CODING BLOCKS

- Introduction to Machine Intelligence

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BRIEF ABOUT ME

- ACADEMIC BACKGROUND:
  - Computer Engineering, **DTU**
- EXPERIENCE:
  - Technical Advisor on Vision and Deep Learning, **Cyclops USA**. (www.cyclops.io)
  - Mentor, OFF, **Google Summer of Code**
  - Media and Data Science Research Group, **Adobe Systems**

INTRODUCTIONS

MACHINE INTELLIGENCE

Machine Learning

what society thinks I do

what my friends think I do

what my parents think I do

$$L_P = \frac{1}{2}\|\mathbf{w}\|^2 - \sum_{i=1}^{l} \alpha_i y_i (\mathbf{x}_i \cdot \mathbf{w} + b) + \sum_{i=1}^{l} \alpha_i$$

$$\alpha_i \geq 0, \forall i$$

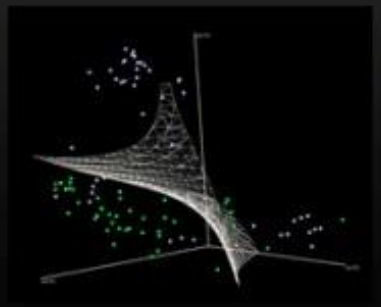
$$\mathbf{w} = \sum_{i=1}^{l} \alpha_i y_i \mathbf{x}_i, \sum_{i=1}^{l} \alpha_i y_i = 0$$

$$\nabla \hat{g}(\theta_t) = \frac{1}{n} \sum_{i=1}^{n} \nabla \ell(x_i, y_i; \theta_t) + \nabla r(\theta_t).$$

$$\theta_{t+1} = \theta_t - \eta_t \nabla \ell(x_{i(t)}, y_{i(t)}; \theta_t) - \eta_t \cdot \nabla r(\theta_t)$$

$$\mathbb{E}_{i(t)}[\ell(x_{i(t)}, y_{i(t)}; \theta_t)] = \frac{1}{n} \sum_{i} \ell(x_i, y_i; \theta_t).$$

what other programmers think I do



what I think I do

```
>>> from sklearn import svm
```

what I really do

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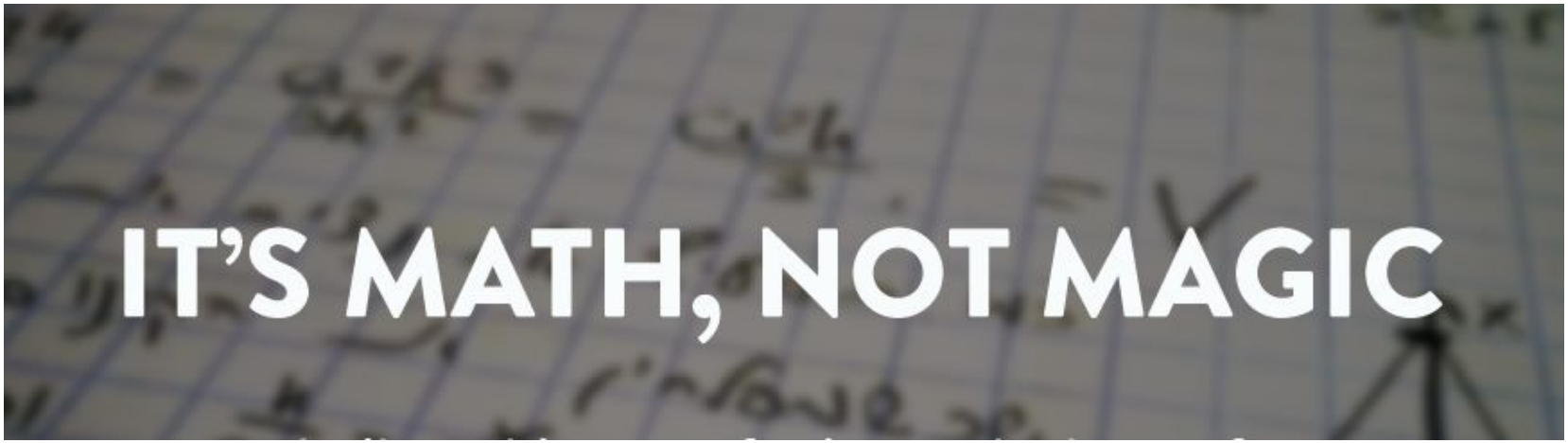
WHAT IT IS



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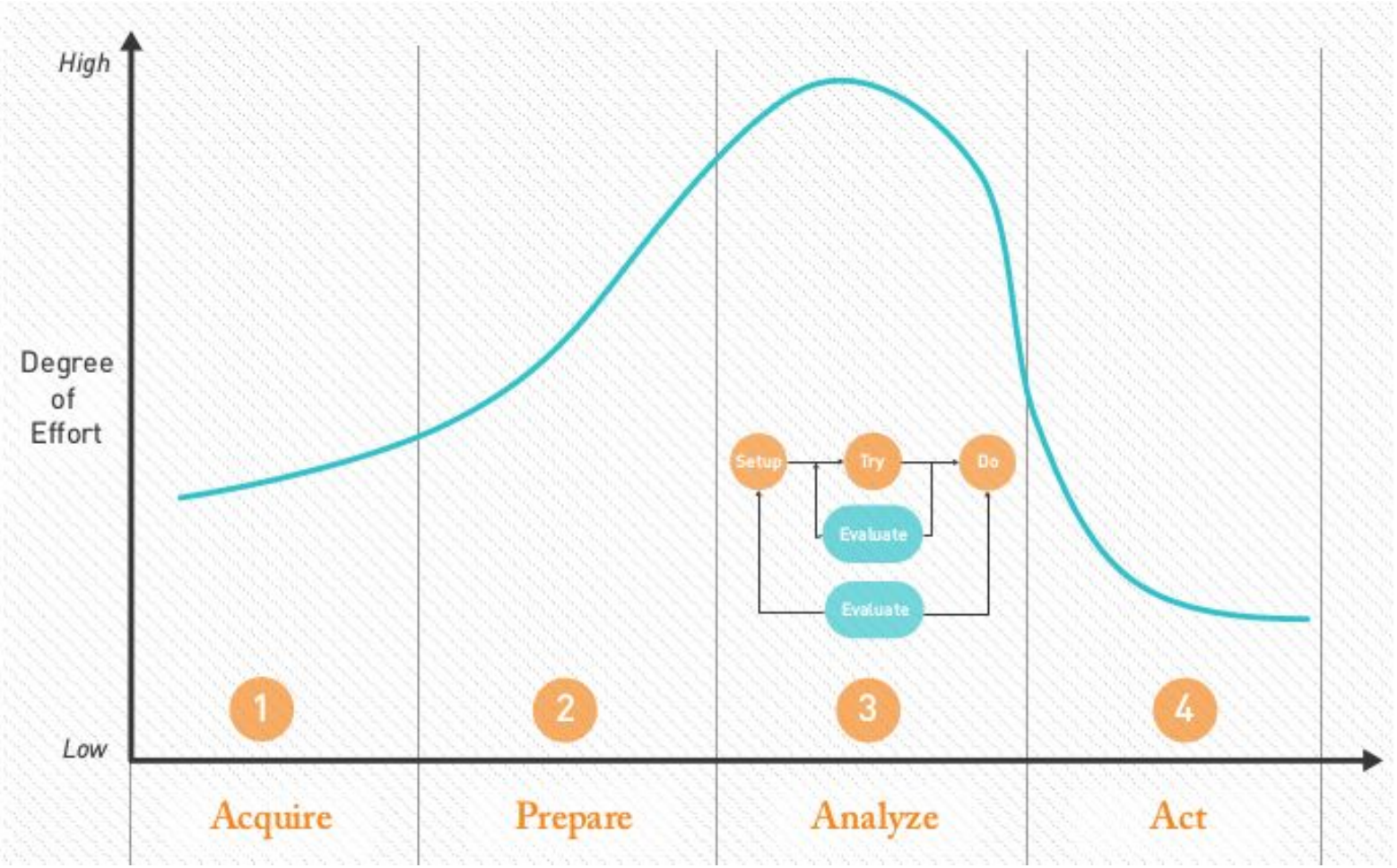
LENDING A STRUCTURE



Thanks: Booz Allen Hamilton

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THE DATA SCIENCE LIFECYCLE

1. Collect Data - **Acquire**

2. Understand the structure of the data - **Prepare**
   + Statistical Reasoning
   + Patience.

3. Build Predictive Models around the Data - **Analyse**
   + Iterative Process
   + Setup - Try - Do
   + Good Bit: Error Minimization Framework = f(Experience)

4. Put them into practice - **Act**
   + Let the business people take over

RECAP: System of Linear Equations

HOW DO YOU SIMULATE THE SAME ON A COMPUTER PROGRAMMATICALLY?

BUILDING ALGORITHMS IS NOT THAT HARD

Why don’t you try for yourself?

CASE 1

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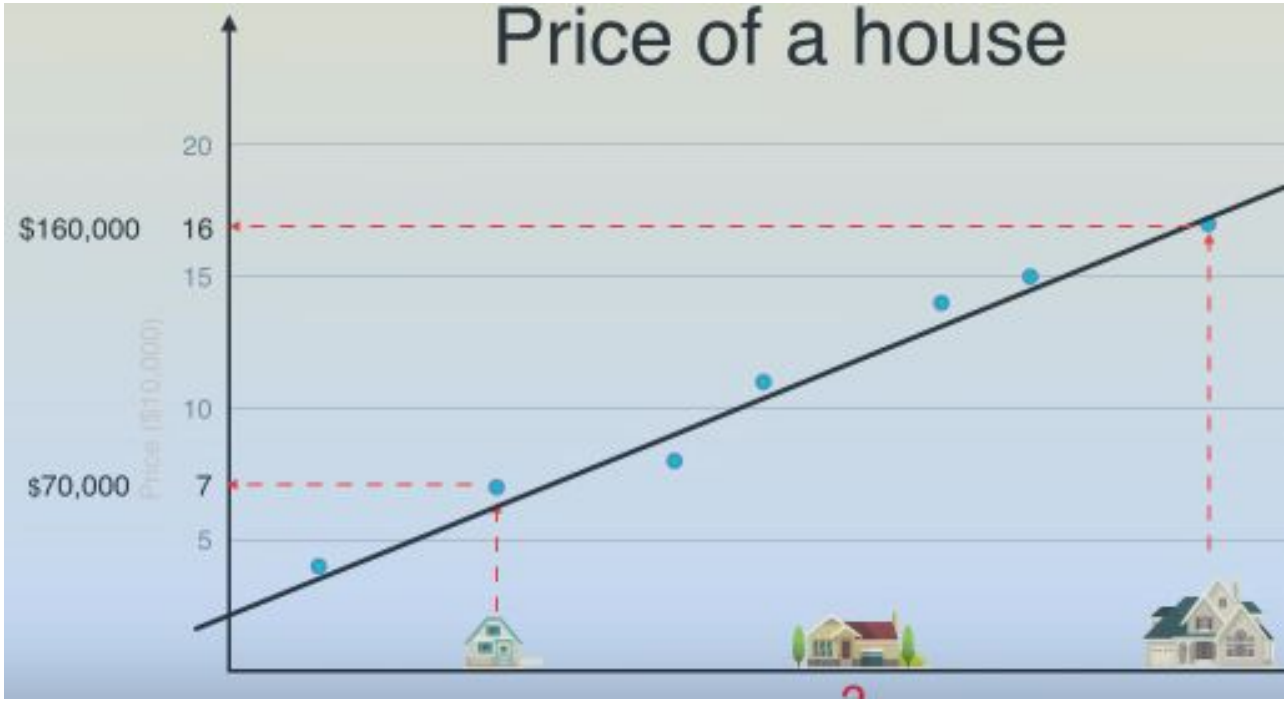
Make a Prediction : Fit a Line



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FOOD FOR THOUGHT

1. Add another variable :- Repute of the Locality
2. Add another variable :- Lease/ Freehold
3. And another :p :- Year of Construction

Talk of : -
1. Problem Dimensionality
2. Nature of Curve to fit

CASE 2

Optimize Location of 3 pizza parlours

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For the algorithm: Initialise to Random Locations

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Did anyone say pizza?

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EVENTUALLY

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Buzz Words

- Supervised Learning, Unsupervised Learning, Reinforcement Learning
- Classification/ Regression
- Features
- Training Data
- Validation Data
- Testing Data
  For later!!
- Overfitting, Underfitting
- Weights

WHICH OF THE ABOVE DISCUSSED PROBLEMS IS

1. SUPERVISED

2. UNSUPERVISED

Justify!!

FORMAL DEFINITION

- Machine learning is a subfield of artificial intelligence (AI) concerned with algorithms that allow computers to learn. What this means, in most cases, is that an algorithm is given a set of data and infers information about the properties of the data—and that information allows it to make predictions about other data that it might see in the future

DRIVING FACTORS !

- Lots of Data
- Ability to process it

Machine Learning Models are essentially Statistical Machines.

SOME STATISTICS

- Every minute up to **300 hours of video** are uploaded to **YouTube**.
- Average of **31.25 million messages** and view **2.77 million videos** every minute on **Facebook**.
- More data has been created in the past two years than in the entire previous history of the human race.
- At the moment less than 0.5% of all data is ever analyzed and used, just imagine the potential here.

THE INDUSTRY IS USING IT..

- **Google** Page Ranking.
- **Netflix** Suggestions.
- **Tesla** Self Driving Cars
- **Amazon** product recommendations.
- **Tinder** matches
- **Facebook** video tagging.

THE POTENTIAL:
FEW INTERESTING APPLICATIONS

Demystifying Prisma: Neural Art

A Neural Algorithm of Artistic Style

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The Mathematical Mozart

Image Captioning: Neural Story

Deep Visual-Semantic Alignments for Generating Image Descriptions

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Generated story about image
Model: Romantic Novels

"He was a shirtless man in the back of his mind, and I let out a curse as he leaned over to kiss me on the shoulder.

He wanted to strangle me, considering the beatiful boy I'd become wearing his boxers."

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Generated story about image
Model: Romantic Novels

“My man was within a woman, and she gave him a questioning look. I don't know what else to say to her . For the first time in years , I had never been as beautiful as the rest of my man .

In fact, he had his hands on her hips , holding her close to his chest and looking down at her as if she were the most stunning woman I d ever seen . The man released a woman 's blood , and that was the reason for all of them.

She hoped to make an appear- ance, convincing him and the woman who was still her first .”

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Conversational Engine

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Pacman Champ: The Gamer

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How easy do you think Lip Reading is ?

Lip-Reading AI

Human Accuracy : 20% to 60%

LipNet Accuracy : 93.4%


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Colorizing the World: Autoencoders

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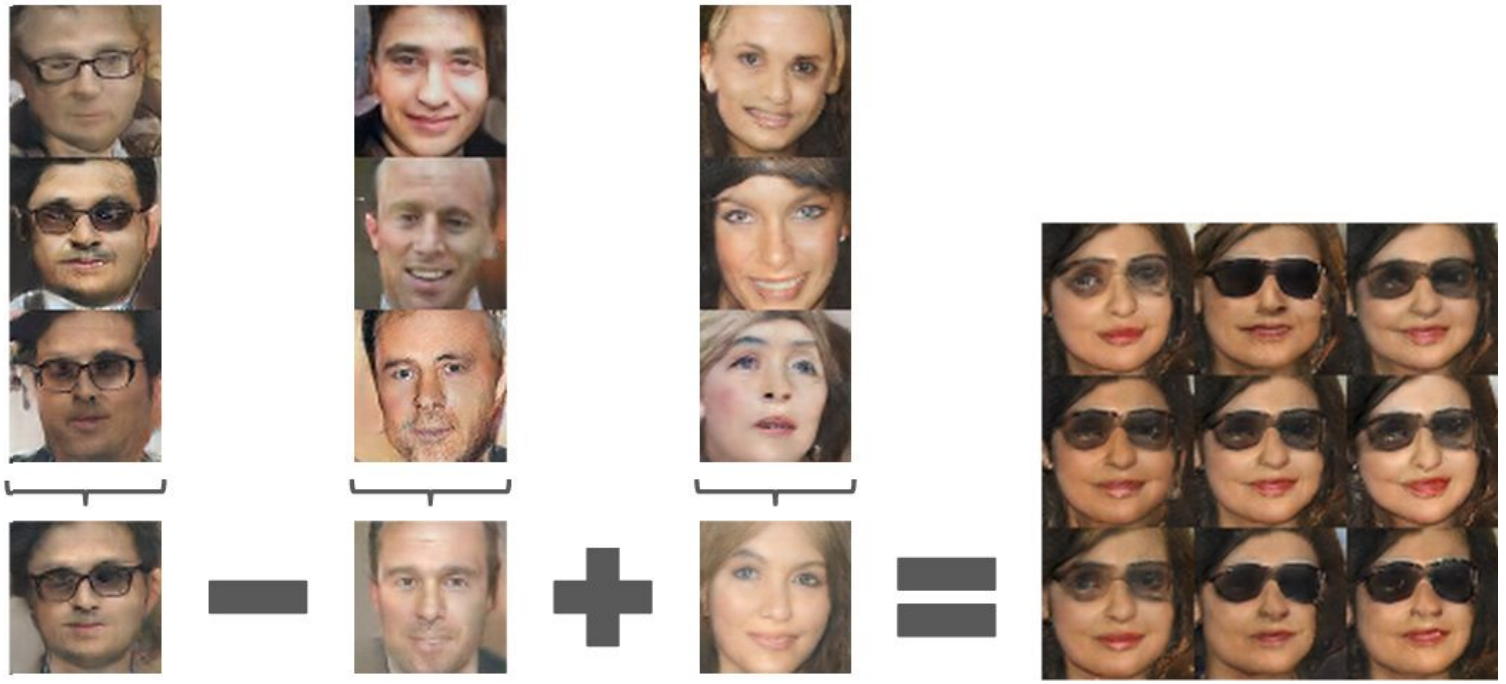
Playing with Words and Image



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DEVELOPER CHECKLIST

- Programming Language
  - Python (Recommended)
  - R
- IDE
  - Jupyter Notebooks
  - IPython
- Mathematical Libraries
  - Numpy
  - Scipy
- Data PreProcessing
  - Pandas
  - OpenCV

DEVELOPER CHECKLIST

- Machine Learning
  - Scikit-Learn
- Deep Learning
  - Keras
  - Tensorflow
  - Caffe
- And..

Passion and Perseverance !

GENERAL RECOMMENDATIONS

1. Read a lot of Research Literature.
2. Get a good grasp on the mathematics.

INTRODUCTION TO PYTHON

Setting Up Jupyter Notebooks

Variable and Data Types

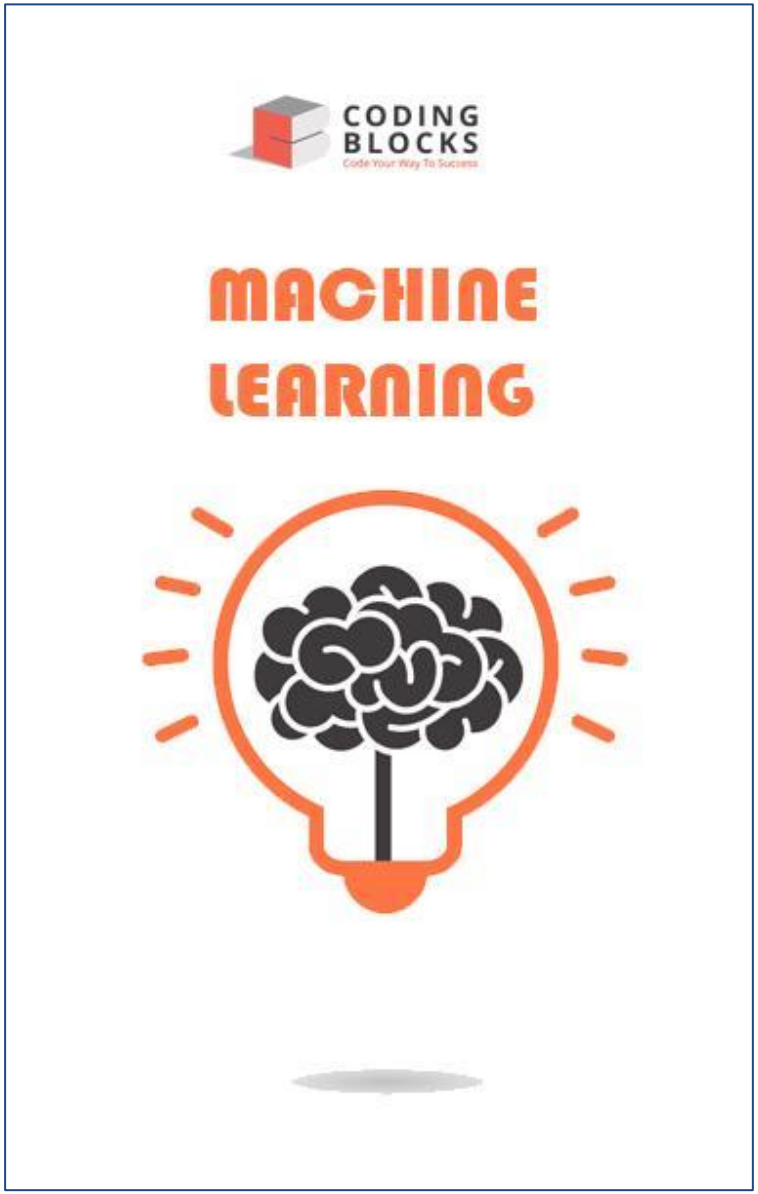
String, Lists and Dictionaries

Packages and Imports

Conditionals Loops and Functions

Object Oriented Paradigm

Doubts and Queries!!



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Thank You!

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