Michele Stramacchia
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EMPLOYMENT

Teaching: October 2019 - present, Professor of Computational Science at Liceo Scientifico Galileo Ferraris, Varese. Task: Lectures on developing and implementing codes in C, C++ and Octave. Introduction to Microsoft Office package, Scratch coding and Information theory.

Engineer Consultant at NTT DATA: April 2019 - October 2019, research and development of a MATLAB toolbox in the framework of decarbonization strategy (reducing climate-changing gas emissions in ENI business operations).

Postdoctoral Researcher: January 2018 - October 2018, researcher at Center For Nonlinear and Complex Systems, Physics department, INSUBRIA University, Como, Italy. Task: research and development of a MATLAB toolbox on Quantum Information and Computation.

Postdoctoral Researcher: October 2016 - June 2017, researcher at University of Southampton, Rolls-Royce University Technology Center, Computational Engineering and Design department. Task: research and development of OPTIMAT-v2, a Matlab toolbox. It includes a range of state-of-the-art technology: 1) Optimized Genetic Algorithm (GA) and Non-Sorting GA (NSGA2) algorithms – for single and multiobjective optimization; 2) High quality Radial Basis Functions, 3) Kriging and CoKriging PSO with the hyperparameters tuning based on a particle swarm optimization; 4) Intelligent and highly customizable update point selection, using metrics such as Expected Improvement, Root of the mean squared error, Surrogate Prediction, Spacefill, K-Mean clustering, Probability of Feasibility of Constraints.

Teaching Assistant: June 2018, Summer School in mathematics and applications (Prof. Giorgio Mantica, Prof. Marco Donatelli, University of Insubria, 12-21 June 2018). Duties: provision of assistance to students under the guidance of academic staff (numerical exercises and MATLAB coding for Image and Signal Processing).

Teaching: September 2017 - March 2019, Professor of Computational Science at Liceo Scientifico G.B. Grassi, Saronno. Task: Lectures on developing and implementing codes in C, C++ and Octave. Introduction to Microsoft Office package and Information theory.

Teaching: October 2017 - July 2018, Professor of Computational Science at ISIS, Newton, Varese. Task: Lectures on developing and implementing codes in C, C++ and Octave. Introduction to Microsoft Office package and Information theory. Network links, Networks nodes, Communication protocols.

Teaching Assistant: September 2014 - September 2016, University of Southampton. Duties: Demonstrator of Maths, Mechanics, Statics, Dynamics, Structures and Materials (tuition and marking, helping out students solving basic problems).

Internship: September 2012 - March 2013, Research period at University of Southampton, Astronautic Group, Supervisor Camilla Colombo.

Teaching: September 2008 - June 2011, Istituto Prealpi, Mathematics and Physics: (tuition and marking).

Internship: September 2005 - March 2006, Research period at National Research Council (CNR), Milano, Supervisors: Prof Luigi De Luca and Eng. Roberto Dondé.

EDUCATION

1. **PhD, Computational Engineering and Design**, University of Southampton, Rolls-Royce University Technology Center, October 2013 - April 2017.
   Doctoral Thesis: "Novel Ensemble of Surrogates-Based Infill Criterion for Engineering Design Optimisation".
   Summary: Extensive survey on related modelling and optimisation strategies to solve *high-dimensional*, *expensive*, *black-box* problems taking a look at some of the current surrogate-based optimisation approaches in order to suggest possible ways of combining and extending them to increase their efficiency and to make them more suitable for industrial purposes. Research and Technological Development of **OPTIMAT-v2**, a MATLAB toolbox for Rolls-Royce plc.
   MAIN TOPICS:

   Optimisation Algorithms: Genetic Algorithms, Particle Swarm Optimisers, Simulated Annealing, Multiobjective Optimisation, Robust Design

   Machine Learning and Data Mining: Regression Algorithms, Clustering Strategy, Dimensionality Reduction

   Statistics: Descriptive Statistics, Inferential Statistics, Bootstrapping, Confidence Intervals, Parameter Estimation, Maximum Likelihood Estimation, Gaussian Process Interpolation and Regression, Design of Experiments (Monte Carlo Techniques, Latin Hypercube Sampling, Sobol Sequence)

   Surrogate Models: Kriging models, Radial Basis Function Approximations, Ensemble of surrogates

   Supervisors: Dr. David Toal, Prof. Andy Keane.
   GRADES: Minor Corrections.

2. **MEng, Space Engineering**, Politecnico di Milano, April 2013.
   Master Thesis: "Distant Periodic Orbits for Asteroid Detection".
   Summary: Feasibility Study for the detection of Potentially Hazardous asteroids (PHAs) from space-based network telescopes placed on Distant Periodic Orbits. The orbital dynamic has been studied in the framework of Planar Circular Restricted Three-Body Problem. Spacecraft placed on this particular orbits are able to detect PHAs incoming from the Sun direction, which could not otherwise be monitored from current Earth-based telescopes. A trade-off on the orbit amplitude and number of spacecraft in the constellation has been performed considering visible sensor telescope technology and, the case of Chelyabinsk meteor was analysed as a real scenario.
   MAIN TOPICS: Optimisation Algorithms, Nonlinear Astrodynamics, Three-Body-Problem, MATLAB coding.
   Supervisors: Prof. Franco Bernelli-Zazzera and Dr. Camilla Colombo.
   GRADES: 95/110

3. **BEng, Aerospace Engineering**, Politecnico di Milano.
   Bachelor Thesis: "Rapid Dynamics De-Pressurization of Solid Propellant".
   Summary: Analysis, characterization, and understanding of the non-steady burning process which is induced in space solid propellants by the rapid depressurisation of the rocket combustion chamber. An extensive series of experimental lab-rocket motor test firings have been conducted to determine the rate of pressure decrease which is required to extinguish a burning solid propellant for space applications. The results of these experimental tests have been used to determine the boundary between extinction and non-extinction for each of several propellant formulae. These boundaries have been presented in terms of the initial pressure derivative, versus the initial chamber pressure.
   MAIN TOPICS: Space propulsion, Solid propellants, Statistics, MATLAB coding.
   Supervisors: Prof. Luigi De Luca and Eng. Roberto Dondé.
   GRADES: 92/110

4. **Diploma as Accountant and Bookkeeper**, Trade High School, Istituto Tecnico Gino Zappa, Saronno.

NON-ACADEMIC BACKGROUND

Professional Engineering Qualification, Milano February 2014 (**Full Marks**).

HONOUR and AWARD

- **Thesis Award - Ancillotto Prize 2013** (Best Master Thesis in Aerospace Engineering), from the Italian Air Force, Treviglio Caravaggio, October 2013.
- **Pegasus Award, April 2013**. Award obtained in recognition of my achievements in the area of European cooperation: proficiency in English, and successful participation in an international exchange programme.

SPECIAL SKILLS

Writing

Academic papers, conference papers and technical reports, coding.

Languages

English, Professional working proficiency (Language Proficiency Test, **IELTS**, August 2015).

French, Limited working proficiency (Language Proficiency Test, **DELF**, November 2006).

Italian, Native or bilingual proficiency.

Computer Experience

Good knowledge of operating systems MAC-OS and WINDOWS.

Advanced programming skills in: MATLAB, C, C++, LATEX, SIMULINK, SATELLITE TOOL KIT, NASTRAN, ORIGINLAB, MICROSOFT OFFICE.

Good programming skills in: PYTHON, MATHEMATICA, FEMLAB, FEMAP, R, JAVA, Jupyter Notebook.

Research Interests

Optimisation: large scale problems, surrogate-based optimisation, robust optimisation, multi-objective optimisation, evolutionary-algorithms, nature-inspired optimisation algorithms, Quantum Information, Quantum Computation, Gaussian processes.

Data Science: Machine Learning, Data Mining, Statistics, Big Data, Information theory.

Astrodynamics: orbit and trajectory design, orbit analysis, dynamical systems, Three-Body Problem, Distant Periodic Orbits, asteroid detection models.

Optimal Control: Pontryagin's Maximum Principle, Hamilton-Jacobi-Bellman equation, Linear-Quadratic control, Linear-Quadratic-Gaussian control.

Hobbies

running, Mixed Martial Arts, football, parachuting, reading science book, computing, motorbike.

PUBLICATIONS

Thesis

1. "Novel Ensemble of Surrogates-Based Infill Criterion for Engineering Design Optimisation", (**PhD thesis**, University of Southampton, 2017).
   URL: https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.766749
2. "Distant Periodic Orbits for Asteroid Detection", (**MEng thesis**, Politecnico di Milano, 2013).
3. "Rapid Dynamics De-Pressurization of Solid Propellant", (**BEng thesis**, Politecnico di Milano).

Article and Conference publications (peer-reviewed and/or invited)

1. Giuliano Benenti, Michele Stramacchia, Giuliano Strini. "Dynamical Casimir effect and state transfer in the ultrastrong coupling regime". 2 June 2019.
2. M. Stramacchia, A. Ridolfo, G. Benenti, E. Paladino, F.M.D. Pellegrino, G. Falci. "Speedup of high-fidelity adiabatic multiqubit gate by ultrastrong coupling of matter and radiation". IQIS18 Italian Quantum Information Science Conference, Catania, Italy, 17-20 September, 2018.
3. J. Kamenik, M. Stramacchia, Toal, D.J.J., and Keane, A.J. "Axial Compressor Rotor Optimization Using a Novel Ensemble of Surrogate-Based Infill Criterion". GTIndia2017, Gas Turbine India Conference, Bangalore, India, 7-8 June 2017.
4. M. Stramacchia, Toal, D.J.J., and Keane, A.J. "Improving the optimisation performance of an ensemble of radial basis functions". 5th International Conference on Engineering Optimization, Iguassu Falls, Brazil, 19-23 June, 2016.
5. M. Stramacchia, C. Colombo and F. Bernelli-Zazzera. "Distant Retrograde Orbits for Space-based Near Earth Objects Detection". Advances in Space Research, Special Issue: Asteroids & Space Debris, published.
6. M. Stramacchia, C. Colombo, G. Mingotti, F. Bernelli-Zazzera, C. McInnes. "Late detection of Chelyabinsk-like asteroids from distant retrograde orbits". Stardust Global Virtual Workshop II, University of Southampton, 19-22 January, 2016.
7. M. Stramacchia, C. Colombo and F. Bernelli-Zazzera. "Distant Periodic Orbits for Space-Based Near Earth Objects Detection". AAS/AIAA Spaceflight Mechanics Meeting, January 26-30, 2014, Advances in the Astronautical Sciences Spaceflight Mechanics Volume 152, 21 pages.
8. M. Stramacchia, C. Colombo and F. Bernelli-Zazzera. "When Space Observation becomes a matter of Heart". SET for BRITAIN, A poster competition at Westminster for early-career researchers, London, House of Commons, January, 2013: Final phase.
9. M. Stramacchia, Toal, D.J.J., and Keane, A.J. "Large Scale Optimisation Algorithms". Poster presentation at Rolls-Royce plc. University Technology Center, annual meeting, Derby 05-10-2015.
10. M. Stramacchia, Toal, D.J.J., and Keane, A.J. "Improving the optimisation performance of an ensemble of radial basis functions". Poster presentation at Rolls-Royce plc. University Technology Center, annual meeting, Derby 11-10-2016.

REFEREES

1. **Full Professor Bernelli-Zazzera Franco**

   Belonging Department: Dipartimento di Scienze e Tecnologie Aerospaziali

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Personal website: http://www.aero.polimi.it/bernelli

2. **Dr David Toal**

   Belonging Department: Computational Engineering and Design Group

   Address: Engineering Centre of Excellence Building 176 University of Southampton Boldrewood Campus Burgess Road Southampton SO16 7QF

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   Telephone: (023) 8059 7662

   Facsimile: (023) 8059 4813

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3. **Associate Professor Camilla Colombo**

   Belonging Department: Dipartimento di Scienze e Tecnologie Aerospaziali

   ramacchia Address: Politecnico di Milano, via La Masa 34, 20156 Milano (Italy)

   Email: camilla.colombo@polimi.it

4. **Associate Professor Giuliano Benenti**

   Belonging Department: Dipartimento di Scienze e Alta Tecnologia,

   Address: Università dell'Insubria, via Valleggio 11, 22100 Como (Italy)

   Email: giuliano.benenti@uninsubria.it