Machine Learning with TensorFlow.js for Drupal 9

Drupal + Component Module + TensorFlow.js

Rick Torzynski
Senior Drupal Developer, ECS
Esteemed Colleague

My Development History

I've been a Drupal Developer for 12 years, working on government agency Drupal websites, healthcare Drupal websites, machine learning applications, and software engineering.

1

ECS
- Senior Drupal Developer

2

TEKsystems
- Contractor at Florida Blue

3

Scribe Fusion
- Software Engineer (Python)

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Our Agenda

- Intro to Machine Learning

- How is it used in Drupal?

- What is Machine Learning / Deep Learning?

- What is TensorFlow.js

- Understanding the Component Module

- Demo

- Looking to the future

- Resources

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Intro to Machine Learning

- "Machine learning focuses on applications that learn from experience and improve their decision-making or predictive accuracy over time." - IBM

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Intro to Machine Learning

- "Just as electricity transformed almost everything 100 years ago, today I actually have a hard time thinking of an industry that I don't think AI will transform in the next several years." - Andrew Ng

Andrew Ng - Stanford Professor & Co-founder of Coursera

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Intro to Machine Learning

Companies currently leveraging machine learning applications

Nvidia
- IoT Edge
- Omniverse*

Tesla
- Self-driving cars

Facebook
- PyTorch - ML Framework
- Friend Recommender
- Face Recognition

LinkedIn
- Job recommendations

* NVIDIA Omniverse™ is a revolutionary virtualplatform built for collaboration and real-time photorealistic simulation.

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Intro to Machine Learning

- **Local companies in Jacksonville, Florida using Machine Learning**

  1. Duos Technologies: Video inspection portals for trains
  2. NLP Logix: Machine Learning applications, ML-enhanced OCR application, ML-enhanced Fraud detection systems, ML Job Recruiter system
  3. Guidewell: Recommendation engine for customers aging into Medicare
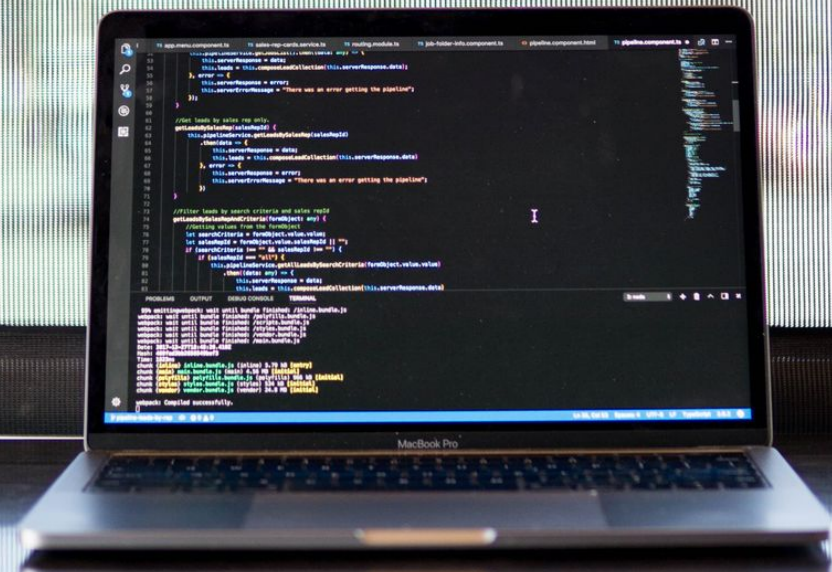 4. AdTheorent: Machine Learning solutions for advertising

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Intro to Machine Learning

- ## Types of Machine Learning
  - Supervised Learning
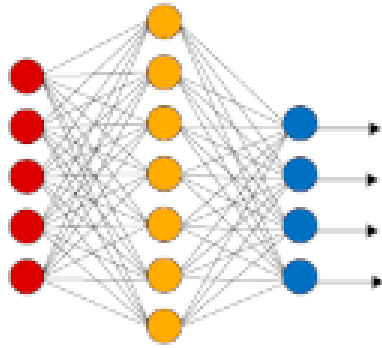 - Unsupervised Learning
  - Deep Learning - Neural Networks

A Beginner's Guide to Machine Learning with ml5.js

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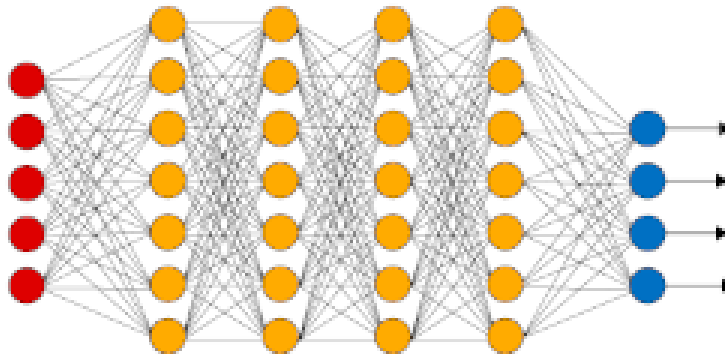MADE WITH
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Intro to Machine Learning

- ## Most-used language for ML: Python
  - High level language very similar to PHP - Pip/Composer
  - Dependencies: Numpy, Scipy, Scikit-learn, Pandas, Matplotlib, Keras, TensorFlow, PyTorch
  - Jupyter Notebooks/Google Collab: interactive in-browser editor

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Intro to Deep Learning

Input Layer
Hidden Layer
Output Layer

- A subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called "artificial neural networks"

  - Input Layer - Images, text, audio, video, numbers, etc.
  - Hidden Layers - Filters for feature extraction
  - Output Layer - Classification, prediction
  - Activation function

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How is Drupal using this technology?

- Currently Drupal has 3 Machine Learning modules available for use:
    1. Machine Learning Libraries
    2. Drupal Compute
    3. Recommender API

- Drupal 7 only

- Allows use of Python or Java code only using Drupal queue

- Proprietary Machine Learning functionality
    - Acquia – Personalization

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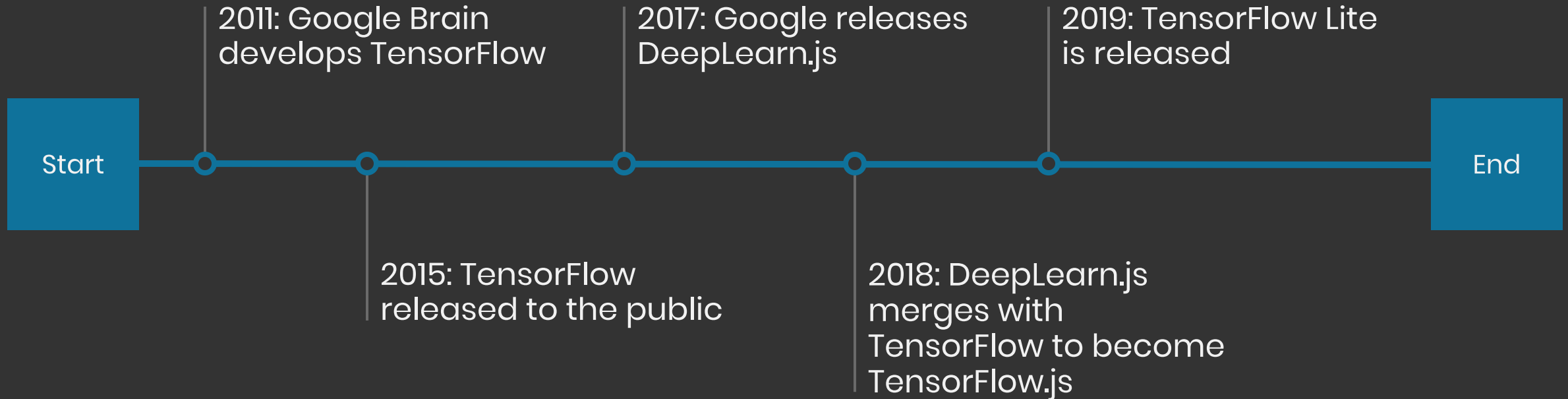# An alternative: Component Module + TensorFlow.js

- ## Component Module

  1. Use JavaScript within a block
  2. JavaScript configuration in block config
  3. Drupal setup to work with JavaScript

- ## TensorFlow.js

  1. Fully developed JavaScript library
  2. Uses WebGL to access GPU for processing
  3. TensorFlow Datasets – Collection of datasets
  4. TensorFlow Hub – Collection of pre-trained models

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Brief History of Tensorflow.js

2011: Google Brain
develops TensorFlow

2017: Google releases
DeepLearn.js

2019: TensorFlow Lite
is released

Start

End

2015: TensorFlow
released to the public

2018: DeepLearn.js
merges with
TensorFlow to become
TensorFlow.js

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Component Module Demo

- **Directory Structure**

  /web/modules/custom/tensorflow

  .../tensorflow/tensorflow.info.yml

  .../tensorflow/components

  .../tensorflow/components/comp_tensorflow/comp_tensorflow1.component.yml

  .../tensorflow/components/comp_tensorflow/index.html

  .../tensorflow/components/comp_tensorflow/tf_script.js

- **Creating Component**

  - Create tensorflow.info.yml file
  - Create comp_tensorflow.componet.yml
  - Create tf_script.js
  - Create index.html

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Future Plans for Tensorflow.js

- Recommender for Drupal Commerce

- Chatbot using NLP

- Job Recommender

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Resources

6.1: Introduction to TensorFlow.js - Intelligence and Learning

https://www.youtube.com/watch?v=Qt3ZABW5lD0

Drupal "component" module: part 1: JS apps as Blocks

https://www.youtube.com/watch?v=SWA8d83j__I

Drupal "component" module: part 2: custom HTML tags (web-components)

https://www.youtube.com/watch?v=ynJDVFHsEzU&t

THANK YOU!

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