Beneficial AI – Concepts and Use Cases

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INFORMATION TECHNOLOGY STANDARDS
SC 42 – Artificial Intelligence

Introduction

Industrial and commercial organizations have been increasing their investment and adoption of artificial intelligence (AI) technology in systems and applications for business processes, products and services. Initial reactions to the technology include negative connotations of risks and danger, bias, job losses, negative environmental impacts, etc. To counter and offset these negative connotations there is a need to articulate the benefits of AI for all involved stakeholders. The articulation of benefits will lead to increase in the transparency and trustworthiness of AI, improved governance, trust, understanding and appreciation of the value of the adopted technology. This will also generate meaningful discussion among the stakeholders and help formulate appropriate business models and value propositions along the AI value chain.

Concepts of a beneficial AI *system*

An AI system is perceived as beneficial when it is trustworthy and is purposefully applied to create positive value for and impact on its stakeholders.

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Different Perspectives — "in the eyes of the beholders"

- *Make* — AI producers, AI developers, AI application providers, data providers
- *Use* — AI customers, AI users
- *Impact* — Community, advocates, regulators, policy makers

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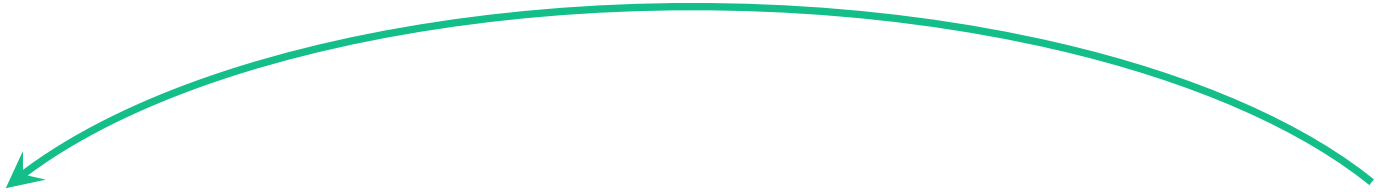
Concepts of a beneficial AI *system*



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Components
Explainability
Fairness
Robustness
Reliability
Privacy
Transparency
Safety
- - - - -

Concepts of a beneficial AI *system*

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meaningfully designed and constructed to serve a particular useful purpose

used in the application context as intended

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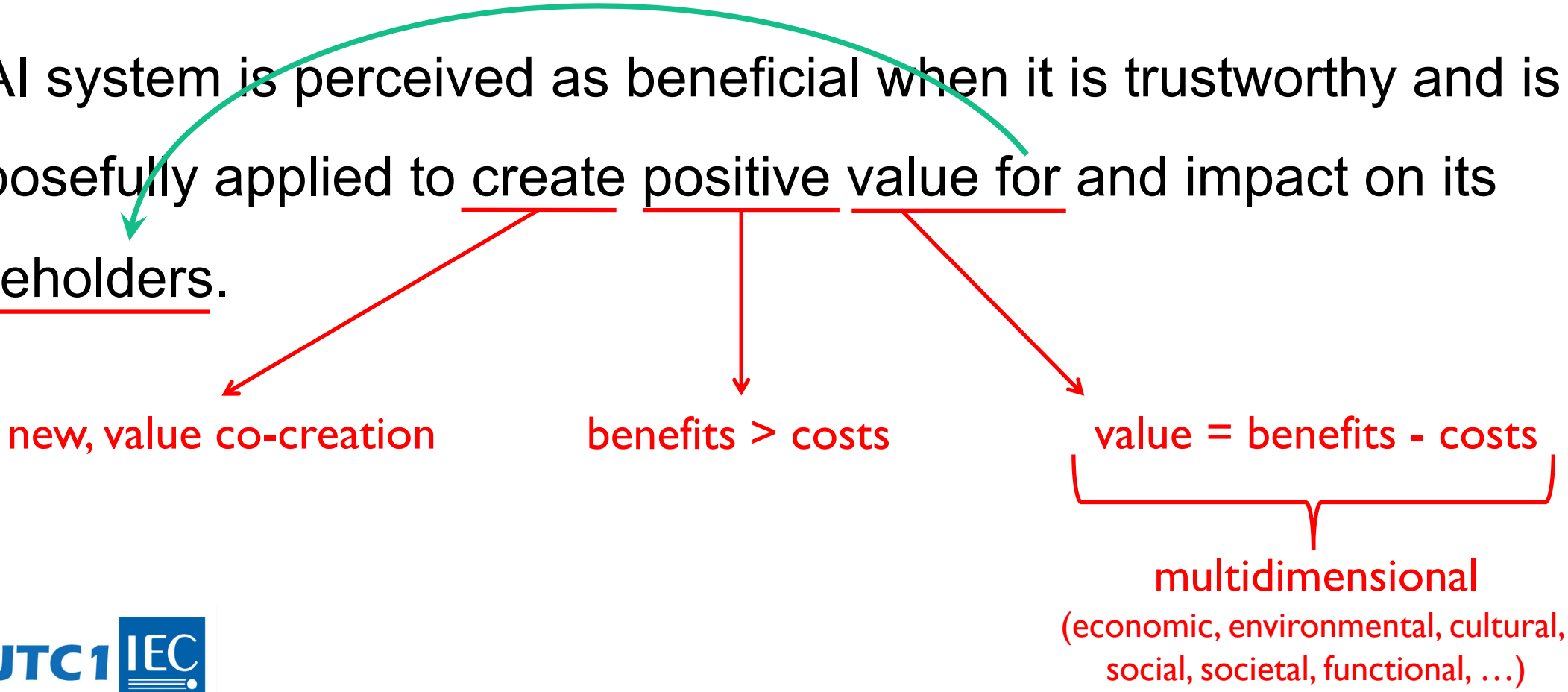

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direct/indirect benefits vs. reduced probability of harm & detriments

Some use cases to illustrate the concepts of beneficial AI system

1. AI solution to quickly identify defects during quality assurance process on wind turbine blades
2. Deep Learning for Identifying metastatic breast cancer
3. How AI is helping indigenous languages survive and thrive
4. Using chatbot to help customers engage the right services
5. Facility management with digital twin

Akin to: some UN SDG's

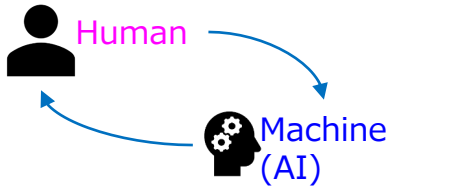
Deer Island, Massachusetts, USA May 29th, 2023

With an estimated 700,000 blades in operation globally, there are, on average, 3800 incidents of blade failure each year

Mishnaevsky Jr., L. "Root Causes and Mechanisms of Failure of Wind Turbine Blades: Overview". Materials (Basel). 2022 May; 15(9): 2959. doi: 10.3390/ma15092959

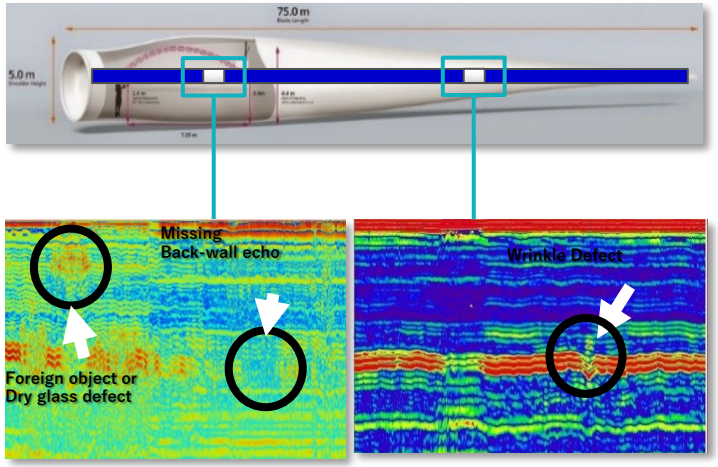
"AI solution to quickly identify defects during quality assurance process on wind turbine blades" (ISO/IEC TR 24030:2021)

- AI system automatically detects defects from ultrasonic testing scanning data through deep learning capabilities. It achieved high coverage (more than 95%) of various defects.
- Human inspectors only need to examine the parts of the blade that are flagged by the AI system (less than 20%).
- This solution means the same inspector can do 4 to 5 blades per day instead of just 1 previously.



Human-machine Teaming

Source: Dr. Fumihiro Maruyama



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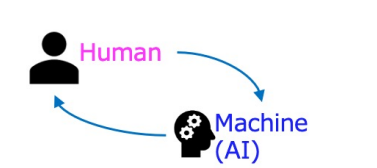

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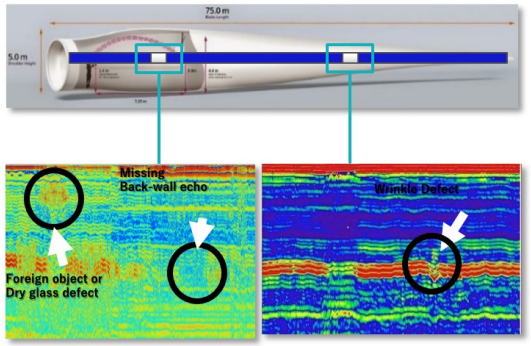

Stakeholders	Producer: Fujitsu Limited
	Customer: wind turbine manufacturers
	Community: Area residents, utility companies, energy customers
Trustworthiness	Explainability, ...
Value (economic, societal,...)	Reduce costs and labor for manufacturer
	Higher quality product
	Reduce chance of product failure
	Prolong product life & energy production
Impact	Reduce probability of harm and detriment to manufacturers
	Reduce probability of harm and detriment to the community
	Reduce liability
	Produce clean energy

Human in charge, AI in the loop

Deep learning for identifying metastatic breast cancer

The International Symposium on Biomedical Imaging (ISBI) held a grand challenge to evaluate computational systems for the automated detection of metastatic breast cancer in whole slide images of sentinel lymph node biopsies.

The Wang et al team won the competition:

"To evaluate the top-ranking deep learning systems against a human pathologist, the Camelyon16 organizers had a pathologist examine the test images used in the competition. For the slide-based classification task, the human pathologist achieved an AUC* of 0.9664, reflecting a 3.4 per-cent error rate. When the predictions of our deep learning system were combined with the predictions of the human pathologist, the AUC was raised to 0.9948 reflecting a drop in the error rate to 0.52 percent." [1]

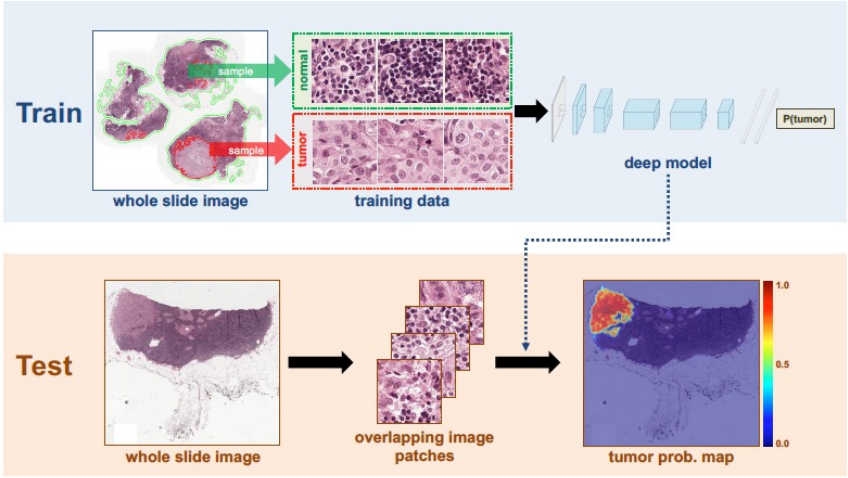

Figure 2: The framework of cancer metastases detection.[1]

Augmented decision making

* area under the receiver operating curve

[1] Wang, D., Khosla, A., Gargeya, R., Irshad, H., Beck, A. *Deep Learning for Identifying Metastatic Breast Cancer*. *The International* Symposium on Biomedical Imaging (grand challenge for automated detection of metastatic breast cancer). Available at: arXiv:1606.05718v1 [q-bio.QM] 18 Jun 2016.

Beneficial AI system

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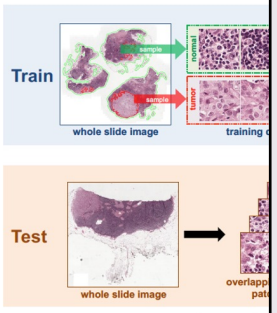


Figure 2: The framework of

AI in t
Augmented d

Stakeholders	Producer: Medical team
	Customer: pathologists, healthcare providers
	Community: Patient population
Trustworthiness	Not available at this time
Value (economic, good health, societal, ...)	Reduce costs and labor for healthcare providers
	Reduce error rate
	More accurate diagnosis, early detection and treatment
	Reduce probability of mis-diagnosis or missed diagnosis
Impact	Promote better healthcare for the patient population
	Improve survival rate for patient population

Human in charge, AI in the loop

How AI is helping indigenous languages survive and thrive

moz://a
DeepSpeech

Speech to text

Pronunciation

Woolaroo
Google Arts & Culture

Woolaroo is a pilot experiment using ML and image-recognition to teach and promote endangered languages such as Yugambeh and the language of the Māori, as well as Calabrian Greek, Yiddish, Louisiana Creole, Nawat, Sicilian, Tamazight, Yang Zhuan, and Rapa Nui.

Beneficial AI system

Speech to text

Stakeholders	Producer: Google, Rongo, …
	Customer: Learners, researchers, …
	Community: Indigenous population
Trustworthiness	Not available at this time
Value (cultural, economic, social …)	Reduce costs and labor for teaching and using the indigenous languages
	Decolonization of the languages
	Data sovereignty
Impact	Revitalization and preservation of indigenous languages
	Reduce probability of cultural distortion

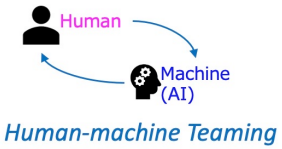
woolaroo
Google Arts & Culture

Human in charge, AI in the loop

Using chatbot to help customers engage the right services

MediBuddy

- Online chatbot perform triage of patient's symptoms among common ailments
- Employ rule-based questions if necessary.
- Direct patient to doctor for treatment if necessary (30 min. call back)
- Connected to other services: pharmacy, delivery, lab tests, insurance, dental, appointments, surgery, vaccination, …
- Serves over 5m people in India



Human-machine Teaming

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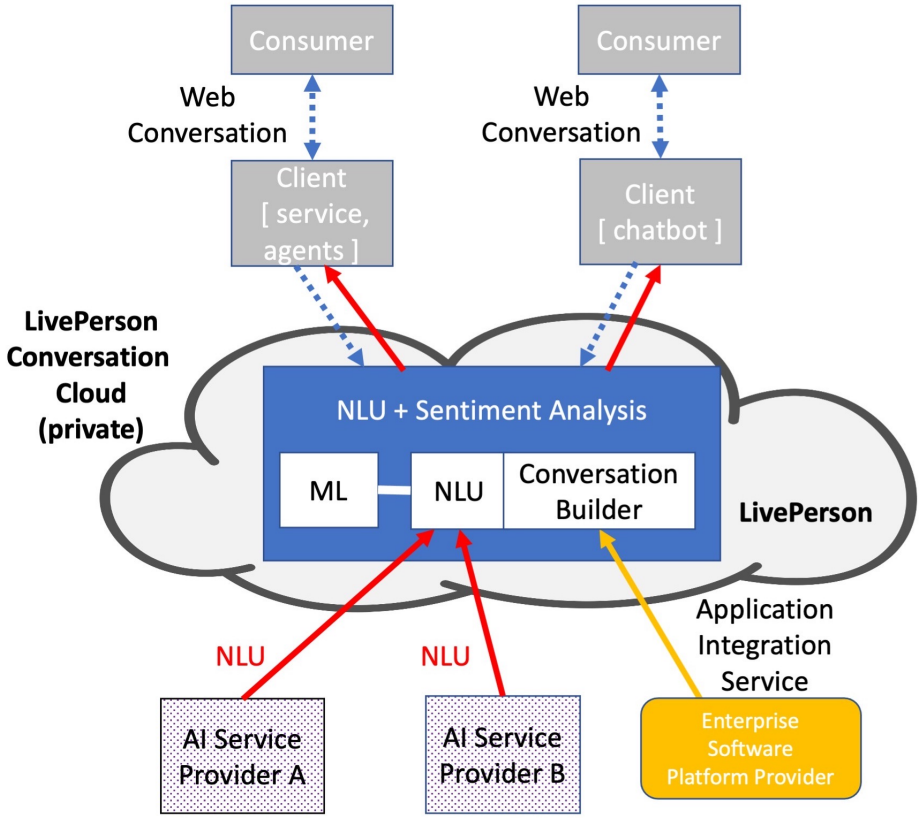
LIVEPERSON

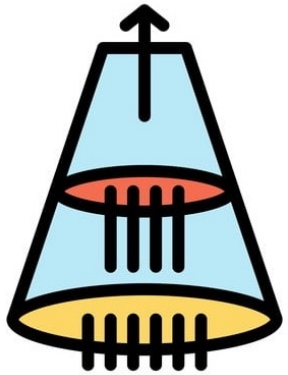


Source: ISO/IEC 5339 Guidance for AI applications

Beneficial AI system

MediBuddy

LIVEPERSON



Decision Making

Un-Structured

Semi-Structured

Structured

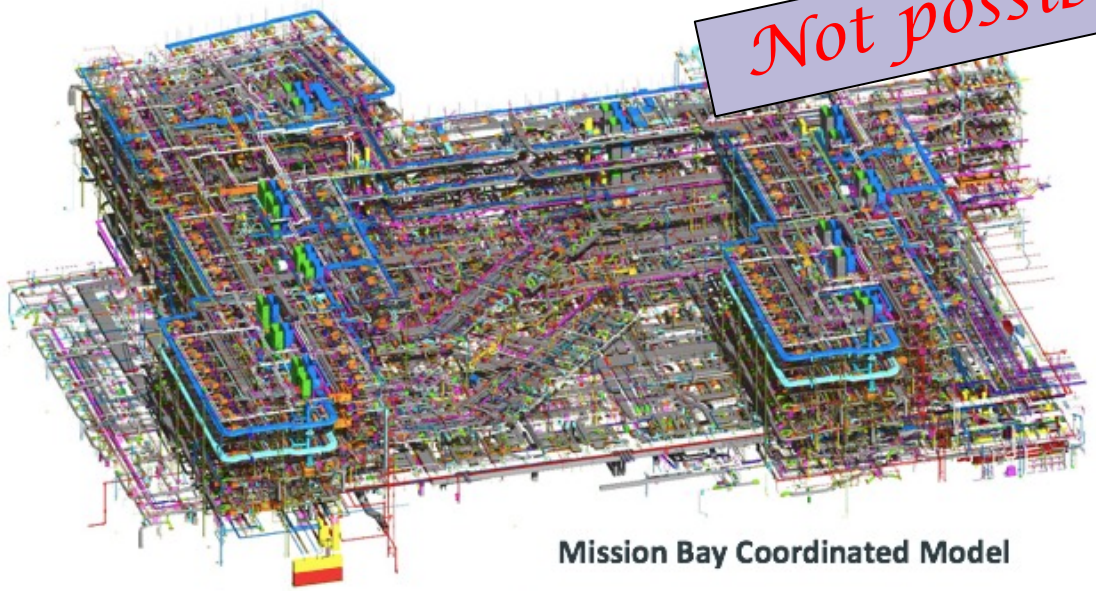
Stakeholders	Producer: MediBuddy, LivePerson
	Customer: Patients, customers
	Community: Patient population, enterprise customer population
Trustworthiness	Not available at this time
Value (healthcare, economic, social ...)	Reduce costs and labor (of agents) for customer patients and customers engagement
	Standardize interactions and responses
	Data analysis + improve ML
Impact	Improve accessibility to medical services to a vast population, same with enterprise customers
	Improve healthcare delivery and customer services

Human in charge, AI in the loop

Facility management with digital twin

A digital twin is a virtual representation of an object or system that spans its life cycle, is updated with real-time data, and uses simulation, machine learning and reasoning to help decision making.

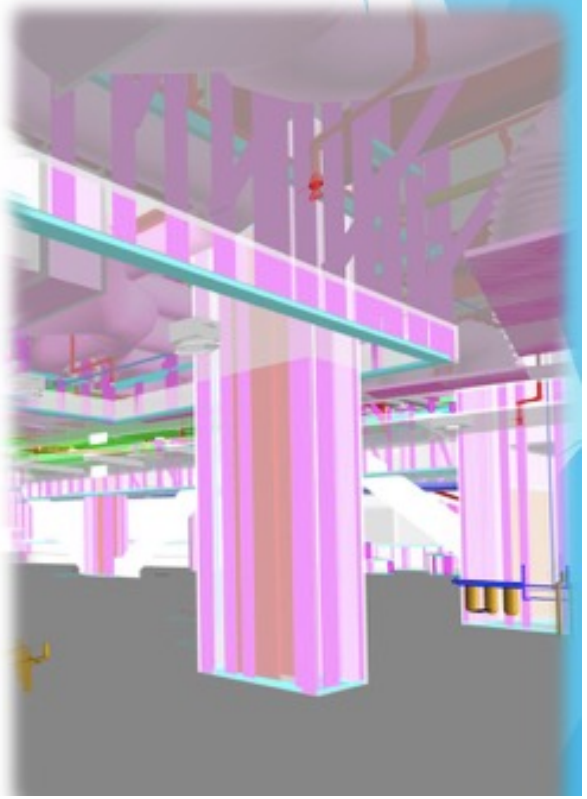
https://www.ibm.com/topics/what-is-a-digi

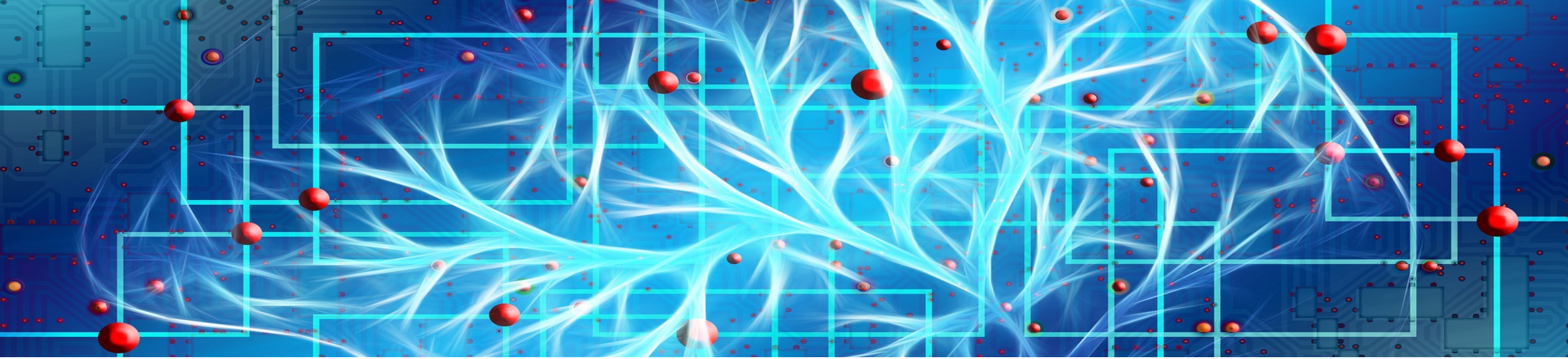


Mission Bay Coordinated Model

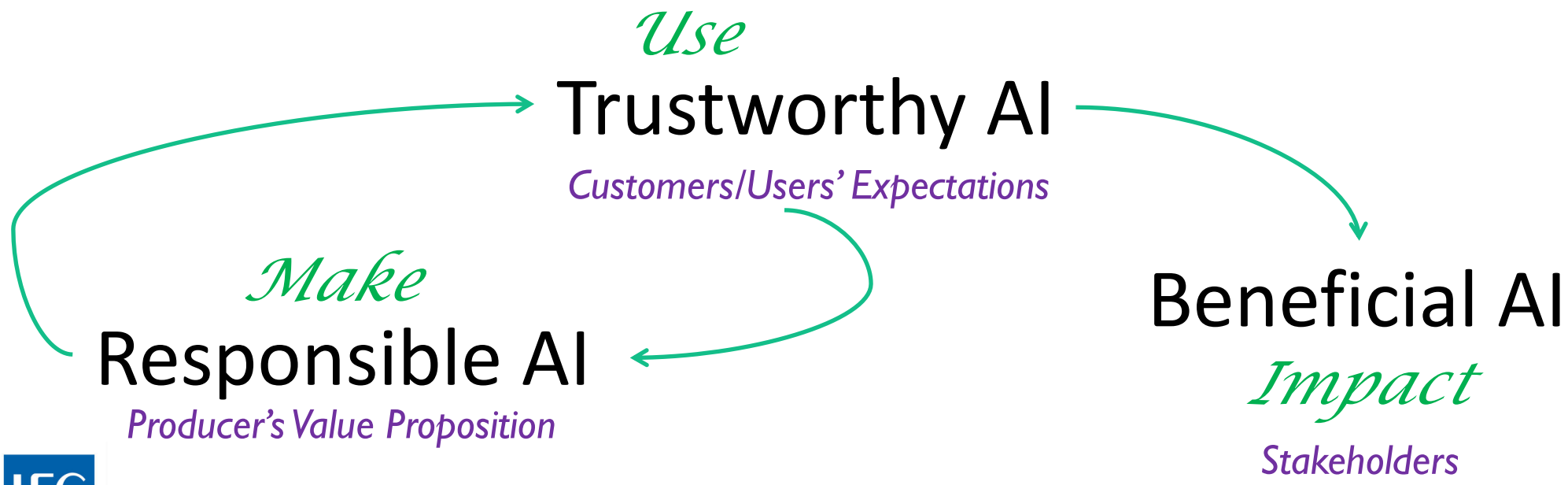
Not possible without AI!

UCSF Health





Summary


Use
Trustworthy AI
Customers/Users' Expectations
Make
Responsible AI
Producer's Value Proposition
Beneficial AI
Impact
Stakeholders

Newly formed and work is underway

ISO/IEC JTC 1 SC 42 Artificial intelligence
Working Group 4 project:
AWI TR 21221 Beneficial AI system

Thank you

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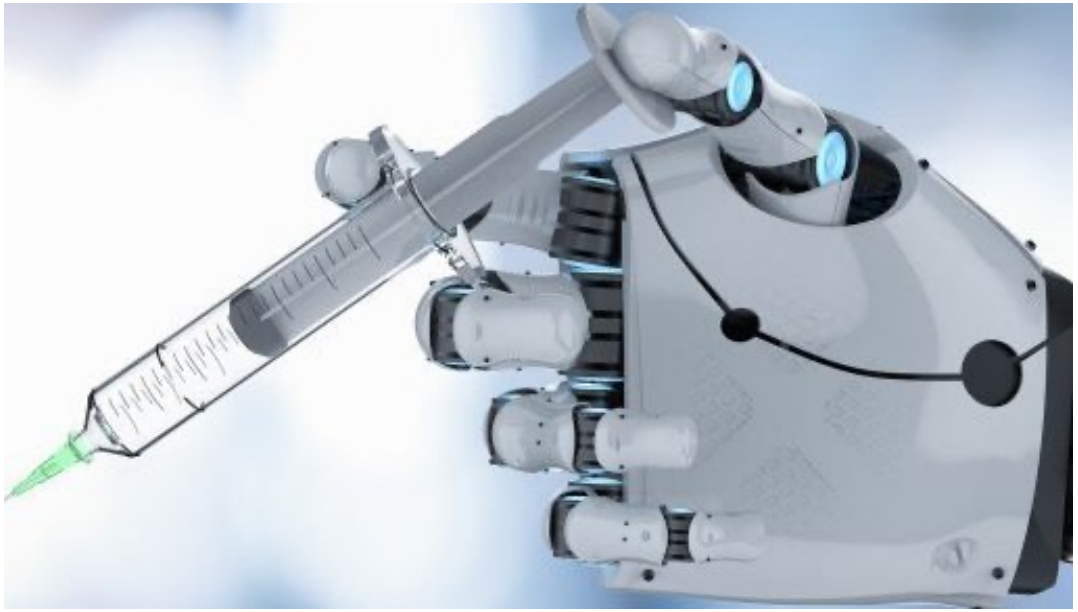

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