U.S. ARMY

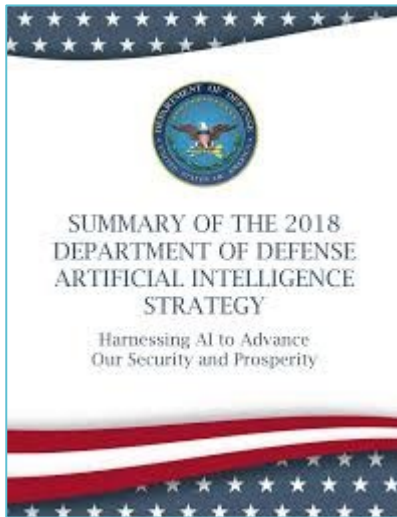# U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND
ARMAMENTS CENTER

Perspectives on Artificial Intelligence   **27 SEP 2023**

Controlled by:	
Controlled by:	ARMY DEVCOM Armaments Center
CUI Category:	UNCLASSIFIED
Distribution Statement:	DIST A: - Approved for Public Release: Distribution Unlimited
POC:	Myron Hohil

DOD AI STRATEGY – EVOLVING POLICY

- "The Department of Defense's (DoD) Artificial Intelligence (AI) Strategy directs the DoD to **accelerate the adoption of AI and the creation of a force fit for our time**."

- Strategic focus areas and implementation goals include:
  1. Cultivating a leading **AI workforce**
  2. **Accelerating** the delivery and adoption of **AI**
  3. Evolving **partnerships** with industry, academia, allies and partners
  4. Establishing a common **foundation** that enables decentralized execution and experimentation
  5. Leading in **military AI ethics and safety**

Jun 2018 – Joint Artificial Intelligence Center Established

Oct 2018 - Army Directive 2018-18 Artificial Intelligence Task Force Established

Feb 2019 - President's Executive Order on Maintaining American Leadership in AI

Feb 2020 – DoD Adopts Ethical Principles for Artificial Intelligence

Mar 2021 – National Security Commission on AI Report

June 2022 – Chief Digital and Artificial Intelligence Office Established

Aug 2023 – DoD announces establishment of Generative AI Task Force

DEVCOM AC AI STRATEGY 2019 – 2020

Provided the Director with a proposed strategy for Artificial Intelligence at the Armaments Center based on the DoD strategy

Assessed Expertise, Facilities, Tools, Projects & Mission Requirements

Workforce Development	Infrastructure & Access	Data Readiness	DevSecOps, Tools, V&V	S&T Projects

LOE 1: Develop a human capital plan
Identify recruitment opportunities and establish training programs

LOE 2: Enable Enterprise Level AI/ML Infrastructure
Access to CLOUD/Hybrid computing & storage, integration of standardized tools and resources, evolve environments for development & TE&VV of AI software

LOE 3: Develop Enterprise Level Prowess
Establish partnerships and collaborative opportunities with Industry, Academia and DoD/GOV organizations
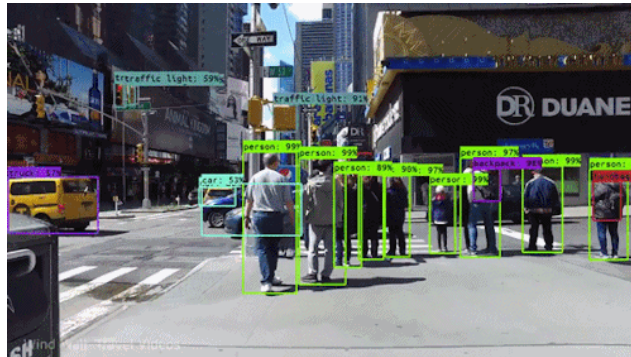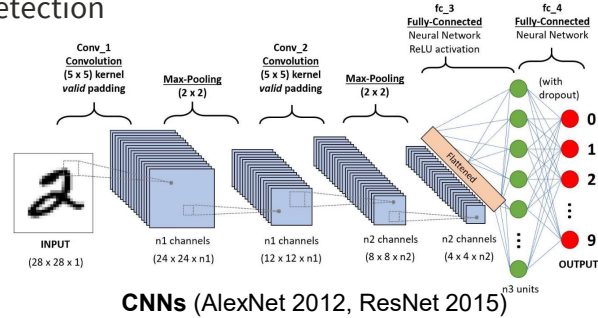
LOE4: Pilot Projects: Focus on AI
Develop and evolve software certification standards in accordance with DoD policy.

Coordination with Army and DoD Policies for the development of AI

EVOLVING TECHNOLOGY (CV)

- Object Detection
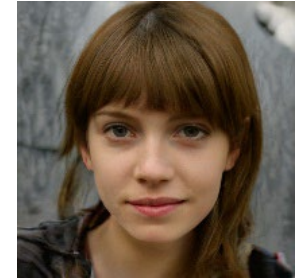

CNNs (AlexNet 2012, ResNet 2015)

YOLO (2015)

Image Captioning (2016)

AI Image Generators (GANs)

University of Tubingen **Style Reconstruction** (2015)

Style GAN NVIDEA (2018)

GANs and Autoencoders

"Deep Fakes" (2018)

EVOLVING TECHNOLOGY (NLP)
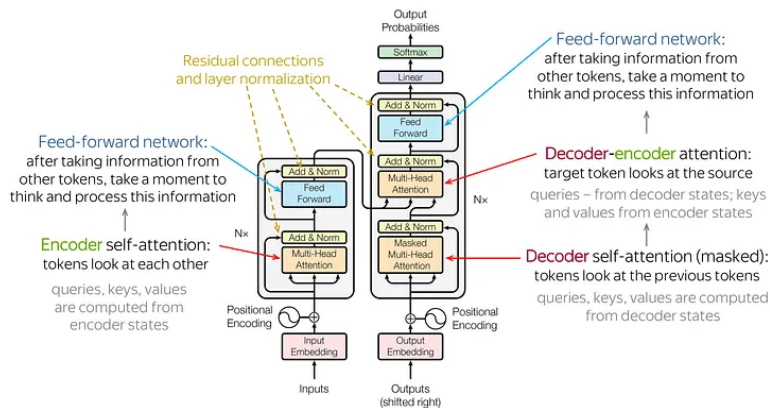
- Speech Recognition and Understanding

2011   **2014**

Watson **(2010)**

- LLMs & Generative Transformers

Transformer architecture (Google) **(2017)**

Generative Pre-Training
ChatGPT-1 **(2018)**
ChatGPT-2 **(2019)**
ChatGPT-3 **(2020)**

MAR 2023 **CHATGPT-4**

"Sparks of Artificial General Intelligence:
Early experiments with GPT-4"

Figure 1.3: We queried GPT-4 three times, at roughly equal time intervals over the span of a month while the system was being refined, with the prompt "Draw a unicorn in TikZ". We can see a clear evolution in the sophistication of GPT-4's drawings. Microsoft Research (**APR 2023**)
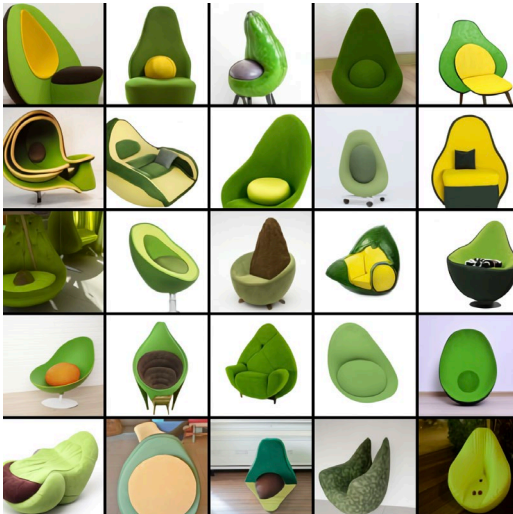
- Avatars – Interactive Personal Assistants

NVIDEA Omniverse Avatar Cloud Engine **(2022)**
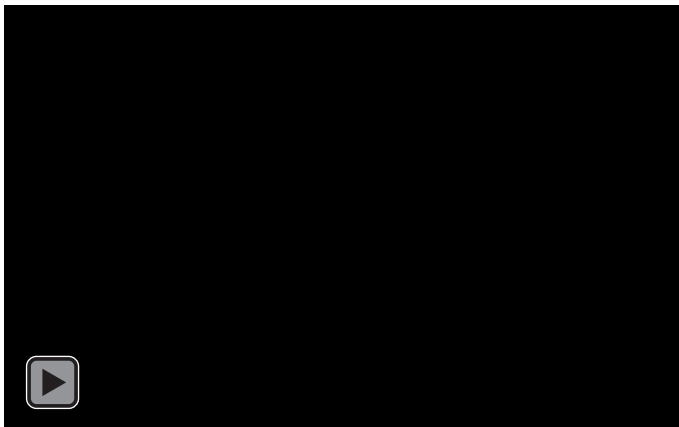
EVOLVING TECHNOLOGY

▪ GANs and Variational Encoders

https://openai.com/research/dall-e

"An armchair in the shape of an avocado"

https://imagen.research.google/

"A chrome-plated duck with a golden beak arguing with an angry turtle in the forest"

▪ Latent Diffusion Models (2022)

https://research.nvidia.com/labs/toronto-ai/VideoLDM/samples.html

"A polar bear is playing bass guitar in snow"

https://imagen.research.google/video/
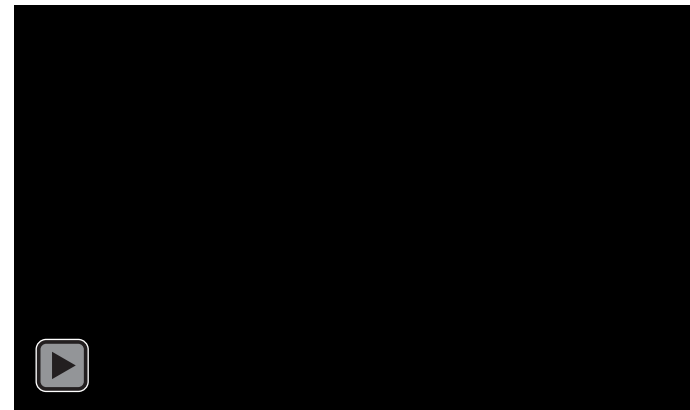
"A glass bead falling into the water with a huge splash. Sunset in the background."
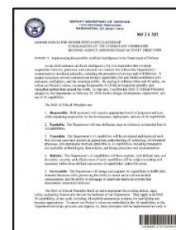
STUDIES ON AUTONOMY

- Artificial Intelligence (AI) and Machine Learning (ML) technologies can provide a high impact and ability to:
  - Reduce cognitive loads.
  - Increase broad system capabilities.

- However, the integration of autonomous functionality for candidate system concepts can be complex.

- Various reports, memorandums, and policies have been released to provide guidance
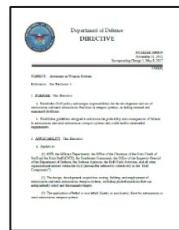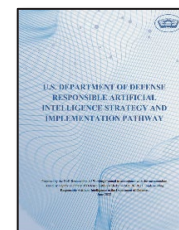
DoDD 3000.09 (2017)   *NSCAI Final Report (2021)*   *RAI Memorandum (2021)*   *RAI Strategy & Implementation (2022)*

- DEVCOM AC has interest in studies that provide insight on the implications of AI and autonomy-related technologies and how such technologies may impact future design efforts for human-machine teaming
  - Partnering with various stakeholders at OUSD, Services, and academia
  - Adhere to current policies and memorandums released by DoD

DEVCOM AC FOCUS ON SE FOR TRUSTED AI

- Increasing complexity through the integration of AI methods for automation and autonomy will impact the way *users interact with AI-enabled systems*.

- The nature of these systems will infuse AI/ML & data science that impact:
  - Systems engineering methods
  - A robust analytic framework with supporting resources and tools
  - Required domain expertise of Systems Engineers to provide solutions.

- The Focus will be on key topics that address three (3) questions:

  - What SE activities and artifacts are best suited to build trust in AI-enabled systems?

  - What infrastructure (data, models, computational resources, tools, test beds) are needed to train & validate trusted AI-enabled systems?

  - What are the key workforce skills and abilities required for an IPT to be successful in the development and management of AI-enabled systems?

THANK YOU.

Myron Hohil; Ph.D.
Senior Scientific Manager (SSTM)
Artificial Intelligence, Sensors &
Collaborative Munitions
USARMY DEVCOM Armaments Center