Machine Learning - Homework 01

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Problem 1:

Autonomous weapons are perceived by many as a great threat. Stephen Hawking, Elon Musk, and Steve Wozniak along with many AI/Robotics researchers voiced their concerns by signing an open letter arguing against the development of autonomous weapons.

Autonomous weapons select and engage targets without human intervention. They include all weapons that can operate beyond meaningful human control. Artificial Intelligence (AI) technology has reached a point where the deployment of such systems is feasible within years.

Nevertheless, such weapons present many challenges and threats. For example, they are cheap and easy to manufacture, making mass-production possible. They could appear on black markets and thus in the hands of terrorists, dictators, or warlords, allowing these actors to easily achieve their radical goals. This would clearly not be beneficial for humanity.

Furthermore, the development of autonomous weapons would tarnish the field of AI, potentially creating a major public backlash against AI, which in turn would curtail the future societal benefits of AI.

On top of the arguments pointed out by the authors, we believe that autonomous weapons pose the threat of being hacked by third parties and used against the purpose for which they were created, even if their supply is controlled.

The danger of AI however is not limited to autonomous weapons. Potential threats lie for example in the field of digital security. DOS attacks (Denial of Service) which reproduce humans patterns (such as writing speed or previous navigation) but which are in reality underdone by intelligent software might be harder to counter. Another potential threat of intelligent software lies in their increasing capacity to analyze large volumes of data and to identify people most likely to pay up when hacked (for example when their personal details are stolen)[1].

Problem 2:

1. quadratic
2. linear
3. none of the two
4. quadratic
5. none of the two
6. linear

[1] `https://www.eff.org/files/2018/02/20/malicious_ai_report_final.pdf`

Problem 3:

1. The stock market index or return is the target variable, while the unemployment rate is the attribute variable.

2. Eye color, nose length and face length are all attribute variables while the set of faces/persons is the target variable.

Problem 4:

We set the attribute variables x_1 : petal length, and x_2 : sepal length
We define the Perceptron prediction rule so that:

$$w_0 + w_1 x_1 + w_2 x_2 = y \tag{1}$$

Where y is lower than 0 when the iris flower is a setosa and higher or equal to 0 when it is a versicolor. We find that the Perceptron prediction rule works as intended for the provided data set with the following weights: $w_0 = 1.5, w_1 = -1,$ and $w_2 = 1$