

# Machine Learning For Kids :: Teachers' notes

<b>Worksheet</b>	<b>Noughts and Crosses</b>
<b>Activity</b>	Create a noughts and crosses game in Scratch that learns how to beat you.
<b>Objective</b>	<b>Teach a computer to play a game</b> <ul style="list-style-type: none"> <li>How machines have been taught to play games since the 1960's.</li> <li>Decision tree learning as a way for computers to learn how to play games.</li> </ul>
<b>Difficulty level</b>	Advanced The Scratch script is long and complex. Most of it is provided in a starter project file, but finding the right places to make changes needs care.
<b>Time estimate</b>	1 – 1.5 hours
<b>Summary</b>	Students will train the computer to play noughts and crosses by playing the game in Scratch. The machine learning model will be trained based on the moves that they make while playing.
<b>Topics</b>	decision tree learning, reinforcement learning, categorical data

## Setup

Each student will need:

<b>Print-outs</b>	Project worksheet (download from <a href="https://machinelearningforkids.co.uk/worksheets">https://machinelearningforkids.co.uk/worksheets</a> ) Blocks in Scratch scripts are colour-coded, so printing in colour will make it easier for students.
<b>Files</b>	noughts-and-crosses.sbx (download from <a href="https://machinelearningforkids.co.uk/worksheets">https://machinelearningforkids.co.uk/worksheets</a> )
<b>Access</b>	Username and password for machinelearningforkids.co.uk

Class account will need:

<b>API keys</b>	None
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## Help

<b>Potential issues</b>	<ul style="list-style-type: none"> <li>Time management is important for this project. Students often lose track of time while playing the game and don't leave enough time for training or coding. It may be helpful to time-box the sections (initial trying out of the game, training the model, testing the model) to keep the class on track.</li> <li>The most common bug in student Scratch scripts is to make the wrong choice in orange drop-down blocks (e.g. choosing "history nought top-right" instead of "history cross top-right"). Encourage students to copy carefully. Working in pairs can help avoid mistakes.</li> <li>It is important to close and re-open the Scratch browser window after each time a machine learning model is trained, otherwise Scratch will keep using previous moves.</li> </ul> <p>General troubleshooting and help at <a href="https://machinelearningforkids.co.uk/help">https://machinelearningforkids.co.uk/help</a></p>
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