Andrea **Chiocca**

Research fellow in the machine design group · University of Pisa

Working address: *Largo Lucio Lazzarino 2, Pisa 56123, Italy*

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"Improving material application and safety through advanced numerical methods and experimentation."

Qualifications summary

- Experienced researcher with a track record of publishing peer-reviewed articles and presentations at international conferences
- Work experience in structural durability and fatigue analysis of welded joints, additive manufacturing, composite and metal materials
- Research experience in both Italian and foreign institutions with well established research collaborations
- Lecturing and tutoring experience for university courses
- Winner of national and international awards

Professional experience

Department of Civil and Industrial Engineering – University of Pisa

Pisa, Italy

Research fellow in the machine design group — *Feb. 2025 - Present*

- Evaluation of static and fatigue properties at varying temperatures of thermoplastic and thermoset composite materials
- Static and fatigue assessment of Self-Piercing Riveting (SPR) joints

Pierburg Pump Technology Italy S.p.A. – Rheinmetall

Livorno, Italy

Research affiliate in R&D department lead by Dr. Raffaele Squarcini — *Feb. 2022 - Jan. 2025*

- Structural integrity of polymer composites and elastomeric grommets for automotive applications
- Structural integrity of Printed Circuit Board Assemblies (PCBAs)

Department of Civil and Industrial Engineering – University of Pisa

Pisa, Italy

Assistant professor in the machine design group — *Feb. 2022 - Jan. 2025*

- Development of the Effective Critical Plane (ECP) factor approach for fatigue analysis of notched components
- Development of optimized computational methodologies for the evaluation of critical plane factors
- Numerical thermal-structural analyses, experimental tests, and analytical modeling for the evaluation of residual stresses in welded joints
- Fatigue assessment of welded components under uni-axial and multiaxial loading conditions
- Fatigue assessment of lattice structures produced via additive manufacturing

Fraunhofer LBF

Darmstadt, Germany

PhD period abroad in the Component-Related Material Behavior group lead by Dr. Rainer Wagener — *Feb. 2021 - June 2021*

- Transfer the representative structure element of an additive manufactured component through different scales using analytical approaches and numerical methods

Fraunhofer LBF

Darmstadt, Germany

Contract work in the Structural Durability group lead by Dr. Jörg Baumgartner — *July 2018 - Oct. 2018*

- Study of cyclic behaviour of additive manufactured specimens produced via the Selective Laser Melting (SLM) process
- Characterization of the anisotropic material behaviour through experimental and numerical tests

Fraunhofer LBF

Darmstadt, Germany

Student internship in the Structural Durability group lead by Dr. Jörg Baumgartner — *Dec. 2017 - May 2018*

- Study of the interaction and coalescence behaviour of multiple cracks in welded joints by means finite element analysis and experimental tests
- Implementation of the developed multiple cracks interaction and coalescence models within the IBESS computational algorithm

Education

PhD in Industrial Engineering (Land Vehicle Engineering and Systems Transportation) — *University of Pisa*

Supervisors: prof. Francesco Frendo and prof. Leonardo Bertini — *Nov. 2021*

- Thesis title: *Influence of residual stresses on the fatigue life of welded joints*

M. Sc. in Mechanical Engineering — *University of Pisa*

Supervisor: prof. Francesco Frendo — *May 2018*

- Thesis title: *Analysis of the interaction and propagation of multiple cracks in weldments*

B. Sc. in Mechanical Engineering — *University of Pisa*

Supervisor: prof. Umberto Desideri — *Dec. 2015*

- Thesis title: *Preliminary structural analysis of a support for compound parabolic collectors*

Lecturing and tutoring

Lecturing

Course lecturer of Machine Design (PF60 - competition class A042) — *University of Pisa*

Training program for teachers in secondary and junior high school (d.lgs. n. 59/2017) — *2024*

Course lecturer of Mechanical Design Using the Finite Element Method (Code 923II) — *University of Pisa*

Master Degree in Energy Engineering — *2021–2024*

Course assistant of Machine Design (Code 231II) — *University of Pisa*

Master Degree in Aerospace Engineering — *2018–2024*

Course lecturer of Computer-aided design laboratory (Code 2167Z) — *University of Pisa*

Bachelor Degree in Mechanical and Manufacturing Technologies — *2024–2025*

Tutoring

Co-supervision of a master's thesis in vehicle engineering (etd-11012024-155304) — *University of Pisa*

Title: Experimental and numerical characterization of an EPDM 55 grommet — *June 2024 - Nov. 2024*

Supervision of a master's thesis in aerospace engineering (etd-01232024-100941) — *University of Pisa*

Title: Study of static and fatigue strength of steel-aluminum hybrid joints with self-piercing rivets — *Sept. 2023 - Feb. 2024*

Co-supervision of a master's thesis in mechanical engineering (etd-10282023-165104) — *University of Pisa*

Title: Fatigue assessment of aluminum structures produced by Wire Arc Additive Manufacturing — *June 2023 - Nov. 2023*

Supervision of a master's thesis in mechanical engineering (etd-01192023-151632) — *University of Pisa*

Title: Investigation of structural reliability of printed circuit boards for automotive products — *Sept. 2022 - Feb. 2023*

Qualifications

Italian Ministry of University and Research

National scientific qualification as associate professor in the Italian higher education system — *Nov. 2024*

University of Pisa

Professional qualification to practice as an industrial engineer — *Dec. 2018*

Awards

AIAS Award - topic area: modeling

Italian scientific society of mechanical design and machine construction (AIAS) — *Sept. 2024*

Best PhD thesis in Industrial Engineering of 2021

University of Pisa — *June 2022*

Top 10 Academic

Ansys Hall of Fame 2020 Competition — *Feb. 2020*

Software simulation award

Italian scientific society of mechanical design and machine construction (AIAS) — *Sept. 2019*

Technical Skills

Software

FEM: Abaqus, Ansys MAPDL, Ansys Workbench
CAD: SolidWorks
MBD: MSC Adams
Others: Mathematica, Scilab, Matlab, Mathcad, GeoGebra

Programming Languages

LaTeX, Python, Matlab, APDL

General

Inkscape, Gimp, ImageJ, Microsoft Office Suite

Languages

Italian: Mother-tongue
English: Fluent — *Certificate of Academic English C1+ level*
German: Intermediate — *Certificate of German language B1 level*

Publications

[1] A. **Chiocca**, M. Pedranz, F. Zanini, S. Carmignato, V. Fontanari, M. Benedetti, and F. Frendo, "Application of the Effective critical plane approach for the fatigue assessment of ductile cast iron under multiaxial and non-proportional loading conditions," *International Journal of Fatigue*, vol. 192, p. 108 716, 2025, ISSN: 01421123. DOI: 10.1016/j.ijfatigue.2024.108716.

[2] A. Niesłony, M. Böhm, M. Sgamma, A. **Chiocca**, F. Bucchi, and F. Frendo, "A Comparative Analysis: Time vs. Frequency Domain Definitions of the Fatemi-Socie Criterion," 2024. DOI: 10.48447/VAL5-2024-037.

[3] M. Sgamma, A. **Chiocca**, and F. Frendo, "Rapid and accurate semi-analytical method for the fatigue assessment with critical plane methods under non-proportional loading and material plasticity," *International Journal of Fatigue*, vol. 182, p. 108 191, 2024, ISSN: 01421123. DOI: 10.1016/j.ijfatigue.2024.108191.

[4] A. **Chiocca** and F. Frendo, "Fatigue assessment of structural components through the Effective Critical Plane factor," *International Journal of Fatigue*, vol. 189, p. 108 565, 2024, ISSN: 01421123. DOI: 10.1016/j.ijfatigue.2024.108565.

[5] A. **Chiocca**, M. Sgamma, and F. Frendo, "A closed-form solution for evaluating the Findley critical plane factor," *European Journal of Mechanics, A/Solids*, vol. 105, p. 105 274, 2024, ISSN: 09977538. DOI: 10.1016/j.euromechsol.2024.105274.

[6] A. **Chiocca**, M. Sgamma, and F. Frendo, "How many critical planes? A perspective insight into structural integrity," in *Procedia Structural Integrity*, vol. 58, Elsevier, 2024, pp. 42–47. DOI: 10.1016/j.prostr.2024.05.007.

[7] A. **Chiocca**, M. Sgamma, F. Frendo, F. Bucchi, and G. Marulo, "Fatigue assessment of a FSAE car rear upright by a closed form solution of the critical plane method," *Frattura ed Integrità Strutturale*, vol. 18, no. 67, pp. 153–162, 2024, ISSN: 1971-8993. DOI: 10.3221/IGF-ESIS.67.11.

[8] F. Fontana, A. **Chiocca**, M. Sgamma, F. Bucchi, and F. Frendo, "Numerical-experimental characterization of the dynamic behavior of PCB for the fatigue analysis of PCBa," *Procedia Structural Integrity*, vol. 47, pp. 757–764, 2023, ISSN: 2452-3216. DOI: 10.1016/J.PROSTR.2023.07.043.

[9] M. Sgamma, A. **Chiocca**, F. Bucchi, and F. Frendo, "Frequency analysis of random fatigue: Setup for an experimental study," *Applied Research*, vol. 2, no. 4, e202200066, 2023, ISSN: 2702-4288. DOI: 10.1002/appl.202200066.

[10] F. Tamburrino, A. **Chiocca**, B. Aruanno, A. Paoli, L. Lardani, E. Carli, G. Derchi, M. R. Giuca, A. V. Razionale, and S. Barone, "A Novel Digitized Method for the Design and Additive Manufacturing of Orthodontic Space Maintainers," *Applied Sciences*, vol. 13, no. 14, p. 8320, 2023, ISSN: 20763417. DOI: 10.3390/app13148320.

[11] A. **Chiocca**, F. Frendo, and G. Marulo, "An efficient algorithm for critical plane factors evaluation," *International Journal of Mechanical Sciences*, vol. 242, p. 107 974, 2023, ISSN: 00207403. DOI: 10.1016/j.ijmecsci.2022.107974.

[12] A. **Chiocca**, M. Sgamma, F. Frendo, and F. Bucchi, "Rapid and accurate fatigue assessment by an efficient critical plane algorithm: application to a FSAE car rear upright," *Procedia Structural Integrity*, vol. 47, pp. 749–756, 2023, ISSN: 2452-3216. DOI: 10.1016/J.PROSTR.2023.07.044.

[13] A. **Chiocca**, M. Sgamma, and F. Frendo, "Closed-form solution for the Fatemi-Socie extended parameter in case of linear elasticity and proportional loading," *Fatigue & Fracture of Engineering Materials & Structures*, 2023, ISSN: 1460-2695. DOI: 10.1111/FFE.14153.

[14] G. Meneghetti, A. Campagnolo, A. Visentin, *et al.*, "Rapid evaluation of notch stress intensity factors using the peak stress method with 3D tetrahedral finite element models: Comparison of commercial codes," *Fatigue and Fracture of Engineering Materials and Structures*, vol. 45, no. 4, pp. 1005–1034, 2022, ISSN: 14602695. DOI: 10.1111/ffe.13645.

[15] M. Moda, A. **Chiocca**, G. Macoretta, B. D. Monelli, and L. BERTINI, "Dataset of dimensionless operating conditions for welding and metal additive manufacturing," vol. 2, 2022. DOI: 10.17632/B2437352KY.2.

[16] M. Moda, A. **Chiocca**, G. Macoretta, B. D. Monelli, and L. Bertini, "Technological implications of the Rosenthal solution for a moving point heat source in steady state on a semi-infinite solid," *Materials & Design*, p. 110 991, 2022, ISSN: 02641275. DOI: 10.1016/j.matdes.2022.110991.

[17] A. **Chiocca**, F. Tamburrino, F. Frendo, and A. Paoli, "Effects of coating on the fatigue endurance of FDM lattice structures," *Procedia Structural Integrity*, vol. 42, pp. 799–805, 2022, ISSN: 24523216. DOI: 10.1016/j.prostr.2022.12.101.

[18] A. **Chiocca**, F. Frendo, F. Aiello, and L. Bertini, "Influence of residual stresses on the fatigue life of welded joints. Numerical simulation and experimental tests," *International Journal of Fatigue*, vol. 162, p. 106 901, 2022, ISSN: 01421123. DOI: 10.1016/j.ijfatigue.2022.106901.

[19] R. Wagener and A. **Chiocca**, "Representative structure elements for the fatigue assessment of additively manufactured components," in *Procedia Structural Integrity*, vol. 34, 2021, pp. 259–265. DOI: 10.1016/j.prostr.2021.12.037.

[20] A. **Chiocca**, F. Frendo, and L. Bertini, "Residual stresses influence on the fatigue strength of structural components," in *Procedia Structural Integrity*, vol. 38, 2021, pp. 447–456. DOI: 10.1016/j.prostr.2022.03.045.

[21] A. **Chiocca**, "Influence of residual stresses on the fatigue life of welded joints," Ph.D. dissertation, University of Pisa, 2021, p. 97. DOI: 10.13131/unipi/etd/10252021-122902.

[22] A. **Chiocca**, F. Frendo, and L. Bertini, "Evaluation of residual stresses in a pipe-to-plate welded joint by means of uncoupled thermal-structural simulation and experimental tests," *International Journal of Mechanical Sciences*, vol. 199, p. 106 401, 2021, ISSN: 00207403. DOI: 10.1016/j.ijmecsci.2021.106401.

[23] F. Frendo, G. Marulo, A. **Chiocca**, and L. Bertini, "Fatigue life assessment of welded joints under sequences of bending and torsion loading blocks of different lengths," *Fatigue and Fracture of Engineering Materials and Structures*, vol. 43, no. 6, pp. 1290–1304, 2020, ISSN: 14602695. DOI: 10.1111/ffe.13223.

[24] A. **Chiocca**, F. Frendo, and L. Bertini, "Experimental evaluation of relaxed strains in a pipe-to-plate welded joint by means of incremental cutting process," *Procedia Structural Integrity*, vol. 28, pp. 2157–2167, 2020, ISSN: 24523216. DOI: 10.1016/j.prostr.2020.11.043.

[25] A. **Chiocca**, F. Frendo, and L. Bertini, "Evaluation of heat sources for the simulation of the temperature distribution in gas metal arc welded joints," *Metals*, vol. 9, no. 11, p. 1142, 2019, ISSN: 20754701. DOI: 10.3390/met9111142.

[26] A. **Chiocca**, F. Frendo, and L. Bertini, "Evaluation of residual stresses in a tube-to-plate welded joint," *MATEC Web of Conferences*, vol. 300, p. 19 005, 2019. DOI: 10.1051/matecconf/201930019005.