Generative AI and knowledge work

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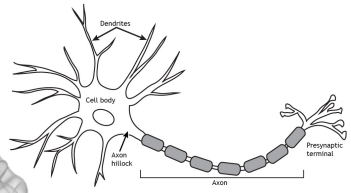
Based on work by Astri Barbala, Rasmus Ulfsnes, Marius Mikalsen and Viggo Wivestad

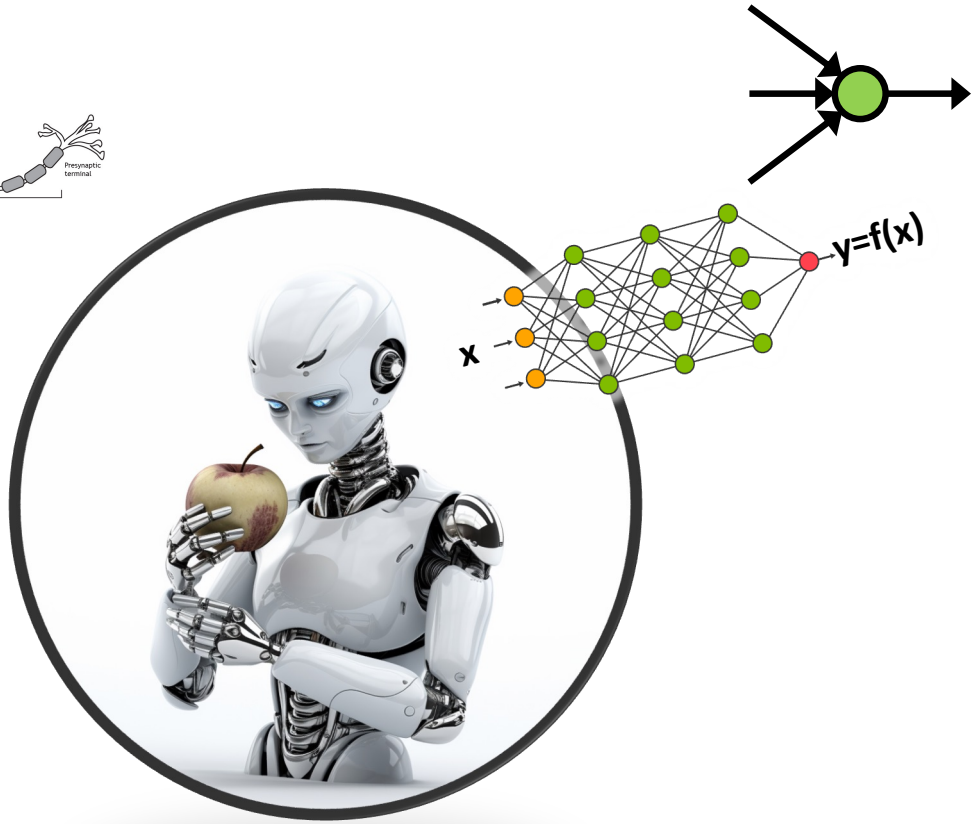
Technology for a better society

Knowledge work

- Examples are engineers, scientists, physicians, ICT-developers etc.
- The main capital is knowledge which is used and produced (and applied to the physical world)
- ICT-developers (e.g. Software programmers) relate to many forms of knowledge
  - The domain (e.g. cancer treatment)
  - The problem (e.g. analyzing tissue)
  - People and processes (e.g. medical procedures)
  - Data (e.g. medical imagery and patient records)
  - The solution (e.g. in the form of software or code that uses data to produce a service to resolve a problem)
- Software is codiefied knowledge in the form of computer programs which is instructions on how to process data and provide results
- Software can be considered as data and is a huge case for generative AI (ChatGPT, GitHub Co-pilot, etc.)

Neural Networks



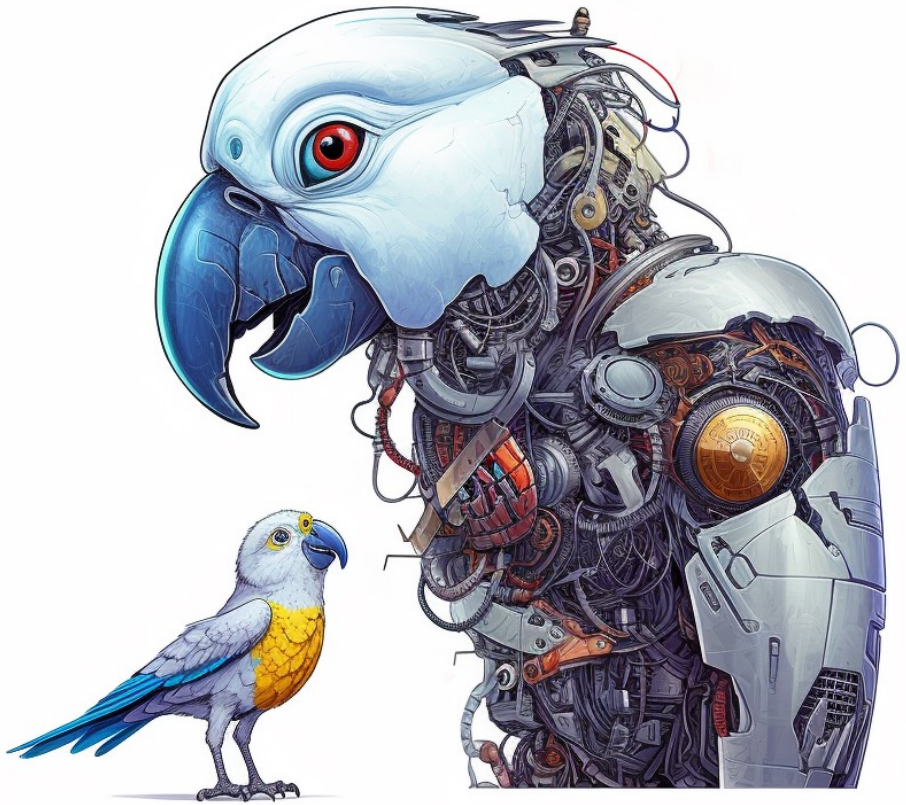


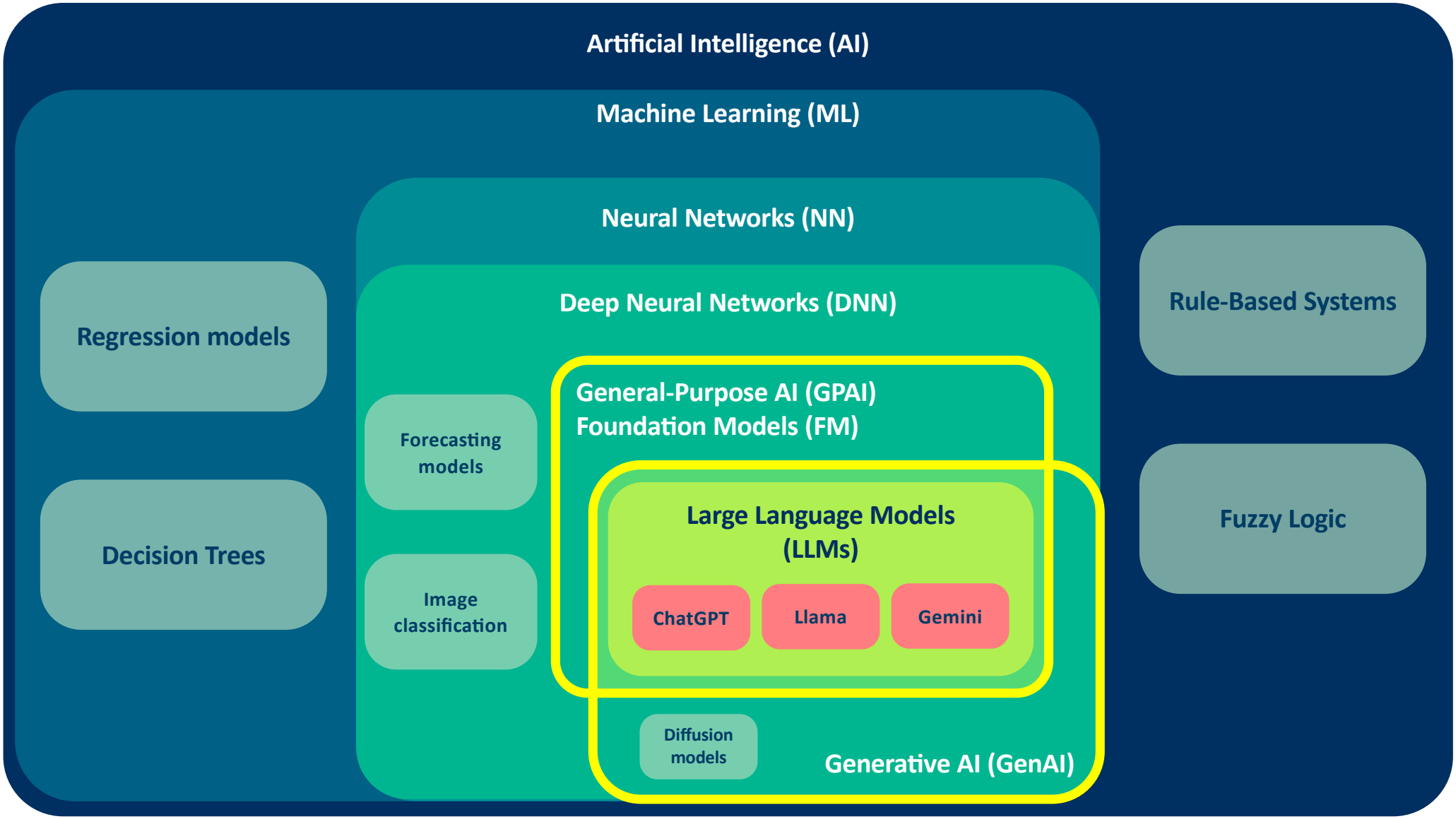
Without training	250 rounds of training	5.000 rounds of training	30.000 rounds of training
"You must decide for yourself," said Elizabeth L;_FfsqeW9*M)4OCg4AAm-x_4t:h WXkm3i5qEt*f0btTf!1,VKle[T?V5 238 qw_34g"?4iQ(C79UoK"dq3SEHC" L.(tEx9CY0wutdgjj!hZl2.Q[G A'D6gsm aP6!!s*Kq4(lA";ZNA9]OS4y":U,RR bss;MNkhONT7Owpp_!Gl!yprd8b : REwOPPUn4c-Scaa_kKQXDD3bS)S?9pN(MXN ?G9?!;Y2Dz[[aZa:	**"You must decide for yourself," said Elizabeth** gra buseriteand the utharth s atouchanders nd shadeto the se owrerer o thino athe athetlf w wad asire tutor t m wo sinast othe wo t Mr m ve the Shersour us mass ho'sed t tha shan all athok I rs ofit yo t onchthe axpld ndise fas e trnglad fere sed, orou ke as thelf se wn the tnn cenneng. f hachaplll I fmy n p oth ther o mbe butane. hastamt ok, f warot Bere a unge sen t t they op "Yo she aise tho hiven tise He sus y athire wald wal be, o akrer etlas o	**"You must decide for yourself," said Elizabeth**, rather repeated an unhappy confirmed, "as now it is a few eyes," were there at Anne's like walking to meet that she always were quite married that some uncumstant's decent the imagination of side, for their two secondness which going at Here fault would be to the same between the necessary. "He was never known that she began and interest of situation."	**"You must decide for yourself," said Elizabeth**, rather repeatedly; "that is very agreeable displeasure, they will ever be a lively young woman as it will be more disagreeable." "My dear Fanny, who is a match of your present satisfaction, and I am at liberty and dinner, for everybody can be happy to you again; and now when I think I used to be capable of other people, by being hastily used to be forgotten in something of the little first possibility of my usual taste which such a party as this word.

NY Times | GPT from scratch

Language model ≠ knowledge model

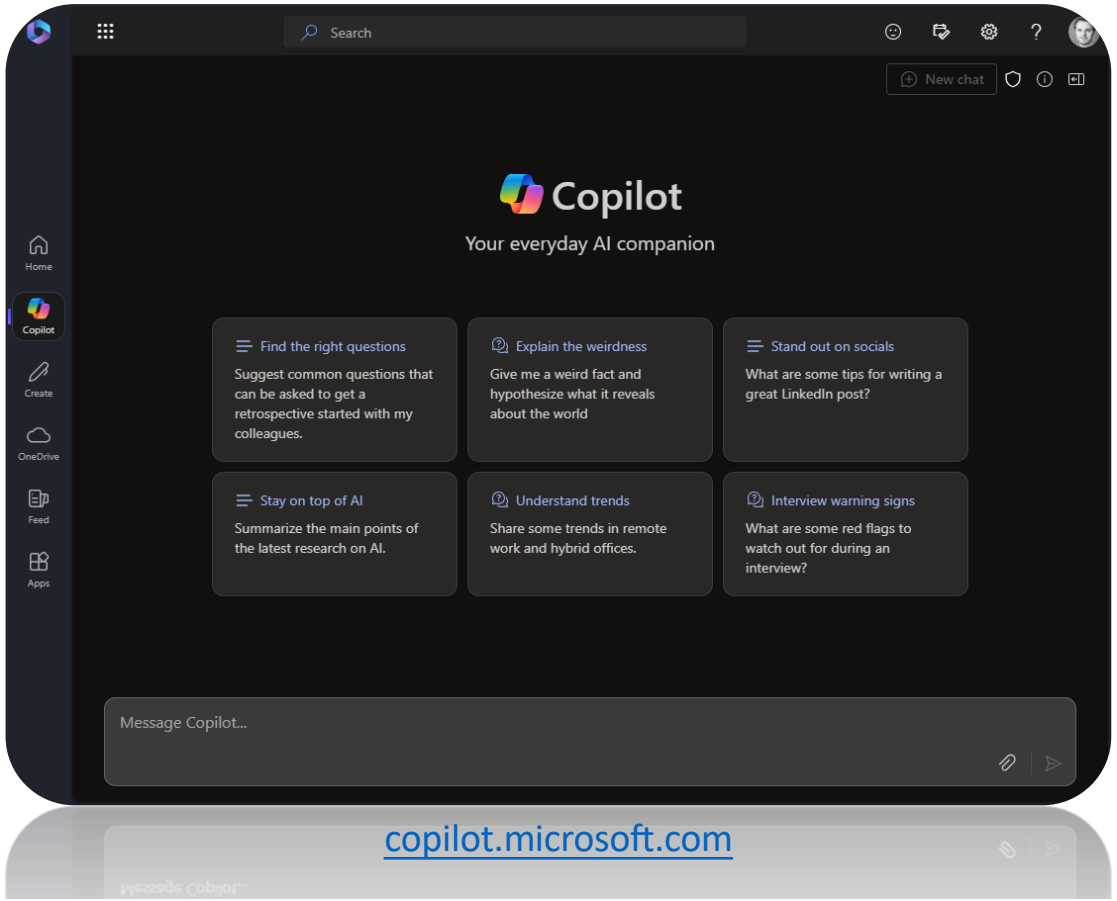
- Doesn't 'know' facts, but generates language based on patterns.
- Responses are based on patterns seen during training, not factual recall
- Stochastic parrot: though able to generate plausible language, do not understand the meaning of the language they process.




Artificial Intelligence (AI)
Machine Learning (ML)
Neural Networks (NN)
Deep Neural Networks (DNN)
Regression models
Decision Trees
Forecasting models
Image classification
General-Purpose AI (GPAI)
Foundation Models (FM)
Large Language Models (LLMs)
ChatGPT
Llama
Gemini
Diffusion models
Generative AI (GenAI)
Rule-Based Systems
Fuzzy Logic

Chatbot Assistants

- Your personal assistant
- Answer questions (prompts)
- Discuss, discover and learn
- Draft documents
- Improve language
- Create images
- …
- Be creative!



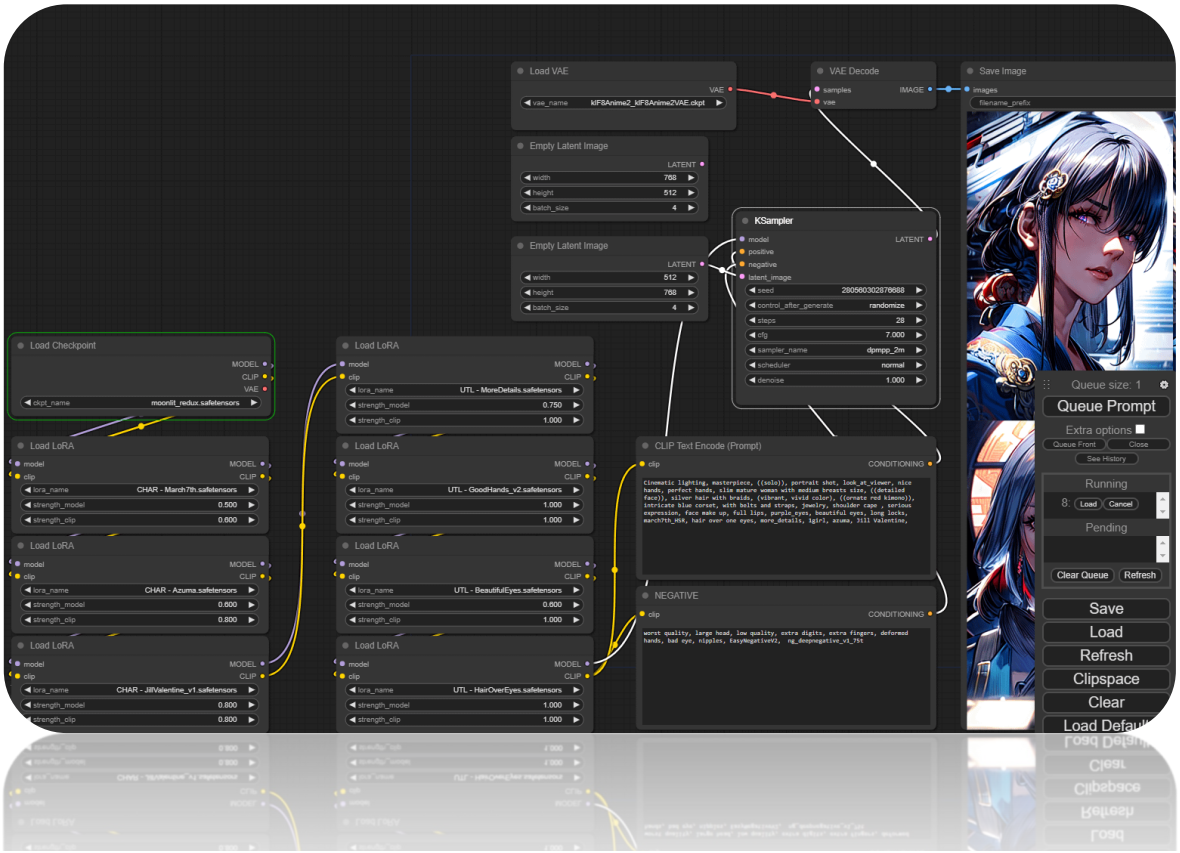
copilot.microsoft.com

Image generation

- Some popular choices
  - 🤖DALL-E
  - 👑Midjourney
  - 🛠️Stable Diffusion
    - Simple: EasyDiffusion or Fooocus
    - Standard: Automatic1111
    - Most versatile: ComfyUI

Resources:

- openai.com/research/dall-e
- docs.midjourney.com
- stable-diffusion-art.com



Video generation

- Text-, image-, or video-to-video
- Current hype: OpenAI's Sora

- Open-surce alternatives
  - Stable Diffusion with plugins like AnimateDiff + ControlNet + AutoMask
  - Stable Video Diffusion

Generative design (3D models)

- Text-to-«3D Models»
  - lumalabs.ai/dashboard/imagine
    github.com/openai/point-e
- Generative optimization algorithms
  - Fusion 360 Generative Design Extension

Software Development

AI-based coding assistants

- Commercial:
  - GitHub Copilot
  - Amazon CodeWhisperer
  - Google Duet AI
- Local, open-source alternative:
  - TabbyML with e.g. StarCoder, CodeLlama, etc.

Two recent studies

(1) Generative AI in the Workplace: Affective Affordances and Employee Flourishing

Astri Barbala, Rasmus Ulfsnes, Viktoria Stray, Viggo Tellefsen Wivestad

*RQ: How can Generative AI facilitate **affective experiences** in a workplace context?*

30 interviews:

- A Nordic public sector organization, 20,000 employees
- A global service provider in the maritime sectors employing over 3,500 staff worldwide
- A technology-intensive consultancy firm with approximately 2,600 employees
- A start-up-focused IT consulting company with around 80 employees.

+ Slack channel observations

(2) From generation to application: Exploring knowledge workers' relations with GenAI

Rasmus Ulfsnes, Marius Mikalsen, Astri Barbala

*RQ: How are knowledge **workers' relations to GenAI** generated and applied in practice?*

12 interviews:

- A technology-intensive consultancy firm with approximately 2,600 employees
- A start-up-focused IT consulting company with around 80 employees

+ Slack channel observations

Semi-structured interview guides -> MS Teams recording -> Transcribed w/Whisper
-> Thematic analysis of interviews and Slack dialogues w/Nvivo

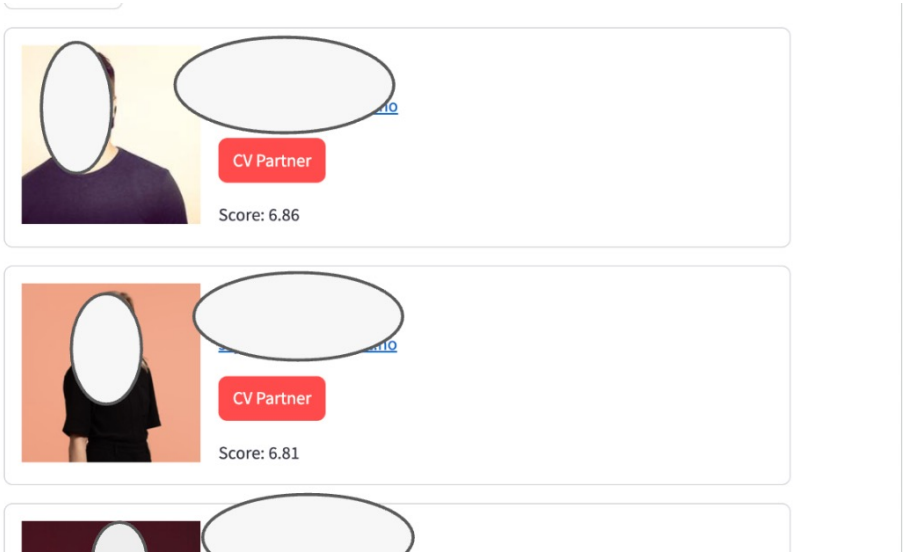
Knowit AI-lab - Evolving Work Processes Through Human-AI Collaboration

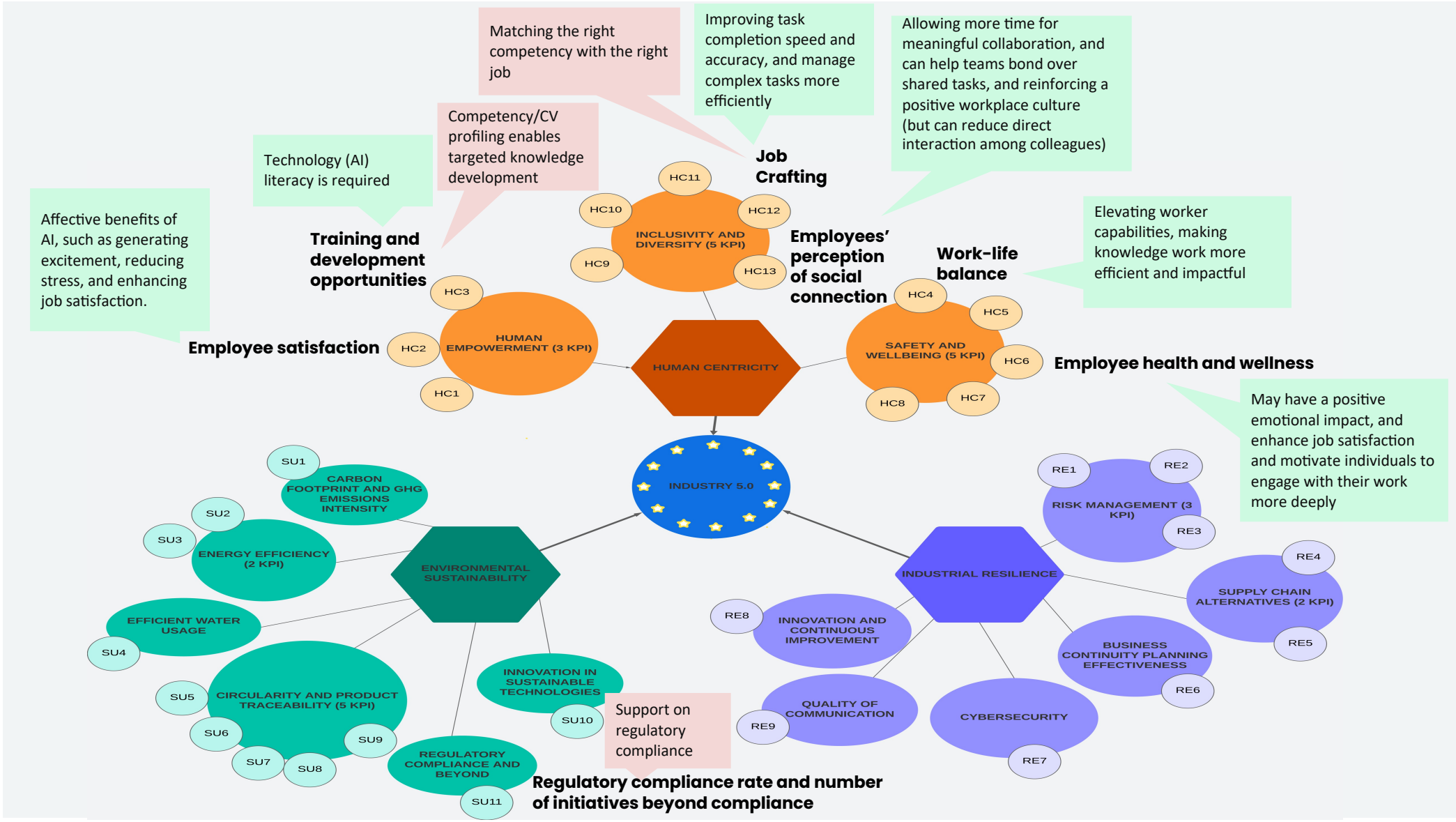
Focus on sales processes and competence management.

- Competence mapping through CV and project history analysis
- Data-driven bidding support
- Predictive project staffing
- Addressing data privacy and maintaining human touch
- Ongoing refinement based on data and user feedback

CV-Role Matcher

Role matching takes in a bid, then compares this with all consultants and provides those who match.




Matching the right competency with the right job
Improving task completion speed and accuracy, and manage complex tasks more efficiently
Allowing more time for meaningful collaboration, and can help teams bond over shared tasks, and reinforcing a positive workplace culture (but can reduce direct interaction among colleagues)
Competency/CV profiling enables targeted knowledge development
Technology (AI) literacy is required
Job Crafting
Training and development opportunities
Employees' perception of social connection
Work-life balance
Affective benefits of AI, such as generating excitement, reducing stress, and enhancing job satisfaction.
Elevating worker capabilities, making knowledge work more efficient and impactful
HC11
HC10
HC12
INCLUSIVITY AND DIVERSITY (5 KPI)
HC9
HC13
HC3
HUMAN EMPOWERMENT (3 KPI)
HC2
HC1
HUMAN CENTRICITY
HC4
HC5
SAFETY AND WELLBEING (5 KPI)
HC6
HC8
HC7
Employee satisfaction
Employee health and wellness
May have a positive emotional impact, and enhance job satisfaction and motivate individuals to engage with their work more deeply
INDUSTRY 5.0
SU1
CARBON FOOTPRINT AND GHG EMISSIONS INTENSITY
SU2
SU3
ENERGY EFFICIENCY (2 KPI)
ENVIRONMENTAL SUSTAINABILITY
EFFICIENT WATER USAGE
SU4
SU5
CIRCULARITY AND PRODUCT TRACEABILITY (5 KPI)
SU6
SU9
SU7
SU8
INNOVATION IN SUSTAINABLE TECHNOLOGIES
SU10
REGULATORY COMPLIANCE AND BEYOND
SU11
Support on regulatory compliance
Regulatory compliance rate and number of initiatives beyond compliance
RE1
RE2
RISK MANAGEMENT (3 KPI)
RE3
INDUSTRIAL RESILIENCE
RE4
SUPPLY CHAIN ALTERNATIVES (2 KPI)
RE5
RE8
INNOVATION AND CONTINUOUS IMPROVEMENT
BUSINESS CONTINUITY PLANNING EFFECTIVENESS
RE6
QUALITY OF COMMUNICATION
RE9
CYBERSECURITY
RE7

Seen through an Industry 5.0 lens

1. **Human-Centric Technology**: The cases emphasize the role of GenAI in augmenting human capabilities rather than replacing them. Knowledge workers benefit from AI's support in automating mundane tasks, allowing them to focus on creative and strategic aspects,
   - 👉 *Aligns with Industry 5.0's focus on human-machine collaboration.*
2. **Augmented Worker Capabilities**: GenAI enhances the productivity of knowledge workers by providing assistance in decision-making, problem-solving, and routine tasks. GenAI also assist in matching the right competency profile with the right job.
   - 👉 *Supports Industry 5.0's aim to elevate worker capabilities through advanced technologies, making knowledge work more efficient and impactful.*
3. **Emotional Well-Being and Workplace Flourishing**: Studies highlight the affective benefits of AI, such as generating excitement, reducing stress, and enhancing job satisfaction.
   - 👉 *Align with Industry 5.0's goal of promoting not only efficiency but also the well-being and emotional flourishing of workers.*
4. **Ethical Use of AI and Data Privacy**: The studies stress the importance of trust, transparency, and data privacy when using AI tools. Addressing these concerns is essential for responsible AI integration.
   - 👉 *A key aspect of Industry 5.0's focus on sustainable and ethical technology use.*
5. **Collaboration and Socialization**: AI can either enhance or reduce collaboration among workers.
   - 👉 *Industry 5.0 promotes synergy between human and digital systems, and these studies show that fostering team-based AI use and shared learning can enhance collective problem-solving.*

SINTEF

Technology for a better society