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**Statement of the European Metrology Network for Mathematics and Statistics
on the
White Paper on Artificial Intelligence - A European Approach to excellence and
trust**

MATHMET is the European Metrology Network for Mathematics and Statistics founded in 2019 with Members from eleven European member countries. Two of the challenges being addressed by MATHMET related to AI: (A) how can the main concepts of metrology – traceability to standard references and procedures, uncertainty quantification, conformity, interoperability of measurement results – be extended to systems that use AI and other complex data analysis methods, and (B) how can AI and machine learning be harnessed in a principled, explainable and transparent way to derive trusted information about systems (physical, chemical, biological, environmental) from measurement data. We are therefore grateful for the presentation of the “White Paper on Artificial Intelligence” – A European approach to excellence and trust by the European Commission. AI will substantially change the production processes with strong effects on quality assurance, increase in efficiency, profitability and competitiveness. For a broad application of AI, reliability, quality and conformity, core activities of metrology, will play a central role.

Introduction:

From MATHMET's point of view, confidence in the accuracy of measurement results and their comparability are key enablers of success for the European economy, healthcare, climate monitoring, advanced manufacturing, energetic system, autonomous transport and information and communication technology (ICT). When measured data (sensors) is used for artificial intelligence (A) or artificial intelligence is used to improve measurement modalities (B), the term ‘trust’ has to be carefully

defined. In this respect, metrological principles ensure the quality standard of data from the physical world used to train artificial intelligent systems (A) and assess the reliability of measurement systems using artificial intelligence (B). Furthermore, the development of methods for the evaluation of uncertainties associated with the results of data mining, machine and deep learning models, as well as for the assessment of their robustness and interpretability, is a key challenge within the scope of MATHMET activities in the near future.

Section 1: An Ecosystem of Excellence

MATHMET acknowledges the development of an ecosystems of excellence as a well-designed instrument to combine European capacities and skills, to address the grand challenge of advancing the development of artificial intelligence and provide support for small and medium-sized enterprises (SMEs) as well as stakeholders operating on big-data (e.g. healthcare, pharmaceuticals, climate monitoring, smart grids and the ICT sector). MATHMET welcomes the development of an ecosystem of excellence for AI and the establishment of interdisciplinary test and innovation centres. In this respect, attention should be paid to:

- the development of methods and standards for characterising data quality
- the provision of public reference databases and analysis-ready, machine-readable data
- data with supporting metadata and semantic representation
- controlled vocabularies and ontologies for knowledge representation
- open-source AI reference algorithms and core libraries
- the inclusion of regulatory requirements in the application of algorithms (regular-compliance-by-design).

Section 2: An Ecosystem of Trust

From MATHMET's point of view, the reliance of the European population on the new technology is one of the key factors for the successful deployment of AI. In addition to the ethical and legal aspects, the reliability, explainability and conformity of AI are

essential to give the European population confidence in this new technology, a condition necessary for the successful deployment of the AI. For the interplay between measurement data and decisions made by artificial intelligence, standardized procedures must be developed. These procedures should indicate not only the decision on the measurand (the object or item under measurement) but also an associated uncertainty allowing for a quantification of the level of confidence and a risk assessment:

- How reliable is the training data?
- Is the training data appropriate for the learning task, e.g., does the data relate to the system under study?
- Is the training data sufficiently representative and have biases been quantified?

MATHMET emphasizes the importance of benchmark tests, reference databases and methods for the assessment and curation of data. In this context, the development of standards and reference systems should be oriented towards the needs of end-users and should be carried out in close cooperation with SMEs. Qualification and training offers should tailor to the needs of end-users and should support and encourage young talents.