". For the bachelor students of Automatic Control, Informatics, Telecommunications and Electronics Engineering Students. Department of Engineering, University of Ferrara. 90 hours.

- Academic Calendar Years 2010/11, 2009/10, 2008/09, 2007/08, 2006/07, 2005/06, 2004/05, and 2003/04. Course module of "System Identification and Data Analysis". For both bachelor and master students of Automatic Control, Informatics, Telecommunications and Electronics Engineering Students. Department of Engineering, University of Ferrara. 60 hours.

- Academic Calendar Years 2010/11, 2009/10, 2008/09, 2007/08, 2005/06, 2004/05, 2003/04, 2002/03, 2001/02, 2000/01, and 1999/00. Course module of "Digital Control and Computer Aided Design". For the bachelor students of Automatic Control, Informatics, Telecommunications and Electronics Engineering Students. Department of Engineering, University of Ferrara. 60 hours.

- Academic Calendar Years 2007/08, 2006/07, 2005/06, 2004/05, and 2003/04. Course module of "Neural Networks and Fuzzy Systems for Identification, Prediction and Control" within the course of "System Automation" (held by Prof. Sergio Beghelli). For the master students of Automatic Control, Informatics, Telecommunications and Electronics Engineering Students. Department of Engineering, University of Ferrara. 60 hours.

- Academic Calendar Years 2007/08, 2006/07, and 2005/06. Course module of "Fault Diagnosis of Dynamic Systems Using Model-Based and Filtering Approaches" within the course of "Automatic Fault Diagnosis" (given by Prof. Pier Ruggero Spina). For the master students of Automatic Control, Informatics, Telecommunications and Electronics Engineering Students. Department of Engineering, University of Ferrara. 60 hours.

- Academic Calendar Year 1998/99. Permanent cooperation for the practical lectures of the Course of "Automatic Control", For the bachelor students of Automatic Control, Informatics, Telecommunications and Electronics Engineering Students. Department of Engineering, University of Ferrara.

- Dr. Simani is currently member of the evaluation commissions for all the abovementioned courses.

Ferrara, Italy. February 17th, 2016

Signature: Silvio Simani