Dr Marco de Angelis

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Personal statement

I develop methods for computing with imprecision, for the automatic verification of engineering models under severe data scarcity and epistemic uncertainty. My work spans uncertainty arithmetic, machine learning, reliability analysis, formal verification, uncertainty quantification, verification and validation and digital twins, with applications to structural and earthquake engineering, carbon accounting and automated compliance. My quantitative numerical work is released as open-source software. At Strathclyde, I lead my research group in *engineering verification*, the StrathDRUMS centre for doctoral training and supervise seven PhD students.

Research interests

- Verified computing with intervals, units, automatic differentiation and probabilistic arithmetic
- Machine learning with intrinsically uncertain data
- Automated compliance of engineering calculations with rigorous uncertainty propagation
- Uncertainty quantification for greenhouse gas calculations
- Open-source digital twins for structural health monitoring
- Humane algorithms for quantitative science and decision making
- Reproducible and open computational science

Employment

Jul 2022 – present	**Lecturer**, Civil and Environmental Engineering, University of Strathclyde.
Jul 2022 – Jun 2026	**Honorary Researcher**, School of Engineering, University of Liverpool.
Jun 2018 – Jun 2022	**(Senior) Research Associate**, EPSRC Programme Grant *Digital Twins for Improved Dynamic Design*, University of Liverpool.
Feb 2016 – May 2018	**Research Associate & Academic Manager**, EPSRC Centre for Doctoral Training in Risk and Uncertainty, University of Liverpool.
Jul 2015 – Jan 2016	**Research Assistant**, University of Liverpool.

Education

2012 – 2015	**PhD** Uncertainty Quantification in Engineering, University of Liverpool.
2008 – 2011	**MEng** Civil Engineering, *magna cum laude*, Roma Tre University.
2005 – 2008	**BEng** Civil Engineering, *magna cum laude*, Roma Tre University.

Research funding

Total awarded at Strathclyde since 2023: approx. £763k — £439k as PI, £324k as Co-I.

2023 – 2029	**PI**, *StrathDRUMS*, Strathclyde centre for doctoral training in data-driven uncertainty-aware multiphysics simulations, £264,000.
2025 – 2028	**PI**, Strathclyde Diamond Jubilee PhD Studentship on uncertainty in CO_2 emissions, approx. £90,750.
2023 – 2029	**PI**, Strathclyde Research Excellence Award PhD Studentship on uncertainty-aware machine learning for CO_2 forecasting, approx. £84,000.
2018	**PI**, PhD studentships at Liverpool: Horizon 2020 MSCA ITN URBASIS (~£280,000) and MRC DiMeN (~£95,000).
2018 – 2028	**Co-I**: Innovate UK KTP with Will Rudd Davidson (£318,345); Royal Society of Edinburgh REUN (£6,000); MRC Confidence in Concept (£50,000); EPSRC IAA (£11,500).

Selected peer-reviewed publications

24 journal, 46 conference papers and 1 book chapter. Underlined: PhD students I supervised or co-supervised.

2026	Keith, S., Tubaldi, E., **de Angelis, M.**, Stripajova, S., & Douglas, J. Assessing the value of information in pricing insurance against multiple hazards: the case of earthquake and liquefaction. *International Journal of Disaster Risk Reduction*, 135, art. 106052. [doi]

2026 McIntosh, A., Loayza Romero, E., & **de Angelis, M.** Interval uncertainty propagation on CO_2 emission calculations in road haulage. In *Proceedings of the 36th European Safety and Reliability Conference (ESREL 2026)*, pp. 2426–2433. [doi]

2025 Ochnio, D., & **de Angelis, M.** Subinterval sensitivity for high dimensional models. In *Proceedings of the 35th European Safety and Reliability & 33rd Society for Risk Analysis Europe Conference (ESREL SRA-E 2025)*, paper P3432. [doi]

2023 **de Angelis, M.**, Gray, A., Ferson, S., & Patelli, E. Robust online updating of a digital twin with imprecise probability. *Mechanical Systems and Signal Processing*, 186, art. 109877. [doi]

2023 Gray, N., **de Angelis, M.**, & Ferson, S. Towards an automatic uncertainty compiler. *International Journal of Approximate Reasoning*, 160, art. 108951. [doi]

2022 Behrendt, M., **de Angelis, M.**, Comerford, L., Zhang, Y., & Beer, M. Projecting interval uncertainty through the discrete Fourier transform: an application to time signals with poor precision. *Mechanical Systems and Signal Processing*, 172, art. 108920. [doi]

2019 Sadeghi, J., **de Angelis, M.**, & Patelli, E. Efficient training of interval neural networks for imprecise training data. *Neural Networks*, 118, pp. 338–351. [doi]

2015 **de Angelis, M.**, Patelli, E., & Beer, M. Advanced line sampling for efficient robust reliability analysis. *Structural Safety*, 52(Part B), pp. 170–182. [doi]

Software, talks and supervision

Software — Open-source Python packages *Intervals*, *PBA* (probability bounds analysis), *Cristallo* (digital twin platform), *Zonolayer* and *Interval-sensitivity*: github.com/marcodeangelis.

Invited talks — University of Oxford (2020); Stony Brook University (2020); Digital Twin Research Workshop, AMRC Sheffield (2019); DigiTwin Showcase, Swansea (2023).

Research visits — IIT Madras, India (2017); Columbia University, New York (2014).

Supervision — 7 current PhD students (4 as primary supervisor); 8 graduated (2 as primary supervisor); 2 MSc and 9 undergraduate dissertations.

Teaching and awards

Teaching — **FHEA** (2026). Module lead at Strathclyde for *Analysis of indeterminate structures* and *Multi-degree-of-freedom systems*, about 260 students a year.

Jun 2025 — **Gold medal: Best numerical results**, NASA and DNV Challenge on Optimization under Uncertainty, ESREL SRA-E 2025.

Jun 2025 — **Best Student Paper**, ESREL SRA-E 2025, awarded to my PhD student Dawid Ochnio.

Aug 2015 — **ISIPTA–IJAR Young Researcher Award**, research excellence in imprecise probabilities.

May 2017 — **Teaching and Learning Award**, Faculty of Science and Engineering, University of Liverpool.

Service

Editorial — Managing Guest Editor, *International Journal of Approximate Reasoning* (2018–2023); scientific committees of SIPTA, REC and ESRA (2020–present); reviewer for 8 journals.

Events — Chair, ESRA symposium on autonomous digital twins (2023); Co-Chair, *Numbers of the Future* (2025); organiser, 9th SIPTA School (2020–21).

Examining — Three internal PhD examinations at Strathclyde (2023–2026); one external, University of Birmingham (2017).

Strathclyde — Engineering Academy Coordinator; Board of Studies Representative; REF reviewer, Faculty of Engineering.