

# Military Research and Artificial Intelligence

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## 1 Introduction

Artificial Intelligence is a sub field of Computer Science. Artificial Intelligence tries to simulate behaviour or actions of humans or a system that thinks or acts rationally. [1] Artificial Intelligence consists of a huge variety of sub fields, which can be divided into reasoning, knowledge, planning, learning, natural language processing, perception and the ability to move and manipulate objects. Many different scientific disciplines contribute to Artificial Intelligence like Mathematics, Philosophy, Neuroscience, Computer Science. [1]

This article focuses on the impact of military research on Artificial Intelligence as shown by the example of DARPA below.

### 1.1 Overview

In section we will define some important terms which are used in this article. In section 3, we will explain what is DARPA and in which relation DARPA stands to Artificial Intelligence. In section 4 we will look into a project funded by DARPA and see why this agency is so important in Artificial Intelligence. In section 5 we will see why DARPA is a driving force in Artificial Intelligence. In 6 we will see a competition of robots sponsored by DARPA. In 7 we will discuss what was learned and what conclusion we offer.

## 2 Disambiguation

**machine learning:** is the ability of computers to understand data, manage results and more.

**cognitive assistant:** can be a robot or a system which helps at certain tasks.

### 3 DARPA

DARPA is the Defense Advanced Research Projects Agency, founded in 1958 and their mission is to ensure U.S. military technology to be better than the rest. DARPA not only influenced military fields, but also non-military fields e.g. computer networking and graphical user interfaces in information technology.<sup>1</sup>

We will talk about three projects of DARPA to see how much they are involved in Artificial Intelligence.

### 4 The CALO Project

CALO(Cognitive Assistant that Learns and Organizes) was an Artificial Intelligence Project. The name was inspired by the Latin word "calonis", which means "soldier's servant". It's main purpose was to integrate numerous Artificial Intelligence technologies into an cognitive assistant. It ran for five years 2003 until 2008. CALO in the end could:

**Organize and Prioritize Information:** CALO will use machine learning algorithms to build a query able model with all the information it gathers from emails, appointments etc.

**Prepare Information Artifacts:** It can help put together new documents, from previous documents.

**Mediate Human Communications:** CALO can be part of a meeting and automatically generates a transcript.

**Manage Tasks:** CALO can also automate routine tasks.

**Schedule and Reason in Time:** CALO can help you manage your time schedule.

**and allocate Resources:** CALO can learn to acquire new resources to help get a job done.

[2]

General-purpose learning methods along with more focused learning applications primarily from the CALO project are now part of the PAL(Personalized Assistant that Learns)Framework, which is from DARPA. There were also interesting spin-off from this project, one probably everyone knows nowadays SIRI that is now part of the Apple iOS.

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<sup>1</sup>[http://www.darpa.mil/About/History/First\\_50\\_Years.aspx](http://www.darpa.mil/About/History/First_50_Years.aspx)

## 5 PPAML

PPAML means Probabilistic Programming for Advancing Machine Learning. The project started in March 2013 and is ongoing until 2017. Email spam filters, smartphone personal assistants and self-driving vehicles are all based on research in machine learning which is part of Artificial Intelligence. The main problem of machine learning is that every new application demands a lot of effort. Which means it is pretty expensive. Also it is hard to develop fast and data independent, meaning the data can be as complex and large as it needs to be, tools. That's why PPAML is developed. PPAML will help to increase the number of people who can successfully build machine learning applications and make machine learning experts much more effective.<sup>2</sup> This would help revolutionize the area of machine learning and would start a golden age in innovation, productivity and effectiveness in Artificial Intelligence. Somewhat a milestone in machine learning if they are successful.

## 6 DRC

The DRC(DARPA Robotics Challenge) is a competition for ambitious teams of robot specialists competing against each other. The robots need to be capable of assisting humans in responding to natural and man-made disasters. There are many tasks which need to be completed by these robots:

- Drive the vehicle
- Egress from the vehicle (get out of the vehicle)
- Open door and travel through opening
- Open valve
- Use a cutting tool to cut a hole in a wall
- Surprise manipulation task
- Traverse rubble - Either cross debris field (by moving the debris or traversing it, or negotiate irregular terrain
- Climb stairs<sup>3</sup>

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<sup>2</sup>[http://www.darpa.mil/Our\\_Work/I20/Programs/probabilistic\\_Programming\\_for\\_Advanced\\_Machine\\_Learning\\_\(PPAML\).aspx](http://www.darpa.mil/Our_Work/I20/Programs/probabilistic_Programming_for_Advanced_Machine_Learning_(PPAML).aspx)

<sup>3</sup>[http://www.theroboticschallenge.org/sites/default/files/docs/2015\\_04\\_09\\_DRC\\_Finals\\_Rule\\_Book\\_DISTAR\\_24388.pdf](http://www.theroboticschallenge.org/sites/default/files/docs/2015_04_09_DRC_Finals_Rule_Book_DISTAR_24388.pdf)

So as we can see there are a lot of requirements to be able to compete in the DRC. It would be really helpful if we would have such robots to help us in catastrophic situations and probably that will be the future.

## 7 Conclusion

We looked at three projects of DARPA:

**CALO:** a cognitive assistant

**PPAML:** a tool to build more comprehensive machine learning programs

**DRC:** a robot competition

We saw that DARPA does a lot for Artificial Intelligence and uses a lot of their resources to develop such intelligent systems. In the end the intentions might not be the best e.g. "Killer Robots" but in the end we learn a lot from all of the DARPA projects and can use them in many future projects in Artificial Intelligence or other fields.

## References

- [1] Stuart Russell, Peter Norvig, and Artificial Intelligence. A modern approach. *Artificial Intelligence. Prentice-Hall, Egnlewood Cliffs*, 25, 1995.
- [2] Wikipedia. Calo — wikipedia, the free encyclopedia, 2014. [Online; accessed 24-May-2015].