

**Dr. Keras or:
How I Learned to Stop Worrying
and Love NLP**

Dalya Gartzman

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**TeMS -
Textual Math Solver**

Simplisico

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 seematics

VISIONARY
DEEP LEARNING


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PART I - What is TeMS?

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The image shows a screenshot of the Simplisico website, which is a math tutor. The website has a red header with the Simplisico logo and navigation links. The main content area features a large video player with a play button. To the left of the video player, there is a sidebar with a list of topics. The background of the website is a chalkboard filled with various mathematical formulas and diagrams. A man with a beard and tattoos is standing in front of the chalkboard, looking at the video player.

Simplisico LTD [IL] | https://www.simplisico.com

English Login Sign up

YOUR PRIVATE MATH TUTOR

Understand · Simple · Solve

INTERSECTION WITH THE Y AXIS

What is actually a y-intercept? It's the point where a line crosses the y-axis. In other words, it's the point where the line intersects the y-axis. This is the point where the line crosses the y-axis.

As you can see, a function has one y-intercept. This is the point where the line crosses the y-axis. This is the point where the line crosses the y-axis.

Using the calculator

Find the y-intercept of the function $f(x) = 2x^2 - 5x + 3$.

Using the calculator

Find the y-intercept of the function $f(x) = 2x^2 - 5x + 3$.

Try it for free

PART I - What is TeMS?



The screenshot shows the Simplisico website interface. At the top, there's a navigation bar with the logo "simplisico math made easy" and a user profile icon. Below the navigation bar, there's a prominent orange button that says "Subscribe now" with a text overlay: "to get unlimited access to Simplisico's extended explanations, a full month costs much less than a private tutoring hour!".

Below the button, there's a text prompt: "Enter the equation you have to solve using the keyboard or on-screen buttons, when finished press 'Show Solution' and learn how to explore your function."

The main area features a large input field containing the equation $f(x) = \frac{5x+6}{2x-3}$. To the right of the input field is a directional pad icon. Below the input field is a calculator interface with a grid of buttons. The buttons include mathematical symbols like x , $\frac{\square}{\square}$, \square^2 , $\sqrt{\square}$, \square^3 , $\sqrt[3]{\square}$, and a row of numbers 7, 8, 9, 4, 5, 6, 1, 2, 3, 0. There are also buttons for basic operations: \times , $-$, $+$, and a row of functions: \sin , \cos , \ln , \log .

At the bottom right of the calculator interface is a blue button labeled "Show Solution >".

PART I - What is TeMS?

The screenshot shows a web browser window with the URL <https://www.simplisico.com>. The page features the Simplisico logo and navigation links. A math problem is displayed on a slide:

**I have 10 minutes to talk and I prepared 42 slides.
How long can I spend on each slide?**

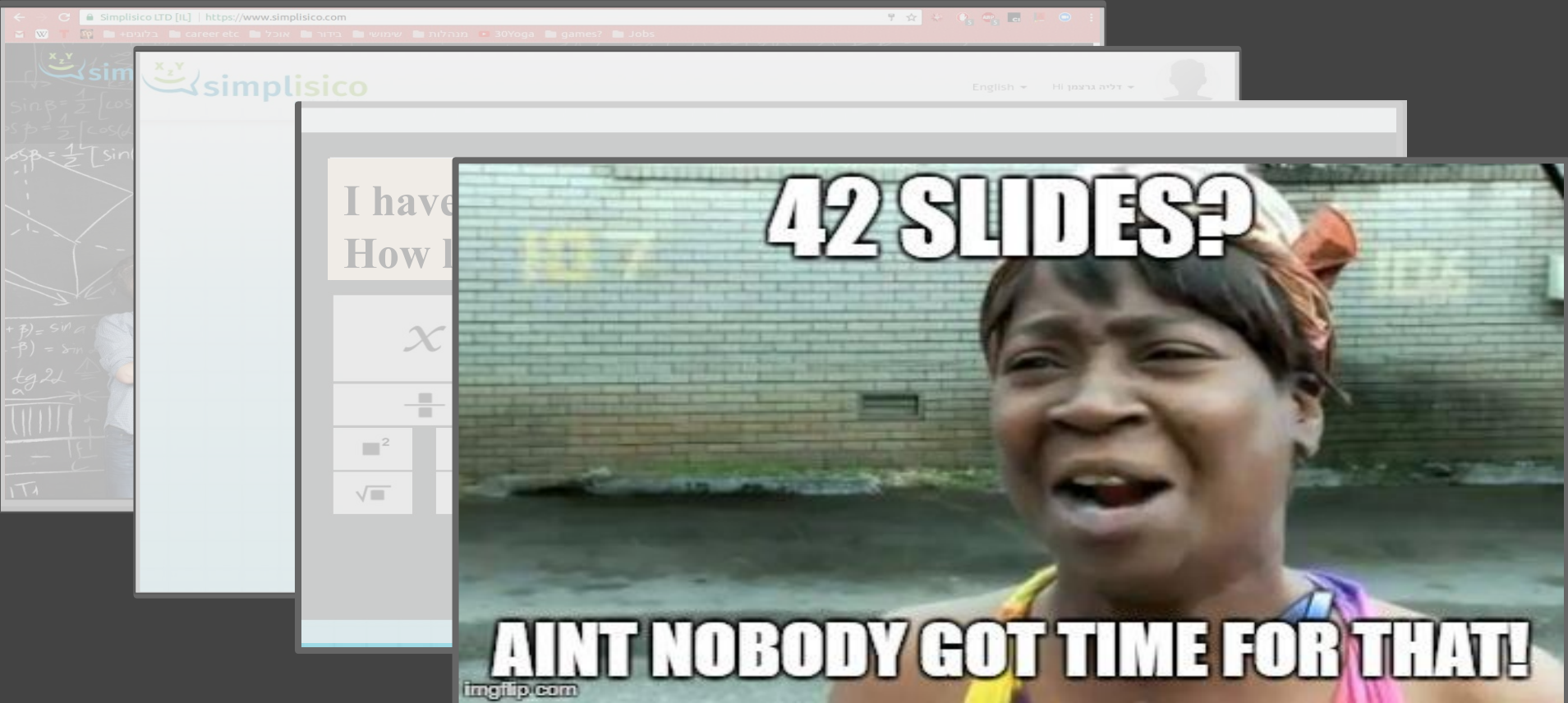
The equation $42 * x = 10$ is shown in a blue box.

Below the problem is a calculator interface with the following layout:

x	C	$\leftarrow \times$	()	\div
$\frac{\square}{\square}$	7	8	9	\times
\square^2	4	5	6	$-$
$\sqrt{\square}$	1	2	3	$+$
$\sqrt[n]{\square}$	0	sin / cos / ln / log	.	

A blue button labeled "Show Solution >" is located at the bottom right of the calculator interface.

PART I - What is TeMS?



Preprocessing

Preprocessing

I have 10 minutes to talk and I prepared 42 slides. How long can I spend on each slide?

Preprocessing

I have **A** minutes to talk and I prepared **B** slides. How long can I spend on each slide?

Preprocessing

I have **A** minutes to talk and I prepared **B** slides. How long can I spend on each slide?

TOKENIZE [10, 42, 0] +
[... 'have', '**varA**', 'minutes', ...
'prepared', '**varB**', 'slides', ...]

Preprocessing

I have **A** minutes to talk and I prepared **B** slides. How long can I spend on each slide?

TOKENIZE [10, 42, 0] +
[... 'have', '**varA**', 'minutes', ...
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EMBED

tree → park
slides → talk

TeMS: a Sequence-to-Permutation RNN with LSTM and Attention

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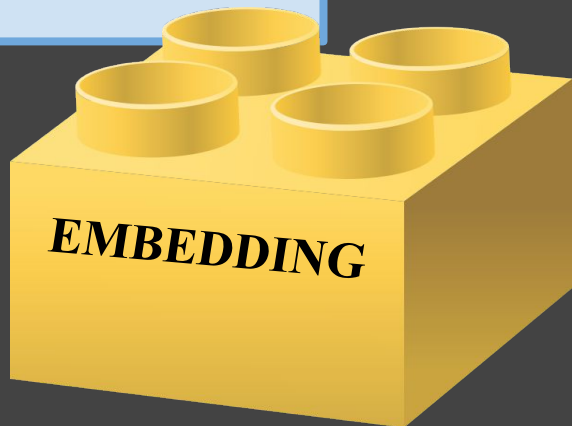
[42, 10, 0]



$42 * x = 10$

TeMS: a Sequence-to-Permutation RNN with LSTM and Attention

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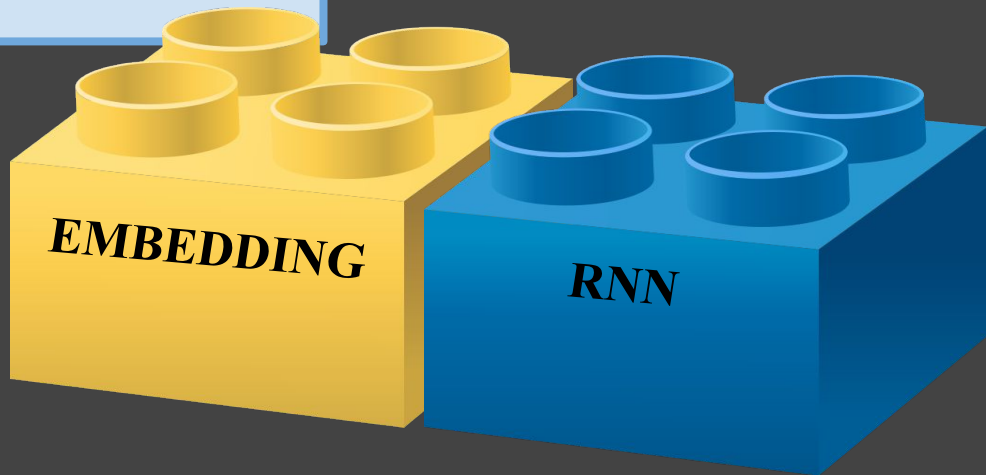
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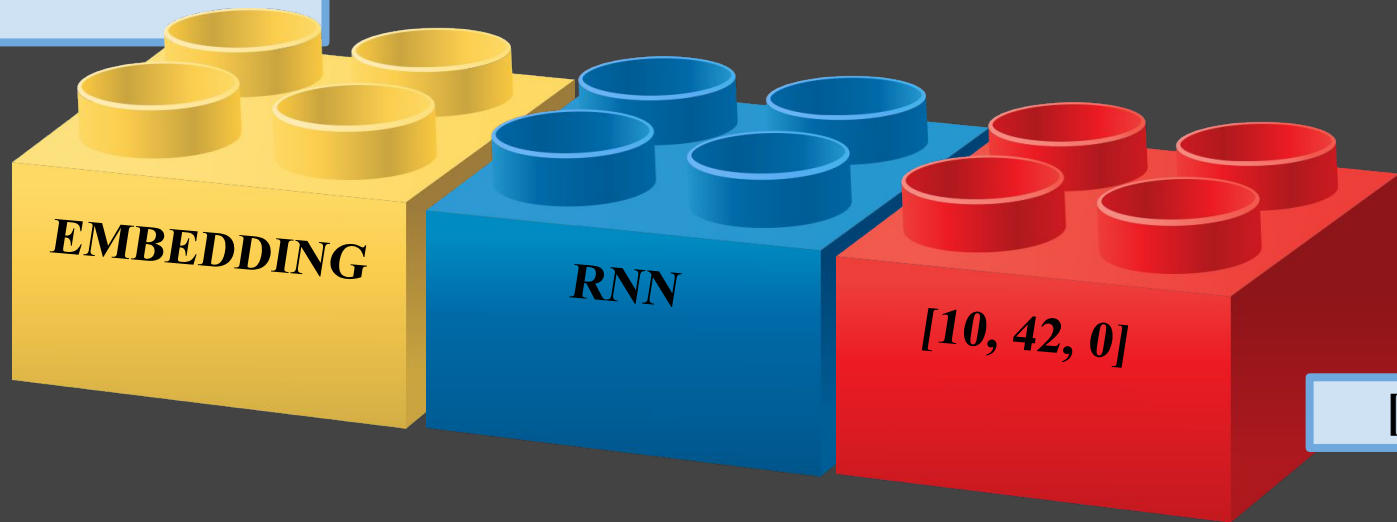
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TeMS: a Sequence-to-Permutation RNN with LSTM and Attention

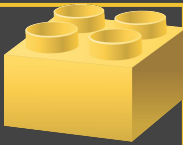
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$[42, 10, 0]$



$42 * x = 10$



```
# generate embeddings
embedding = w2v.Word2Vec()
embedding.build_vocab(all_questions)
embedding.train(all_questions)
```

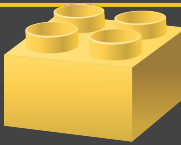
```
# Words model
words_model = Sequential()
words_model.add(Embedding(vocab_size, embedding_dim, weights=[embedding]))
words_model.add(LSTM(64, activation='softmax', return_sequences=True, dropout=0.5))
words_model.add(LSTM(64, activation='relu', return_sequences=False, dropout=0.5))
words_input = Input(shape=(max_len,))
processed_words = words_model(words_input)
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# Numbers model
nums_model = Sequential()
nums_model.add(Dense(3, input_dim=3))
nums_input = Input(shape=(3,))
processed_nums = nums_model(nums_input)
```

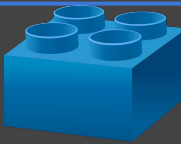
```
# Concatenate models
merged = keras.layers.concatenate([processed_nums, processed_words])
```

```
# add one dense layer to integrate the merging
hidden = Dense(32, activation='tanh')(merged)
hidden = Dropout(0.5)(hidden)
# finish with a dense layer
output = Dense(3)(hidden)
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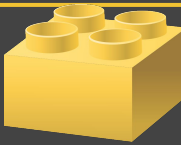
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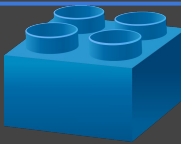
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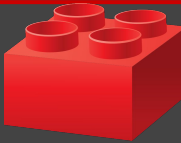


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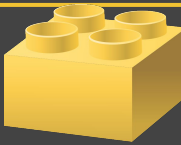
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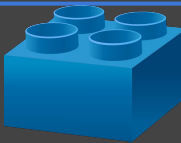
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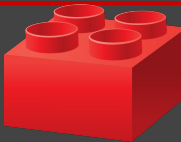


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Results

Input:

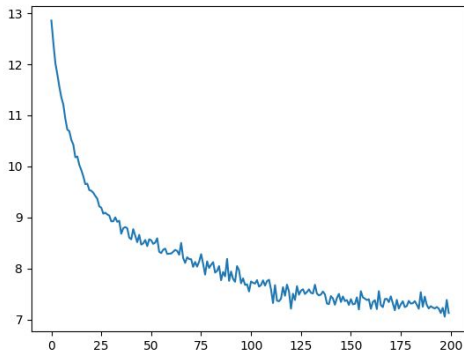
['You have 5 apples...',
'23 years from now...',
'Sean collected 47 stamps...',
'A cup of coffee costs 13.5\$...',
'Fourteen drinks were served ...']

Prediction:

$5 * x = 39 - 19$
 $2 * x = 23 - 16.8$
 $5 * x = 47 - 17$
 $2 * x = 13.5 - 3.5$
 $4 * x = 14 - 6$

Truth:

$5 * x = 39 - 19$
 $2 * x = 23 - 16.8$
 $5 * x = 47 - 17$
 $2 * x = 13.5 - 3.5$
 $-4 * x = 6 - 14$

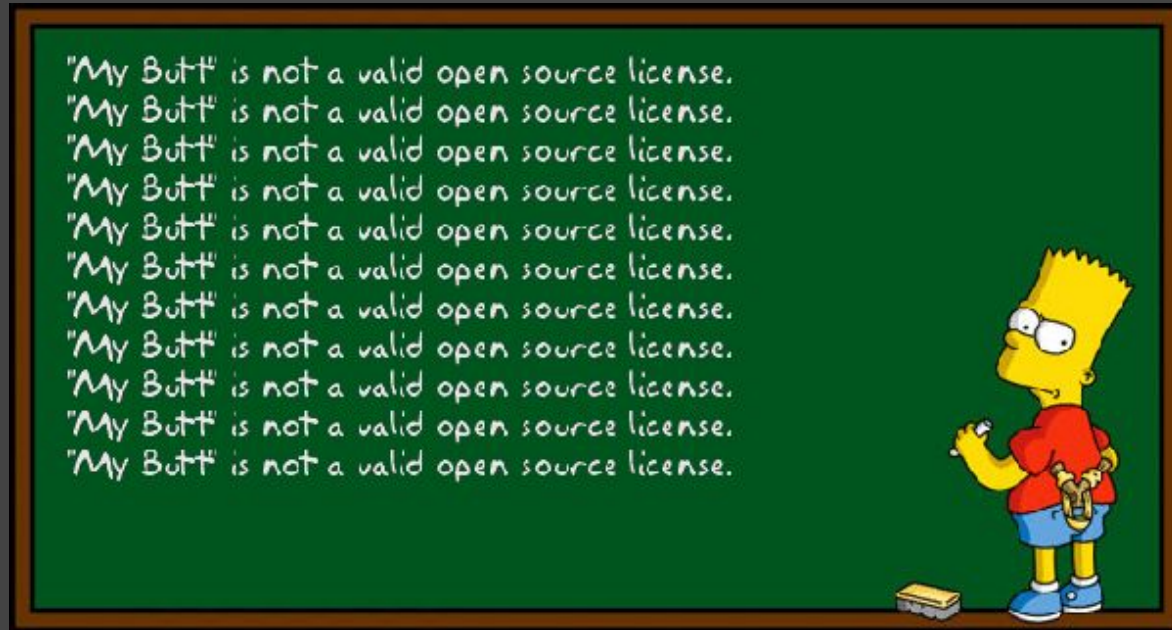


PART I Recap



PART II -

How to Reach a Wider Audience



Tip #1 -



Documentation, Documentation, Documentation?!?

Tip #1 -

Documentation, Documentation, Documentation?!?

Intro/Tutorial



Tip #1 -



Documentation, Documentation, Documentation?!?

Documentation

Intro/Tutorial



Tip #1 -



Documentation, Documentation, Documentation?!?

Support



Documentation



Intro/Tutorial



Tip #1 -

Documentation, Documentation, Documentation?!?

Intro/Tutorial



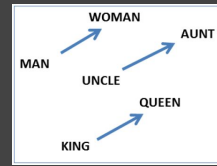
Documentation



Support



MAN → WOMAN → AUNT
UNCLE → QUEEN
KING →



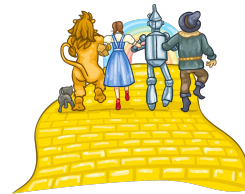
Tip #3 - Dare to be Mainstream



PART II Recap

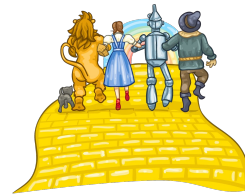
PART II Recap

Friendly



PART II Recap

Friendly



Fun

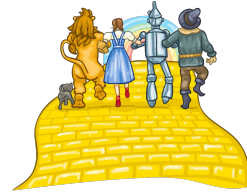


PART II Recap

Accessible



Friendly



Fun



Take Home Message




Thank you :)
Questions?

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