



# Assignment 2

Introduksjon til Kunstig Intelligens

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# 1 Halving game

## 1.1 Results

```
● > python .\halving_game.py
The number is 5 and it is P1's turn
P1's action: --
The number is 4 and it is P2's turn
P2's action: --
The number is 3 and it is P1's turn
P1's action: /2
The number is 1 and it is P2's turn
P2's action: --
The number is 0 and P1 won
```

Figure 1: Result halving game

# 2 Bucket game

## 2.1 Results

```
> python .\bucket_game.py
The state is (0, ['A', 'B', 'C']) and it is P1's turn
P1's action: B
The state is (1, [3, 1]) and it is P2's turn
P2's action: 1
The state is (0, [1]) and P1's utility is 1
```

Figure 2: Result bucket game

## 3 Tic-tac-toe

### 3.1 Time taken for first move

```
> python .\tic_tac_toe.py

=== Tic-tac-toe first move timing comparison ===
Minimax first move: (0, 0), time = 9.389368 seconds
Alpha-Beta first move: (0, 0), time = 0.357086 seconds
```

Figure 3: Time taken for first move

### 3.2 Results

Read from up to down

<p>P1 plays (0, 0)</p> <pre> x       ---+---+---       ---+---+---       </pre>	<p>It is P2's turn to move P2 plays (0, 2)</p> <pre> x   x   o ---+---+---   o   ---+---+---       </pre>	<p>It is P1's turn to move P1 plays (1, 2)</p> <pre> x   x   o ---+---+--- o   o   x ---+---+--- x       </pre>
<p>It is P2's turn to move P2 plays (1, 1)</p> <pre> x       ---+---+---   o   ---+---+---       </pre>	<p>It is P1's turn to move P1 plays (2, 0)</p> <pre> x   x   o ---+---+---   o   ---+---+--- x       </pre>	<p>It is P2's turn to move P2 plays (2, 1)</p> <pre> x   x   o ---+---+--- o   o   x ---+---+--- x   o   </pre>
<p>It is P1's turn to move P1 plays (0, 1)</p> <pre> x   x   ---+---+---   o   ---+---+---       </pre>	<p>It is P2's turn to move P2 plays (1, 0)</p> <pre> x   x   o ---+---+--- o   o   ---+---+--- x       </pre>	<p>It is P1's turn to move P1 plays (2, 2)</p> <pre> x   x   o ---+---+--- o   o   x ---+---+--- x   o   x </pre> <p>The game is a draw</p>

(a) First 3 moves

(b) Second 3 moves

(c) Last 3 moves

Figure 4: Tic tac toe moves

## References