Terms of Reference
NAFEMS Engineering Data Science Technical Working Group

1   TECHNICAL AREA COVERED BY THE GROUP

The NAFEMS Engineering Data Science Working Group (EDSWG) advocates the use of data science, including machine learning (ML), Artificial Intelligence (AI) and optimisation methods to improve product design process and draw meaningful insights from data to support product design decisions.

The working group is a vendor neutral, cross-industry, international body of experts operating in the area of Engineering Data Science (EDS).

NAFEMS was formed in the early 1980s when industry was starting to solve practical engineering problems using finite element analysis techniques. The UK Government setup a project to investigate issues related to the accuracy of the methods that were being employed. Out of this project the "National Agency for Finite Element Methods and Standards", quickly shortened to NAFEMS, was founded as a special interest group. The organisation has grown over the subsequent decades and today is an independent not-for-profit company, owned by its members involved in many different types of engineering simulation covering both products and processes.

Characteristics of the Engineering Data Science problems and how they differ from Data Science as applied in the other fields:

- A lot of data is contained within 3D geometry data and engineering models. As such the data is not readily available in tabular format as required by machine learning methods.
- Data originating from simulations often requires up-front investment to create or extract attributes and there may be fewer data points than that from other fields.
- For the EDS the Use Interface/coding tools should be designed for users with a background in a variety of engineering fields, not just computer science.
- The number of outputs to predict are significantly larger than in the other fields.
- In many cases, engineers know the underlying physical laws and the data science process would benefit from making use of this information to reduce the number of data required and to train more accurate predictive models.
- The EDS is often linked to simulation and in many cases the responses are generated via intensive simulations from tabular inputs. These tabular inputs are often arranged using Design of Experiments (DOE). DOE can be adaptive to perform active and potentially incremental learning.

Topics of interest for the EDSWG include but are not limited to:

- Appropriate verification & validation approaches to build engineering machine learning models
- Integration of data based and physics informed approaches
- Usage of variable fidelity data (e.g., simulations and physical experiments), accounting for uncertainty of such data
- Efficient coupling of optimisation with machine learning methods
- Application of machine learning for small amount of data
- Providing guidance on how to get started by sharing success stories, communicating best practices

- Identifying the barriers standing in the way of EDS adoption
- Current challenges
- Synthetic data generation
- Working with geometric data
- Machine Learning model update: keeping track of data and model history, model deployment

2 AIMS

EDSWG aims to provide guidance to the product design and operation teams in the use of data science to improve processes and support design and operation decisions. This will be achieved by sharing experiences, following the developments in this field, connecting people in this field for discussions and promoting best practices.

In a longer term EDSWG could work towards proposing standards for machine learning applied to simulations.

Investigate/Follow:

- Challenges in EDS
- New developments in other fields that can benefit EDS

Promote and Develop:

- Guidelines on how to get started in EDS
- Best practices on how to conduct studies in EDS

Communicate and Share:

- EDS best practices through whitepapers, presentations, booklets, panel discussions:
  - When to use
  - How to get started
  - Steps of the process
- Success stories through whitepapers, presentations
- Identify the barriers standing in the way of EDS adoption
- Ease of use of EDS tools for variety of engineering backgrounds

3 STRUCTURE

The Technical Working Group (TWG) is composed of experts who contribute their time and knowledge on a voluntary basis. TWG members are responsible for identifying the outputs, directing and contributing to the activities of the TWG.

The outputs of the TWG are commissioned by current TWG members. TWG outputs may be developed by TWG members or external experts. Where an output is produced by an external expert, the TWG is responsible for ensuring that the output is technically accurate and relevant to the NAFEMS membership.

At the discretion of the TWG, focus groups may be formed to address a specific application area/numerical method.

Wednesday, 10 December 2025

4 BYLAWS

4.1 TWG MEMBERS

Members of the TWG are listed on meeting minutes as present, contributing or sent apologies.

If a member of the TWG does not contribute for more than 9 months, they will be warned that their membership of the TWG may be terminated. An individual's TWG membership may be terminated after 12 months of non-contribution, at the discretion of the Chair.

New TWG members are required to be a representative of an organisation that holds a current NAFEMS membership.

At the discretion of the TWG Chair, participation in a TWG meeting may be represented by one of two or three individuals from the member organization to reduce the workload on individuals.

Working group members must have attended a minimum of 50% of working group meetings over the last 12 months in order to be eligible to participate in group votes.

The number of TWG members should ideally range from between 10-20.

The membership of a TWG is listed on the NAFEMS website.

4.2 JOINING THE TWG

Potential new TWG members are required to submit a curriculum vitae (or equivalent) to the NAFEMS Technical Working Group Manager (TWGM) indicating their knowledge and experience in the area covered by the TWG. The TWG may ask the potential new member to explain why they want to join the TWG and what they can contribute. The information provided will be reviewed by the TWG and if approved, the person will be invited to attend meetings and participate in the group's activities. It is expected that TWG members will hold a senior technical position and have significant technical expertise.

4.3 MEETING LOGISTICS

Minutes will be taken for all TWG meetings and actions will be identified. The minutes should be circulated within a month (ideally less) of a meeting date. The TWGM will produce the meeting minutes unless another meeting attendee is selected by the Chair.

The primary method of meeting will be via a web-based platform to enable international involvement in the group. The TWG is encouraged to take advantage of major NAFEMS or industry events to meet in person. Where a physical meeting is scheduled attempts should be made to provide a web-based connection to the meeting to allow participation of those who are not able to attend the meeting in person.

The TWG is required to meet at least 6 times a year.

4.4 LEADERSHIP ROLES

The positions of Chair and Vice-Chair are open for review every three years on the anniversary of the initial appointment. There is no requirement for the role to be rotated. Only current members of the TWG may vote or be nominated as Chair. The responsibilities of the TWG Chair and Vice Chair are defined in Section 8.

The Chair of the TWG should ideally be an industrial user of modelling, analysis and simulation technology.

4.5 DECISION MAKING

Where a vote is required it will be carried out via email to the Chair or, if the position of Chair is being voted on, to the TWGM.

Only current members of the TWG are allowed to vote. Each organisation that has a representative in the TWG will have one vote. If an organisation has more than one person participating in the TWG, the vote will be shared between the participants.

If required, the casting vote will be held by the Chair.

4.6 COMMUNICATION

TWG communication should be carried out using the group email address. It is the responsibility of the NAFEMS TWGM to ensure that the TWG distribution list is current. Personal distribution lists are discouraged as they require constant updates.

5 MEASURES OF SUCCESS

The success of the TWG is measured in terms of:

- Outputs include but are not limited to:
  - Publications
  - Developing/maintaining an area of the NAFEMS PSE Framework
  - Webinars
  - "How to.." Guides
  - Training Courses

- Activity & Engagement including but not limited to:
  - Number of TWG meetings
  - Number of attendees per meeting
  - % of TWG group members who attended zero meetings in the last 12 months
  - Number of individual leaving the TWG
  - Number of new expression of interesting in joining the TWG

6 RESOURCE REQUIREMENTS

The group is administered by the NAFEMS Technical Working Group Manager (TWGM).

Logistical support for the TWG, consisting of providing a web-based meeting platform, scheduling meetings and web-hosting of TWG output is provided by NAFEMS.

Funding is available from NAFEMS to support the development of TWG outputs. This funding can take the form of contracts for authors, contracts for the individuals tasked with reviewing. Applications for funding should be made to the NAFEMS Technical Officer.

7 DURATION

The TWG will continue in perpetuity until terminated by the NAFEMS CEO.

8 ROLES & RESPONSIBILITIES

TWG Members are responsible for:

- identifying the outputs and directing the activities of the TWG
- ensuring that TWG output is technically accurate and relevant to the NAFEMS membership
- regularly contributing to TWG activities. Contributions can include:
  - attending and actively participating in TWG meetings;
  - participating in topic discussions and activities between meetings, whether individually or as part of a focus team;
  - sending relevant comments or reports on agenda items to the Chair in good time for the meeting;
  - volunteering for and carrying out actions arising from the meetings including developing outputs, reviewing TWG resources, authoring invitations to tender etc.

TWG Chair is responsible for:
- providing leadership to the TWG
- acting as the focal point of the TWG
- ensuring that TWG meetings are run effectively.

TWG Vice Chair is responsible for:
- providing leadership to the TWG
- chairing the TWG in the absence of the Chair.
- supporting the TWG Chair.

NAFEMS Technical Working Group Manager is a NAFEMS staff member responsible for:
- acting as the primary point of contact between the TWG and NAFEMS
- TWG meeting logistics
- Processing new member requests
- Producing the minutes for TWG meetings

NAFEMS Technical Officer is a NAFEMS staff member responsible for:
- acting as the NAFEMS point of contact for TWG funding
- acting as the NAFEMS point of contact for approving TWG output

NAFEMS CEO has the authority to terminate or request a change of scope for the TWG

9 APPROVAL

Tim Morris

CEO, NAFEMS

Date 2025-12-10

Wednesday, 10 December 2025