Integrating Technical, Durability, and AI Competencies in Blended International Training weeks for nuclear engineering students

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2 Hasselt University, SES, U-RISE, Diepenbeek, Belgium

PSI, 7-9 July 2026

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EUTERP Training & Education in Radiation Protection

>20 years of Cooperation for Higher Education on Radiological and Nuclear Engineering

CHERNE

- Created in 2005 with 6 academic partners
- an open network (**www.irisib.be/cherne**)
- 2026
  - New partners and next generations
  - New challenges
  - Broader collaboration initiatives

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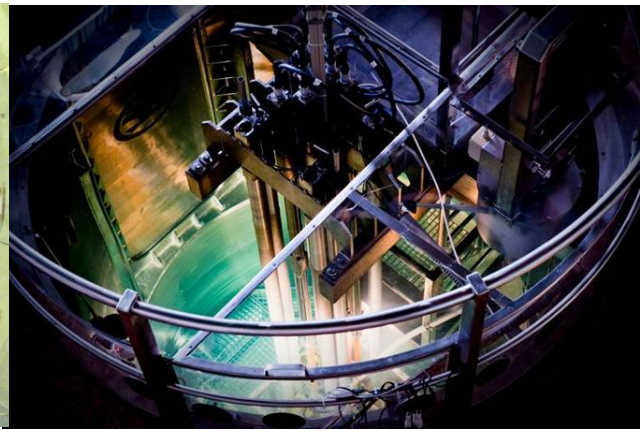
CHERNE teaching activities

for students of member institutions

- at least a one-week: min 2 ECTS
- On site training, including, access to large facilities, research network
- Mainly mobility using ERASMUS grants and individual partner grants





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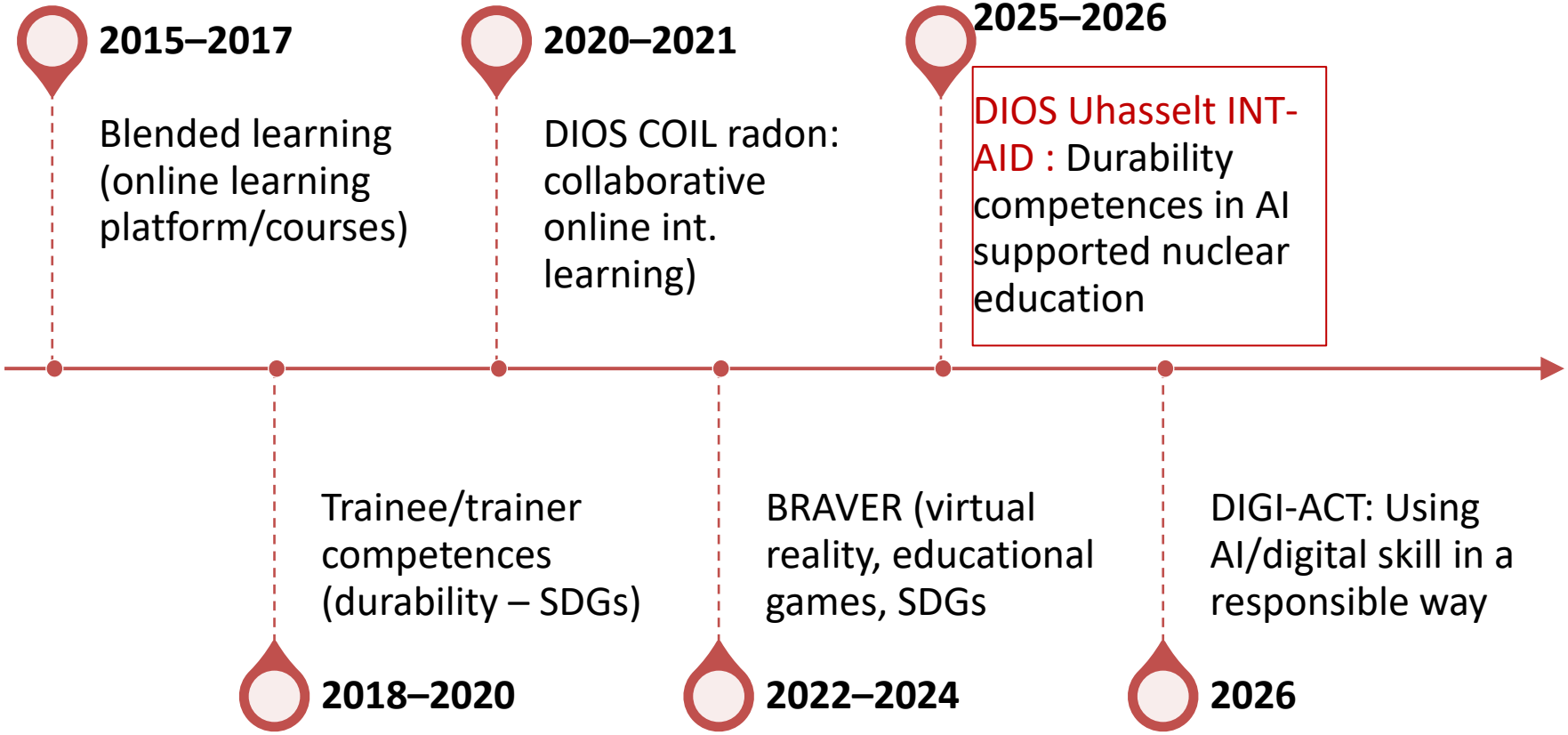
> 10y of Erasmus partnership projects (KA2) on specific innovative education



consortia of 6-7 CHERNE partners + external associates

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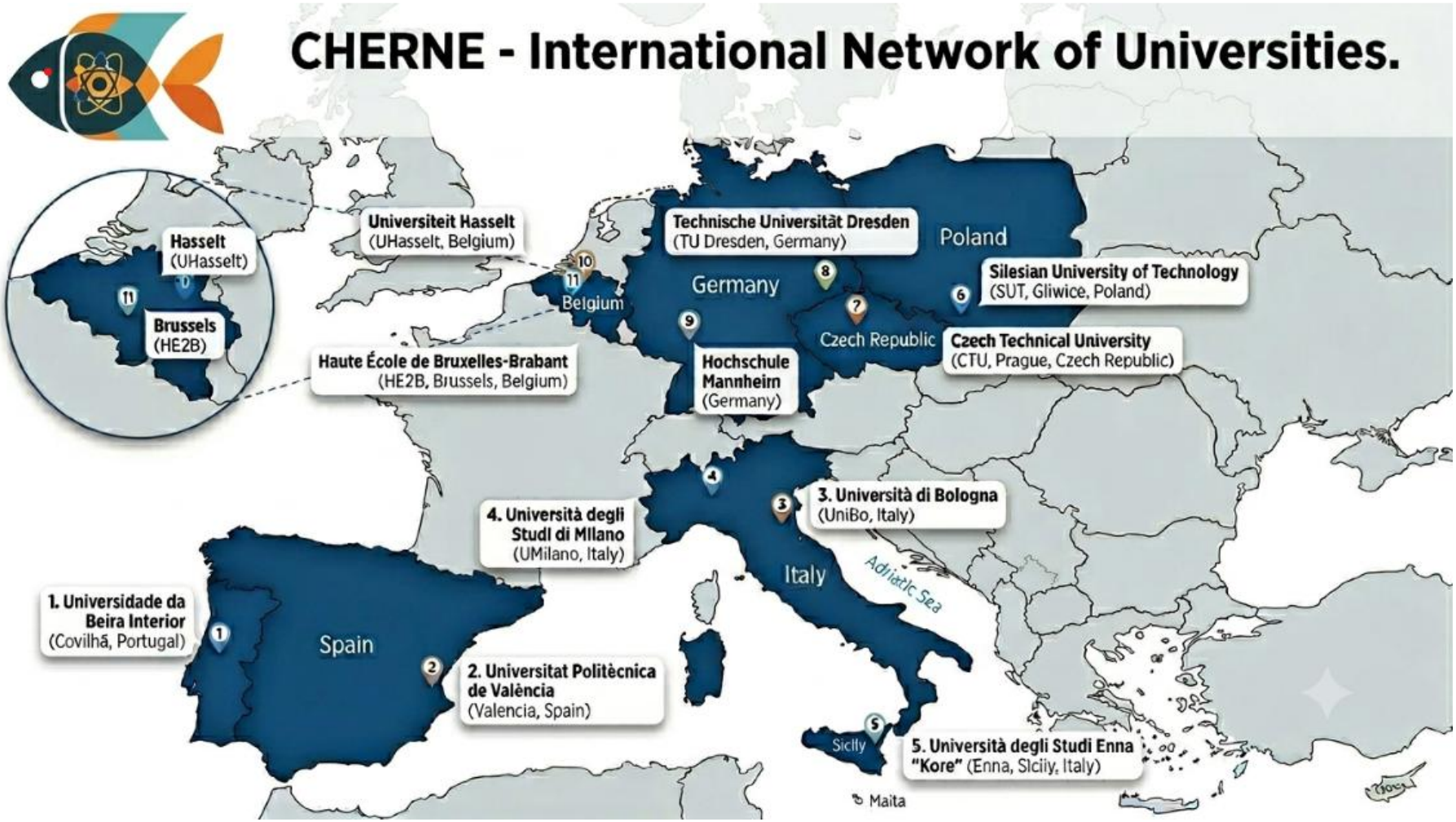
CHERNE - International Network of Universities.



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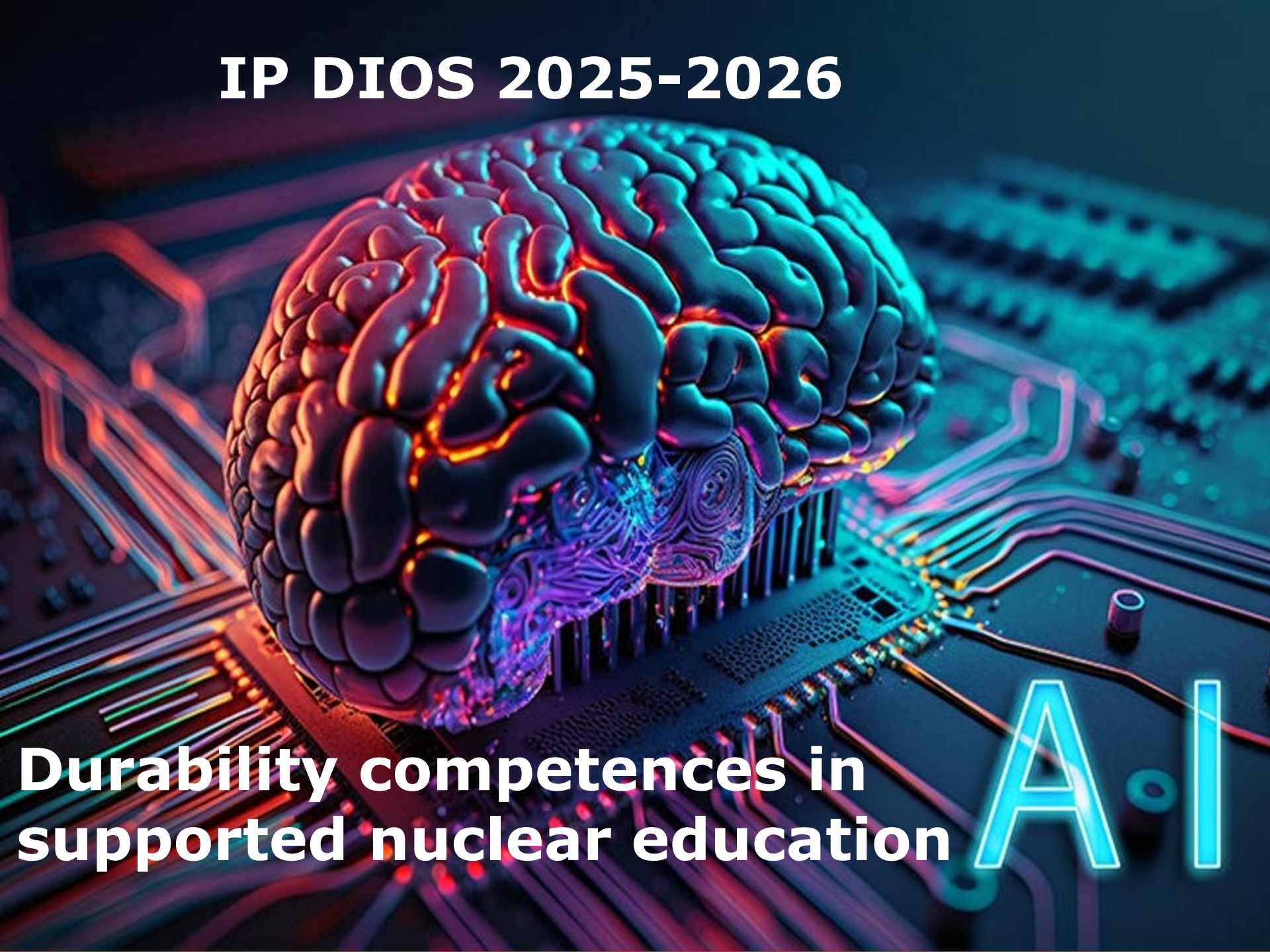
IP DIOS 2025-2026



Durability competences in supported nuclear education

Project description

- Interfaculty project
  - Industrial engineering sciences (IIW)
  - School of Educational Sciences (SES)

- Integration and responsible use of AI in nuclear engineering education

- Impact study SES to track changes in attitude towards responsible use of AI

Project description

- 3-day staff training
  - Gain experience and insights
- 5-day student training [EnvirAI training school 2026]
- Partners
  - CHERNE members
  - FANC
  - JRC Geel
  - SCK-CEN

Staff training on AI

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Staff training at UHasselt

17 participants over 3 days

Goals

- Prepare Erasmus project DIGI-ACT
- Increase knowledge through experts
- Exchange of good practices
  - PBL cases Silesian University of Technology (SUT, Pl)
  - AI policies across partners : current challenge in progress

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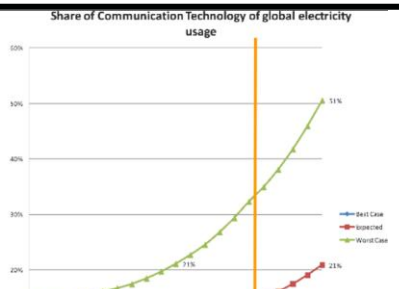
Christoph Cop [AP Antwerp]

AI Today

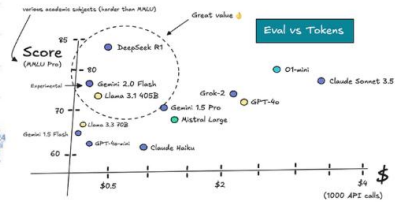
"AI is better in those things where you are nor an expert."

A bit hard to estimate energy use for AI

Andrae, A.S.G.; Edler, T. On Global Electricity Usage of Communication Technology: Trends to 2030. *Challenges* **2015**, *6*, 117-157. https://doi.org/10.3390/challe6010117



Cost per token drops fast!



Cost for 2 million tokens (input+output) decreased from $180->$0.75 in 2 years. 240x cheaper

Feb 2025

https://medium.com/data-science-collective/economics-of-llms-evaluations-vs-pricing-04802074e095

Ethical AI

Verduidelijking

Ethiek is not the same as legal!

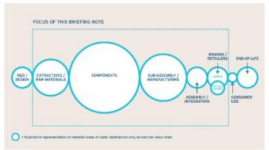
Factors	Legal	Ethical
Ethos	Regards ethics as a set of limits and something that has to be done	Defines ethics as a set of principles to guide choices
Objectives	Geared toward preventing unlawful conduct	Geared toward achieving responsible conduct
Method	Emphasizes rules and uses increased monitoring and penalties to enforce these rules	Treats ethics as infused in business practice (leadership, core systems, decision-making processes, etc)
Behavioral Assumptions	Rooted in deterrence theory (how to prevent people from doing bad things by manipulating the costs of misconduct)	Rooted in individual and communal values (both material and spiritual)

*Adapted from Paine (1994)

Silicium mine

Water

- A datacenter uses about 25,500,000 liter per megawatt per year
- (many datacenters are hundreds of megawats)



Gallium

Lithium

Water scarecity?

- An access problem
- There is not always enough useful (sweet, unpolluted) water available.
  - Farming
  - Drinking
  - Industry
  - …

Jelle Hoedemaekers [Agoria]

State of AI in the EU

AI Ethics & Sustainability

Uhasselt – 19/11/25

.AGORIA

Scope assessment

Exemptions from scope

- National security/defence
- AI used for scientific research
- AI systems in R&D phase (before deployment)
- Non-professional use
- Free and open-source software

Member States can **keep & create laws more favourable to workers** *Art. 2(5e)*

Unless placed or put into service as **forbidden** or **high-risk AI system**

Transparency obligations still apply

28

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Step 2 : Role assessment

A **person, company or organisation…**

That **develops** an AI system or GPAI model

Or has them developed and **places them on the market**

Or **puts the AI system into service** under its own name or trademark.

A **person, company or organisation…**

That **uses an AI system under its authority**.

31

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AI Act Timeline

12/07/2024	Publication in Official Journal
01/08/2024	Entry into force
02/02/2025	General Provisions (Title I) apply
02/02/2025	Prohibited AI Systems (Title II) apply
02/08/2025	Application date for main articles – General purpose AI , Governance
02/08/2026	**Application for High-Risk AI Systems - Digital applications (Annex III)**
02/08/2027	Application for High-Risk AI Systems – Safety components of products (Annex I a)

41

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The AI Act's risk-based approach

33

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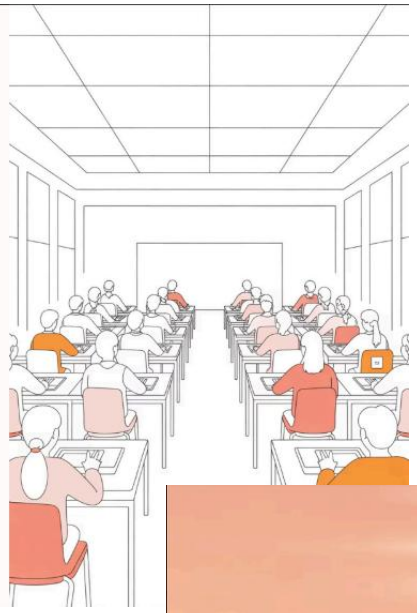
Elke Emmers [SES]

Charter for the Use of AI in Educational Master's Programmes

This charter establishes comprehensive guidelines and expectations for the use of ChatGPT and other generative AI tools within educational master's programmes. Our aim is to foster ethical, responsible, and transparent use of these technologies whilst maintaining academic integrity and supporting genuine learning outcomes.



Transparency: The Foundation of Responsible AI Use

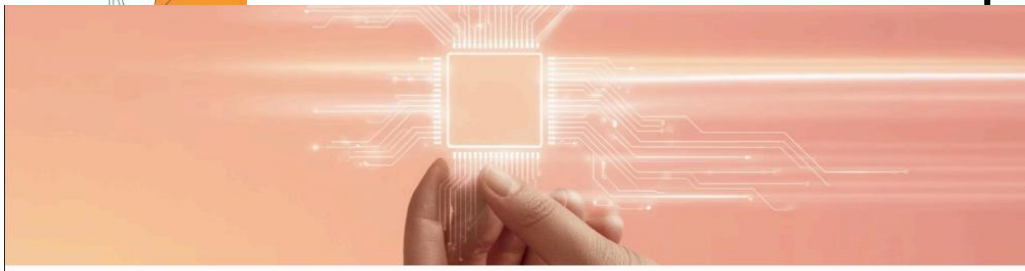
Transparency forms the cornerstone of ethical AI integration in academic work. Students must clearly indicate which AI tools they have used and explain their purpose, including an overview of the prompts employed.

Declaration of Use

Students must include a clear disclaimer in their assignments stating: "Whilst creating this assignment, I used ChatGPT to generate ideas and improve the structure of my work. This tool was used to supplement my own expertise and critical thinking. After use, I reviewed and adjusted the content where necessary. I take full responsibility for the content of my work."

Course-Specific Guidelines

For each educational unit (OPO), specific transparency requirements are defined. This includes clear guidance on permitted uses (such as language assistance or search functions) and prohibited applications (such as code generation), ensuring students understand the boundaries within each course context.



Responsible Use: Ownership and Ethics

Ownership & Accountability

Students bear complete responsibility for the content of their work, even when using AI tools. AI use must always be accompanied by a critical attitude towards generated information. Despite AI assistance, students must always maintain control and final responsibility over their work.

> "Always verify the accuracy of information generated by AI tools. You remain responsible for the correctness and reliability of your submitted work."

Ethical Considerations

Students must always consider privacy of data, algorithmic transparency, limitation of biases, and equal access when using AI

Awareness of Limitations

Students must understand AI's limitations, including potential biases, inaccuracies, and ecological footprint

Ecological Responsibility

Recognition of the environmental impact of AI technologies and consideration of sustainable use

I confess: I'm a strong believer
not AI-driven but AI-supported

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Yiannis Pontikes [KU Leuven]

Science Communication in 90 Minutes: Turning Concepts and Data into an Impactful Manuscript

Version 2025.1

Y. Pontikes

Leuven, November 2025

Let's start…

Writing scientific papers is not a difficult task. The challenge lies in:

a) Having a clear message you want to communicate
b) Having data of good enough quality and good enough in volume, to justify the novelty and interpretation of your findings
c) Having a clear way to express yourself
d) Using English properly

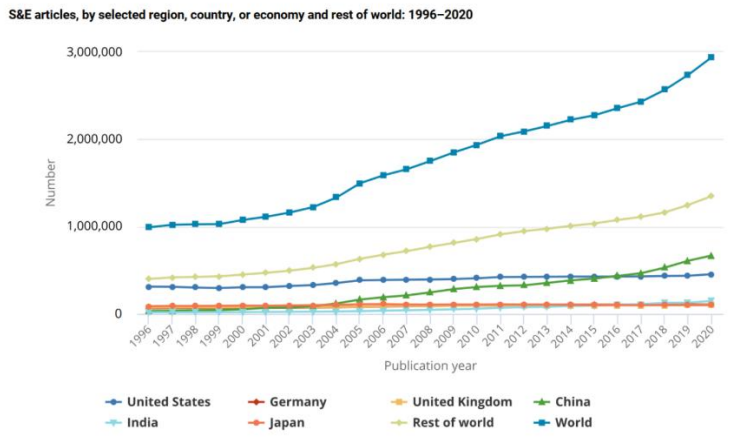
This is for 80% of the engineering papers. If you want to publish to Nature and Science, there is probably some complexity…

What is a paper?

Message to take-home:
There is a methodology to write a paper!

(but without any data and analysis, there is no paper)

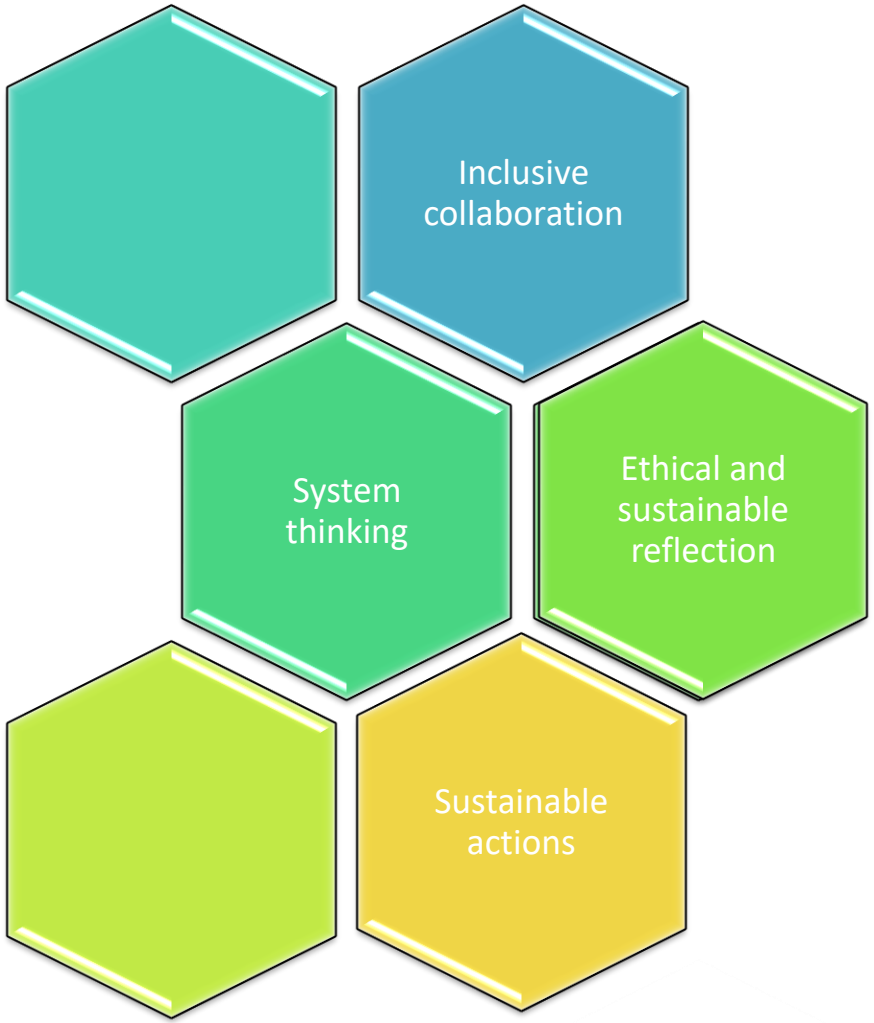
Scientific landscape in 2020 (and trends)



National Science Board, National Science Foundation. 2021. Publications Output: U.S. and International Comparisons. Science and Engineering Indicators 2022. NSB-2021-4. Alexandria, VA. Available at ttps://ncses.nsf.gov/pubs/nsb20214

EnvirAI training school 2026 : 3ects

UHasselt durability competences:

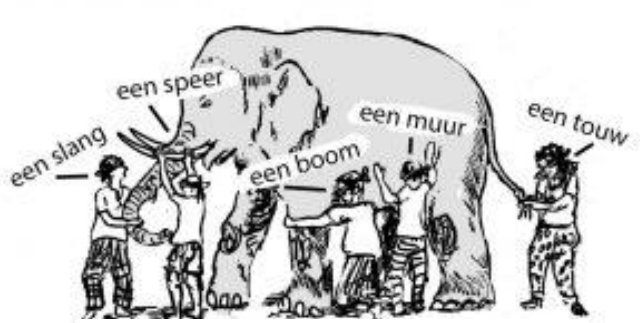


Why SDGs in education for engineers?

Starting from a given context/topic

Think and reflect on diverse aspects: zoom out and in

- Indirect impact -> societal challenges
- Long term -> effects on other aspects?



Connect with stakeholders

- Take initiative to reach out
- Respect and interprete different point of views

Create connectedness

- Solidarity
- Responsibility

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EnvirAI 2026

International training week with 17 students and staff

- UHasselt, Belgium (2)
- He2B, Belgium (1)
- UBI, Portugal (3)
- UMilano, Italy (3)
- UniBo, Italy (1)
- UPV, Spain (1)
- SUT, Poland (3)
- CTU, Czech republic (3)

Prétraining group task (1ECTS) : subjects

- Food legislation (focus on radioactivity)
- Radon problems (restrictions, indoor exposure, geographical differences, related industries)
- XRF (restrictions heavy metal content in jewellery)
- NORM reuse (reuse/waste/trade problems)

Prétraining group task: Guidelines

Mixed –groups : first interaction
AI support allowed but transparant use
Indirect durability competences

Context and comparison: EU and non-EU

Start from at least 3 recent articles (2020 - …)

- Output:
  - Presentation 15min + 5min questions
  - Annex use of AI (AI source, prompts…)
  - Annex team (task and time) management

- Evaluation: 30% of the total score

Stakeholders and experts

AI &durability

Hands-on labs

MONDAY 30/03	TUESDAY 31/03	WEDNESDAY 1/04	THURSDAY 2/04	FRIDAY 3/04
Icebreaker Presentation of AI pretraining task	Tips and tricks on use of AI **FANC**: environmental monitoring and legislation	Lab day at ISIB, Brussels	Preparation time Workshop SDG's	Preparation time Impact study AI
Lunch (building D)	**Lunch (building H)**	**Lunch (ISIB)**	**Lunch (Hasselt)**	**Lunch (Hasselt)**
Lab work Group A and B [Technology centre] Group C and D [Building H, Nuclear lab]	Lab work Group A and B [Building H, Nuclear lab] Group C and D [Technology centre]	Lab day at ISIB, Brussels	**Company visit** SCK: environmental lab SCK: Emergency response team	Final presentations
Guest lecture on AI	**Social Dinner**			

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Guest lecture

Responsible use of AI for engineers of the future

by prof. dr. Nick Michiels and prof. dr. Davy Vanacken

THE GOOD THE BAD AND THE UGLY

UHASSELT CHERNE EURECA • PRO EUROPEAN UNIVERSITY

De opleiding industrieel ingenieur is een gezamenlijke opleiding van UHasselt en KU Leuven

UHASSELT KU LEUVEN

Lab 1: C-14 determination in alcoholic beverages using LSC

Supervisor : ing Wim Eerdekens

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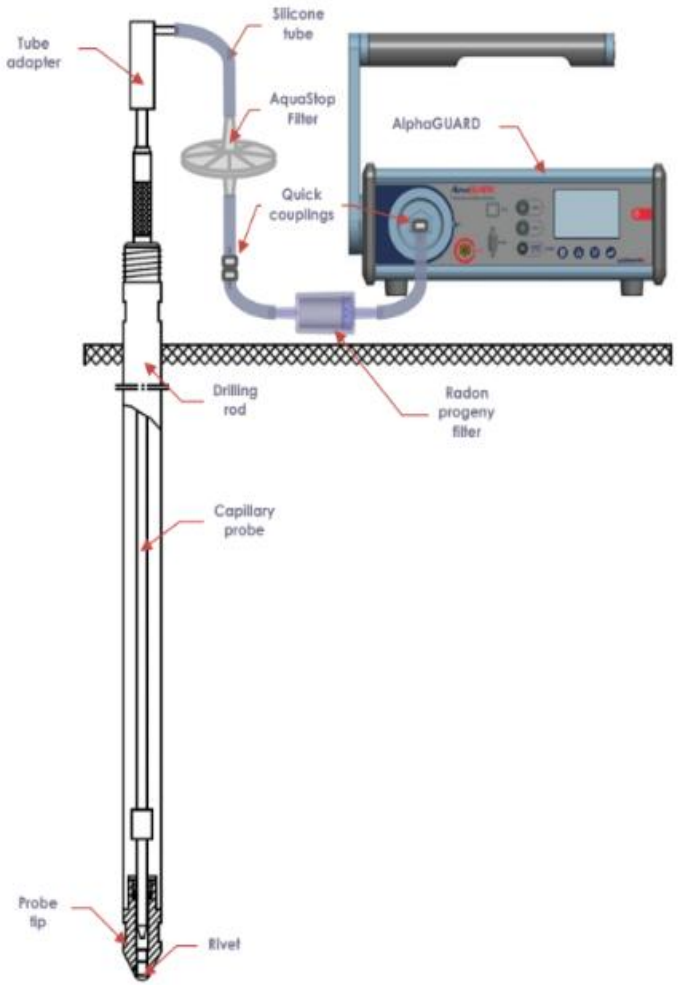
Lab 2: Measurement of radon in water and soil using the alphaguard



Supervisor: drs Diogo Almeida

Lab 3: Study of jewellery with XRF

- Dangerous metals in jewellery
- Nickel, lead and cadmium in jewellery are covered by legislation.
- Study will be done on jewellery imported from Asia and other non-European regions

Always use the light stand and safety shield (or the bench top stand) when measuring small samples.

Supervisor : ing Eva Vandersmissen

Picture: https://rotaxmetals.net/brass-jewelry-pros-and-cons/

'Serious safety risks', warns Belgian consumer watchdog over Temu and Shein

Thursday, 30 October 2025

By The Brussels Times with Belga

Necklaces, while less hazardous overall, often contained excessive levels of cadmium, a toxic and carcinogenic metal. One piece tested contained 8,500 times the legal limit.

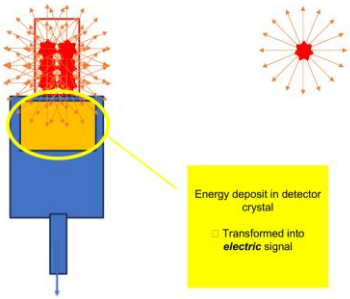
Report: https://www.brusselstimes.com/1818672/serious-safety-risks-warns-belgian-consumer-watchdog-over-temu-and-shein

Lab 4: Characterising NORM samples using HPGe spectroscopy

- From preparation steps to measurements and data analysis
- CaF2 samples

Supervisor : drs. Daan Schoefs

HPGe in a nutshell

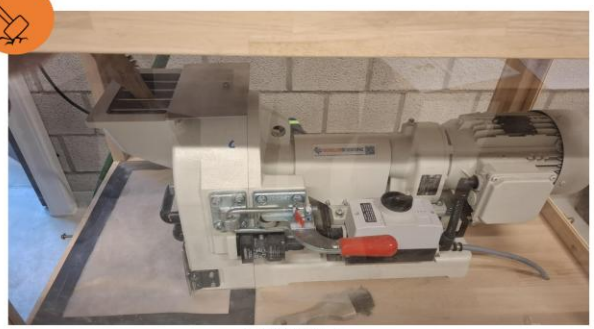


What will we do?

GOAL: Identify and quantify radionuclides in an environmental sample

SAMPLE PREPARATION | DETECTOR CALIBRATION | MEASUREMENT OF THE SAMPLE | ANALYSIS OF THE SPECTRUM

Our equipment



Material crusher

Reduce the particle size of the dry material

Homogenize the sample

Our equipment

HPGe Detector in lead castle

Inside of the lead castle

Used for research

Expensive & fragile equipment (> 100k EUR)

Handle with care!

Users should be **prepared**

When in doubt, questions **should** be asked before further action

EnvirAI labs @ partner He2B

- Charcoal canisters/radoneye exposed at
  - students @ home,
  - in radon chamber He2B

- Wednesday

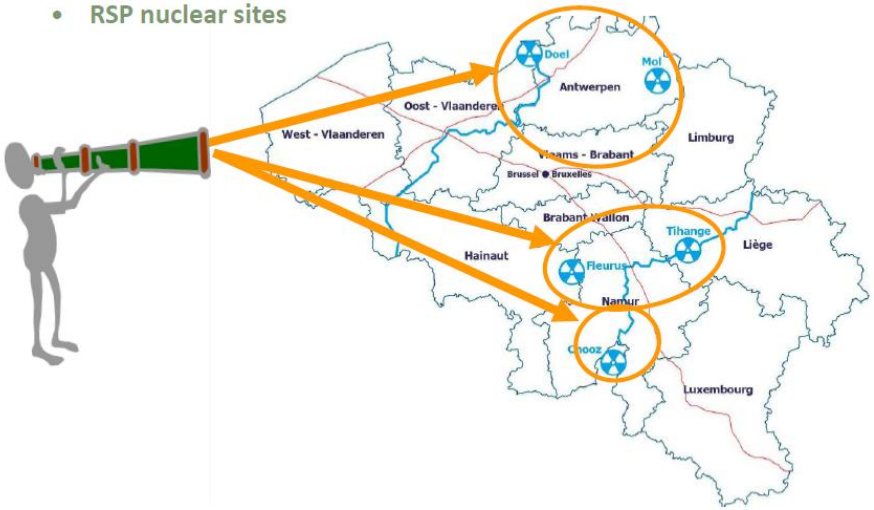
  - NaI spectrometry for radon canisters
  - HPGe analysis of soil samples
  - XRF on paintings
  - NaI spectrometry on food samples (K-40 in milk)

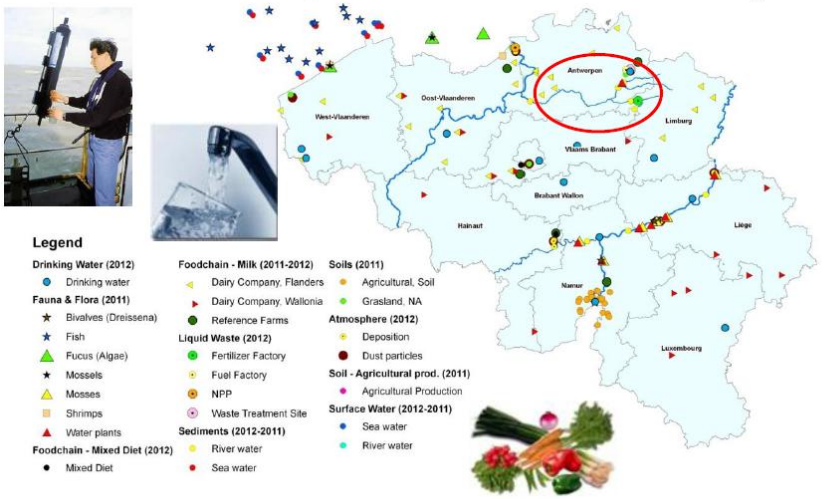
FANC

Boris Dehandschutter

Radiological Surveillance Program in Belgium

- NORM related issues (NORM industry, building materials, …
- RSP Reference zones
- RSP nuclear sites





AI tips and tricks workshop

Supervisor : Prof dr Elke Emmers,
drs Miette Plessers, drs. Luciano Pierson

Literature Review & Information Management

Literature Discovery Tools

- **Connected Papers:** Visualizes citation networks to discover related research and identify influential papers in your field
- **Consensus:** Searches academic literature and summarizes findings using AI to extract key conclusions
- **Scholar GPT:** Conversational AI interface for searching and understanding academic papers

Reference Management Tools

- **Zotero/Mendeley:** Organize citations, generate bibliographies, and annotate papers with AI-enhanced features
- **Systematic Review Support:** AI (Rayyan) can assist with abstract screening, identifying relevant studies, and extracting data for meta-analyses

Discussions and interactions

I Find It Acceptable to Use AI to Write My Scientific Texts

I Should Keep My AI Use Secret from My Supervisor 🤫

Data Analysis & Visualization

Statistical Analysis Tools

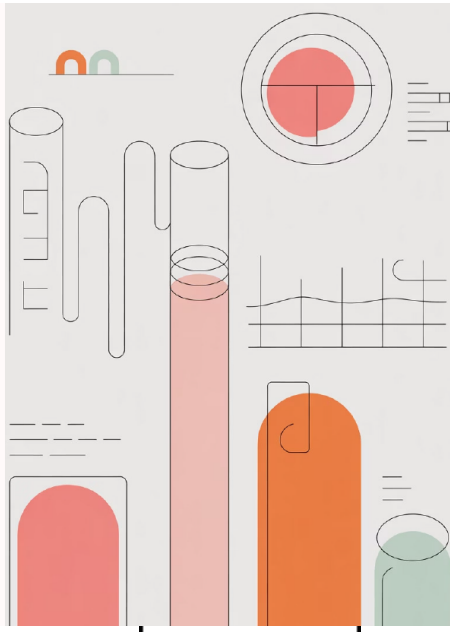
Traditional Software Enhanced by AI:

- **SPSS, SAS, R:** Now feature AI-powered syntax suggestions and automated analysis recommendations
- **Automated Prompts:** These tools can now suggest appropriate tests based on your data structure and research questions
- **ChatGPT Consultation:** Ask "which analysis?" questions to understand options before committing to an approach

Visualization Tools

Creating Impactful Graphics:

- **Tableau:** Transforms complex datasets into interactive, publication-ready tables and charts
- **Canva & DALL-E:** Generate conceptual models, theoretical frameworks, and explanatory diagrams
- **AI-Enhanced Design:** Suggests color schemes, layouts, and visual hierarchies for maximum impact

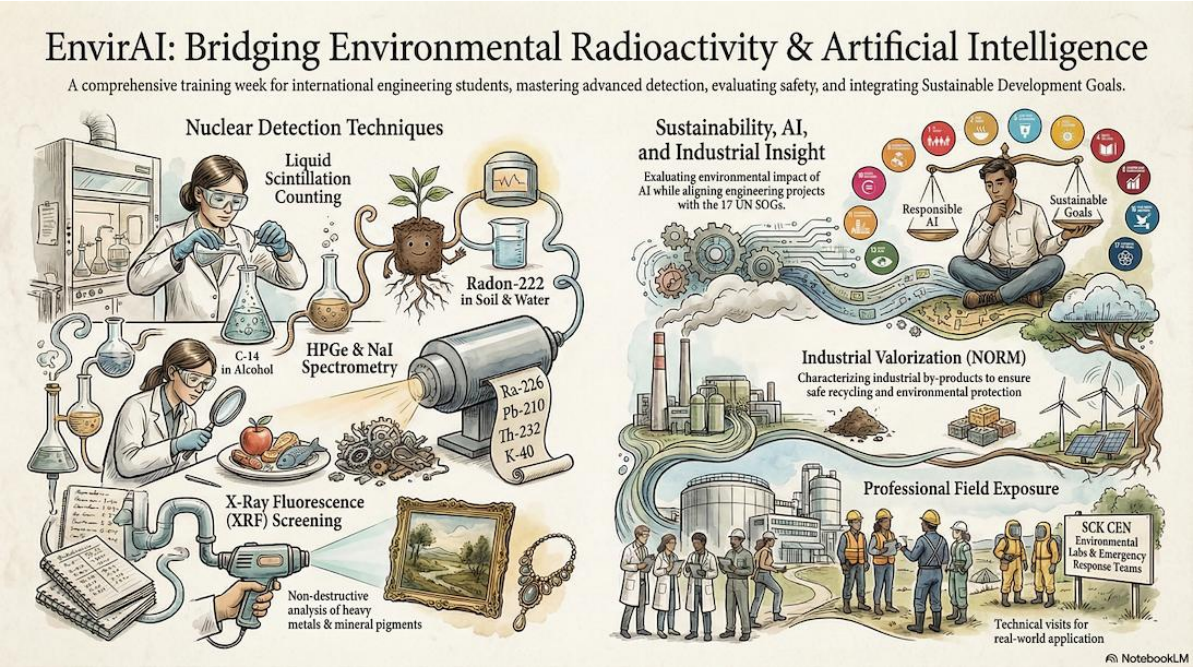


Introduction of SCK CEN and the SCK CEN Academy *GKD training room, ground floor*	**Tom Clarijs**
Group 1 | Visit of the LRM (Low-level Radioactivity Measurements) laboratory *GKD building, LRM lab, ground floor*	**Mirela Vasile**
Group 2 | Radioactivity measurements in the environment *Training room GKD building, ground floor & skills lab*	**Johan Camps & Jonas Jacobs**

Evaluation

On-site 2ECTS

- Team work during lab sessions 10%
- Presentation: content and understanding: important 50%
- Creative output produced using AI tools 10%



Impact study

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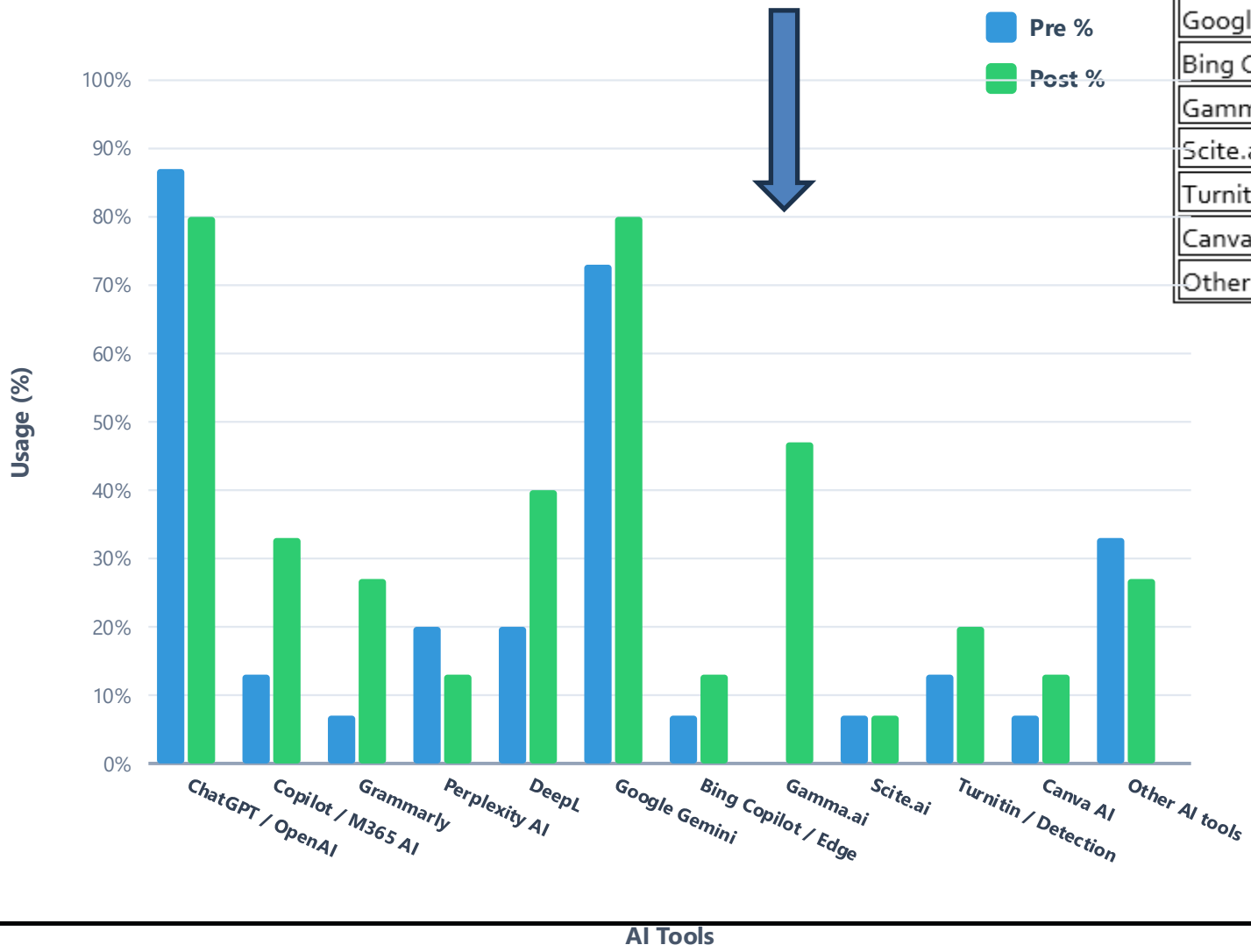
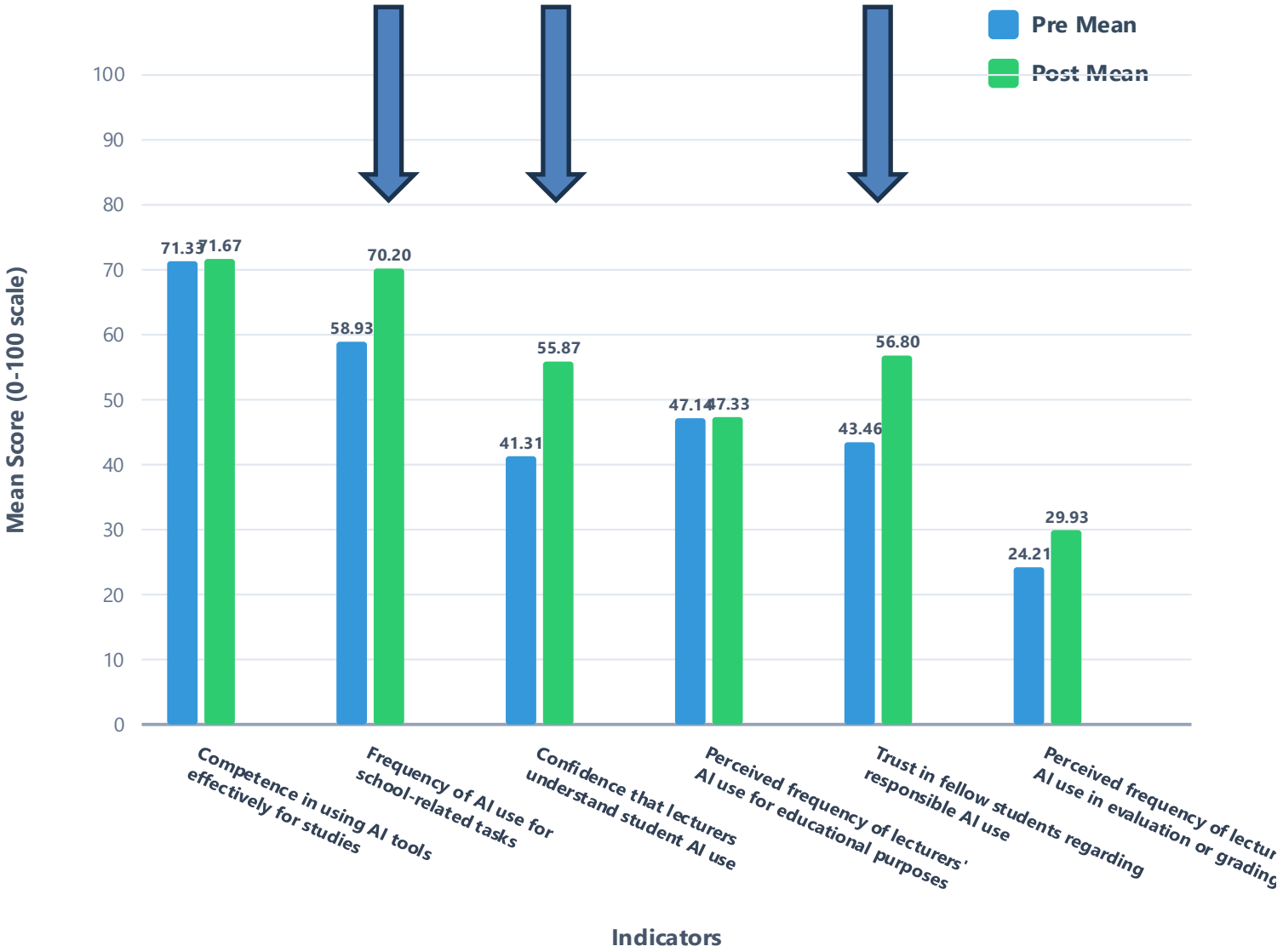
Preliminary results

AI Tool	Pre %	Post %
ChatGPT / OpenAI tools	87%	80%
Copilot / Microsoft 365 AI	13%	33%
Grammarly	7%	27%
Perplexity AI	20%	13%
DeepL	20%	40%
Google Gemini	73%	80%
Bing Copilot / Edge	7%	13%
Gamma.ai	–	47%
Scite.ai	7%	7%
Turnitin / AI Detection Tools	13%	20%
Canva AI	7%	13%
Other AI tools	33%	27%



Preliminary results

Frequency of AI Use and Perceived Competence (Pre vs. Post)



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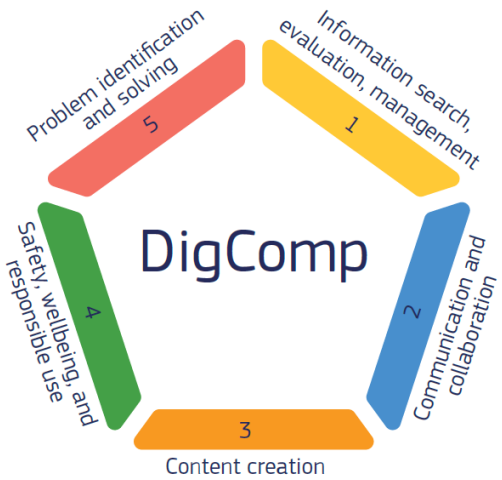
Preliminary results

Table 4.3. AIMES responsible AI indicators pre–post descriptive comparison

AIMES Dimension	Pre Mean	Post Mean	Pre N	Post N	Difference
Ethical AI use and maintaining personal agency	2.19	2.33	16	15	+0.15
Effective AI use and peer prompting practices	2.12	1.93	16	15	-0.19
Verifying AI outputs for accuracy	5.62	5.67	16	15	+0.04
Understanding AI capabilities and limitations	2.25	2.53	16	15	+0.28
Protecting personal and sensitive data	2.38	2.53	16	15	+0.16
Transparency regarding AI assistance	5.00	5.07	16	15	+0.07
Seeking transparency and explanations from AI systems	2.50	2.73	16	15	+0.23
Awareness of bias, fairness and inclusivity	2.00	2.20	16	15	+0.20
Considering societal and environmental implications	1.94	1.93	16	15	-0.00
Accountability and following institutional guidelines	2.38	2.60	16	15	+0.23

Future: Responsible Digital competences DIGI-ACT project



Fact:

- rapid changes in digital technologies impacting all sectors, mainly related to AI development
- 56% of adult and 43% of high school students admit having lack in basic digital skills(*)
- 92% of EU workers need digital tools and devices to perform their job(*)
- Nuclear is a very sensitive sector

Need to develop specific training to

- Encourage a responsible and ethical use of AI in their own studies and future job
- Pointed out the environmental impact of these practices

(*)DigComp 3.0 European Digital competences Framework 5th edition December 2025

Conclusions

- Innovative education and short term mobility for staff and students

- Integration of Technical, Durability, and AI Competencies in Blended International Training weeks for nuclear engineering students

  variety of learning activities

  variety of skilled trainers

- Assessment based on different components (KSA)

- Impact study : preliminary results of 1 training week

  new AI tools

  small attitude changes

Thanks to all colleagues and external partners to collaborate in this project!
Thanks for the financial support of DIOS@UHasselt

Thank you for your attention!