

HCAIM Human Centred Artificial Intelligence Master's

Péter Hanák, BME VIK, phanak@edu.bme.hu

Special thanks to
Péter Antal, BME MIT, antal@mit.bme.hu

The HCAIM project

Duration: January 2021 – March 2024

- ***A collaboration between industry, academia and research centres to define the BoK* for AI developers in a European context***
- ***Four Masters Programmes focussing on Human-Centred AI***
- ***Online courseware in EU languages***

*BoK = Body of Knowledge, the complete set of concepts, terms and activities that make up a professional domain (Wikipedia)



Co-financed by the Connecting Europe
Facility of the European Union

Who ? A consortium of ...

Universities



Research Centers



SMEs



WHAT is Human-Centred Artificial Intelligence?

The **human-centric approach to AI** strives to ensure that **human values are central to how AI systems are**

- developed,
- deployed,
- used and
- monitored,

by ensuring respect for fundamental rights.*

* Definition of the European Commission's High-level expert group on Artificial Intelligence

Motivating factors

Technology is not the only factor in the success of AI

- Technology has advanced rapidly in the last few years
- **AI has started to move from Labs to Society**
- The 'big questions' are no longer (only) about technology...

Social and legal aspects are more and more important

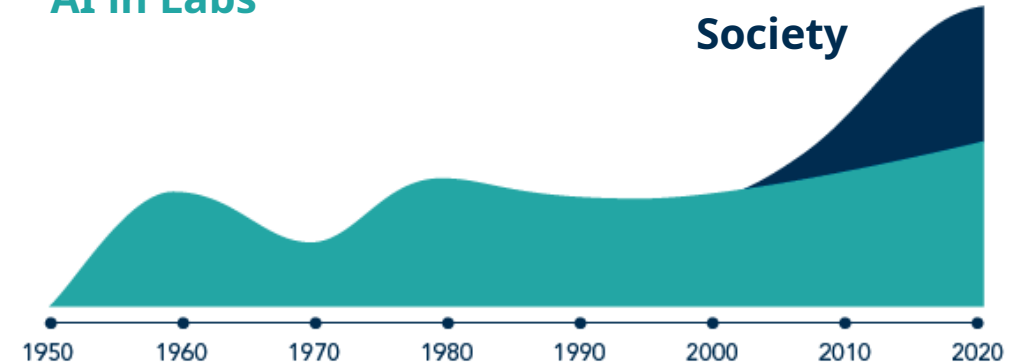
- EU (and others) are recognizing AI as 'transformational technology'
- Comparable to the invention of steam power, electricity, and the digital computer
- Lasting impact on society
- Regulation required to get it right → in progress in 2024

Design factors

- Plenty of ethics and law (> 15 ECTS)
- Integration of ethics with technology
- Attention on application & deployment of AI
- Research-driven

AI in Labs

AI in Society



Source: NL Scientific Council for Government Policy, "Opgave AI", 2021-11-11

Huge changes since 2020 when HCAIM was conceptualized (said by ChatGPT)

- **Generative AI Breakthroughs** (e.g. GPT-4, text & image)
- **Multimodal AI** (text, visual, auditory and sensory data)
- AI in Scientific Progress (eg. chemistry, material science)
- **Specialized AI Tools** (healthcare, finance, etc.)
- **AI in Governance and Regulation** (e.g. EU's AI Act)
- AI Copilots (for cybersecurity, decision-making, etc.)

Question: What are the most significant advances in AI since January 2021 upto now? Please give a short list of them.

**ChatGPT with GPT-4 capabilities
(version November 2024 update)
Date of inquiry: Nov. 23, 2024**

ChatGPT: Here are some of the most significant advances in AI from January 2021 to now:

- 1 Generative AI Breakthroughs:** Generative AI models like OpenAI's GPT-4 and Google's Gemini Ultra reached unprecedented capabilities. These models are being used not just for text and image generation but for scientific discovery, creative tasks, and process optimization ([Analytics Insight](#), [World Economic Forum](#)).
- 2 Multimodal AI:** AI systems are becoming more versatile, integrating text, visual, auditory, and sensory data for richer, more human-like interaction ([Analytics Insight](#)).
- 3 AI in Scientific Progress:** AI applications such as Synbot (for molecule synthesis) and GNoME (for discovering stable crystals) are advancing research in chemistry and materials science ([World Economic Forum](#)).
- 4 Specialized AI Tools:** A shift toward creating AI tailored to specific industries and functions has accelerated, with examples in healthcare, finance, and supply chain management ([Analytics Insight](#), [RTInsights](#)).
- 5 Increased Investments in Generative AI:** Despite an overall decline in AI investments, funding for generative AI skyrocketed, attracting \$25.2 billion in 2023—nine times more than in 2022 ([World Economic Forum](#)).
- 6 AI in Governance and Regulation:** AI-related regulations have grown, especially in the U.S. and Europe, reflecting the global emphasis on responsible AI use ([World Economic Forum](#)).
- 7 AI Copilots:** Tools like Microsoft's Security Copilot exemplify AI's integration into specialized roles such as cybersecurity, enhancing efficiency and decision-making ([Analytics Insight](#)).

These advancements highlight AI's rapid evolution and integration into diverse fields, setting the stage for transformative impacts across industries. Let me know if you'd like detailed insights into any specific area!

From the chapter on “The impact of Generative AI”

Opportunities and possibilities

Generative AI as a Production tool

Efficiency and quality business processes



Creative process

IT



Material prosperity

New Jobs



Quality of work

Government functioning



Legal tech

Generative AI as a Learning tool

Language and translation



Education

Search engines



Interactive support

Generative AI as a Problem solver



Scientific domain
Drug development

Materials like batteries



Healthcare

Societal issues, sustainability



Military domain

Cybersecurity



Challenges and risks

Impact on individual citizens

Bias/discrimination



Privacy, data protection, user autonomy

Cognitive development
Social development



Copyright, neighbouring and database rights, portrait rights

Dependence and market power

Increasing dependence on US Tech companies
Strategic dependencies



Concentration of power
Entry barriers

Labour and labour market

Employment, Income distribution
Wage decline



Quality of work

Income distribution
Job security
Polarisation labour market



Impact on society

Superstar firms
Increasing social and economic inequality



Substantial energy demand
Climate change

Degradation of information ecosystem
Mis- and disinformation



Uncertain reliability
automation bias

Military security
Systemic security



Misuse and abuse
Hate speech

Source:
The government-wide vision on Generative AI of the Netherlands, 2024-01-07

<https://www.government.nl/documents/parliamentary-documents/2024/01/17/government-wide-vision-on-generative-ai-of-the-netherlands>

Their claim:
The first government strategy in Europe

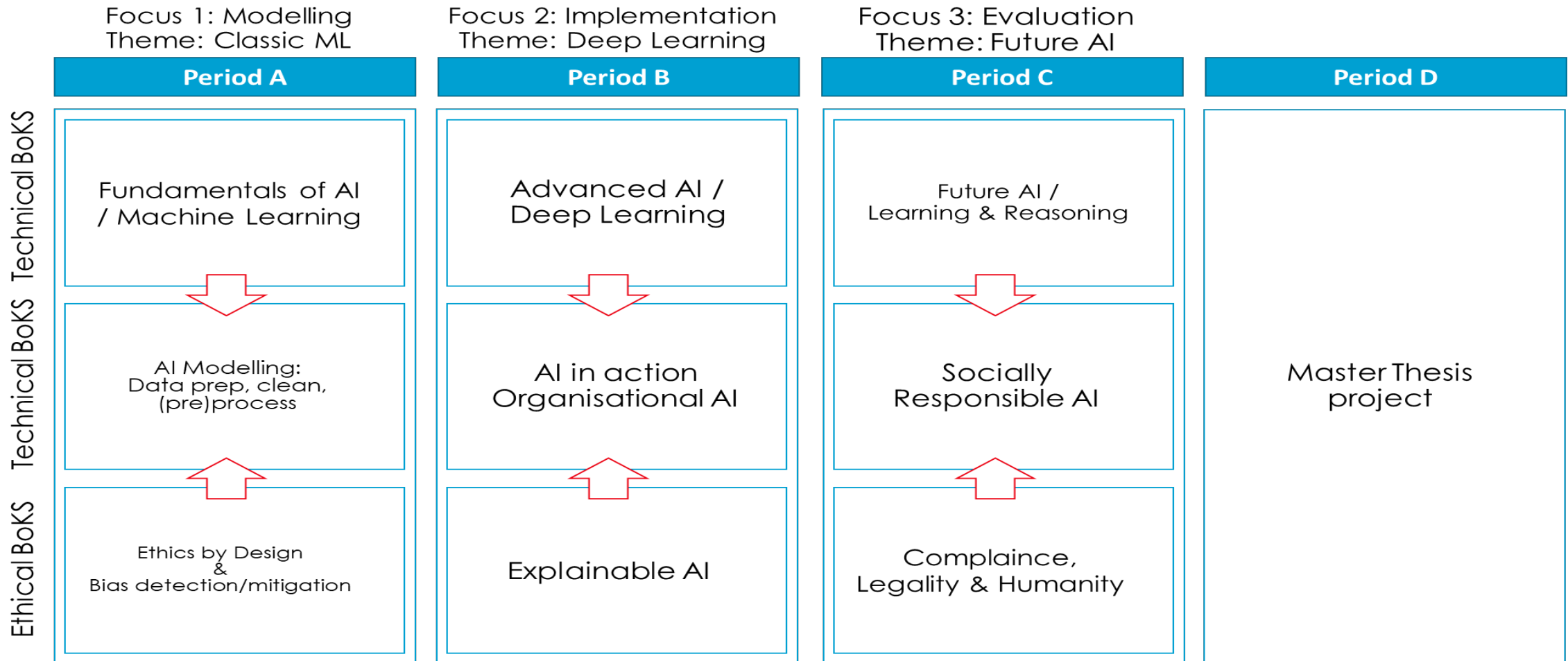
WHAT is Human-Centred Artificial Intelligence?

The human-centric approach to AI strives to mitigate the potential risks related to AI.

The HCAIM course prepares students to

- **create and implement AI innovations, in order to**
- **harness the potential and benefits of AI digital society, while**
- **avoiding or mitigating the risks related to AI.**

Major topics



Specialities at BME

* The 60-credit HCAI masters is **embedded** in the 120 credit Computer Engineering masters.

* CE Students at our AI specialisations have **alternatives** so they can **optimize** their studies.

MSc at BME

HCAIM at BME

Course type			Course group	Course title	Neptun code	ECTS	ECTS req.				
HCAIM	BME	BME					min.	max.			
I.											
Basic	Common	From each group, "ECTS req. min." must be completed. From each group, at most "ECTS req.. max." may be recognized within the 60 HCAIM credits.	1	Applied algebra and mathematical logic (autumn)	TE90MX75	5	5	5			
				Mathematical statistics (autumn)	VISZMA11	5					
				Stochastics (autumn)	TE90MX77	5					
	Specialization-dependent				2	Machine learning (spring)	VIMIMA27	5	5	5	
						3	Deep Learning (autumn)	VITMMA19	5	4	14
							Deep Learning in Practice with Python and LUA (autumn)	VITMAV45	4		
							Application of Deep Learning in Visual Computing (spring)	VIIIMB10	5		
							Neural networks (spring)	VIMIJV07	4		
						4	The security of machine learning (spring)	VIHIMB09	5	5	10
							Trusted artificial intelligence and data analytics (spring)	VIMIMB10	5		
	Elective					Artificial intelligence and ethics (spring)	GT41V105	2	2	2	
						Artificial intelligence and law (autumn)	GT55V106	2	2	2	
						Artificial general intelligence (autumn)	VIMIIV22	2	2	2	
Common				Project lab 2 (with AI content)		5	5	5			
				Thesis work 1 (with AI content)		10					
				Thesis work 2 (with HCAI content)		20	15	15			
A. HCAIM basic, total						89	45	60			
II.											
Optional	Common	Mandatory completion depending on specialization		Project lab 1 (with AI content)		5	0	5			
				11	Intelligent data analysis and decision support (spring)	VIMIMB09	5	0	5		
	Business intelligence (autumn)		VIAUMA24								
	AI-based human-machine interaction (autumn)		VITMMA23								
	12		Machine learning case studies (autumn)	VITMMA18	5	0	5				
Business intelligence lab (spring)		VIAUMB09									
	UX laboratory (spring)	VITMMB14									
	13	Advanced data analysis methods lab (spring)	VITMMB10	5	0	5					
B. HCAIM optional, total						20	0	20			
HCAIM basic + specialization optional, total								45	80		
III.											
Optional	Elective	Recognizable	14	Any HCAI related course (after prior arrangement)							
HCAIM optional, elective courses to the minimum 60 ECTS								15	0		

Major tasks and project achievements

- Curriculum development:
- [Overview](#) * [Modules](#) * [Modules in detail](#) *
[Learning events in 22 languages](#)
- Public webinars on [LinkedIn](#) and [YouTube](#)
- Scientific conferences:
- HCRAI, June 2023, Budapest;
- HCAI-EP, Dec. 2023, Dublin & 2024, Naples
- Hackathon competitions (Ethicon) in 2022 and 2023, online
- [Blended Intensive Programs](#) with Erasmus support in Utrecht:
- 2022/23 ~45 students, 2023/24 ~25, 2024/25: ~80 expected

Webinars

THE AGE OF CYBORG
ETHICAL, POLITICAL, SOCIAL AND ECONOMIC IMPLICATIONS OF HUMANS AND MACHINES

ALESSANDRO BARDUCCI
R&D MANAGER

www.humancentered-ai.eu

FRIDAY, MAR 25, 2022
15:00 - 15:45 CET

Co-financed by the Connecting Europe Facility of the European Union

FOLLOW US ON [social media icons]

PROVABILITY, ACCOUNTABILITY, UNDERSTANDABILITY
AND THEIR ROLE IN ETHICS GUIDELINES

DR. PÉTER ANTAL
DR. MIHÁLY HÉDER

www.humancentered-ai.eu

THURSDAY, NOV 25, 2021
13:00 - 13:45 CET

Megtekinthető itt: YouTube

FOLLOW US ON [social media icons]

MEET THE INSTRUCTORS!
DEMO & WORKSHOP: SILENT SPEECH INTERFACES & HCI/ML ASPECTS

TAMAS GABOR CSAPO, PHD
ASS. PROF @ BME

www.humancentered-ai.eu

THURSDAY, APRIL 28TH, 2022
15:00 - 15:45 CET

Co-financed by the Connecting Europe Facility of the European Union

FOLLOW US ON [social media icons]

MEET THE INSTRUCTORS!
DEMO & WORKSHOP: SECURITY AND PRIVACY IN MACHINE LEARNING

GERGELY ÁCS, PHD
ASS. PROF @ BME

www.humancentered-ai.eu

THURSDAY, APRIL 14TH, 2022
15:00 - 15:45 CET

Co-financed by the Connecting Europe Facility of the European Union

FOLLOW US ON [social media icons]

making ai trustworthy

OCT 7TH, 2021
13 PM - 14 PM

Dr. Stefan Leijnen
Prof of Research Group AI
HU University of Applied Sciences, Utrecht

Tarry Singh
CEO deepkapha AI Lab, Real AI B.V., Assen, Netherlands

Students at BME VIK

- Number of students „enrolled” so far for HCAIM: ~90 in total
- Graduates in 2022: 3 (three)
- Graduates in 2023: 8 (eight)
- Graduates in Spring 2024: 5 (five)
- Graduates expected in Autumn 2024 and in 2025: upto 20 (twenty)
- There are a few students from other BME faculties
- Dropout is relatively high as students are under time constraints

Continuation project: PANORAIMA

Acknowledgements

to the HCAIM teams in five countries,
especially

Barry Feeney, TU Dublin, IE: project leader

Huib Aldewereld, HU, NL

László Jereb, BME VIK: local project leader

Péter Antal, BME MIT

Mihály Héder, BME GTK

Thank you for your attention!