Tommaso Grossi

Assistant Professor @ Scuola Superiore Sant'Anna

Bio

Tommaso Grossi, is a Mechanical Engineer with a PhD in Industrial Engineering. He graduated in Mechanical Engineering from the University of Pisa with full honors (110/110 cum laude) and attended in parallel the Scuola Superiore Sant'Anna as an Allievo Ordinario. Thanks to this fellowship, he spent the summer of 2014 at NASA's Jet Propulsion Laboratory in Pasadena (CA), working on machine learning algorithms for gesture recognition in hands-free wearable devices.

After graduation, Dr. Grossi worked for four years in the private sector, serving as a CAE Analyst at Ducati Motor Holding, as a Test Engineer at Maserati S.p.A., and as an R&D Engineer for the Scuderia Toro Rosso Formula One Team. His responsibilities included finite element modeling, calibration of autonomous driving algorithms based on computer vision models, and testing of metallic and composite materials.

Dr. Grossi returned to the University of Pisa to pursue doctoral studies in Industrial Engineering. His PhD research focused on uncertainty estimation in residual stress identification of metallic and non-metallic materials using relaxation methods. His main contribution was demonstrating the impossibility of determining confidence intervals for results without additional physical assumptions about the identified residual stress distributions, and proposing an operational procedure for calculating them when accepting results averaged over a characteristic dimensional scale of the material.

His research has been awarded prizes by the Society of Experimental Mechanics at the 2022 and 2023 Annual Conferences, at the 2nd Workshop on Experimental and Computational Mechanics (2023) and at the 12th International Conference on Residual Stresses (2025). In 2023, he conducted research at the Norwegian University of Science and Technology (NTNU) in Trondheim on machine learning-based exploration of 3D-printed lattice materials under the supervision of Prof. Chao Gao.

Following his PhD, Dr. Grossi obtained a research fellowship at the University of Pisa, partially funded by Baker Hughes, focusing on the characterization of

fracture toughness, fatigue resistance, and hydrogen embrittlement phenomena in high-strength metallic alloys in the presence of manufacturing defects and gaseous hydrogen. He has also worked on AI-based acceleration of finite element solutions for elastoplasticity partial differential equations at stress raisers through training of neural operators. This work has resulted in a manuscript currently undergoing the second round of review at Nature Communications Engineering.

Since 2025, Dr. Grossi has served as Assistant Professor at the Scuola Superiore Sant'Anna in Pisa. His research focuses on the reliability of structural steels under future energy scenarios, with particular attention to the influence of hydrogen–natural gas combustion atmospheres on material degradation mechanisms such as scale formation and decarburization. His work also investigates hybrid industrial heating technologies combining hydrogen combustion and electrical resistive elements, with the aim of assessing their impact on product surface quality and material damage. In parallel, he develops machine learning strategies—including active learning and Bayesian optimization—to accelerate multi-parametric numerical simulations for the redesign of 3D-printed burner components capable of operating with flexible fuel compositions.

Dr. Grossi has organized two thematic sessions at the 2023 Society of Experimental Mechanics conference (Orlando, FL) on *Inverse Methodologies and Uncertainties in the Identification of Residual Stresses and Material Properties*, and the symposium *Quantifying uncertainty in residual stress measurements: a cross-method perspective* for the 12th International Conference on Residual Stresses (Detroit, MI).

From 2020 to 2025, he served as an auxiliary court-appointed technical expert for the trial following the collapse of the Morandi Bridge in Genoa, developing strength models for corroded steel strands supporting the prestressed reinforced concrete stays. From 2022 to 2023, he served as an auxiliary court-appointed technical expert for the trial related to the collapse of the movable bridge at Darsena Pagliari in La Spezia, developing fatigue models for bolted connections under cyclic loading.

Dr. Grossi has served as a formally appointed teaching assistant for Prof. Marco Beghini's Tecnica delle Costruzioni Meccaniche course for second-year Mechanical Engineering undergraduates during the academic years 2022/2023, 2023/2024, 2024/2025 and 2025/2026, conducting weekly tutorials and student office hours.

He holds a conservatory diploma in piano with full honors (10/10 cum laude), earned in 2012 from the Conservatorio P. Mascagni in Livorno under Maestro Daniel Rivera, and continues to play and teach piano performance.

Work Experience

2025 - present **ASSISTANT PROFESSOR**, *Scuola Superiore Sant'Anna*, Pisa, Italy

- Analyzing the influence of future combustion gases (H_2-natural gas mixtures) on the reliability, scale formation, and decarburization of steel grades.
- Evaluating the technical feasibility and impact of hybrid heating (H_2 combustion and electrical resistive elements) on product surface quality and material damage.
- Utilizing active learning and Bayesian optimization to accelerate multi-parametric simulations for the redesign of 3D-printed, fuel-flexible burner components.

2025 - present **ADJUNCT PROFESSOR**, *Italian Naval Academy (Accademia Navale) – Italian Navy*, Livorno, Italy

- Lecturer for the course "Nozioni di Costruzione di Macchine e Tecnologia Meccanica"

2025 - present **MEMBER OF THE SCIENTIFIC BOARD**, *International Conference on Residual Stresses (ICRS)*

2023 - 2025 **RESEARCH FELLOW**, *Università di Pisa*, Pisa, Italy

- Reliability of steel components subjected to hydrogen embrittlement
- Experimental identification of fracture toughness for small cracks
- Measurement of residual stresses induced by surface treatments
- AI-based acceleration of elastic-plastic FE analyses

2022 - present **TEACHING ASSISTANT**, *Università di Pisa*, Pisa, Italy

- Teaching assistant for the course "Tecnica delle Costruzioni Meccaniche", owned by Prof. Marco Beghini
- Formally enrolled for the 2022/2023, 2023/2024, 2024/2025 and 2025/2026 academic years
- Weekly exercises and student office hours

2022 - 2023 **ADJUNT C.T.U.**, *Court of La Spezia*, La Spezia, Italy

- Member of the panel of experts serving as technical consultants for the collapse of the *Pagliari drawbridge* in La Spezia
- Directly appointed by the judge

2020 - 2025 **ADJUNT C.T.U.**, *Court of Genova*, Genova, Italy

- Member of the panel of experts serving as technical consultants for the collapse of the *Morandi bridge* in Genova
- Directly appointed by the judge
- Investigations on computational modeling of heavily corroded pre-stressing steel strands

2017 - 2020 **R&D ENGINEER**, *Scuderia Alpha Tauri F1 Team (formerly Scuderia Toro Rosso F1 Team)*, Faenza, Italy

- R&D tests on experimental components, sign-off (fatigue and failure tests) on current car parts, homologation (static and crash tests) of safety-related components, material characterization and testing according to ASTM standards, experimental stress analyses with strain gauges
- Responsible for the daily operation of a 8-channel hydraulic bench and three uniaxial servo-hydraulic machines, in addition to manual pistons for custom test setups
- Developer (both software & hardware) of a LabVIEW-based data acquisition system for load cells, LVDTs and miscellaneous sensors, currently used in all lab tests for homologations and structural tests on chassis, suspensions, wings and bodywork

2016 - 2017 **TEST ENGINEER**, *Maserati S.p.A*, Modena, Italy

- Calibration and testing of ML-based Advanced Driver Assistance Systems (ADAS) on benches, simulators and vehicles
- Vehicle data acquisition and analysis of vehicle dynamics on European proving grounds, tracks and public roads
- Reverse engineering of competitors through experimental model identification and definition of objective KPIs
- Level 2 Autonomous Driving successfully implemented in Maserati MY18 model range
- Management of blue collar workers for prototype vehicles setup

2016 **CAE ANALYST**, *Ducati Motor Holding S.p.A*, Bologna, Italy

- Research on FEM modeling of structural adhesives
- Development of a best practice for FEM modeling of adhesive joints in motorcycle components
- Redesign of components (Monster 1200/1200S), targeting weight reduction

2015 - 2016 **RESEARCH CONSULTANT**, *Freelance*

- Research on modeling of Shape Memory Alloys (Nitinol) for a novel medical device (WO Patent 2003011182A2, filed by Dr. Edoardo Scarcello and Prof. Giuseppe Triggiani), designed as a treatment for Abdominal aortic aneurysm
- Development of a fully parametric FEM model (Ansys APDL) for structural dimensioning and analysis
- Preparation of all technical drawings required for manufacturing

2014 **SUMMER RESEARCHER**, *NASA Jet Propulsion Laboratory*, Pasadena CA, U.S.A

- Research on real-time ML-based gesture recognition algorithms for the detection of a predefined gesture vocabulary in the framework of a hands-free wearable device (JPL BioSleeve)
- Development, simulation and practical realization of a Inertial-Measurement-Unit sensor module for gesture recognition on arm movements based on the Dynamic Time Warping algorithm and integrated with the BioSleeve, successfully presented at the 2014 IROC-A Challenge, hosted by US Marine Corps

Education

2023 **Visiting PhD Student**, *NTNU*, Trondheim, Norway

- Design of 3D printed components with data-driven approaches
- Working under the supervision of Prof. Chao Gao

2020 - 2023 **PhD in Industrial Engineering**, *University of Pisa*
Curriculum in Mechanical Engineering
Thesis: *"Ill-Posedness of Residual Stress Evaluations with Relaxation Methods"*

2014 - 2016 **Master of Science in Mechanical Engineering**, *University of Pisa*, 110/110 with honours, Qualified as a Professional Engineer
Thesis: *"Mechanical strength of adhesively bonded joints: analytical models and FEM techniques"*

2011 - 2014 **Bachelor of Science in Mechanical Engineering**, *University of Pisa*, 110/110 with honours
Thesis: *"Acoustic detection of cavitation in pumps with MATLAB: a stand-alone microphone system"*

2011 - 2016 ***Allievo Ordinario*, Engineering class**, *Scuola Superiore Sant'Anna*, Pisa, Italy

2003 - 2012 **Diploma in Piano (Master's Degree equivalent)**, *Istituto Superiore di Studi Musicali P. Mascagni*, Livorno, Italy, 10/10 with honours

Papers

2026 **Materials**
Guazzini, A., Bucciarelli, F., Tarica, G., Grossi, T. & Monelli, B.D. (2026). *Rapid Evaluation of Chaboche–Voce Material Model Parameters Through a Fully Reversed Strain-Controlled Test*

2026 **International Journal of Hydrogen Energy**
Grossi, T., Colla, V., Di Giorgio, F. & Valentini, R. (2026). *Hydrogen permeation and trapping in iron at sub-atmospheric partial pressures using a gas/electrochemical Devanathan–Stachurski cell*

2026 **Journal of Failure Analysis and Prevention**
Grossi, T., Neri, P., Santus, C. & Colla, V. (2026). *Measurement of Non-uniform Residual Stresses Using the Incremental Hole Drilling Method and Digital Image Correlation: A Feasibility Study on Deep Rolled Specimens*

2026 **Journal of Failure Analysis and Prevention**
Grossi, T. (2026). *Ill-Posedness, Bias, and the Case for Average Stresses in Residual Stress Evaluations*

2026 **International Journal of Hydrogen Energy**
Grossi, T., Guazzini, A., Romanelli, L., Belardini, C.M. & Monelli, B.D. (2026). *A Multi-task Bayesian Optimization framework to identify a Gurson–Tvergaard–Needleman constitutive model for an MS1500 steel in hydrogen environment*

2026 **Measurement**
Grossi, T., Neri, P. & Santus, C. (2026). *Improved residual stress evaluation with Hole-Drilling and DIC through the L-curve tool and super-resolution along depth*

2026 **Matériaux & Techniques**
Colla, V., Toscanelli, O., Grossi, T., Petrucciani, A., Niero, M., Reche, D., Ban, A., Hubrich, M., Jacobs, L., Raulf, M., Busenkell, F., Schlupp, M., Rickers, M., Smeulders, B., Cook, M., Filemon, W., Bakermans, P. & Bakhoda, S. (2026). *Improving sustainability of cold rolling of low-carbon steels via oil free lubricants*

2026 **AISTech 2026 — Proceedings of the Iron & Steel Technology Conference**
Colla, V., Grossi, T., Petrucciani, A. & Toscanelli, O. (2026). *Integrated Multiscale Simulation Framework for Cold Rolling With Oil-Free Lubricants: Development and Preliminary Validation*

2026 **AISTech 2026 — Proceedings of the Iron & Steel Technology Conference**
Bernds, M., Colla, V., Dettori, S., Grossi, T., Haikarainen, C., Hauck, T., Kleimt, B., Matino, I., Nkwitchoua Djangang, A., Pedrelli, L., Peiss, V., Rothe, S., Saxén, H., Thienpont, E., Vannini, L. & Wolff, A. (2026). *Digital Twins for Multiagent-Based Production and Energy Management Optimization of Integrated Steel Works*

2026 **AISTech 2026 — Proceedings of the Iron & Steel Technology Conference**
Branca, T., Cateni, S., Colla, V., Grossi, T., Matino, I. & Vignali, A. (2026). *Simulation of Integrated Steel Works Transitional Pathways Toward H_2-DRI-Based Route*

2025 **Nature Communications Engineering**
Grossi, T., Beghini, M. & Benedetti, M. (2025). *NeuberNet: a neural operator solving elastic-plastic partial differential equations at V-notches from low-fidelity elastic simulations*

2025 **Metals**
Bucciarelli, F., Guazzini, A., Grossi, T., Macoretta, G. & Monelli, B.D. (2025). *Constitutive Modeling of Creep–Fatigue Interaction in 1Cr-1Mo-0.25V Steel for Hold-Time Testing*

2025 **Research Square Preprint**
Grossi, T., Beghini, M. & Benedetti, M. (2025). *NeuberNet: a neural operator solving elastic-plastic PDEs at V-notches from low-fidelity elastic simulations*

2025 **Procedia Structural Integrity**
Senegaglia, I., Macoretta, G., Grossi, T. & Monelli, B.D. (2025). *Cyclic-elastic behavior in plastically pre-strained lattice structures*

2024 **ASME Turbo Expo 2024: Turbomachinery Technical Conference and Exposition**
Senegaglia, I., Grossi, T., Macoretta, G., Monelli, B.D., Fardelli, A., Tripoli, G., del Turco, P. & Colantoni, S. (2024). *Numerical Analysis of a Nozzle Guided Vane Filled With Lattice Structures*

2024 **Applied Mechanics**
Beghini, M. & Grossi, T. (2024). *Measuring Residual Stresses with Crack Compliance Methods: An Ill-Posed Inverse Problem with a Closed-Form Kernel*

2024 **Journal of Theoretical and Applied Mechanics**
Santus, C., Romanelli, L., Grossi, T. & Neri, P. (2024). *Determination of Chaboche and Bouc-Wen parameters for quenched and tempered steel*

2024 **Journal of Materials Engineering and Performance**
Beghini, M., Bertini, L., Cococcioni, M., Grossi, T., Santus, C. & Benincasa, A. (2024). *Regularization of Hole-Drilling Residual Stress Measurements with Eccentric Holes: An Approach with Influence Functions*

2024 **Experimental Mechanics**
Beghini, M. & Grossi, T. (2024). *Towards a Reliable Uncertainty Quantification in Residual Stress Measurements with Relaxation Methods: Finding Average Residual Stresses is a Well-Posed Problem*

2023 **Journal of Engineering for Gas Turbines and Power**
Beghini, M., Grossi, T., Macoretta, G., Monelli, B.D., Senegaglia, I., Del Turco, P., Fardelli, A. & Morante, F. (2023). *Tuning Modal Behavior Of Additively Manufactured Lattice Structures*

2023 **Journal of Theoretical, Computational and Applied Mechanics**
Beghini, M., Grossi, T., Santus, C. & Valentini, E. (2023). *Revealing systematic errors in hole drilling measurements through a calibration bench: the case of zero-depth data*

2023 **International Journal of Fatigue**
Santus, C., Romanelli, L., Grossi, T., Bertini, L., Le Bone, L., Chiesi, F. & Tognarelli, L. (2023). *Elastic–plastic analysis of high load ratio fatigue tests on a shot-peened quenched and tempered steel, combining the Chaboche model and the Theory of Critical Distances*

2023 **Materials Today: Proceedings**
Beghini, M., Grossi, T. & Santus, C. (2023). *Validation of a strain gauge rosette setup on a cantilever specimen: Application to a calibration bench for residual stresses*

2023 **ASME Turbo Expo 2023: Turbomachinery Technical Conference and Exposition**
Beghini, M., Grossi, T., Macoretta, G., Monelli, B.D., Senegaglia, I., del Turco, P., Fardelli, A. & Morante, F. (2023). *Tuning Modal Behaviour of Additively Manufactured Lattice Structures*

2023 **Experimental Mechanics**
Beghini, M., Grossi, T., Prime, M. & Santus, C. (2023). *Ill-Posedness and the Bias-Variance Tradeoff in Residual Stress Measurement Inverse Solutions*

2023 **IOP Conference Series: Materials Science and Engineering**
Beghini, M., Grossi, T., Santus, C., Seralessandri, L. & Gulisano, S. (2023). *Residual stress measurements on a deep rolled aluminum specimen through X-Ray Diffraction and Hole-Drilling, validated on a calibration bench*

2023 **Applied Sciences**
Santus, C., Romanelli, L., Grossi, T., Bertini, L., Neri, P., Le Bone, L., Chiesi, F. & Tognarelli, L. (2023). *Investigation of Chaboche and Bouc–Wen Parameters of Quenched and Tempered Steel and Comparison of Model Predictive Capabilities*

2023 **International Journal of Plasticity**
Santus, C., Grossi, T., Romanelli, L., Pedranz, M. & Benedetti, M. (2023). *A computationally fast and accurate procedure for the identification of the Chaboche isotropic-kinematic hardening model parameters based on strain-controlled cycles and asymptotic ratcheting rate*

2022 **International Journal of Fatigue**
Santus, C., Romanelli, L., Grossi, T., Neri, P., Romoli, L., Lutey, A., Pedranz, M. & Benedetti, M. (2022). *Torsional-loaded notched specimen fatigue strength prediction based on mode I and mode III critical distances and fracture surface investigations with a 3D optical profilometer*

2022 **ICSP14–14th International Conference on Shot Peening**
Beghini, M., Grossi, T., Santus, C., Torboli, A., Benincasa, A. & Bandini, M. (2022). *X-Ray Diffraction and Hole-Drilling residual stress measurements of shot peening treatments validated on a calibration bench*

2022 **Atti della conferenza AIAS2022**
Santus, C., Romanelli, L., Grossi, T., Bertini, L., Benedetti, M. & Tognarelli, L. (2022). *Procedura di determinazione dei parametri di chaboche di un acciaio con comportamento elasto-plastico in regime di fatica ad alto numero di cicli*

Invited Talks

2025 **Department of Industrial Engineering**, *Università di Trento*
Operator-learning algorithms in finite-element analyses: past simulations accelerate future solutions

2024 **ConScience: Towards a Responsible Use of Machine Learning**, *Università di Pisa*
No more mesh refinements through AI: Predicting plastic fields around notches from coarse elastic data

2023 **Annual Conference of the Society of Experimental Mechanics**, *Orlando (FL), US*
Non-parametric identification of stress-strain curves through spherical indentation

2022 **Deparment of Mathematics**, *Università di Genova*
The inverse problem of relaxation methods for determining residual stresses in mechanical components

2021 **Poliferie**, *No-profit organization*
AI and humans: state of the situation

Awards

2025 **Outstanding presentation**
Awarded by the American Society for Metals for the paper *When confidence intervals are too confident: how inverse methods fool us and how to fix them*, presented at the 12th International Conference on Residual Stresses in Detroit, MI

2023 **Outstanding presentation**
Awarded by the Society of Experimental Mechanics for the paper *Fast Computation of Calibration Matrices in Relaxation Methods Inverse Solutions Through Substructuring*, presented at the SEM 2023 Annual conference in Orlando, FL

2023 **Best Paper Award in Experimental Solid Mechanics**
Awarded by the Selection Committee during the 2nd Workshop on Experimental and Computational Mechanics for the paper *Analysis on the determination of Chaboche and Bouc-Wen parameters for a quenched and tempered steel*

2022 **Outstanding presentation**
Awarded by the Society of Experimental Mechanics for the paper *On the Combined Effects of Hole Depth Steps and Tikhonov Regularization on Hole-Drilling Measurements*, presented at the SEM 2022 Annual conference in Pittsburgh, PA

2011 **Alfiere del Lavoro**
A certificate of merit conferred from the President of the Italian Republic to the 25 best Italian students

2011 **Scuola Normale Superiore**, *Pisa, Italy*
Winner of a student position in Mathematics (declined)

2011 **Pirro Liguori scolarship**
Winner of a five-year scolarship (9k€) for Engineering studies at the University of Pisa

Organizer/Chair at Conferences

2025 **12th International Conference on Residual Stresses**, *Detroit (MI), US*
Organizer of Symposium *"Quantifying uncertainty in residual stress measurements: a cross-method perspective"*

2023 **Annual Conference of the Society of Experimental Mechanics**, *Orlando (FL), US*
Session 41 & Session 47: *"Inverse Methodologies and Uncertainties in the Identification of Residual Stresses Stresses and Material Properties"*

Speaker at Conferences

2026 **Congresso AIM**, *Brescia, IT*

2026 **AISTech 2026**, *Pittsburgh (PA), US*

2025 **12th International Conference on Residual Stresses**, *Detroit (MI), US*

2025 **Congresso AIAS 2025**, *Firenze, IT*

2024 **11th European Conference on Residual Stresses**, *Prague, CZ*

2024 **Congresso AIAS 2024**, *Napoli, IT*

2023 **Annual Conference of the Society of Experimental Mechanics**, *Orlando (FL), US*

2023 **Congresso AIAS 2023**, *Genova, IT*

2022 **11th International Conference on Residual Stresses**, *Nancy, FR*

2022 **Annual Conference of the Society of Experimental Mechanics**, *Pittsburgh (PA), US*

2022 **38th Danubia-Adria Symposium on Advances in Experimental Mechanics**, *Poros, GR*

2022 **Congresso AIAS 2022**, *Padova, IT*

2022 **14th International Conference on Shot Peening**, *Milano, IT*

Skills

Computer

- Python (incl. Pandas, PyTorch, Optuna)
- CUDA framework for GPU-based AI
- ANSYS (incl. APDL, Workbench, Fluent)
- MATLAB
- LabVIEW
- SolidWorks
- MathCAD
- Siemens NX
- Photoshop & GIMP
- LaTeX

Languages

English	Fluent
German	Intermediate
Spanish	Intermediate

Ai sensi dell'art. 15 del D. Lgs. 33/2013 e delle disposizioni del Garante per la Protezione dei Dati Personali, la presente versione del Curriculum Vitae è redatta priva di dati personali (data e luogo di nascita, codice fiscale, recapiti di contatto, firma) ai fini della pubblicazione sul sito web istituzionale.

Tutto quanto dichiarato corrisponde a verità ai sensi delle norme in materia di dichiarazioni sostitutive di cui agli artt. 46 e 47 del D.P.R. 445/2000.