Project Proposal: Sick-Arithmetic

Group name: ShallowMind

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1. Abstract

With this project we will create an AI that will be able to perform basic mathematical computations. Users will be able to give the AI equations and will be able to evaluate the output of the AI. This way the AI will learn from its mistakes and will become better with every equation that will be given. Users will also be able to generate a report detailing the intelligence and progress of the AI over each iteration.

2. Role Assignment

Roles	Name	Task description
User	Zachary Frank	Provide feedback on updates to the project.
Customer	Zachary Frank	Give the software developer and development manager requirements based on user feedback and needs.
Software developer	Emyl	Lead the development and make software design decisions.
Development manager	Cédric	Project management and managing customer requirements

3. Introduction

We wanted to combine AI and mathematics by teaching one to perform mathematical computations. It is our hope to create an application that will help people learn how an AI is trained using mathematical equations. This will give a user the ability to train their own AI from scratch and learn what methods are most effective. To do this, the client needs a friendly user interface that will allow them to communicate mathematical equations as input to the AI and receive feedback. The client also needs a way for users to evaluate the intelligence and progress of the AI they have been training.

Similar software:

During our research we found that multiple attempts at teaching AI math has been done, for example by using the neural network api Keras. We also found research in the field of psychology where the neural network's learning of math is compared to that of a child's[1].

The biggest project we found was DeepMind's attempt at teaching an AI to pass a high-school math exam, by teaching it arithmetic, calculus and algebra. Their AI scored 14 out of 40 on the exam. While the scope of this project is bigger than ours, it serves as a great inspiration![2]

[1] http://web.stanford.edu/~kmickey/pdf/MickeyMcClelland2014.pdf

[2] https://www.zdnet.com/article/ai-aint-no-a-student-deepmind-flunks-high-school-math/ & https://arxiv.org/abs/1904.01557

4. Requirements

a. Recognize mathematical syntax

i. Equals

Learn the association between two numbers with an equal sign. Evaluate whether a statement is true or false ie. 20 = 20 is true, 3 = 2 is false. Also answer questions such as 4 = ? and return 4.

ii. Addition

Learn how to add the value of numbers on either side of a plus sign and find their sum.

iii. Subtraction

Learn how to subtract the value of one number from another and find their difference.

iv. Combine Operations

Combine several operations together such as 5 + 5 = 10 and evaluate if the statement is true or false.

v. Negative Numbers (Optional)

Perform the above operations with negative numbers.

vi. Multiplication (Optional)

Learn how to multiply the value of numbers on either side of a multiplication sign and find their product.

vii. Division (Optional)

Learn how to divide the value of numbers on either side of a division sign and find their quotient.

b. Simple user interface

Create a simple user interface that has an input field for the equation. (Optional, input field for hand drawn formulas). An output field where the AI can give the answer to an equation.

c. Evaluate the effectiveness of training

After the AI is given example equations it should be tested to see its effectiveness regarding solving equations.

d. Record evaluations in a database

After the AI gives a solution to an equation it should be stored in a database to track the learning progress.

e. Recognize hand drawn formulas (Optional)

Use image recognition to provide another method of providing input.