



Navigating the AI Frontier: Evolution, Workforce Dynamics and Ethics



About me

- Founder
Nural Research
- Product Manager
Enterprise AI manufacturing start-up

Formerly

- Consultant
McKinsey & Co.
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Harvard University
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University of Cambridge





→ Today's aim

1.

What is AI in 2023 and who are the key actors?



2.

How is AI influencing industries and the workforce?



3.

Ethical considerations and emerging regulation





Myth Debunking



Myth

Reality

AI and machine learning are the same

Machine learning is a subset of AI

AI will make humans obsolete in the workplace

AI works best when **augmenting human work**

AI will outpace human intelligence

Robust General AI is a distant future

AI makes more fair decisions than humans

AI exacerbates the bias embedded within datasets: Garbage in, garbage out

Data scientists and ML engineers are shaping the future of AI

AI is shaped by all key decision makers. Effective and ethical implementation requires interdisciplinary thought



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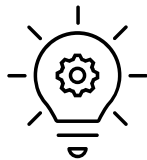
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Understanding Generative AI



Traditional AI

vs



Generative AI



Generative AI has unlocked mass consumer and business adoption

Increased global spending:

Generative AI to Become a \$1.3 Trillion Market by 2032

Time to reach 100m users

(Visual Capitalist)

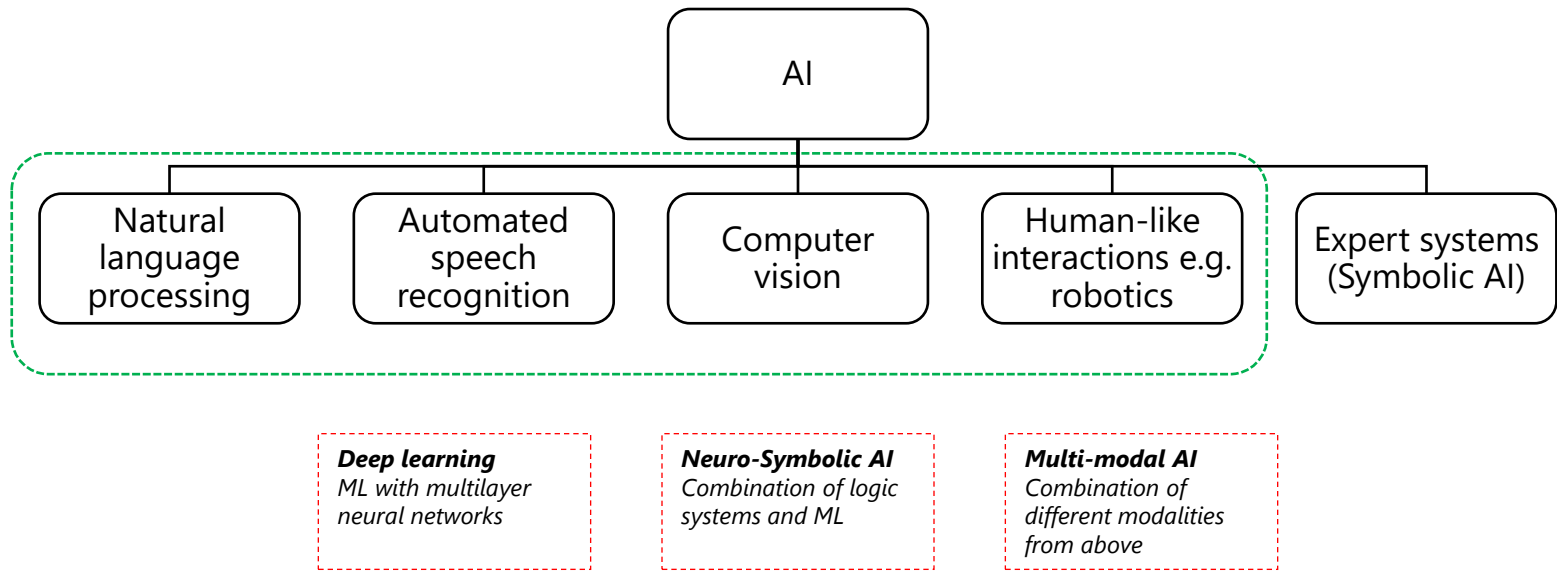



For discussion

How does Generative AI link to the rest of the AI industry?



AI segments: Machine learning is the workhorse behind recent AI advancements



 = Under ML / Reinforcement learning umbrella



Deeper dive into ML

Unsupervised

- No labelled data
- Finds previously unknown patterns in the data

Supervised

- Labelled training data
- Tune parameters to training set

Reinforcement

- Learns from trial and error in real time
- Leverages Neural Network as policy approximator
- Rewards and penalties



Data structures seen in industry

Structured

- Standardized **data schema**
- Easy to **analyze and query**
- **Reduced storage potential**
- Increased **integration potential**
- Can be difficult to amend



Semi-structured

- **No pre-defined data schema**
- Contains some **structural properties or hierarchy**
- Easier to store than unstructured data

e.g. JSON, CSV

Unstructured

- **No clearly defined framework** (e.g. free text, images)
- Fast to collect, slow to process
- **Flexible schema** leads to faster queries (no joins)



mongoDB. Data lakes

The Foundation Model Stack is Growing More Powerful

APPLICATION

New Jasper HyperWrite runway Adopt tome
 GitHub Copilot codium tabnine ChatGPT

Existing Code Notion yoodli lexion Microsoft Adobe

Explosion of new applications and reimagining of existing applications based on foundation models.

OPPORTUNITY:
 In the long run, almost every kind of application will be recreated or reimagined.

TOOLING

Orchestration LangChain Fxfile DUST
 GPTIndex Cognosis

Evaluation Humanloop HoneyHive
 WHYLABS

DATA SOURCES

External DBs and APIs

ACTIONS

External DBs and APIs

A tooling layer has emerged to let developers build FM applications faster and connect to external endpoints.

OPPORTUNITY:
 New ways to differentiate apps, apart from the underlying FM model capabilities.

FOUNDATION MODEL

Proprietary FMs OpenAI coderc AI21labs ANTHROPIC Google AI Microsoft Turing

Model Hub HuggingFace GitHub

Open-source FMs Stable Diffusion EleutherAI BLOOM OPT GLM-130B

Open-source Data Sources LAION The Pile Common Crawl

An iPhone vs. Android style battle is emerging between proprietary and open-source models.

OPPORTUNITY:
 Different teams with different missions will choose sides based on priorities of development speed versus customization.

FM OPS

Deployment Optimization: OctoML

Inference: Modal beam SaturnCloud BANANA

Training: mosaicML cerebras Lightning*

Data Tooling: Snorkel xetdata fastdnp

FM Ops lets developers optimize, train, and run their models more efficiently.

OPPORTUNITY:
 Sophisticated teams can use FM Ops to create differentiated capabilities and cost structures.

CLOUD

Azure aws Google Cloud

FM apps are so strategic that they will influence developers' broader cloud platform choices.

SILICON

NVIDIA AMD amazon SymbiqNova Google cerebras

Access to a supply of GPUs and AI-specialized silicon is critical for FM training and inference.



FACEBOOK AI





5 Enablers to the AI revolution



1. Data



2. Storage



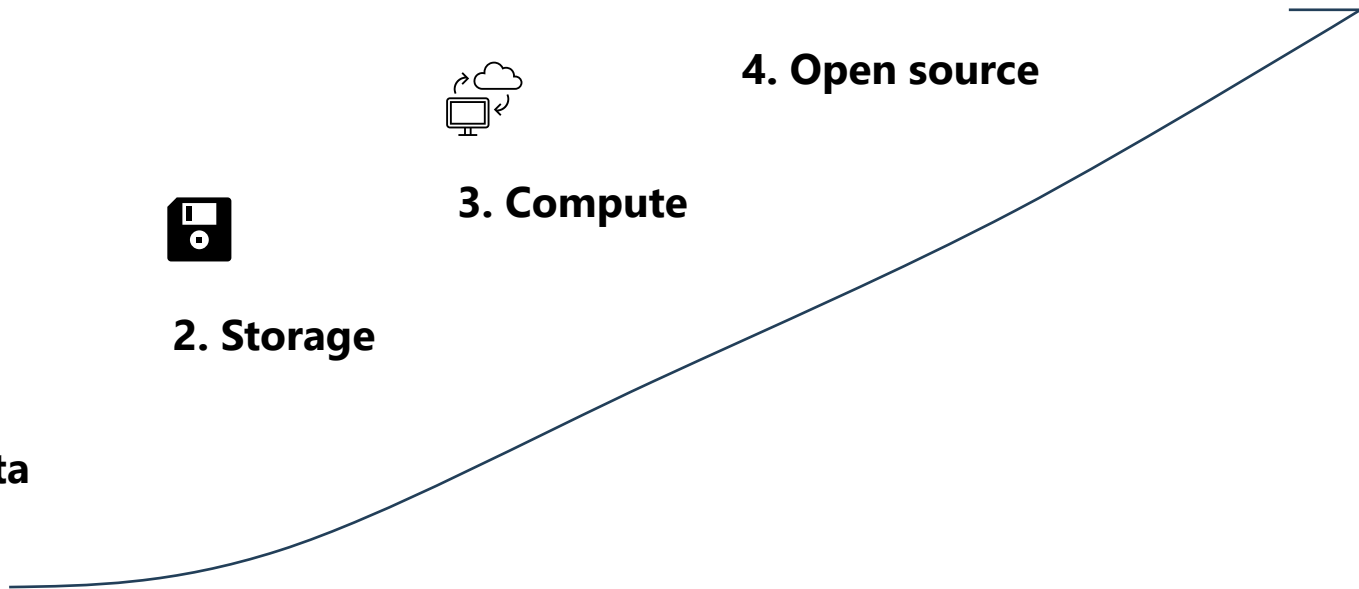
3. Compute




4. Open source



5. Talent





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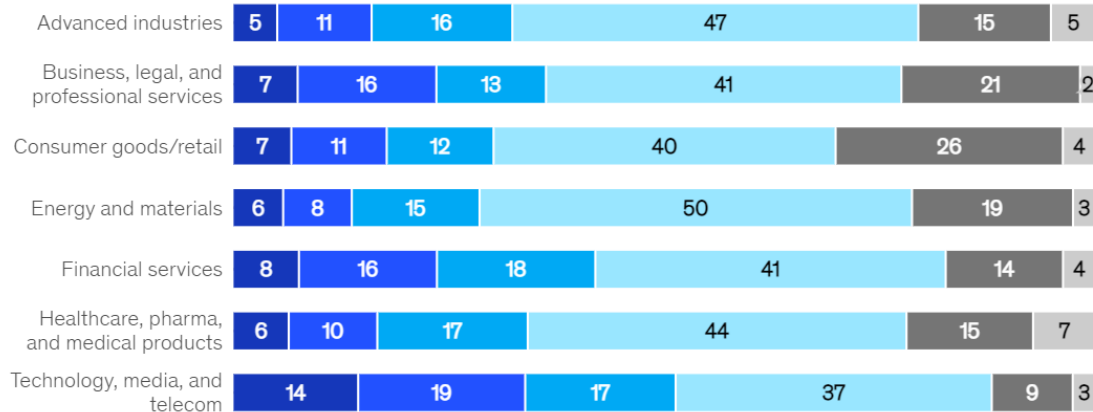
Industry focus: Industries requiring creativity or repetitive tasks are most impacted

Respondents across regions, industries, and seniority levels say they are already using generative AI tools.

Reported exposure to generative AI tools, % of respondents

Select demographic

■ Regularly use for work ■ Regularly use for work and outside of work ■ Regularly use outside of work
■ Have tried at least once ■ No exposure ■ Don't know



“AI has risen from a topic relegated to tech employees to a focus of company leaders” - McKinsey



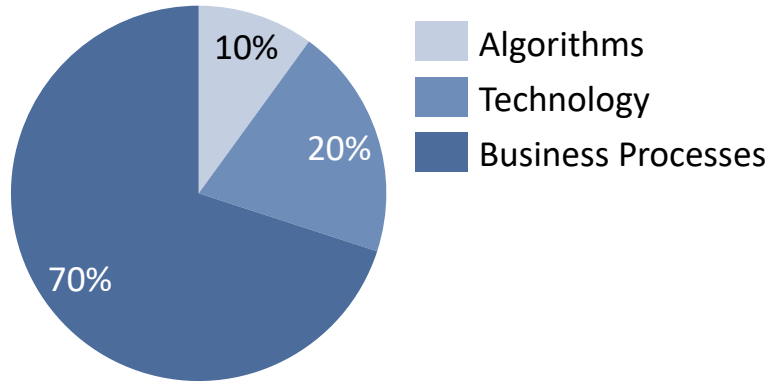
Business Functions: AI adoption is driving increased revenue and reduced costs

Area	Examples	Revenue impact	Cost impact
Risk	Impact & probability recommendation system, smart devices for safety	●	●
Strategy & Finance	Robotic process automation, auditing with NLP/ computer vision	◐	◐
Manufacturing	Stage by stage analytics for demand prediction, machine vision – quality control	●	●
HR	AI interviews, internal company chatbots	◐	◐
R&D	Trial automation, Novel data insights	◐	◐
Marketing & Sales	Tailored customer experiences	◐	◐

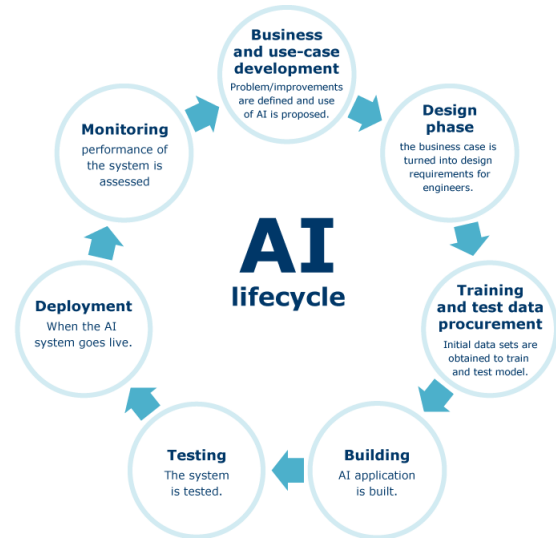


Implementing AI within a business

Typical AI investment allocation



Typical AI workflow





Workforce: AI will have the largest impact on knowledge work

4 workforce impacts of current AI technology

1. 60% of current time could be automated for knowledge workers by 2045
2. Demand for existing AI related roles will increase
3. Roles requiring language understanding, but low expertise at highest risk of displacement
4. Creative roles will be impacted significantly and may face "self-competition"



New AI related roles will emerge unlocking new enterprise capabilities



AI engineer



Prompt engineer

Workforce: While generative AI has the largest automation impact in high wage jobs, AI will impact low wage roles most significantly

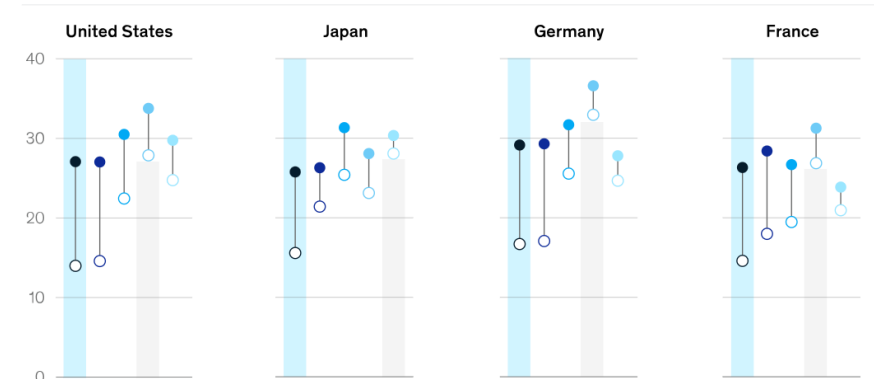
Midpoint automation adoption¹ by 2030 as a share of time spent on work activities, US, %



Automation adoption per wage quintile, % in 2030, midpoint scenario

Wage quintiles Higher earners 81-100 61-80 41-60 21-40 0-20 Lower earners

○ Without generative AI¹ ● With generative AI □ Largest increase in automation adoption from generative AI ▒ Largest automation adoption without generative AI





5 AI and industry predictions: The next three years

1. AI adoption growth rare in industry will spike and plateau
2. Service operations workforce size will have significantly decreased
3. Most enterprises will have AI and prompt engineers
4. Major AI labs will face large lawsuits due to their training data
5. Robust, explainable ML will take prevalence over current generative approaches



Looking ahead: AI industry

Levers

Enablers

- ✓ Big data
- ✓ Increased processing power – Moore's Law
- ✓ Abstracted ML platforms
- ✓ Funding
- ✓ Demand for personalized experiences
- ✓ Human-level understanding

Challenges

- ✓ Regulation formation and navigation
- ✓ Explainability
- ✓ Liability
- ✓ Edge-cases
- ✓ Data and concept drift
- ✓ Data ownership

Opportunities

- ✓ Addressing inequality
- ✓ Growth of non- English AI
- ✓ Zero-shot learning

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Artificial intelligence

+ Add to myFT

How actors are losing their voices to AI

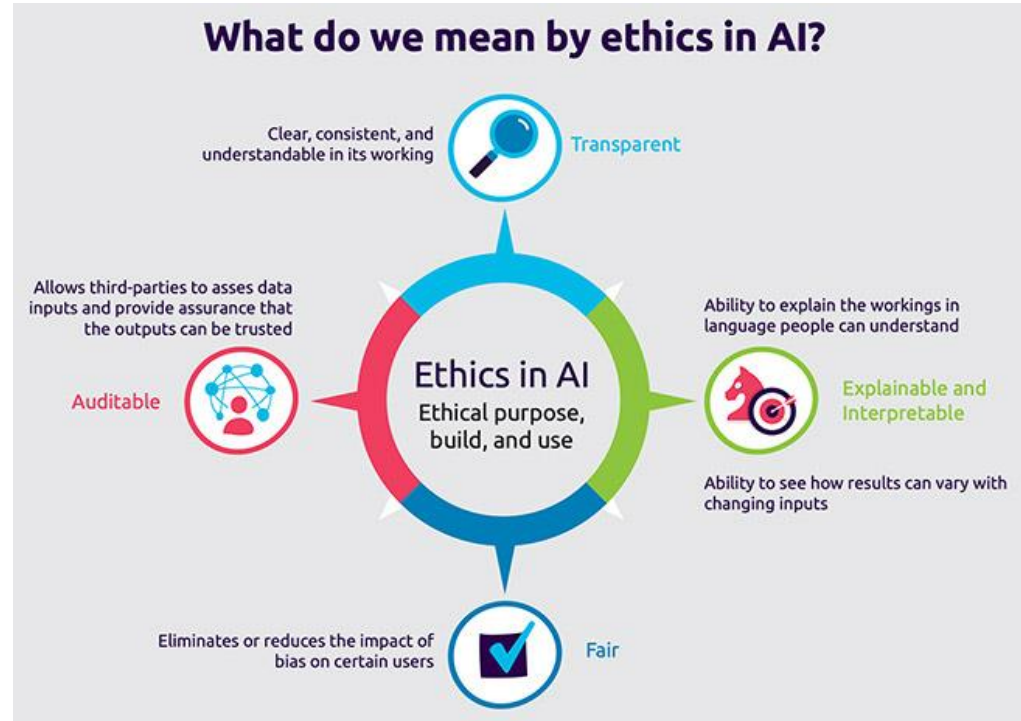
Performers forced to compete with themselves as companies' use of technology for cloning prompts calls to update copyright law



What is ethical AI

Ethical AI considers:

1. The broader social externalities of AI use
2. Grand challenges to be solved leveraging AI

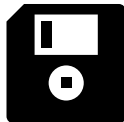




Framework: Where bias enters

1.

Data sources



2.

Modelling and training



3.

**Poor implementation by
end user**





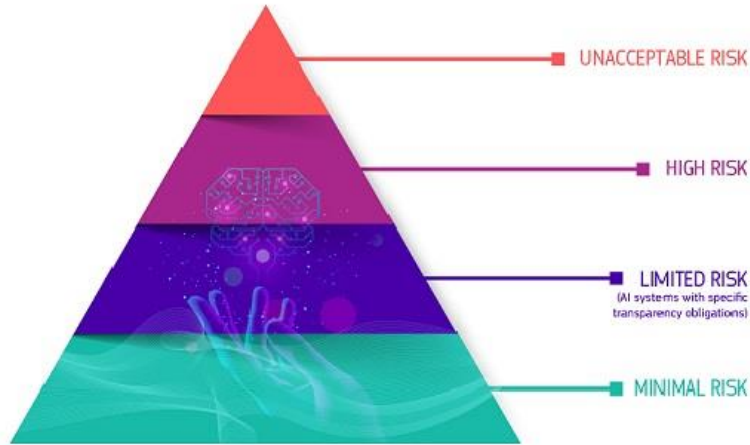
Risks

Category	Detail	Risk level
Safety & performance	Poor performance in high-risk industries - Data drift, hallucination	●
	Social weapons – Misinformation and manipulation and deepfakes	●
	Autonomous weapons	◐
Fairness & privacy	Bias – Reinforced by statistical distributions of datasets	●
	Data privacy	●
Externalities	Job loss	◐
	Free acting AI	◑



Regulation: Regulators are beginning to close the technology gap

EU AI act: Risk based approach













Note: LLMs were not predicted when initial act proposed

China: Interim Measures for the Management of Generative Artificial Intelligence Services

- Balancing innovation with regulation

Grading Foundation Model Providers' Compliance with the Draft EU AI Act

Source: Stanford Research on Foundation Models (CRFM), Institute for Human-Centered Artificial Intelligence (HAI)

	 OpenAI	 cohere	 stability.ai	 ANTHROPIC	 Google	 BigScience	 Meta	 AI21labs	 ALEPH ALPHA	 EleutherAI	Totals
Draft AI Act Requirements	GPT-4	Cohere Command	Stable Diffusion v2	Claude	PaLM 2	BLOOM	LLaMA	Jurassic-2	Luminous	GPT-NeoX	
Data sources	● ○ ○ ○	● ● ● ●	● ● ● ●	○ ○ ○ ○	● ● ○ ○	● ● ● ●	● ● ● ●	○ ○ ○ ○	○ ○ ○ ○	● ● ● ●	22
Data governance	● ● ○ ○	● ● ● ●	● ● ○ ○	○ ○ ○ ○	● ● ● ○	● ● ● ●	● ● ○ ○	○ ○ ○ ○	○ ○ ○ ○	● ● ● ○	19
Copyrighted data	○ ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○	● ● ● ○	○ ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○	● ● ● ●	7
Compute	○ ○ ○ ○	○ ○ ○ ○	● ● ● ●	○ ○ ○ ○	○ ○ ○ ○	● ● ● ●	● ● ● ●	○ ○ ○ ○	● ○ ○ ○	● ● ● ●	17
Energy	○ ○ ○ ○	● ○ ○ ○	● ● ● ○	○ ○ ○ ○	○ ○ ○ ○	● ● ● ●	● ● ● ●	○ ○ ○ ○	○ ○ ○ ○	● ● ● ●	16
Capabilities & limitations	● ● ● ●	● ● ● ○	● ● ● ●	● ○ ○ ○	● ● ● ●	● ● ● ○	● ● ● ○	● ● ○ ○	● ○ ○ ○	● ● ● ○	27
Risks & mitigations	● ● ● ○	● ● ● ○	● ○ ○ ○	● ○ ○ ○	● ● ● ○	● ● ○ ○	● ○ ○ ○	● ● ○ ○	○ ○ ○ ○	● ○ ○ ○	16
Evaluations	● ● ● ●	● ● ○ ○	○ ○ ○ ○	○ ○ ○ ○	● ● ● ○	● ● ● ○	● ● ○ ○	○ ○ ○ ○	● ○ ○ ○	● ○ ○ ○	15
Testing	● ● ● ○	● ● ○ ○	○ ○ ○ ○	○ ○ ○ ○	● ● ○ ○	● ● ○ ○	○ ○ ○ ○	● ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○	10
Machine-generated content	● ● ● ○	● ● ● ○	○ ○ ○ ○	● ● ● ○	● ● ● ○	● ● ● ○	○ ○ ● ○	● ● ● ○	● ○ ○ ○	● ● ○ ○	21
Member states	● ● ○ ○	○ ○ ○ ○	○ ○ ○ ○	● ● ● ○	● ● ● ●	○ ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○	● ○ ○ ○	○ ○ ○ ○	9
Downstream documentation	● ● ● ○	● ● ● ●	● ● ● ●	○ ○ ○ ○	● ● ● ●	● ● ● ●	● ● ○ ○	○ ○ ○ ○	○ ○ ○ ○	● ● ● ○	24
Totals	25 / 48	23 / 48	22 / 48	7 / 48	27 / 48	36 / 48	21 / 48	8 / 48	5 / 48	29 / 48	



AI 4 good



**Ethical and legal
implementation**



Impactful application



About Nural Research



Exploring how AI is being used to tackle global grand challenges



Exist to bridge the gap between those going on to utilise AI and those developing them



AI and data science advisory



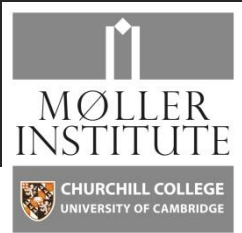
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About Me

- Founder Nural Research
- Former Choate Memorial Fellow at Harvard focusing on Data Science
- Passionate about democratising knowledge and building without limits

Connect

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Thank you for listening

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The Generative AI Application Landscape



APPLICATION LAYER	Marketing (content)						
	Sales (email)	Code generation	Image generation				Gaming
	Support (chat / email)	Code documentation	Consumer / Social				RPA
	General writing	Text to SQL	Media / Advertising				Music
	Note taking	Web app builders	Design	Voice Synthesis	Video editing / generation	3D models / scenes	Audio
	Other						Biology & chemistry
	TEXT	CODE	IMAGE	SPEECH	VIDEO	3D	OTHER
MODEL LAYER	OpenAI GPT-3	OpenAI GPT-3	OpenAI Dall-E 2	OpenAI	Microsoft X-CLIP	DreamFusion	TBD
	DeepMind Gopher	Tabnine	Stable Diffusion		Meta Make-A-Video	NVIDIA GET3D	
	Facebook OPT	Stability.ai	Craiyon			MDM	
	Hugging Face Bloom						
	Cohere						
	Anthropic						
	AI2						
	Alibaba, Yandex, etc.						

→ Ignitarium



Context:

Ignitarium is a product engineering design company based in India building products including a real-time noise suppression system

Problem:

Traditional approaches to noise suppression are not fully effective (incl. frequency filters and traditional DSP algorithms)

Solution:

The company implemented a deep learning-based (GRU) small memory noise suppression system Works on devices with low available RAM

Outcome:

Noise suppression on stationary and non-stationary noise

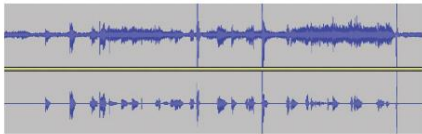
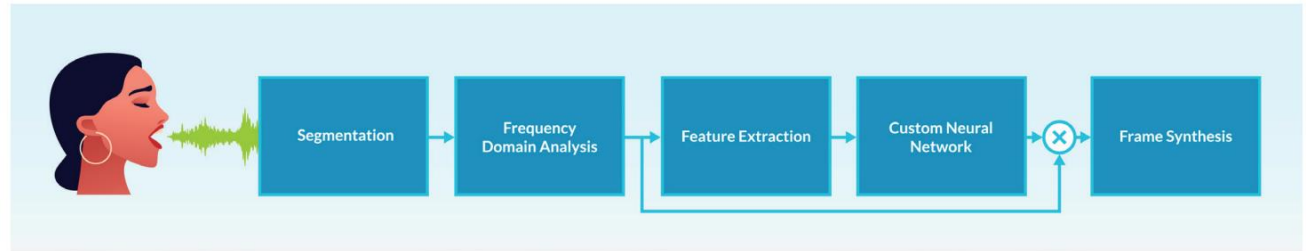


Fig.(a) Before and after noise suppression (time domain view)





Disney

**Context:**

Disney, founded 1923, has always stored archives of its content for future creators to draw inspiration from. Previously, physical archives and now digital

Problem:

Querying 100 years worth of content is time consuming and difficult without corresponding metadata tags

Solution:

Disney implemented a deep learning tagging system to augment the tagging process ("content genome")

Trained to distinguish similar features within animations

Taxonomy must be robust

Outcome:

Specific, tailored searches (e.g. explosions)
Reduced manual watch time
Potential to disrupt future of video search