

HUMAN vs Machine!

Who shows whom
the way?



An Initiative of the Federal Ministry
of Education and Research

Science Year 2019



ARTIFICIAL
INTELLIGENCE

"Human vs Machine!"

Instructions – students

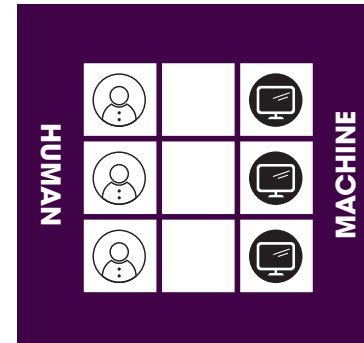
Activity materials



The materials for each group consist of:

- A game board,
- 6 game pieces (3 for the human  and 3 for the machine ) ,
- 24 wipeable situation cards,
- 12 color cards,
- Five role cards,
- A situation overview with the front pages of the 24 situation cards,
- A wipeable move overview with the backs of the 24 situation cards,
- A water-soluble pen,
- 5 result sheets,
- A game sequence diagram, and
- This quick guide with the explanation of the rules of the game.

Rules for Hexapawn

In this activity, you play the game of Hexapawn between a human and a machine on a small board with 3 by 3 squares. The aim of the game is to defeat the opponent by capturing all their pieces, blocking them so they cannot move, or by using your own pieces to reach the opponent's side of the board.

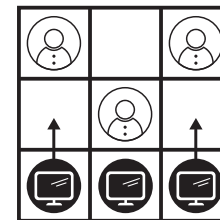


Each player has three game pieces (marked with  for the human and  for the machine), which are placed on opposite sides of the board. Human and machine take turns moving. The human goes first.

The playing pieces move like pawns in chess. So there are two options:

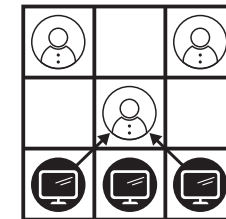
1.

Move one square straight ahead, if the square is not already occupied by another piece.



2.

Move one square diagonally to capture an opponent's piece located there.



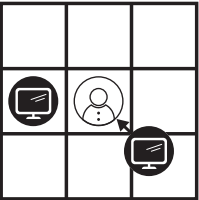
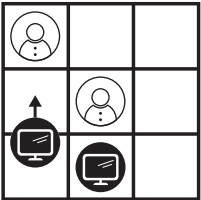
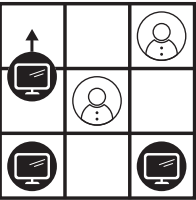
There are three ways to win:

- 1.**

A player reaches the opponent's side of the board with a piece.
- 2.**

All of the opponent's pieces are blocked, so the opponent cannot make any more moves.
- 3.**

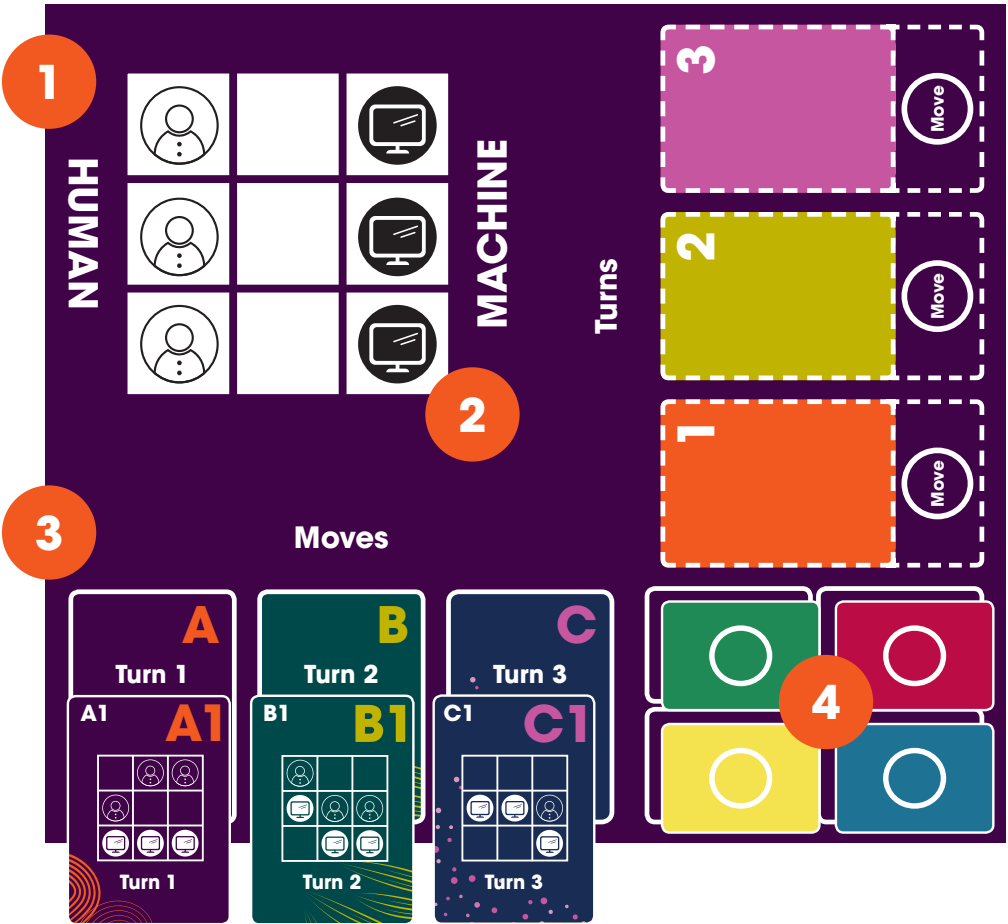
All opposing pieces captured.



Before the game

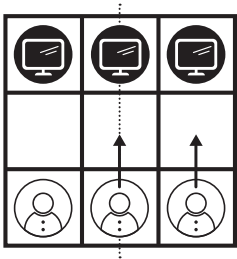
Place the game board unfolded in front of you and get the game materials ready. To do this, place the three human game pieces on the human side of the board and the three machine game pieces on the machine side of the board. Stack the 24 situation cards on the three boxes labelled "Moves" according to the letter – A, B or C – and their consecutive numbering. Sort the color cards by color and place them on the corresponding color boxes on the board.

Finally, hand out the role cards. One person takes the role of the human and plays as cleverly as possible against the machine. The remaining players together become the machine.



How “Human vs Machine” works

The human starts the game and moves first. For the first move, the human may move either the right or middle piece. (Moving with the left-hand piece is really the same as moving the one on the right. The resulting game would just be a reflection.) On later moves, the human may move any piece.



Then it's the machine's turn. The names of the roles are in **boldface**:

1. First the **Situation Evaluator** must classify the current game situation. First, they check to see if the machine has lost. If not, they look for the current game situation on the situation overview and announce it (e.g., A2).
2. The **Move Finder** takes the correct situation card from the corresponding stack and looks to see which colors (blue, yellow, green or red) it can be played with. For each of the possible colors, they take one color card from the color card stacks. These are mixed and then offered to the **Move Picker**, face down, for drawing.

3. The **Move Picker** randomly draws a color card and places it, together with the situation card, on the square corresponding to the current turn on the board. Then the **Move Picker** moves the machine's piece as indicated on the situation card by the arrow with the same color as the color card.
4. After the machine has moved, the **Win Checker** checks whether the machine has just won. If this is not the case, the next round begins and the human moves again.

This procedure is repeated until either the human or the machine has won (there will be a maximum of three moves for the machine). Then:

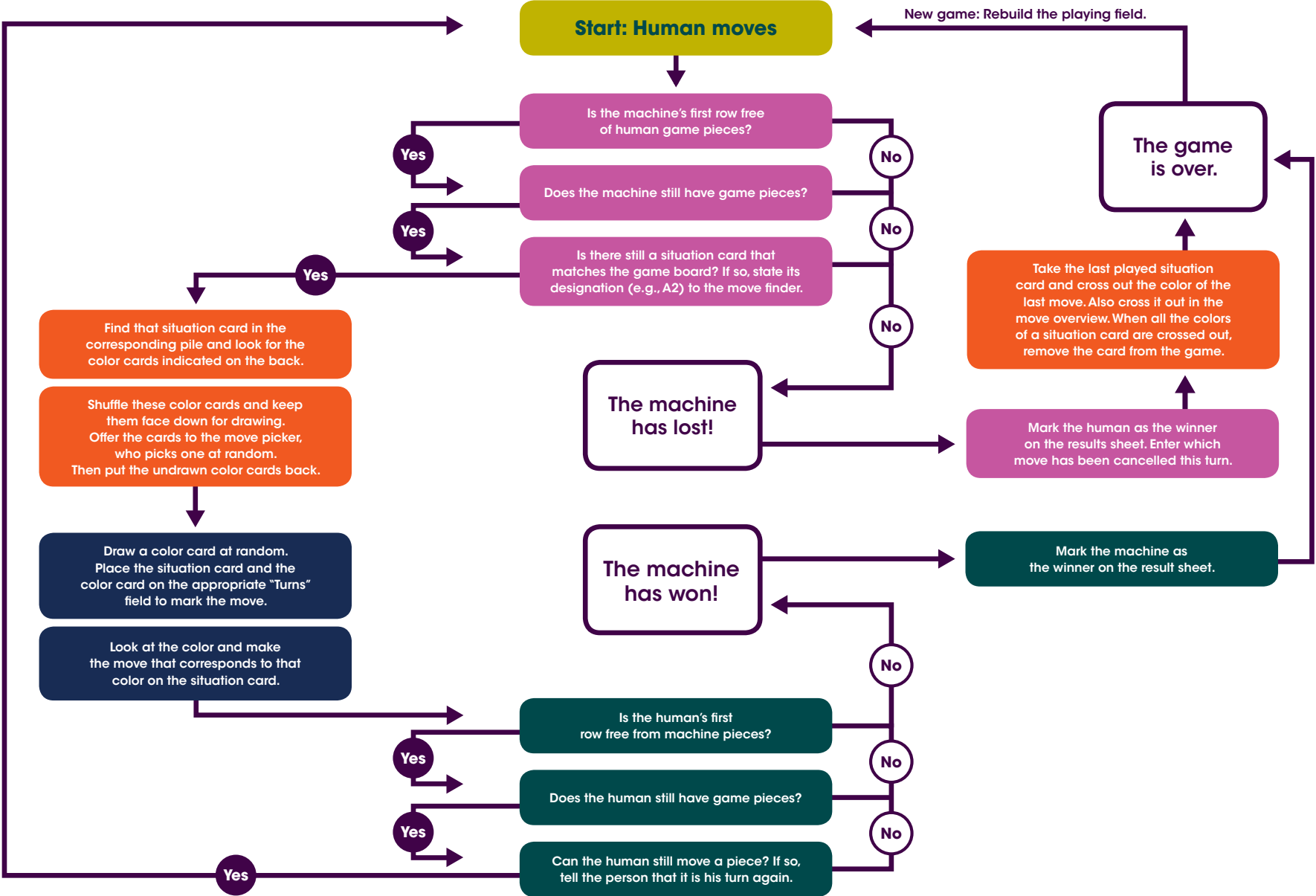
1. The **Situation Evaluator** or the **Win Checker** enters the result of the game on the result sheet.
2. If the machine has lost, the **Move Finder** crosses out the color of the last move on the situation card and on the situation overview.
2. If all the colors on a situation card are crossed out, the **Move Finder** removes it from the game.

Note: If you are part of the machine, and you see a move that would immediately win the game, you must still follow these instructions completely, even if you think it is a bad idea!



game sequence diagram:
Human vs Machine!

- Human
- Win Checker (Machine)
- Move Finder
- Move Picker
- Win Checker (Human)



A version of this graphic in original size is available with the game.

Material information

Situation cards

Each of the situation cards represent one of the possible combinations of game pieces on the board.

At the top edge of the card is the identifier, e.g. B5.

The B represents the second round, the 5 for the corresponding game situation.
Below is the corresponding playing field situation.

The first round has two situation cards: A1 and A2.

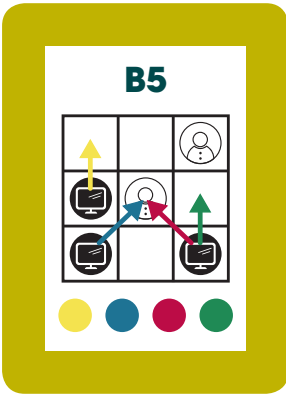
The second round has eleven situation cards: B1 to B11.

The third round has also eleven situation cards: C1 to C11.

On the back of the card are colored circles and corresponding arrows, which represent the possible moves of the machine. If the machine loses, the colored circle of the last move executed is crossed out.



front



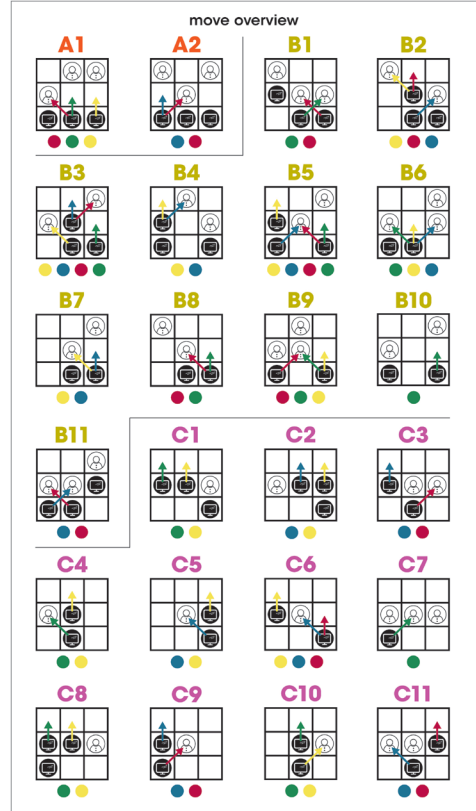
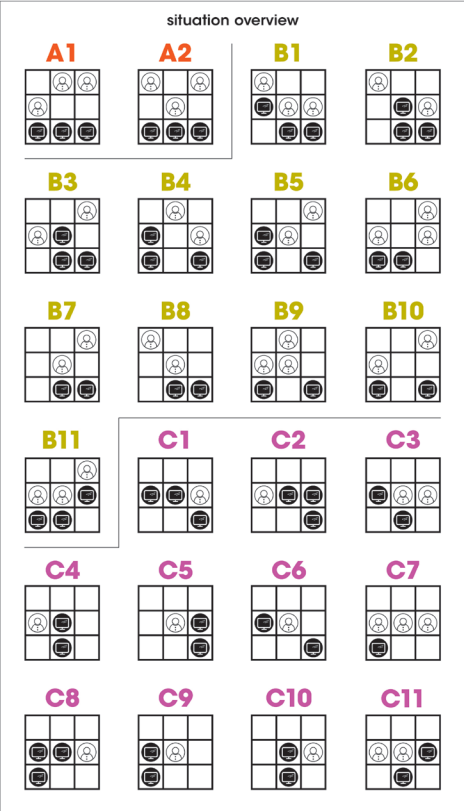
back

Situation overview

The situation overview shows the front sides of the 24 situation cards to make it easier to find the current game situation.

Move overview

The move overview is used for the central and clear marking of deleted moves.



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Publisher

Deutsche Telekom Stiftung, Graurheindorfer Str. 153, 53117 Bonn
Federal Ministry of Education and Research
Council/Board 23 | Science Communication; Science Years, 10117 Berlin

Design and further development of the game Hexapawn*

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KOMPAKTMEDIEN Agentur für Kommunikation GmbH

* the game utilizes the idea of Hexapan, or Hexapawn Educable Robot,
presented by Martin Gardner in Scientific American, 1962

Editing and Implementation

Paderborn University, Computing Education Research Group
with support of the Didactics of Mathematics Research Group

Project Management

DLR Project Management Agency

Version

July 2019

Packaging / Assembly

Caritasverband für den Kreis Coesfeld (registered association)



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